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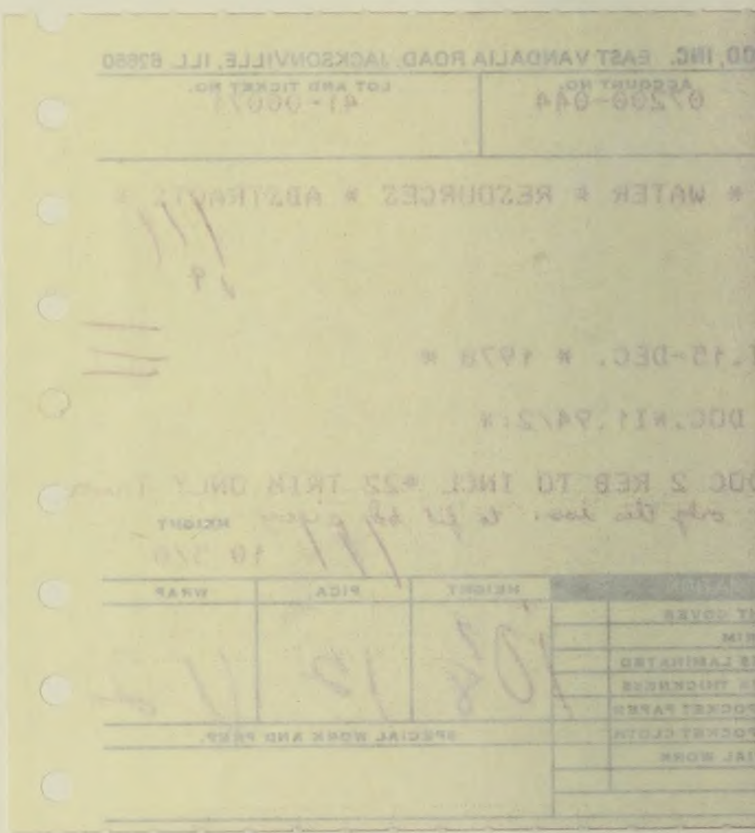

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SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 18
SEPTEMBER 15, 1978

W78-08201 -- W78-08800

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent onographs, journal articles, reports, and other publication rmats. The contents of these documents cover the water-lated aspects of the life, physical, and social sciences as ell as related engineering and legal aspects of the charac-ristics, conservation, control, use, or management of water. ach abstract includes a full bibliographical citation and a set descriptors or identifiers which are listed in the **Water esources Thesaurus.** Each abstract entry is classified into 0 fields and 60 groups similar to the water resources re-earch categories established by the Committee on Water esources Research of the Federal Council for Science and echnology.

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elected Water Resources Abstracts is designed to serve he scientific and technical information needs of scientists, ngineers, and managers as one of several planned services f the Water Resources Scientific Information Center WRSIC). The Center was established by the Secretary of the nterior and has been designated by the Federal Council for Science and Technology to serve the water resources com-munity by improving the communication of water-related esearch results. The Center is pursuing this objective by co-ordinating and supplementing the existing scientific and tech-nical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent litera-ture in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from estab-lished discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Ab-stracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear ab-stractless in SWRA. Similar arrangements with other pro-ducers of abstracts are contemplated as planned augmen-tation of the information base.

The input from these Centers, and from the 51 Water Re-sources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the informa-tion base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and ar-rangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

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ABSTRACT SOURCES

2. WATER CYCLE

2A. General

THE STABILITY OF PARAMETER ESTIMATION IN THE GENERAL LINEAR MODEL,
Ireland Office of Public Works, Dublin.
T. Bree.
Journal of Hydrology, Vol. 37, No. 1/2, p 47-66, April 1978. 4 fig, 4 tab, 11 ref.

Descriptors: *Runoff, *Water storage, *Hydrographs, *Model studies, Mathematical models, Precipitation(Atmospheric), Rainfall, Unit hydrographs, Storage, Rainfall-runoff relationships, Equations, Estimating equations, Rivers, Streamflow, Storms, Floods, Hydrologic cycle, Hydrology.

The identification of system parameters in the general or multi-parametric linear model can give rise to serious difficulties, particularly when only a small amount of data is available. The problem is centered on the degree of collinearity in the input to the system. A high degree of collinearity causes ill-conditioning, and small errors in the input-output data result in severe oscillations in the derived kernel function. This effect was examined by analyzing the system both in the time domain and in the transform domain, and in each case an index was derived which measures the degree of collinearity present. The stochastic linear model was fitted to the relationship between effective rainfall and direct surface runoff by the direct algebraic method in which the objective function is the sum of squared deviations between the observed and predicted runoff, and the statistical properties of this estimator were described. In a numerical example, the optimal unit hydrograph was derived by combining the data from a number of independent flood events. The addition of further rainfall-runoff data into the joint estimation procedure greatly reduces the degree of collinearity. The model was extended to allow for an observed correlation in the random disturbances of the system, and the parameter estimates were validated using an additional flood event. (Sims-ISWS)
W78-08282

SIMULATION OF THE HYDROLOGIC CYCLE USING ATMOSPHERIC WATER VAPOR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
P. Magyar, A. N. Shahane, D. L. Thomas, and P. Bock.
Journal of Hydrology, Vol. 37, No. 1/2, p 111-128, April 1978. 7 fig, 6 tab, 16 ref.

Descriptors: *Hydologic cycle, *Synthetic hydrology, *Meteorological data, *Model studies, Mathematical models, *Water vapor, Atmosphere, Precipitation(Atmospheric), Runoff, Evapotranspiration, Watersheds(Basins), Drainage, Hydrology, Meteorology, Water vapor transport.

To extract useful hydrologic information from existing meteorological observations, a recently developed simulation procedure for four experimental drainage basins (size ranging from 51,800 to 151,028 sq km) of the US was described. In addition to generating and verifying the mean monthyl hydrometeorological time series for a 5-year period, an attempt was made to extend mean monthly hydrometeorological components for a period of 26 years using a longer span of the available historical precipitation and runoff time series. The final outcome of the computerized simulation program provides the extreme values (with five selected return periods) for two atmospheric components (precipitation, runoff, evapotranspiration, and change in terrestrial storage). These maximum and minimum values are expected to be useful in developing various criteria while planning the large-scale water resource projects on flood routing, land drainage, irrigation, erosion protection, navigation, water power utilization, and water supply. (Sims-ISWS)
W78-08285

SENSIBILITY OF PARAMETERS OF THE SSARR MODEL (SENSIBILITE DES PARAMETRES DU MODELE SSARR),
Hydro-Quebec, Montreal. Service Hydraulique.
N. Kang.
Journal of Hydraulic Research, Vol. 16, No. 1, p 1-25, 1978. 20 fig, 20 tab, 12 ref.

Descriptors: *Watersheds(Basins), *Model studies, *Runoff, *Computer models, Rainfall-runoff relationships, Hydrology, Precipitation(Atmospheric), Evaporation, Infiltration, Hydrographs, Soil moisture, Reservoirs, Analytical techniques, Foreign research, SSARR model, Model parameters.

The most powerful use of the SSARR model is in its flexibility, which permits the user to model hydrologically any watershed. However, hydrologic experience and familiarity with the program are needed for the successful use of this model. The great flexibility of the model comes from the watershed parameters (16) introduced in the model. The present studies gave a basis understanding of these parameters and their effects on the streamflow computation. An attempt was made to quantify these effects in giving in per cent the variations of discharge, runoff volume, etc., in relation to the variations of each parameter. Results of these studies could be used by anyone who applies the SSARR program to model any particular watershed. (Humphreys-ISWS)
W78-08293

UNDERGROUND RESERVOIRS TO CONTROL THE WATER CYCLE,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 4B.
W78-08297

COMPUTATION OF THE RAIN RUNOFF OF UNSTUDIED RIVERS IN THE USSR,
For primary bibliographic entry see Field 4A.
W78-08575

2B. Precipitation

CALIFORNIA DROUGHT OF 1976 AND 1977: EXTENT, DAMAGE, AND GOVERNMENTAL RESPONSE.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-08225

WEATHER AND WATER.
World Meteorological Organization, Geneva (Switzerland).
Available from the National Technical Information Service, Springfield, VA 22161 as N77 25740 H2/E, Price codes: A03 in paper copy, A01 in microfiche. Report WMO-No. 463, 1977. 25 p, 13 fig.

Descriptors: *Meteorology, *Hydrology, *Weather, *Precipitation(Atmospheric), *Forecasting, *Water loss, *Water supply, Irrigation, Land use, Climates, Dams, Flood control, Climatology, *Hydrological forecasting, *Climatic change, Dam flooding.

The complex interdependence of meteorology and hydrology are documented from a non-technical viewpoint. Topics addressed include: hydrological forecasting, weather and water data for designing hydraulic structures, dam flooding, water loss avoidance, effect of land use on water supply, irrigation, winds, climatic change, the role of the World Meteorological Organization (WMO) in water resources development, WMO projects in developing countries in Africa, Asia, and South America, and WMO activities in hydrology and water resources development. (Seip-IPA)
W78-08245

THE PREDICTION OF SHORT-DURATION STORM RAINFALL INTENSITY MAXIMA,
Saint David's Univ. Coll., Lampeter (Wales). Dept. of Geography.
G. N. Sumner.
Journal of Hydrology, Vol. 37, No. 1/2, p 91-100, April 1978. 3 fig, 3 tab, 4 ref.

Descriptors: *Rainfall intensity, *Storms, *Rainfall, Model studies, Mathematical models, Equations, Data processing, Analytical techniques, Forecasting, Statistics, Correlation analysis, Weather, Meteorology, Short-duration rainfall, Intensity maxima.

The acquisition of rainfall intensity maxima data over very short durations (generaly less than 15 min) for individual rainstorms remains a problem. Autograhic gauges of a desirable accuracy are rarely available at low cost, and other forms of measurement such as radar, also depend heavily upon intensive capital investment. Certan within-storm maximum intensity relationships, however, can be exploited to permit the estimation of shorter-period from longer-period values, where the instrumental base is poor or sparse. Statistically significant relationships emerge between short and longer duration maxima over a number of rain events at a site. The significance of these relationships increases as the durations correlated approach one another, due to interdependence of data. More usefully, however, curves of the form I sub t = kt to the (-n) power, generally applied to intensity maxima over periods of the order of decades, can be equally well-fitted to observed intensity maxima over different durations in the same rain event. Examples of convectional storms and frontal disturbances were given, and in each case the goodness of fit was excellent. (Sims-ISWS)
W78-08283

SIMULATION OF THE HYDROLOGIC CYCLE USING ATMOSPHERIC WATER VAPOR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W78-08285

RAINFALL ANALYSIS FOR THE DESIGN OF STORM SEWERS IN BOMBAY,
Associated Industrial Consultants, Bombay (India).
S. D. Chawathe, U. R. Shinde, S. S. Fadanvis, and V. V. Goel.
Journal of the Institution of Engineers (India), Vol 58, Part EN1, p 14-20, October, 1977. 1 fig, 9 tab, 5 ref.

Descriptors: *Rainfall, *Runoff, *Storm water, *Storm drains, Analytical techniques, Mathematical studies, Data collection, Computer programs, Urban runoff, *Rainfall intensity, Sewerage, Municipal wastes.

Rainfall intensity, duration, and frequency relationships were examined for two sections of Bombay, India, over 24-33 yrs as a preliminary to designing and upgrading storm sewers. Rainfall data over 24 yrs in Colaba represented 1,349 storms; 33 yrs of rainfall records for Santa Cruz

encompassed 2,708 storms. A rational method of storm sewer system design was used in conjunction with the least squares method of rainfall analysis to calculate the design discharge from the product of the runoff coefficient, the area serviced by the designed storm sewer, and the storm intensity over a specific duration and frequency. Rainfall intensity was derived as a function of storm duration and storm frequency. A computer program was developed to correlate data on storm frequencies of various durations and intensities with intensity-duration-frequency relationships for specific storm frequencies. The relationships were then used to estimate runoff in storm sewers by the rational formula. Calculated rainfall and runoff data were in close agreement with observed values. The information from the study was to be used in designing storm water sewers for the city of Bombay. (Lisk-FIRL)
W78-08433

IMPACT OF RAINFALL ENHANCEMENT ON HYDROLOGY,
Kansas State Univ., Manhattan. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3B.
W78-08570

SOUTHERN ARIZONA FLOODS OF OCTOBER 6-11, 1977,
Weather Service Forecast Office, Phoenix, AZ.
For primary bibliographic entry see Field 2E.
W78-08577

A DEVICE TO EXCLUDE DUST FROM RAIN-WATER SAMPLES,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
D. G. Benham, and K. Mellanby.
Weather, Vol. 33, No. 4, p 151-154, April 1978. 2 fig, 4 ref.

Descriptors: *Instrumentation, *Sampling, *Rain water, *Rain gages, Patents, Equipment, Precipitation gages, Gages, Water sampling, Electronics, Automatic control, Automation.

The device described appears to act rapidly, is relatively inexpensive and simple to produce, and, as it is battery operated, can be used at sites remote from electric power supplies. It is based on the principle that the continuous impact of rain drops falling on the sensing area removes a protective cover from the rain gauge. Dust, falling leaves, wind, and other extraneous vibrations and sounds do not activate the cover. The device can be set specifically to discriminate between various forms of precipitation, e.g., drizzle, hail, heavy rain. The device was shown diagrammatically and the electronic circuitry was indicated. The main sensor consists of a thin aluminum plate which acts both as a sounding board and a cover for the rain gauge. The plate is connected to a microphone, being mounted so that the vibrations or impulses are transmitted to it. The microphone activates a small direct current motor. The apparatus will operate continuously for several months using two 9-volt dry batteries. The electronic circuitry can be used to filter the signal and to discriminate between the types of signal produced so that only the desired form of signal removes the cover. This device was awarded a provisional patent No. 32032 on 29 July 1977. (Humphreys-ISWS)
W78-08578

2C. Snow, Ice, and Frost

SNOWMAPPING IN SOUTHERN NORWAY BY USE OF LANDSAT IMAGERY,
Norsk Inst. for Vannforskning, Blindern.
J. Skorve.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-33572, Price codes: A03 in paper copy, A01 in microfiche. Report NASA CR 155031, May 25, 1977. 25 p, 21 fig, 2 tab.

Descriptors: *Snow survey, *Norway, *Snow cover, *Remote sensing, Satellites(Artificial), Snowmelt, Mapping, Precipitation(Atmospheric), *Snowmapping, *LANDSAT, *Areal hydrology.

LANDSAT remote sensing techniques were used to study the snowcover in four mountainous basins in southern Norway which represent four different climatological conditions. Data from 1975 and 1976 enabled the observation of one complete melting season; observations cover the period of mid-May to the end of August 1975. Subsequent runoff information is compared with the rate of decrease in areal extent of the snow cover in each basin. LANDSAT imagery is well-suited for snowmapping in mountainous Norway. There is an obvious correlation between the areal extent of snow cover and the amount of water stored in the basins as snow. LANDSAT images and data are presented. (Seip-IPA)
W78-08238

MEASUREMENTS OF THE ENERGY FLUXES INVOLVED IN THE ENERGY BUDGET OF A SNOW COVER,
Atmospheric Environment Service, Downsview (Ontario).
D. C. McKay, and G. W. Thurtell.
Journal of Applied Meteorology, Vol 17, No 3, p 339-349, March 1978. 3 fig, 2 tab, 22 ref.

Descriptors: *Snow cover, *Energy budget, *On-site investigations, Energy, Snow, Measurement, Data processing, Meteorological data, Temperature, Air temperature, Winds, Radiation, Solar radiation, Humidity, Heat transfer, Energy fluxes.

Measurements of the various energy components involved in an energy balance of a snow cover were made at the Elora Research Station, University of Guelph, during the winter of 1976. A pressure sphere anemometer and a sonic anemometer-thermometer, in conjunction with fast response, fine wire, resistance thermometers and Lyman-alpha humidiometers, were used to measure the fluxes of sensible and latent heat by eddy correlation techniques. A net radiometer and soil heat flux plates measured the radiative and soil heat fluxes. The data allowed a complete energy budget to be calculated, including the energy stored in the snowpack and/or utilized in the fusion process, determined as a residual. The data indicated the absence of any close relationship between the net radiation and sensible and latent heat fluxes during the diurnal cycle. The flux of heat into the snowpack was found to be a major component of the energy balance. Maximum evaporation from the snow to be a major component of the energy balance. Maximum evaporation from the snow surface was observed to occur following the replacement of warm moist air masses by cold dry air masses. During these periods the sensible and latent heat fluxes were greater than the net radiation and resulted in a rapid loss of energy from the snowpack. The determination of evaporation from the snowpack using a Bowen ratio energy balance approach was found to be impractical because the large energy flux into the snowpack could not be determined independently with sufficient accuracy. (Sims-ISWS)
W78-08272

WATER YIELD OF LOW-ALPINE SNOW TUSSOCK GRASSLAND IN CENTRAL OTAGO,
Otago Univ., Dunedin (New Zealand). Dept. of Botany.
For primary bibliographic entry see Field 2G.
W78-08277

PAST GLACIAL ACTIVITY IN THE CANADIAN HIGH ARCTIC,
Alberta Univ., Edmonton. Dept. of Geography.
J. England, and R. S. Bradley.
Science, Vol 200, No 4330, p 265-270, April 21, 1978. 2 fig, 41 ref.

Descriptors: *Arctic Ocean, *Glaciology, *Arctic, *Geomorphology, Ice, On-site investigations, Glacial drift, History, Geologic history, Evaluation, Analysis, *Greenland, *Ellesmere Island, Ice sheet.

Field observations on northeast Ellesmere Island indicated that the maximum advance of the northwest Greenland Ice Sheet was about 100 km beyond its present margin. This occurred before the outermost Ellesmere Island ice advance, which took place more than 30,000 years before present (B.P.), Recession from the Ellesmere Island ice margin began at least 28,000 to 30,000 and possibly more than 35,000 years B.P. During this sequence of glacial events, significant land areas remained free of ice. The late Wisconsin ice extent along both northeast Ellesmere Island and northwest Greenland was extremely limited, leaving an ice-free corridor along Kennedy and Robeson channels. Recession from these ice margins is indicated by initial postglacial emergence around 8100 to 8400 years B.P. The relatively minor extent of late Wisconsin ice in the High Arctic probably reflects a period of extreme aridity occasioned by the buildup of the Laurentide Ice Sheet to the south. (Humphreys-ISWS)
W78-08279

WATER MOVEMENT IN POROUS MEDIA TOWARDS AN ICE FRONT,
Technische Hogschool, Eindhoven (Netherlands). Dept. of Technical Physics.
M. B. G. M. Biermans, K. M. Dkjkema, and D. A. De Vries.
Journal of Hydrology, Vol. 37, No. 1/2, p 137-148, April 1978. 9 fig, 3 tab, 11 ref.

Descriptors: *Soil water movement, *Frozen ground, *Freezing, *Laboratory tests, Ice, Ice-water interfaces, Porous media, Temperature, Water temperature, Pressure, Frost heaving, Frost action, Soils, Soil water, Physics, Soil science, *Ice fronts.

The influence of pressure on water flow towards an ice front, located above a glass filter, was investigated experimentally at temperatures in the range from 0 to -0.05C. At constant temperature, pressures of the ice and the water were controlled independently. The former was kept at 1 atm., while the latter was lowered stepwise between 1 and 0.2 atm. At a given temperature, equilibrium was observed at a pressure difference between ice and water that can be found from a Kelvin-type equation. At a smaller pressure difference, water flowed towards the ice, while ice accretion and frost heaving occurred. At a larger pressure difference, melting of the ice and water flow away from the ice front were observed. A simplified description was given of the phenomena occurring in the interfacial layer of water between the ice and the glass filter. (Sims-ISWS)
W78-08287

PROBLEMS OF THE THEORY OF FLASH FLOOD FORMATION IN THE RIVERS OF THE PERMAFROST ZONE,
For primary bibliographic entry see Field 2E.
W78-08576

2D. Evaporation and Transpiration

MEASUREMENTS OF THE ENERGY FLUXES INVOLVED IN THE ENERGY BUDGET OF A SNOW COVER,
Atmospheric Environment Service, Downsview (Ontario).

For primary bibliographic entry see Field 2C.
W78-08272

EFFICIENT PREDICTION OF GROUND SURFACE TEMPERATURE AND MOISTURE, WITH INCLUSION OF A LAYER OF VEGETATION,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2G.
W78-08275

EVAPORATION FROM HORIZONTAL SOIL COLUMNS WITH VARIABLE DIFFUSIVITY,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak.
Journal of Hydrology, Vol. 37, No. 1/2, p 129-136, April 1978. 3 fig, 7 ref, 1 append.

Descriptors: *Evaporation, *Diffusivity, *Soil moisture, *Model studies, Mathematical models, Moisture content, Equations, Mathematics, Soil water, Soil water movement, Porous media, Soils, Hydraulic conductivity, Analytical techniques.

Presented herein was an analytical solution to the problem of evaporation from horizontal soil columns in which diffusivity increases linearly with moisture content. The exact solution of the nonlinear governing differential equation was compared with the solution of the linearised governing differential equation. The solution of the problem with variable diffusivity in relation to the constant diffusivity case was discussed. The analysis showed that the existing solution for constant diffusivity is a special case of the solution for variable diffusivity presented in this paper. (Sims-ISWS)
W78-08286

SOIL MOISTURE EFFECTS ON TRANSPIRATION AND NET CARBON DIOXIDE EXCHANGE OF SORGHUM,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-08362

DIURNAL ALBEDO VARIATION OF BLACK SPRUCE AND SPHAGNUM-SEDGE BOGS,
Oregon State Univ. Extension Service, Corvallis.
E. R. Berglund, and A. C. Mace, Jr.
Canadian Journal of Forest Research, Vol. 6, No. 3, p 247-252, September 1976. 2 fig, 2 tab, 16 ref.

Descriptors: *Fluctuation, *Bogs, *Albedo, Wetlands, Seasonal, Diurnal, Canopy roughness, Black spruce, Sphagnum-sedge, Reflected solar radiation, Microrelief.

Diurnal albedo relationships were determined for two bog types in northern Minnesota. Two opposing, cart-mounted Kipp and Zonen pyranometers traversed a tramway to integrate space and time variations of incoming and reflected solar radiation (wave-band 0.3-3.0 microns). The black spruce (Picea mariana (Mill.) B.S.P.) stand's diurnal albedo was parabolic. Albedo increased with solar altitude to a maximum at 1200 h (7-8%) and then decreased. Greatest within-season variation occurred during June and September. Canopy roughness was the dominant influence on albedo variation and differences. The sphagnum-sedge type diurnal albedo was M-shaped. A minimum albedo between two maxima occurred at 1200 h. Albedos increased from the 1200-h minimum to each maxima as a result of reported surface 'flattening' effects, increased specular reflection, and changes in solar radiation quality. Albedos before the first and after the second maxima were dominated by the microrelief roughness of the sphagnum-sedge hummocks. (Stihler-Mass)
W78-08414

VARIATION IN SOIL MOISTURE UNDER NATURAL VEGETATION,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
T. W. Sammis, and D. L. Weeks.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 235-240. 3 tab, 1 fig, 4 ref.

Descriptors: *Desert plants, Moisture, *Evapotranspiration, Soil water movement, Sampling, Moisture availability, *Soil-water-plant relationships, Soil surveys, *Cresosote, *Bursage.

Soil water content was measured every two weeks during 1974-75, using a neutron probe at selected locations around the desert plant species creosote (Larria Divaricata), and bursage (Ambrosia Deltoidea), and in an open space. The purpose was to estimate the plants evapotranspiration rate by measuring soil moisture depletion. The sampling problem associated with measuring soil moisture using neutron access tubes is the number, location, and installation depth of the tubes. Analyses of the total soil moisture beneath the creosote plant showed greater variability between access tubes located near different plants the same distance from the crown of the plant than between tubes located around the same plant. Because of the size of the bursage plant, the variability in total soil moisture beneath the plant was greater among tubes around the same plant than between tubes at the same position at different plants. (Payton-Arizona)
W78-08733

2E. Streamflow and Runoff

THE STABILITY OF PARAMETER ESTIMATION IN THE GENERAL LINEAR MODEL,
Ireland Office of Public Works, Dublin.
For primary bibliographic entry see Field 2A.
W78-08282

TIME-SYNCHRONISED STAGE RECORDERS FOR THE MONITORING OF INCREMENTAL DISCHARGE INPUTS IN SMALL STREAMS,
Bristol Univ. (England). Dept. of Geography.
M. G. Anderson, and T. P. Burt.
Journal of Hydrology, Vol. 37, No. 1/2, p 101-109, April 1978. 7 fig, 1 tab, 6 ref.

Descriptors: *Stream gages, *Instrumentation, Equipment, *Water level recorders, *Streamflow, Watersheds(Basins), Streams, Runoff, Base flow, Discharge(Water), Subsurface drainage, Subsurface runoff, On-site investigations, On-site data collections, Electrical equipment, Hydrology, *Stage recorders.

In small catchments the precise timing and magnitude of discharge inputs from various source areas are required for the detailed investigation of catchment hydology processes. A design of an electrical stage recorder was given. The recorded recorder allows synchronous timing of discharge events at various points. Several such stage recorders may be linked to a single multi-channel chart recorder. Results were presented which show the system to be capable of a high degree of resolution in the recording of times of peak discharge at six adjacent sites within a 1.5-sq km upland catchment. (Sims-ISWS)
W78-08284

DILUTION GAUGING ON THE RECESSION LIMB: 2. THE INTEGRATION METHOD,
Institute of Hydrology, Wallingford (England).
K. Gilman.
Hydrological Sciences Bulletin, Vol. 22, No. 4, p 469-481, December 1977. 2 fig, 2 tab, 14 ref.

Descriptors: *Tracers, *Gaging, *Hydrograph analysis, Recession curves, Hydrology, Streams, Flow, Discharge(Water), Equations, Mathematics, Mathematical studies, *Tracer injection, Dilution gauging, Tracer movement, Systematic error.

The application of dilution gauging techniques to natural streams and other variable flows incurs a systematic error caused by the change in discharge with time. On the recession limb of a hydrograph, the change is usually smooth and gradual, and errors can be expected intuitively to be small. In a preceding paper the author investigated errors arising from this cause in the case of a constant rate tracer injection and developed formulas for the calculation of bias from known values of the recession constant and the distribution of residence time in the gauging reach. This paper extended the theory of the residence time model to the case of a dilution gauging by the integration method and presented analogous formulas for the errors. (See also W78-05774) (Lee-ISWS)
W78-08289

NON-TIDAL VARIABILITY IN THE CHESAPEAKE BAY AND POTOMAC RIVER: EVIDENCE FOR NON-LOCAL FORCING,
Johns Hopkins Univ., Baltimore, MD. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2L.
W78-08299

CRITICAL FLOW IN RIVERS WITH FLOOD PLAINS,
LaLonde, Girouard, Letendre and Associates, Montreal (Quebec).
S. Petryk, and E. U. Grant.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY5, Proceedings Paper 13733, p 583-594, May 1978. 9 fig, 6 ref, 2 append.

Descriptors: *Critical flow, *Rivers, *Flood plains, *Model studies, Mathematical models, Channels, Channel flow, Flood control, Flow, Hydraulics, Froude number, Analytical techniques.

Problems with the two existing critical flow computation procedures were examined, and a simplified method was proposed for composite section channels. Existing methods, which are based on the minimum in the specific energy curve, can result in two major problems. The first one is that excessively high flow depths may be difined as critical. The second problem is that more than one minimum in the specific energy curve can occur; i.e., more than one flow depth may be defined as critical for a given discharge. The proposed method defines crigtical depth as the level where the discharge weighted Froude number is equal to 1.00. Example computations were carried out for a river and flood plain case. They illustrated the proposed computation procedure and compared the results obtained by the three methods of analysis. (Sims-ISWS)
W78-08568

RIVER TRANSPORT MODELING FOR UNSTEADY FLOWS,
Sutron Corp., Arlington, VA.
T. N. Keefer, and H. E. Jobson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY5, Proceedings Paper 13735, p 635-647, May 1978. 4 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Streamflow, *Unsteady flow, *Mass transfer, *Georgia, Flow, Model studies, Mathematical models, Dye releases, Rivers, River flow, Dispersion, Water levels, Hydraulics, *Chattahoochee River(GA).

Coupled flow-mass transport models were applied to a 17-mile (27.8-km) reach of the Chattahoochee River between Buford and Norcross, Georgia. Discharge variations from 550 cfs to 8,000 cfs (15 cu m/s to 100 cu m/s) in less than 20 min were analyzed. Accompanying stage variations were as much as 7 ft (2 m). Two data sets with 5-min time resolution were used to calibrate and verify the flow model. A longitudinal depth profile at steady low flow also was used in the calibration. Data from a 3-day continuous-injection dye study were used to verify the mass-transport model. The study demonstrated the feasibility of coupled models under highly unsteady flow conditions. The dye study demonstrated the unusual nature of conservative mass transport in unsteady flow. Both the flow and mass-transport models produced answers approaching the accuracy of the data. These are estimated as + or - 29 min in time, + or - 15%-20% for discharge, and + or - 0.5-ft (0.1-m) for stage. (Sims-ISWS)
W78-08569

EFFECT OF RESERVOIRS ON THE DEGREE OF RIVER RUNOFF REGULATION IN THE USSR,
For primary bibliographic entry see Field 4A.
W78-08571

METHOD FOR COMPUTING (BY COMPUTER) THE RETRANSFORMATION OF FLOOD RUNOFF HYDROGRAPHS FOR RIVERS REGULATED BY A CASCADE OF RESERVOIRS (AS EXEMPLIFIED BY THE VOLGA-KAMA CASCADE),
For primary bibliographic entry see Field 4A.
W78-08572

REGIONALIZATION OF THE USSR ACCORDING TO COPHASED ANNUAL RIVER RUNOFF FLUCTUATIONS,
N. V. Lalykin.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 127-132, 1976. 1 tab, 3 fig, 10 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 307-316, 1975.

Descriptors: *Runoff, *Rivers, *Fluctuations, *Regional analysis, Hydrologic data, Discharge(Water), Annual, Cycles, Foreign research, Foreign countries, River flow, *USSR, Regionalization.

Cophased annual runoff fluctuations are understood to be the single-valued pattern of flow of the phases of the cycles or the synchronism of runoff phases. To regionalize the USSR rivers according to the similarity of cyclic runoff fluctuations, the author used small and medium rivers having a zonal flow regime. For regionalization according to cophasal runoff, 400 rivers were selected with an observation record of not less than 25 years. The dimensions of the river basins were tabulated. The regionalization was performed on the basis of normalized integral difference curves of annual runoff and of correlation coefficients. Within each region a degree of similarity of long-period runoff fluctuations was used for which the longest cycles of any river remained representative. As a rule, this condition is satisfied when the correlation coefficient between the runoff of rivers of a region is no less than 0.50-0.60. Analysis of the data made it possible to identify 40 hydrosynoptic regions. (Humphreys-ISWS)
W78-08573

INVESTIGATION OF THE MAXIMUM RUNOFF OF RIVERS IN THE SOVIET FAR EAST,
D. L. Sokolovskiy, I. F. Goroshkov, Yu. M. Georgiyevskiy, A. A. Samokhin, and N. N. Solov'yeva.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 98-101, 1976. 1 tab, 14 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 54-60, 1975.

Descriptors: *Runoff, *Runoff coefficients, *Flash floods, *Flood discharge, Peak discharge, River flow, Surface runoff, Foreign research, Foreign countries, Watersheds(Basins), Geographical regions, Asia, Discharge(Water), *USSR(Far Eastern region), Maximum runoff.

To develop maximum runoff standards, a study was made of the runoff of rivers and small watercourses in Far Eastern regions. To obtain field data on the runoff of small watercourses, field investigations were made for 14 years of maximum discharges from the traces of past floods. About 700 watercourses were investigated in the Amur and Lena river basins, on Sakhalin Island, and Kamchatka. Not only these data, but the runoff and precipitation observations of the Hydrometeorological Service, and the results of investigations by the Far Eastern Hydrometeorological Scientific Research Institute, by the Far Eastern State Planning and Surveying Institute of the State Committee for Transportation Construction of the USSR, and other organizations were used to develop the standards. The results of simultaneous runoff and precipitation observations during flood periods were used to compute the runoff coefficients as the ratio of flood runoff depth to the depth of flood-forming precipitation. It was recommended that the tabulated runoff coefficients be used in the developed working formula to compute flash flood discharges of 1% probability. The mean deviation of discharges, computed from this formula, from observed discharges is 10-40%. (Humphreys-ISWS)
W78-08574

COMPUTATION OF THE RAIN RUNOFF OF UNSTUDIED RIVERS IN THE USSR,
For primary bibliographic entry see Field 4A.
W78-08575

PROBLEMS OF THE THEORY OF FLASH FLOOD FORMATION IN THE RIVERS OF THE PERMAFROST ZONE,
Ye. D. Gopchenko.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 91-94, 1976. 5 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 31-39, 1975.

Descriptors: *Flash floods, *Theoretical analysis, *Hydrograph analysis, *Rainfall-runoff relationships, Runoff, Cold regions, Permafrost, Rivers, Mathematical studies, Foreign research, Analysis, Analytical techniques, Equations, Hydrographs, Recession curves, Mathematical models, *USSR.

The lithological section of permafrost can be a divided arbitrarily into two layers: (1) a very loose active layer having a high infiltration rate, and (2) a virtually impermeable permafrost layer which acts as a water barrier in the warm part of the year and the depth of which is not constant, but increases or decreases depending on the sign of the heat budget at the permafrost table. To describe the formation of runoff from slopes in the zone of active water exchange of the active layer with only slightly changing position of the permafrost table, the differential equations of motion: were used. Developed equations for the rising branch and recession branch of hydrographs of runoff from a slope for variable depth of thawings along the slope for variable depth of thawings along the slope and subsurface runoff were presented. (Humphreys-ISWS)
W78-08576

SOUTHERN ARIZONA FLOODS OF OCTOBER 6-11, 1977,
Weather Service Forecast Office, Phoenix, AZ.
E. J. Perfrement, and R. A. Wood.
Weatherwise, Vol. 31, No. 2, p 66-70, April 1978. 3 fig, 7 photos.

Descriptors: *Arizona, *Floods, *Rainfall, *Disasters, Tropical storms, Data collections, Rivers, Rainfall disposition, Distribution, Isohyets, Flood damage, Flood peak, Storms, Storm runoff, Flooding, Floodwater, Surveys, *Heather, *Gila River, *Santa Cruz River, *San Pedro River.

Arizona is not far from the Pacific Ocean and, therefore, is subject to an occasional tropical storm, especially during September and October. One of these storms, 'Heather' brought near-record rains and flooding to portions of the state on October 6-11, 1977. This storm resulted in a 50 to 100 year flood along the Santa Cruz River from Nogales to Marana. For many areas, the storm values approached, or in some instances exceeded, rainfall totals for an average year. The Santa Cruz's peak discharge from Nogales to Continental reached the so-called '100-year flood level' of 30-40,000 cubic feet per second (cfs), and an estimated 18-25,000 cfs in the Tucson area-a 50-year flood level. Peak discharge on the San Pedro River was an estimated 24,000 cfs at Charleston. Peak discharge on the Gila River at Kelvin was 19,000 cfs. Estimates of up to $13 million in damage resulted from the storm. Most of the damage was confined to the Santa Cruz River, between Nogales and Marana. Particularly hard hit were bridges and roadways, but private property and agriculture also were affected. There were no injuries or deaths in any of the flooding. (Humphreys-ISWS)
W78-08577

2F. Groundwater

DIURNAL PERIODICITY IN GROUND-WATER RECHARGE RATES,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4B.
W78-08274

SOLUTE TRAVEL TIMES TO WELLS IN SINGLE OR MULTIPLE LAYERED AQUIFERS,
Iowa Agriculture and Home Economics Experimental Station, Ames.
J. Cushman, and D. Kirkman.
Journal of Hydrology, Vol. 37, No. 1/2, p 169-184, April 1978. 6 fig, 11 ref.

Descriptors: *Travel time, *Groundwater movement, *Water wells, *Model studies, Mathematical models, Wells, Drawdown, Injection wells, Pollutants, Path of pollutants, Solutes, Flow, Aquifers, Groundwater, Hydraulic conductivity, Recharge, Hydrology.

Approximate travel times were given for a solute to reach a well from an injection point and for a well of finite radius screened throughout an aquifer resting on an impervious sole where: (1) there is a constant head at the outer boundary of the flow region; and (2) there is no flow across the outer boundary. In both cases, the time of travel for a solute entering the top of the aquifer at a point r sub k satisfies approximately a logarithmic relationship as follows: ln r sub k = A ln t + B where t is the time of travel from the point r sub k to the well, and A and B are constants depending on the problem considered. This linear relationship holds only up to a certain distance of injection from the well. This distance varies with the problem considered. (Sims-ISWS)
W78-08288

ETERMINATION OF AQUIFER PARAME-ERS FOR A MULTIPLE WELL SYSTEM,
iddle East Technical Univ., Ankara (Turkey).
ept. of Engineering Sciences.
. Corapcioglu.
ydrological Sciences Bulletin, Vol. 22, No. 4, p 83-486, December 1977. 1 fig, 1 tab, 5 ref.

escriptors: *Aquifer characteristics, *Hydraulic roperties, *Aquifer testing, *Graphical methods, ransmissivity, Storage coefficient, Aquifers, ater wells, Observation wells, Curves, Type urves, Multiple well system.

A curve fitting method was described which deter-nines the storage coefficient and transmissivity of n extensive aquifer in which several wells are umping simultaneously. A family of type curves as constructed using several values of S/T. For ny assumed value of S/T, there is a type curve for hich 1/t is the independent variable and Sigma Q ub iW(u sub i) is the dependent variable. If the ischarge is the same for each well, Sigma W(w ub i) can be plotted, instead, as the dependent ariable. The assumptions and restrictions for the roposed method are similar to those which apply o the Theis curve-fitting method. (Visocky-ISWS)
W78-08290

A MATHEMATICAL MODEL OF STRATIFIED GROUNDWATER FLOW,
Egyptian Desert Inst., Cairo. Water Resources Div.
N. Rofail.
Hydrological Sciences Bulletin, Vol. 22, No. 4, p 503-512, December 1977. 4 fig, 3 ref.

Descriptors: *Stratification, *Saline water intrusion, *Mathematical models, *Aquifers, Groundwater movement, Boundaries(Surfaces), Groundwater recharge, Equations, Numerical analysis, Computer programs, Hydrologic boundaries.

The problem of stratified groundwater flow (salt water intrusion) was considered in the general case where the hydrological boundaries can have any shape and the impervious bed can have any configuration. The recharge and discharge also can be considered according to any given function of time. The fluid density was assumed to be constant throughout each layer. The effect at the boundaries was considered, whether the boundaries were a river or a continuation of the aquifer with different parameters. The systems of equations were taken in alternative matrix forms. The three time level implicit scheme was used, and the multi sweep method was applied for the computation. The numerical procedure of the mathematical model is linearly unconditionally stable. In this procedure, no iteration routines were introduced, and therefore, it was considered exceptionally economical in memory and in computing time. (Visocky-ISWS)
W78-08291

USE OF TRACERS TO CONFIRM GROUNDWATER FLOW,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-08296

UNDERGROUND RESERVOIRS TO CONTROL THE WATER CYCLE,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 4B.
W78-08297

GROUND WATER MANUAL, A GUIDE FOR THE INVESTIGATION, DEVELOPMENT, AND MANAGEMENT OF GROUND-WATER RESOURCES.
Bureau of Reclamation, Washington, D.C.
Stock Number 024-003-00106-6 For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, and the Bureau of Reclamation, Engineering and Research Center, P.O. Box 25007, Denver Federal Center, Denver, Colo. 80225. Water Resources Technical Publication, First Edition, 1977. 480 p, 104 fig, 35 tab, 272 ref, append.

Descriptors: *Groundwater, *Publications, *Aquifers, Base flow, Groundwater resources, Aquifer testing, Aquifer systems, Data collections, Groundwater movement, Groundwater potential, Aquifer yield estimation, Water wells, Borehole geophysics, Permeability tests, Well design, Dewatering systems, Drilling, Pumps, Well specifications, Well sterilization, Bibliographies, Well-aquifer relationships, Infiltration, Corrosion, Incrustation, Turbine pumps, Well rehabilitation.

This manual has been prepared as a guide to field personnel in the more practical aspects and commonly encountered problems of ground-water investigations, development, and management. Information is presented concerning such aspects as ground-water occurrence and flow, well-aquifer relationships, ground-water investigations, aquifer test analysis, estimating aquifer yield, data collection, and geophysical investigations. In addition, permeability tests, well design, dewatering systems, well specifications and drilling, well sterilization, pumps, and other aspects have been discussed. An extensive bibliography has also been included. The manual has been developed over a period of years, and its many contributors have diversified technical backgrounds. Contributors include personnel from the Bureau of Reclamation Engineering and Research Center and field offices, other agencies, foreign governments, and many individual scientists and engineers. (Bur Reclam)
W78-08542

EXACT SOLUTIONS FOR TWO-DIMENSIONAL GROUNDWATER FLOW PROBLEMS INVOLVING A SEMI-PERVIOUS BOUNDARY,
Rijkswaterstaat, Rijswijk (Netherlands). Data Processing Div.
P. Van der Veer.
Journal of Hydrology, Vol. 37, No. 1/2, p 159-168, April 1978. 9 fig, 3 ref.

Descriptors: *Groundwater movement, *Groundwater, *Subsurface drainage, *Model studies, Mathematical models, Drainage, Soil water, Soil water movement, Equations, Boundary layers, Permeability, Soil science, Polders, Semi-pervious layers.

Defined herein were an analytical function (V) of the complex potential (omega) and its derivative with respect to the complex coordinate (z) which can be used to find exact solutions for two-dimensional groundwater flow problems involving a semi-pervious boundary. Boundary conditions may involve a semi-pervious layer of constant resistance, vertical equipotential lines, and vertical stream lines. Solutions were found by conformal mapping of the V-plane on the z-plane and by solving the first-order differential equation that is formed by the relationship between V and z. Some examples of the use of the function V were given. (Sims-ISWS)
W78-08547

RESULTS OF PUMPING TESTS IN CRYSTALLINE-ROCK AQUIFERS,
Geraghty and Miller, Inc., Tampa, FL.
For primary bibliographic entry see Field 4B.
W78-08556

HYDROGEOLOGY OF THE MEDICINE HAT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W78-08580

2G. Water In Soils

EFFICIENT PREDICTION OF GROUND SURFACE TEMPERATURE AND MOISTURE, WITH INCLUSION OF A LAYER OF VEGETATION,
National Center for Atmospheric Research, Boulder, CO.
J. W. Deardoff.
Journal of Geophysical Research, Vol 83, No C4, p 1889-1903, April 20, 1978. 11 fig, 3 tab, 49 ref.

Descriptors: *Soil temperature, *Soil moisture, *Vegetation effects, *Model studies, Mathematical models, Vegetation, Soil properties, Evaporation, Evapotranspiration, Solar radiation, Forecasting, Estimating equations, Energy budget, Rainfall, Drying, Temperature, Moisture content.

An efficient time-dependent equation for predicting ground surface temperature was tested against a 12-layer soil model and compared with five other approximate methods in current use. It was found to be generally superior if diurnal forcing is present and very much superior to the use of the insulated surface assumption. An analogous method of predicting ground surface moisture content was presented. The method allows the surface to become moist quickly during improved methods are not of much relevance unless the main influences of a vegetation layer are included. Therefore, an efficient one-layer foliage parameterization was developed that extends continuously from the case of no shielding of the ground by vegetation to complete shielding. It included influences of both ground and foliage albedos and emissivities, net leaf area index, stomatal resistance, retained water on the foliage, and several other considerations. When it was tested against data for wheat, the one-layer parameterization appeared to be quite adequate despite the many simplifying assumptions. The parameterization predicted that errors of up to a factor of 2 in evapotranspiration can be incurred by ignoring the presence of a vegetation layer. (Sims-ISWS)
W78-08275

WATER YIELD OF LOW-ALPINE SNOW TUSSOCK GRASSLAND IN CENTRAL OTAGO,
Otago Univ., Dunedin (New Zealand). Dept. of Botany.
A. F. Mark, and J. Rowley.
Journal of Hydrology (New Zealand), Vol 15, No 2, p 59-79, 1976. 15 fig, 3 tab, 13 ref.

Descriptors: *Water yield, *Grasslands, *Alpine, Hydrology, Transpiration, Interception, Watersheds(Basins), Hydrologic budget, Soils, Water balance, Snow, *New Zealand, *Otago(New Zealand), Snow tussock grassland.

Transpiration and interception studies have confirmed earlier claims that the increased water surplus under large snow tussocks results from their substantial gains by interception. This more than compensates for their relatively high transpiration. With water potentially the most valuable product of many high mountain areas, and the water-deficient Taieri catchment in particular, the conclusion that the maximum water yield (and control) from the low-alpine snow tussock grasslands was obtained (in this region at least) from a natural undisturbed cover warrants testing on a larger scale. Fifteen non-weighing lysimeters somewhat smaller than a unit area of a single snow tussock, operated for six years in low-alpine snow tussock grassland at c. 1000 m on Rock and Pillar Range, have shown that the type and condition of plant

cover can modify appreciably the water yield. Untreated snow tussocks provided the greatest water surplus: 63% of the 1348 mm mean annual raingauge catch, while a sward of blue tussock yielded significantly less (49%). Snow tussocks which initially were either burned or severely clipped were associated with intermediate yields: 60% and 54%, respectively, for the six-year period, although annual throughput from the burned plants showed a significant increase with time, relative to that of the normal tussocks, coinciding with their recovery. Water surplus under bare soil (56%) was also intermediate between normal snow tussocks and the blue tussock sward. (Lee-ISWS)
W78-08277

EVAPORATION FROM HORIZONTAL SOIL COLUMNS WITH VARIABLE DIFFUSIVITY,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2D.
W78-08286

WATER MOVEMENT IN POROUS MEDIA TOWARDS AN ICE FRONT,
Technische Hogschool, Eindhoven (Netherlands). Dept. of Technical Physics.
For primary bibliographic entry see Field 2C.
W78-08287

EROSION OF COHESIVE SOILS,
Stuttgart Univ. (West Germany). Inst. fuer Theoretische und Angewandte Physik.
For primary bibliographic entry see Field 2J.
W78-08294

WATER MOVEMENT IN BARE AND CROPPED SOIL UNDER ISOLATED TRICKLE EMITTERS: I. ANALYSIS OF BARE SOIL EXPERIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
W. A. Jury, and K. D. Earl.
Soil Science Society of America, Journal, Vol. 41, No. 5, p 852-856, September-October, 1977. 8 fig, 1 tab, 12 ref.

Descriptors: *Soil water movement, *Irrigation efficiency, *Water content, *Ponding, *Loam, Irrigation practices, Hydraulic conductivity, Tensiometers, Irrigated land, *Trickle irrigation.

Water movement in arid-land irrigated soils is important to crop production, and is studied extensively in the Southwest. A field experiment on a Buren sandy loam with a low saturated hydraulic conductivity is reported here. Water movement in soil irrigated from a single isolated trickle emitter was observed. Soil water movement was followed by tensiometers and gravimetric water-content sampling, and surface ponding was photographed. More water moved laterally in the weekly irrigation plots than in the daily ones, which required consideration of surface-ponding effects for mathematical modeling. (Popkin-Arizona)
W78-08313

SALINITY AND NITROGEN MINERALIZATION IN SOIL,
Indian Agricultural Research Inst. New Delhi. Div. of Soil Science and Agricultural Chemistry.
R. D. Laura.
Soil Biology and Biochemistry, Vol. 9, p 333-336, 1977. 5 tab, 22 ref.

Descriptors: *Salinity, *Nitrogen, *Ammonification, *Soil amendments, Nutrients, Crop production, Plant growth, Soil moisture, Sandy loam, Laboratory tests, Ammonia, Nitrates, Nitrites, Fertilizers, Ureas, Arid lands, Nitrogen transformations, Nitrogen mineralization, Soil processes, Compost.

Next to soil moisture, salinity and nutrients are the limiting factors for crop production and plant growth. The effects of salinity on ammonification, nitrification and mineral nitrogen accumulation in incubated soils are studied in a laboratory experiment using a sandy loam soil in New Delhi, India. NH4-N, NO2-N and NO3-N were measured periodically for 102 days in the laboratory soil and in soil amended with farm compost, mustard oil cake or urea. While increased salinity retarded ammonification, it did not suppress it completely. Nitrification was retarded, suppressed or inhibited completely by salinity, depending on the amount of salt and amendment type. Accumulated mineral N decreased with increased salinity. Possible mechanisms for these relations are briefly noted. (Popkin-Arizona)
W78-08337

SOLUTE TRANSFER, WITH EXCHANGE BETWEEN MOBILE AND STAGNANT WATER, THROUGH UNSATURATED SAND,
Universite Scientifique et Medicale de Grenoble (France). Inst. de Mecanique.
J. P. Gaudet, H. Jegat, G. Vachaud, and P. J. Wierenga.
Soil Science Society of America Journal, Vol 41, No 4, p 665-671, July - August, 1977. 6 fig, 2 tab, 22 ref.

Descriptors: *Ion transport, *Stagnant water, *Unsaturated flow, *Soil water movement, *Leaching, Sands, Irrigation efficiency, Soil water, Salinity, Mathematical models, Water content, Diffusion, Dispersion, Soil-water chemistry, Soil chemical properties.

Solute movement in soils is an extensively researched field in the arid-land irrigation agriculture of the Southwest U.S. Solute movement in soils is of interest for improving leaching and irrigation efficiency. The equation which describes solute movement in soil is reviewed, and the assumption that the solute does not react with the media is discussed. Salt concentrations were measured in place along the flow axis and at the exit of an unsaturated column of graded sand, and leached at a constant rate with water containing noninteracting salt. Observed and computed solute distribution profiles were compared. Dispersion coefficients, diffusional mass transfer coefficients, and fraction mobile water were obtained at one depth, and used to calculate values at other depths. Excellent agreement between observed and computed values were obtained. The model, which accounts for stagnant and reactive solute, presented a good description of solute transfer and exchange between mobile and stagnant water. The amount of stangnat water increased with decreasing water content. The apparent dispersion coefficient decreased with decreasing water content. The model explains solute tailing, stagnant water and slow diffusion in unsaturated soils. (Popkin-Arizona)
W78-08360

DETERMINING CATION EXCHANGE CAPACITY: A NEW PROCEDURE FOR CALCAREDUS AND GYPSIFEROUS SOILS,
Agricultural Research Service, Riverside, CA. Salinity Lab.
M. Polemio, and J. D. Rhoades.
Soil Science Society of America, Journal, May-June 1977, Vol 41, No 3, p 524-528. 2 tab, 2 fig, 23 ref.

Descriptors: *Cation exchange, *Soil chemistry, *Soil chemical properties, *Soil analysis, *Laboratory tests, Calcareous soils, Sodium chloride, Magnesium compounds, Mineralogy, Calcite, Leaching, Gypsiferous soils, Exchangeable sodium compounds, Magnesium compounds.

Soil-chemical properties determine the quality of leached water in irrigated arid land soils. A new, two-step procedure for determining cation exchange capacity (CEC) of calcareous and gypsiferous soils is presented. Soil sample is saturated with sodium by four successive equilibrations using NaOAc-NaCl solution. The saturated sample then is extracted with three increments of MgNO3. Total Na and Cl are determined in the extracted solution. Total Cl is determined so that soluble Na may be deducted from the total Na. The exchangeable na, or total Na less soluble Na, is equivalent to the CEC. The method eliminates most errors inherent in conventional methods. (Popkin-Arizona)
W78-08361

SOIL MOISTURE EFFECTS ON TRANSPIRATION AND NET CARBON DIOXIDE EXCHANGE OF SORGHUM,
Kansas State Univ., Manhattan. Dept. of Agronomy.
C. R. Sumavao, E. T. Kanemasu, and T. Hodges.
Agricultural Meteorology, Vol 18, p 401-408, 1977. 5 fig, 1 tab, 12 ref.

Descriptors: *Soil moisture, *Transpiration, *Carbon dioxide, *Sorghum, *Soil-water-plant relationships, Arid lands, Moisture stress, Irrigated land, Crop production, Plant growth, Energy budget, Air temperature, Stomata, Photosynthesis.

Sorghum is a common crop in the American arid and semi-arid lands, as it is in Kansas. This field study determined the effect of soil moisture on net carbon dioxide exchange (NCE) and transpiration of sorghum (Sorghum bicolor). Test crops were grown under well-watered and water-stressed conditions at the Evapotranspiration Experimental Site southwest of Manhattan, Kansas. Adjacent 5m x 6m plots were used. The one plot was artificially stressed by withholding rainfall intentionally through the use of a movable shelter. The well-watered plot was irrigated initially and regularly to assure a uniform stand. Components of the energy balance, soil moisture, leaf and air temperature, stomatal resistance, and leaf-water potential used to determine NCE and transpiration rates. Transpiration and NCE rates were reduced when available soil moisture was less than 35 percent of maximum, or 91 mm and the rate was enhanced by air temperatures exceeding 33C. Photosynthetic rates declined when leaf temperatures exceeded 33C. At and below the critical soil-moisture level, leaf-water potential decreased and resistance to vapor transport increased; that reduced transpiration and NCE rates. Figures show seasonal patterns of available soil moisture; daily trends in potential and actual transpiration, NCE rates, and leaf and air temperatures; near midday differences in temperatures as a function of soil moisture. A table shows estimated stomatal resistance of crops under both treatment. (Popkin-Arizona)
W78-08362

SPECIFIC SURFACE CHARACTERISTICS OF ARIZONA SOILS,
Arizona Agricultural Experiment Station, Tucson.
D. F. Post.
Journal of the Arizona Academy of Science, Vol 12, No 1, p 12-14, February 1977. 2 tab, 18 ref.

Descriptors: *Arizona, Arid climates, On-site data collections, *Clays, Soil investigations, Soil moisture, *Soil analysis, *Soil types, *Irrigation effects, Irrigation water, Sampling, Analytical techniques, *Soil physical properties.

Lack of rainfall has restricted agricultural expansion in southern and central Arizona to those areas receiving irrigation water. Samples of ten representative soils, ranging from loamy sand to clay, were collected and analyzed from test sites in Maricopa, Pinal and Pima Counties. Specific surface data, related soil properties were summarized. The per cent of clay in these ten soils was found to be the predominant factor determining the soil's specific surface. (Jewkes-Arizona)
W78-08364

SOIL WATER CHANGES IN THE CREOSOTEBUSH AND BUR-SAGE DURING A DRY PERIOD IN SOUTHERN ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Flagstaff, AZ.
D. R. Cable.
Journal of the Arizona Academy of Science, Vol 12, No 1, p 15-20, February, 1977. 6 fig.

Descriptors: *Arizona, *Soil water movement, Recharge, Sampling, Evapotranspiration, Evaporation, Moisture deficit, Desert plants, Arid climates, Precipitation(Atmospheric), Impact(Rainfall), On-site investigations, Water utilization, *Creosotebush, *Bur-sage.

This study was designed to investigate the seasonal pattern of soil water recharge and use by two Sonoran desert shrubs, creosotebush (Larrea divaricata) and bursage (Ambrosia deltoidea), at five sites. Recharge and soil water depletion were measured within stands of creosotebush and bursage from June 1974 to December 1975. Results demonstrated: (1) soil water was rapidly extracted following recharge, within two or three weeks, during the winter and spring; (3) evaporation of soil water from bare areas, and (4) creosotebush and bur-sage were able to exist during relatively long periods of almost no precipitation. (Jewkes-Arizona)
W78-08368

DETERMINATION OF KINETICS OF PHOSPHORUS MINERALIZATION IN SOILS UNDER OXIDIZING CONDITIONS,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-08378

FERTILIZER AND PESTICIDE MOVEMENT FROM CITRUS GROVES IN FLORIDA FLATWOOD SOILS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 5B.
W78-08379

A POSSIBLE MODEL FOR THE SURFACE-INDUCED HYDROLYSIS OF ORGANO PHOSPHORUS PESTICIDES ON KAOLINITE CLAYS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
U. Mingelgrin, S. Saltzman, and B. Yaron.
Soil Science Society of America Journal, Vol 41, No 3, p 519-523, May-June, 1977. 4 tab, 1 fig, 28 ref.

Descriptors: *Hydrolosis, *Pesticides, *Organophosphorus compounds, *Organic pesticides, *Chemical degradation, *Kaolinite, Clays, Phosphorus, Laterites, Hydrosols, Pesticide removal, Adsorption, Soil moisture, Cations, Catalysis, Soil chemical properties.

Because pesticides are commonly applied to aridland irrigated soils, pesticide degradation is an important research area for irrigated lands in the Southwest U.S. Kaolinite, an important component in southwestern U.S. and tropical soils, particularly Ultisols and Oxisols, is a potential carrier of some pesticides because of pesticide-kaolinite interaction. Kaolinite enhancement of pesticide degradation, degradation at specific adsorption sites, the moisture and cation dependence of kaolinite's catalytic activity, the phosphate hydrolysis product, and surface-induced hydrolysis of pesticides are reviewed. A mechanism of surface hydrolysis is introduced which accounts for the susceptibility of organophosphate ester molecules to hydrolysize the phosphate ester bond, where the molecules are then rapidly degraded on the kaolinite surfaces. The ligand water associated with counter ions performs the hydrolysis of the organophosphate molecules. The degradation of the pesticide depends on the saturating cation and its hydration status. The model is based on collected and reviewed data for a number of organophosphorus insecticides, particularly parathion. (Popkin-Arizona)
W78-08391

WATER MOVEMENT IN BARE AND CROPPED SOIL UNDER ISOLATED TRICKLE EMITTERS: II. ANALYSIS OF CROPPED EXPERIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
K. D. Earl, and W. A. Jury.
Soil Science Society of America Journal, Vol 41, No 5, p 856-861, September-October, 1977. 6 fig, 4 tab, 21 ref.

Descriptors: *Soil water movement, *Crop response, *Irrigation efficiency, *Crop production, *Moisture stress, Irrigation practices, Irrigation systems, Hydraulic conductivity, Tensiometers, Water content, Ponding, Evapotranspiration, Root distribution, Irrigated land, Loam, Vegetable crops, *Trickle irrigation.

Water movement in arid land irrigated soils is important to crop production, and is studied extensively in the Southwest U.S. A field experiment on a Buren sandy loam with a low saturated hydraulic conductivity, and cropped with summer squash (Zucchini) is reported. Water movement in soil irrigated from a single isolated trickle emitter was observed. Soil water movement was followed by tensiometers and gravimetric water-content sampling, and surface ponding was photographed. Replicated plots receiving the same volumes of water were irrigated three times daily and once a week. Irrigation volumes were adjusted according to evapotranspiration and tensiometric data. Weekly irrigations produced greater water movement both laterally and vertically downward than daily irrigations. There was greater root density beneath emitters because of water stress. Zucchini yields in the outer ring of weekly irrigated plants were 30 percent higher than the most productive daily irrigated plots. Total green matter and dry matter yields were greater in weekly irrigated plots. Crops watered by widely spaced emitters on low conductivity soils might yield better under weekly irrigations than under more frequent irrigations. (Popkin-Arizona)
W78-08392

ANALYSIS OF ESTUARINE SOIL GRADIENTS IN SALT MARSHES OF THE SOUTHWESTERN NETHERLANDS WITH SPECIAL REFERENCE TO THE SCHELDT ESTUARY,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 5A.
W78-08407

PROTON BINDING IN FULVIC ACID EXTRACTED FROM SEWAGE SLUDGE-SOIL MIXTURE,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 5A.
W78-08462

SOIL PERCOLATION TESTS IN THE LAGOS AREA,
Lagos Univ. (Nigeria).
For primary bibliographic entry see Field 5B.
W78-08464

THE MOVEMENT OF SEWAGE EFFLUENT THROUGH SOIL COLUMNS: THE MAJOR IONS (NA, CA, MG, CL, AND SO4),
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W78-08492

FLOW AGAINST DISPERSION IN NONADSORBING POROUS MEDIA,
California Univ., Davis. Dept. of Land, Air and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
M. A. Marino.
Journal of Hydrology, Vol. 37, No. 1/2, p 149-158, April 1978. 12 ref, 1 append.

Descriptors: *Dispersion, *Flow, *Porous media, *Soil water movement, Model studies, Mathematical models, Groundwater, Soil water, Solutes, Tracers, Equations, Mathematics, Aquifers, Water quality, Path of pollutants.

Analytical solutions were developed for dispersion problems in finite nonadsorbing porous media in which the flows are opposite to the dispersion. The flows were assumed to be one-dimensional in a horizontal direction, and the average velocities were taken to be constants throughout the flow fields. Concentrations varying as exponential functions of time were enforced at the source of the dispersion, while a condition in which the change in concentration is proportional to the flow was applied at the other boundary. Also included were solutions that take into account the decay of a radioactive tracer as it is being transported through nonadsorbing porous media. Different forms for the solutions were given to facilitate the computation of particular values. The solutions are useful for analyzing the possible prevention of the spread of poor-quality water by a flow of freshwater. (Sims-ISWS)
W78-08546

HYDRODYNAMIC DISPERSION DURING ABSORPTION OF WATER BY SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
D. E. Smiles, J. R. Philip, J. H. Knight, and D. E. Elrick.
Soil Science Society of America Journal, Vol. 42, No. 2, p 229-234, March-April 1978. 7 fig, 2 tab, 14 ref.

Descriptors: *Dispersion, *Soil water movement, *Solutes, *Absorption, Laboratory tests, Leaching, Unsteady flow, Unsaturated flow, Soil water, Soil properties, Moisture content, Salts, Hydrodynamics, Soils, Soil science.

An experimental study is reported of hydrodynamic dispersion of low concentration solutions during absorption into horizontal columns of soil with initially uniform moisture and solute contents. The initial soil solutions were of relatively high salt concentration. It was found that both the water and salt concentration profiles preserved similarity in terms of distance divided by the square root of time. This observation implies that the longitudinal dispersion coefficient is insensitive to pore water velocity and may be taken as a function of the volumetric water content only, at least for a given initial (low) moisture content. The formulation which follows is frankly phenomenological. It provides a simple means of predicting dispersion during flow in unsaturated soils which promises to be sufficiently accurate for most purposes. (Sims-ISWS)
W78-08557

PERTINENT CRITERIA FOR DESCRIBING THE DISSOLUTION OF GYPSUM BEDS IN FLOWING WATER,
Georgia Coastal Plain Experimental Station, Tifton, Dept. of Agronomy.
T. C. Keisling, P. S. C. Rao, and R. E. Jessup.
Soil Science Society of America Journal, Vol. 42, No. 2, p 234-236, March-April 1978. 1 fig, 4 ref.

Descriptors: *Gypsum, *Dissolved solids, *Mass transfer, Model studies, Mathematical models, Solutes, Flow, Dispersion, Erosion, Soils, Soil science, *Dissolution, Dissolution coefficient.

The equation for convective-dispersive solute transport in porous beds and the continuity equation were used to derive a relationship describing the dissolution of gypsum beds in flowing water. The parameters involved in the derived relationship were: bed length, solution flow velocity, dispersion coefficient, mass transfer rate coefficient, and gypsum fragment size. The proposed relationship was compared with previously published data and shown to be valid. A potential practical field application of the procedure was presented. (Sims-ISWS)
W78-08558

CALIBRATION STABILITY AND RESPONSE TIME FOR SALINITY SENSORS,
Agricultural Research Service, Riverside, CA. Salinity Lab.
J. D. Wood.
Soil Science Society of America Journal, Vol. 42, No. 2, p 248-250, March-April 1978. 1 fig, 4 tab, 14 ref.

Descriptors: *Instrumentation, *Salinity, *Saline soils, *Calibrations, Equipment, Laboratory tests, Stability, Electrical conductance, Measurement, Soil science, Sensors, Salinity sensors, Sensor calibration, Response time, Calibration stability.

Commercially produced salinity sensors removed from field and lysimeter experiments lasting from 3 to 5 years were tested for calibration stability relative to the original factory calibration. Significant changes in calibration occurred in up to 14% of the sensors after 4 and 5 years of use. Response to a step-change in salinity also was examined for commercial units in a field installation. Calculated response factors were lower than those found in a previous laboratory experiment. However, response was sufficiently rapid to assure accurate readings if changes in salinity occur in time intervals exceeding 5 days. (Sims-ISWS)
W78-08559

THEORETICAL MODELING OF MIXED-ELECTROLYTE SOLUTION FLOWS FOR UNSATURATED SOILS,
Agricultural Research Organization, Bet Dagan (Israel). Div. of Soil Physics.
E. Bresler.
Soil Science, Vol. 125, No. 4, p 196-203, April 1978. 20 ref.

Descriptors: *Mathematical models, *Unsaturated flow, *Salts, *Soils, Theoretical anaysis, Equations, Calcium, Sodium, Convection, Diffusion, Dispersion, Ion exchange, Hydraulic conductivity, Mixed salt solution, Double-layer theory, Coupling.

A mixed salt solution with ions that interact with the soil matrix are important in field problems involving the simultaneous flow of water and mixed Na-Ca salts in unsaturated soils. Governing partial differential equations describing transient, one-dimensional, simulatneous transfer of mixed anions, cations, and water were formulated, taking into account physicochemical interaction between mono and divalent ions and the soil matrix. Effects of convection, diffusion, mechanical dispersion, anion exclusion, cation exchange and adsorption, and coupling phenomena were considered jointly. Soil-interacting and coupling parameters were estimated theoretically from mixed-ion diffuse double-layer theory, taking into account tactoids, capillarity, and hydrodynamic considerations. The coupling-interacting parameters included; osmotic efficiency coefficient, anion exclusion, cation exchange equilibria, soil water retentivity, and unsaturated hydraulic conductivity and their dependence on soil water content and soil solution concentration and composition. A finite difference approach that eliminates numerical dispersion was used to approximate the nonlinear partial differential equations and the boundary conditions appropriate to infiltration, redistribution, drainage, and evaporation of soil water. A brief computational scheme concluded the paper. (Visocky-ISWS)
W78-08563

A SOIL COLUMN TENSION LYSIMETER THAT MINIMIZES EXPERIMENTAL EDGE EFFECTS,
Dartmouth Coll., Hanover, NH. Dept. of Biological Sciences.
C. S. Cronan.
Soil Science, Vol 125, No 5, p 306-309, May 1978. 2 fig, 2 tab, 12 ref.

Descriptors: *Lysimeters, *Leachate, *Soil chemistry, *Infiltration, *Percolation, Instrumentation, Infiltrometers, Runoff, Soil water, Leaching, Solubility, Percolating water, Rainfall-runoff relationships, Seepage, Penetration, Soil physical properties, Soil water movement, *Tension lysimeter, *Edge effects.

A new tension lysimeter, intended for use with isolated, undisturbed soil columns, has been developed. This lysimeter offers the following advantages: it is inexpensive; it minimizes problems associated with experimental edge effects; it is essentially chemically inert; and it permits sampling both saturated and unsaturated flow in soil leaching experiments. Data were presented to illustrate the relatively low variability observed in flow volumes and leachate chemistry between replicate undisturbed soil columns receiving identical treatments. (Henley-ISWS)
W78-08565

DISPERSION STUDY OF BURIED ELEMENTAL MERCURY,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 5E.
W78-08655

A NEW DIELECTRIC SOIL MOISTURE METER FOR FIELD MEASUREMENT OF SOIL MOISTURE,
Technical Univ. of Prague (Czechoslovakia). Dept. of Irrigation and Drainage.
E. V. Kuraz, and J. Matousek.
International Commission on Irrigation and Drainage, Vol 26, No 1, p 76-79, January, 1977. 3 fig, 5 ref.

Descriptors: *Soil moisture measurement, Soil water, Soil properties, Bulk density, Sampling, *Measurement(Dielectric method).

A new apparatus for the soil moisture measurement in field conditions by a dielectric method has been developed. The arrangement is based on the principle of the capacitance--frequency convertor. With a good operating reliability and temperature stability, a miniaturization of the device has been reached. The apparatus works in the whole range of moisture content, the measurement is also influenced by the change of bulk density. The temperature change is irrelevant and the sensitivity to the change of the chemical composition is low. The measuring procedure is very simple, the reading is possible either on the scale, or a registering apparatus can be connected. For each soil a calibration curve has to be determined. (Skogerboe-Colorado State)
W78-08707

DEEP PLOWING, CURE FOR SODIC CLAYPAN,
Agricultural Research Service, Mandan, ND.
For primary bibliographic entry see Field 3F.
W78-08708

OUR NEWEST NATURAL RESOURCE--COMPACTION--GOOD AND BAD EFFECTS ON ENERGY NEEDS,
Agricultural Research Service, Morris, MN.
For primary bibliographic entry see Field 3F.
W78-08709

MODELING INFILTRATION UNDER MOVING SPRINKLER IRRIGATION SYSTEMS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
D. C. Slack.
Paper No. 77-2557, (1977). Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Palmer House Hotel, Chicago, Illinois. 23 p, 9 fig, 1 tab, 21 ref.

Descriptors: *Model studies, Infiltration, *Sprinkler irrigation, Irrigation, *Irrigation systems, Soils, Simulation analysis, *Mein and Larson model, *Irrigation soils.

A modified Mein and Larson model was employed to predict time to surface ponding under two types of center pivot irrigation systems on two agricultural soils. Results were compared with those observed in the field. The model did a good job of predicting time to surface ponding but did not perform as well as for predicting volume infiltrated at ponding. (Skogerboe-Colorado State)
W78-08720

EXPERIMENTAL EVALUATION OF TWO INFILTRATION EQUATIONS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
F. Idike, C. L. Larson, D. C. Slack, and R. A. Young.
Paper No. 77-2558, (1977). Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Palmer House Hotel, Chicago, Illinois. 21 p, 6 fig, 4 tab, 21 ref.

Descriptors: *Infiltration, Soil water, Soil moisture, *Soil water movement, *Runoff forecasting, *Equations, Evaluation, Application rates, *Holtan equation, *Mein and Larson equation, Forecasting.

Infiltration from constant application rates as predicted by the Holtan equation and the Mein and Larson equation was compared to values determined experimentally. Both equations did a good job of predicting infiltration during latter and middle portions of the experimental runs. The Mein and Larson equation did a good job of predicting time to start of runoff, while the Holtan equation generally underpredicted infiltration during initial stages of the runs. (Skogerboe-Colorado State)
W78-08721

THE CONTROL OF NITRATE AS A WATER POLLUTANT,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 5G.
W78-08723

RESIDUAL WAXES FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W78-08731

VARIATION IN SOIL MOISTURE UNDER NATURAL VEGETATION,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W78-08733

EFFECT OF GRAZED LUCERNE ON THE MOISTURE STATUS OF WHEAT GROWING SOILS,
New South Wales Dept. of Agriculture (Australia). Tamworth Agricultural Research Center.
For primary bibliographic entry see Field 3F.
W78-08744

OBSERVATIONS OF SOIL WATER AND SALT MOVEMENT UNDER DRIP AND FLOOD IRRIGATION IN AN APPLE ORCHARD,
Commonwealth Scientific and Industrial Research Organization Merbein (Australia). Div. of Horticultural Research.
For primary bibliographic entry see Field 3C.
W78-08745

NATURE AND IMPACT OF TEMPERATURE AND MOISTURE IN ARID WEATHERING AND SOIL FORMING PROCESSES - A REVIEW.
Ghent Rijksuniversiteit (Belgium). Lab. for Physical Geography and Pedology.
W. Verheye.
Pedologie, Vol 26, No 3, p 205-224, 1976. 2 fig, 4 tab, 40 ref.

Descriptors: *Weathering, *Soil formation, *Soil moisture, *Rock properties, *Dew, *Reviews, Leaching, Rainfall, Antecedent moisture content, Microenvironment, Rock mechanics, Soil types, Salts, Gypsum, Chlorides, Dune sands, Arid lands, Soil chemical properties, Iran, Israel, Kenya.

Arid and semiarid areas are defined by climate, vegetation, soil type, and especially temperature and moisture as soil temperature and rainfall regimes. Examples of time variability of rainfall data for stations in Iran, Israel, and Kenya and its spatial variability are commonly used to explain the local occurrence of Argids in the desert. Leaching and clay movement are the result of hazardous but important soil moistening. The effectivness of rainfall as a source of soil moisture is reviewed, where amount of rain, antecedent conditions, type and stage of vegetative cover, soil texture and structure, and runoff effects are important. Atmospheric dew, linked not only to high air moisture but to thermic and hydric profile of the soil, is a main promoter of microbiological life, influences hydration of salts, and affects stone splitting along with other mechanical disintegration processes. The effect of temperature variations on mechanical weathering is noted. The combined action of temperature and soil moisture is shown to influence pressure gradients in rocks, particularly when salts are present. For the drier parts of the semi-desert (annual rainfall 200-300) some salts and gypsum may be leached during the rainy season without consistent impact on permanent horizon differentiation. The sequence of soil development is Torriothent in extremely dry areas, Calciorthid in the common arid and drier semiarid belts, toward Comborthid in moister semiarid regions. Salorthids and Gypsiothids are related to saline regions. Torripsamments and Torrifluvents represent dune areas and depression zones. Argids are explained by saline-alkaline conditions and a fluctuating groundwater table. (Popkin-Arizona)
W78-08755

RELATIVE MOVEMENT OF BROMIDE AND NITRATE IN SOILS UNDER THREE IRRIGATION SYSTEMS,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
A. B. Onken, C. W. Wendt, R. S. Hargrove, and O. C. Wilke.
Soil Science Society of America, Journal, Vol 41, No 1, p 50-52, 1977. 4 fig, 4 ref.

Descriptors: *Ion transport, *Bromides, *Nitrates, *Soil water movement, *Irrigation practices, Solutes, Sodium compounds, Corn(Field), Sands, Furrow irrigation, Sprinkler irrigation, Subsurface irrigation, Plant growth, Soil profiles, Statistical models, Field tests, Sodium bromide.

The applicability of bromide as an indicator of nitrate movement in soils was tested under field conditions. A mixture of sodium nitrate and sodium bromide was band applied to sweet corn (Zea mays L.) on Miles loamy fine sand. Three irrigation methods: furrow, sprinkler, and subirrigation, were used on the plots. Nitrate and bromide moved together in the soil profile, but concentrations were quantitatively unrelated due to antecedent nitrate-nitrogen, and differential nitrogen and bromide uptake by growing plants. Nitrate and bromide will move similarly in soil under field conditions, though bromide cannot be used to determine quantitative movement of nitrate. Figures show nitrogen and bromide in soil profiles for all three irrigation methods, and regression of nitrate-nitrogen and bromide in soil samples. (Popkin-Arizona)
W78-08756

EXCHANGE CAPACITY OF CALCIUM AND SODIUM SOILS AS DETERMINED BY DIFFERENT REPLACING CATIONS,
Technion-Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
I. Ravina, and E. Gurovich.
Soil Science Society of America, Journal, Vol 41, No 2, p 319-322, 1977. 2 fig, 5 tab, 26 ref.

Descriptors: *Cation exchange, *Soil chemical properties, *Cation adsorption, *Ion transport, *Leaching, Organic matter, Calcium, Sodium, Soil types, Polarity, Irrigation water, Loess, Calcareous soils, Organic soils, Arid soils.

Cation-exchange capacity is an important soil chemical property which affects ionic mobility, cation adsorption, ion adsorption, ion exchange, and other phenomena. Three arid land soils (Grumosol, Loess, Terra-rosa), with very low organic matter, were saturated with calcium and leached, and saturated with sodium and leached. Exchange capacities were measured for different cations. Experimental values for cation exchange capacity depended on the initially adsorbed cation and the replacement. The magnitude of exchange capacity increased with increased ionic radius, or polarizability of the replacing cation. The sodium soil showed a greater exchange capacity than the calcium soil. The exchange capacity of a calcium-saturated soil increased as the ionic radium of the replacement cation is larger. The magnitude of exchange capacity of the sodium-saturated soil decreased with increased ionic radius of the replacement cation. This work implies the effect of irrigation with high sodium or calcium water on the exchange capacity of irrigated soils. (Popkin-Arizona)
W78-08757

2H. Lakes

RESERVOIR SEDIMENTATION UNDER UNCERTAINTY: ANALYTIC APPROACH VERSUS SIMULATION,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 2J.
W78-08292

PROJECTIONS OF PHOSPHORUS LEVELS IN WHITE LAKE,
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5C.
W78-08304

LIMNOLOGICAL CHARACTERISTICS AND FISHERY POTENTIAL OF MAN-MADE DESERT PONDS,
Arizona Cooperative Fishery Research Unit, Tucson.
S. R. Alcorn, and C. D. Ziebell.
Journal of the Arizona - Nevada Academy of Science, Vol 13, No 1, p 29-42, June, 1977. 4 tab, 6 ref.

Descriptors: *Limnology, *Aquatic environment, Hydrologic aspects, Ponds, Water properties, Sampling, Water analysis, Aquatic life, Water quality, *Fish establishment, Environmental effects, Aquatic habitats, On-site data collections, *Arizona, Deserts.

Four southern Arizona pump-in ponds and represas were studied to determine the suitability of the water to support fish. Basic parameters included temperature, dissolved oxygen, pH and photic depth. Study conclusions suggested pump-in ponds were most likely to meet the necessary water quality criteria including necessary temperature, dissolved oxygen regimes suitable for fish, water depth of approximately 2.0 m, and absence of excess nutrients. Water quality of represas did not appear conducive to the establishment of fish, due to uncontrollable water levels and the presence of excess nutrients, causing eutrophication. Study of fish food chains is still necessary before a desert fishery can be successfully established. (Jewkes-Arizona)
W78-08356

ZOOGEOGRAPHY OF THE ARIZONA FAIRY SHRIMPS (CRUSTACEA: ANOSTRACA),
Arizona State Univ., Tempe.
D. Belk.
Journal of the Arizona Academy of Science, Vol 12, No 2, p 70-78, June, 1978. 3 fig, 43 ref.

Descriptors: Shellfish, *Shrimp, Crustaceans, *Arizona, Aquatic environment, Arid climates, Water chemistry, Aquatic habitats, On-site data collections, Ponds, Distribution patterns, *Environmental effects, Aquatic population, Wildlife, Water temperature.

Arizona has the most diverse fairy shrimp population of any comparable area in North America, with 13 species of the 35 recorded for all of North America. Arizona's fairy shrimp species were investigated to determine how environmental differences contributed both to species diversity and to geographical distribution. Egg hatching response to different water temperatures, varied responses to thermal tolerance and climatic variations were discussed. Study conclusions suggested regional differences in fairy shrimp species appear to be controlled by climatic variations accompanying temporary pond fillng cycles and differences in water chemistry. (Jewkes-Arizona)
W78-08365

BACTERIOLOGICAL STUDIES OF THE MESOTROPHIC LAKE JASNE,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-08382

PRIMARY PRODUCTION OF THE PLANKTON IN LAKE JEZIORAK,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-08383

INTRODUCTORY INVESTIGATIONS ON THE STRATIFICATION OF THE UNDERGROUND ORGANS OF MACROPHYTES IN LAKE JEZIORAK,
Nicholas Copernicus Univ. of Torun (Poland). Dept. of Systematics and Plants Geography.
For primary bibliographic entry see Field 5C.
W78-08384

THE PRODUCTION OF PERIPHYTONIC ALGAE IN LAKE TYNWALD,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-08385

DISTRIBUTION, PRODUCTION AND DYNAMICS OF DEVELOPMENT OF THE HELEOCHARIS PALUSTRIS (L.) ROEM. ET SCHULT. IN THE JEZIORAK LAKE,
Nicholas Copernicus Univ. of Torun (Poland). Dept. of Systematics and Plant Geography.
For primary bibliographic entry see Field 5C.
W78-08386

SWIMMERS' ITCH IN NEW BRUNSWICK: DISTRIBUTION AND DESCRIPTION OF CAUSATIVE AGENT, CERCARIA CATASCOPII N.SP.,
New Brunswick Univ., Fredericton. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08394

DISTRIBUTION AND PRODUCTION OF TWO CRUSTACEANS IN A WETLAND POND,
Georgia Inst. of Tech., Atlanta. School of Biology.
R. F. Martien, and A. C. Benke.
American Midland Naturalist, Vol 98, No 1, p 162-175, 1977. 3 fig, 2 tab, 29 ref.

Descriptors: *Wetlands, *Crustaceans, *Isopods, *Amphipod, *Distribution patterns, *Ponds, Swamps, *Georgia, Aquatic animals, Production, Periphyton, Reproduction, Benthos, Turnover, Crangonyx gracilis, Asellus obtusus, Cephalanthus occidentalis, Nyssa biflora.

Annual production of the isopod, Asellus obtusus, and the amphipod, Crangonyx gracilis sp., in a small wetland pond in Georgia was estimated by the Hynes method. Both species were found in two distinct vegetable zones: a central Cephalanthus occidentalis zone and a marginal Nyssa biflora zone. In the Nyssa zone, the crustaceans occurred in the aufwuchs and benthos, but in the Cephalanthus zone, only in the aufwuchs. Although growth of each species was relatively asynchronous, each appeared to have one generation per year. Combined aufwuchs-benthos production in the Nyssa zone was 2.44 g/sq m dry wt for Crangonyx and 1.44 g/sq m for Asellus. Annual turnover ratios were 6.1 and 6.0, respectively. Aufwuchs production in the Cephalanthus zone was 1.63 g/sq m for Crangonyx and 0.65 g/sq m for Asellus. Annual turnover ratios were 6.8 and 8.1, respectively. Benthos in Nyssa contributed the greatest crusteacean production to this zone based upon standing stock values, but aufwuchs populations were the only significant source of production in the Cephalanthus zone. (Steiner-Mass)
W78-08400

LAGOON OF ISLANDS, TASMANIA--DEATH KNELL FOR A UNIQUE ECOSYSTEM,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 6G.
W78-08417

USE OF NATURAL BASIN WETLANDS BY BREEDING WATERFOWL IN NORTH DAKOTA,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
H. A. Kantrud, and R. E. Stewart.
Journal of Wildlife Management, Vol. 41, No. 2, p 243-253, April, 1977. 2 fig, 3 tab, 27 ref.

Descriptors: *Waterfowl, *Ducks, *Wetlands, Ponds, *North Dakota, *Prairie potholes, *Breeding waterfowl, Wetland type, Ponded water, Permanence.

Use of basin wetlands by breeding populations of 12 species of waterfowl was investigated in 1965 and during 1967-1969 throughout the prairie pothole region of North Dakota. Data were obtained primarily by random sampling techniques. Of the total population occupying natural basin wetlands, 55 percent occupied seasonal and 36 percent occupied semi-permanent wetlands. Seasonsal wetlands contained 60 percent of the population of dabbling ducks, while semi-permanent wetlands supported 75 percent of the population of diving ducks. On basins with ponded water, highest concentrations of breeding pairs occurred on temporary, seasonal, and semi-permanent wetlands; moderate concentrations were recorded on ephemeral, fen, and undifferentiated tillage wetlands; and low concentrations occurred on permanent and alkali wetlands. The proportion of basins that retained ponded water had a direct bearing on the value of each type of wetland to breeding waterfowl. Relative values of the more intermittent types of wetlands greatly increased during years of ample precipitation. (Stihler-Mass)
W78-08418

TOXIC EFFECTS OF MILITARY WASTEWATER EFFLUENT,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5C.
W78-08629

2I. Water In Plants

MODELING EFFECTS OF AQUATIC PLANTS IN RIVERS.
Ministry of Works and Development, Hamilton (New Zealand).
For primary bibliographic entry see Field 5C.
W78-08300

WATER MOVEMENT IN BARE AND CROPPED SOIL UNDER ISOLATED TRICKLE EMITTERS: I. ANALYSIS OF BARE SOIL EXPERIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08313

SOIL MOISTURE EFFECTS ON TRANSPIRATION AND NET CARBON DIOXIDE EXCHANGE OF SORGHUM,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-08362

SOIL WATER CHANGES IN THE CREOSOTEBUSH AND BUR-SAGE DURING A DRY PERIOD IN SOUTHERN ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Flagstaff, AZ.
For primary bibliographic entry see Field 2G.
W78-08368

VEGETATION CHANGE IN THE SONORAN DESERT REGION, ARIZONA AND SONORA,
Forest Service, Fort Collins, CO; and Rocky Mountain Forest and Range Experiment Station, Flagstaff, AZ.
S. C. Martin, and R. M. Turner.
Journal of the Arizona Academy of Science, Vol 12, No 2, p 59-69, June, 1977. 7 fig, 19 ref.

Descriptors: Arizona, Mexico, Vegetation effects, Vegetation regrowth, *Desert plants, Plant populations, Environmental effects, Cacti, *Arid climates, Deserts, *Photography, Succession, Wildlife, Watershed management, Climatology, Rainfall.

Six series of photographs recorded changing vegetation conditions in the Sonoran Desert of Arizona and Sonora, 1906-1975. Some of the vegetational changes noted were due to rainfall variability, including periods of droughts, or periods with above average rainfall. Suggested changes caused by man included: introduction of grazing, fires, poor watershed management, and removal of woody plants. Long-term studies of the relationship between rainfall and vegetation need to be undertaken, but such studies need protected study sites, free from human influence. (Jewkes-Arizona)
W78-08370

COMPARISON OF THE PHOTOSYNTHETIC CHARACTERISTICS OF THREE SUBMERSED AQUATIC PLANTS,
Florida Univ., Gainesville. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W78-08376

WATER MOVEMENT IN BARE AND CROPPED SOIL UNDER ISOLATED TRICKLE EMITTERS: II. ANALYSIS OF CROPPED EXPERIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08392

INCREASING RANGELAND FORAGE PRODUCTION BY WATER HARVESTING,
Agricultural Research Service, Tucson, AZ. Southwestern Watershed Research Center; and Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
H. A. Schreiber, and G. W. Frasier.
Journal of Range Management, Vol 31, No 1, p 37-40, January, 1978. 2 fig, 2 tab, 11 ref.

Descriptors: *Arizona, *Arid climates, *Forage grasses, *Water supply, Surface runoff, Rainfall-runoff relationships, Plant growth, *Water control, *Water harvesting, *Range management, On-site tests, *Watershed management.

A three year study (1974-1976) was conducted on test plots on the lower Walnut Gulch Watershed, near Tombstone, Arizona, to evaluate the effect of increased water on forage production of blue panicgrass (Panicum antidotale Retz). Available water for plant growth was increased through runoff farming (water harvesting) techniques. Applying paraffin for water repellancy increased water collected in runoff areas. Test yields indicated forage production from controlled plots was 5 times greater than in plots receiving an uninterrupted planting of grass, less than 130mm. (5.1 inches) of precipitation during the growing season. (Jewkes-Arizona)
W78-08399

DISTRIBUTION AND PRODUCTION OF TWO CRUSTACEANS IN A WETLAND POND,
Georgia Inst. of Tech., Atlanta. School of Biology.
For primary bibliographic entry see Field 2H.
W78-08400

EFFECTS OF SALINITY AND DRAINAGE ON THE GROWTH OF THREE SALT MARSH GRASSES,
Louisiana State Univ., Baton Rouge. Dept. of Botany.
R. T. Parrondo, J. G. Gosselink, and C. S. Hopkinson.
Botanical Gazette, Vol 139, No 1, p 102-107, 1978. 2 fig, 3 tab, 30 ref.

Descriptors: *Salt marshes, *Halophytes, *Salt tolerance, *Ecological distribution, Wetlands, Marsh plants, Marshes, Salinity, Productivity, Grasses, *Salt marsh grasses, Spartina alterniflora, Spartina cynosuroides, Distichlis spicata.

seedlings of Spartina alterniflora, Spartina cynosuroides, and Distichlis spicata were grown in a controlled environment in a nutrient solution containing different concentrations of NaCl. In another experiment, seedlings of S. alterniflora and S. cynosuroides were grown in a greenhouse, in a 50-50 sediment-sand mixture under constantly flooded or drained substrate. Dry-weight accumulations of plants indicated that, of the three species tested, D. spicata was the most tolerant of high salinity. S. alterniflora and S. cynosuroides were similar in their response to salinity, but less tolerant than D. spicata. In general, increasing the salinity of the root medium reduced the shoot growth more than root growth. Roots of S. alterniflora grew better under flooded than drained conditions, while overall growth of S. cynosuroides was better in drained than flooded sediment. These findings are compared to field observations on the relative distribution of these species in the salt marsh, and the relative importance of salinity and flooding in determining plant distribution is briefly discussed. (Steiner-Mass)
W78-08401

SALT TOLERANCE IN THE HALOPHYTE SUAEDA MARITIMA (L.) DUM: INTERACTION BETWEEN ALUMINIUM AND SALINITY,
Sussex Univ., Brighton (England). School of Biological Sciences.
A. R. Yeo, and T. J. Flowers.
Annals of Botany, Vol 41, p 331-339, 1977. 2 fig, 5 tab, 45 ref.

Descriptors: *Halophytes, *Salinity, *Aluminium, Marsh plants, Root development, Productivity, Root systems, *Salt tolerance, *Suaeda maritima.

Growth of Suaeda maritima was stimulated by low aluminum concentrations in saline solution culture with an increase in the number and extent of lateral roots. Under non-saline conditions the same Al concentrations inhibited growth and led to an abnormal lateral root initiation. Increasing the level of Al led to growth inhibition under both culture conditions. Salinity reduced the uptake of Al into plant tissue, and there was no evidence that Al was tolerated internally. Although short-term P32 influx was increased by Al there was no long-term effect of significance on the levels of Na, K, Ca, nor P in the shoots. The results are discussed in relation to proposed mechanisms of Al toxicity and the interaction between Al and salt toxicities. An explanation is proposed for both stimulatory and inhibitory effects of Al as a quantitative expression of a single primary effect upon the root system. (Steiner-Mass)
W78-08402

PRIMARY PRODUCTION IN A LOUISIANA GULF COAST SPARTINA ALTERNIFLORA MARSH,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
C. J. Kirby, and J. G. Gosselink.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 589, Price codes: A02 in paper copy, A01 in microfiche. Ecology, Vol 57, No 5, p 1052-1059, Late summer, 1976. 3 fig, 3 tab, 21 ref.

Descriptors: *Primary productivity, *Coastal marshes, *Saltmarsh, *Louisiana, Marshes, Wetlands, *Biomass, *Spartina laterniflora, Aboveground biomass, *Barataria Bay(La).

Live and dead aboveground biomass of Spartina alterniflora Loisel in a Louisiana salt marsh was determined monthly over an annual cycle. Litterbags were used to determine loss rates of particulate vegetation from the marsh surface. Net aboveground primary production estimates ranged from 750 to 2,600 g/sq m/yr depending on how the data were handled. Analysis of the results suggested that true net production was probably much closer to the highest estimate than to the lowest. (Stihler-Mass)
W78-08404

EFFECT OF DEFOLIATION ON ROOT GROWTH OF SOME ARID ZONE PERENNIAL PLANTS,
Commonwealth Scientific and Industrial Research Organization Wembley (Australia). Div. of Land Resources Management; and Commonwealth Scientific and Industrial Research Organization Canberra (Australia). Div. of Land Resources Management.
K. C. Hodgkinson, and H. G. Baas Becking.
Australian Journal of Agricultural Research, Vol 29, No 1, p 31-42, January, 1978. 13 fig, 1 tab, 25 ref.

Descriptors: *Australia, *Plant growth, Plant growth regulators, *Plant physiology, *Root development, Plant morphology, Vegetation, *Desert plants, Defoliants, *Arid lands, *Grasses, Growth rate, *On-site tests, Evaluation, *Alfalfa.

Experiments compared the effect of defoliation on the root growth of three perennial plants: wallaby grass (Danthonia caespitosa), old man saltbush (Atriplex nummularia), and bladder saltbush (A. vesicaria) with lucerne (Medicago sativa). lucerne (Medicago sativa) is not. Longterm effects, up to 3 days after defoliation, were studied in root observation boxes outdoors. Responses of roots to defoliation were recorded by use of time-lapse photography. Tests suggested that rate of root extension of the Atriplex spp was approximately double that of M. sativa and D. caespitosa. Severity of defoliation reduced rate of root extension, increasing root mortality and decreasing the branching of roots, After complete defoliation, root extension of D. caespitosa showed signs of slowing down within an hour, while root extension of A. nummularia and M. sariva toolk 12 to 14 hours for a decrease in root extension. (Jewkes-Arizona)
W78-08408

DIURNAL ALBEDO VARIATION OF BLACK SPRUCE AND SPHAGNUM-SEDGE BOGS,
Oregon State Univ. Extension Service, Corvallis.
For primary bibliographic entry see Field 2D.
W78-08414

ABOVE-GROUND BIOMASS OF VASCULAR PLANTS IN A SUBARCTIC JAMES BAY SALT MARSH,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2L.
W78-08416

LAGOON OF ISLANDS, TASMANIA--DEATH KNELL FOR A UNIQUE ECOSYSTEM,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 6G.
W78-08417

USE OF NATURAL BASIN WETLANDS BY BREEDING WATERFOWL IN NORTH DAKOTA,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 2H.
W78-08418

STUDIES ON THE POPULATION ECOLOGY OF THE SALT MARSH GASTROPOD BATILLARIA ZONALIS,
University of the Pacific, Dillon Beach, CA. Pacific Marine Station.
For primary bibliographic entry see Field 2L.
W78-08419

THE USE OF AERIAL COLOR INFRARED PHOTOGRAPHY IN MAPPING THE VEGETATION OF A FRESHWATER MARSH,
American Univ., Washington, DC. Dept. of Biology.
L. J. Shima, R. R. Anderson, and V. P. Carter.
Chesapeake Science, Vol. 17, No. 2, p 74-85, June, 1976. 4 fig, 2 tab, 25 ref.

Descriptors: *Aerial photography, *Infrared radiation, *Mapping, *Vegetation, *Freshwater marshes, *Remote sensing, Plant groupings, Color infrared photography, *Patuxent River(Md), *Maryland.

Spring and fal vegetation maps were prepared from a freshwater marsh on the Patuxent River, Maryland. Low altitude, color infrared (IR) aerial photos were correlated with data obtained from field surveys. The vegetation units mapped refer to areas of homogenous color on the photos. These areas of homogenous color represent species associations or monospecific stands which produce a distinctive tonal signature. Color fluctuations within an area having a distinctive tonal signature are primarily caused by a quantitative variation of plant species but are also related to the growth habit, vigor of the plant species, and environmental conditions which affect the vegetation and in turn the color of the recorded image. Changes in the color over the growing season reflect plant successions were due to their unique colors, saturations, and textures. Comparisons of photographs made in nearby marshes demonstrated that three of the twelve spring, and five of the fourteen fall vegetation units were mapped can be reliably indentified. (Maroncelli-Mass)
W78-08421

WATER REQUIREMENTS OF AVOCADO IN ISRAEL, II. INFLUENCE ON YIELD, FRUIT GROWTH AND OIL CONTENT,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 3F.
W78-08422

FIELD OBSERVATIONS ON THE COLONIZATION OF NEW SUBSTRATA AND DENUDED INTERTIDAL SURFACES BY BENTHIC MACROPHYTIC ALGAE,
Dar es Salaam Univ. (Tanzania). Dept. of Botany.
K. E. Mshigeni.
Botanica Marina, Vol 21, p 49-57, 1978. 11 fig, 3 tab, 4 ref.

Descriptors: *Benthic flora, *Algae, *Sessile algae, *Plant populations, *Hawaii, *Vegetation establishment, *Revegetation, Aquatic plants, Planting management, Reproduction, *Hypnea, *Acanthophora.

Investigations have been conducted on the colonization of new substrata (brick surfaces) and recolonization of denuded intertidal surfaces by frondose benthic algae on the tropical shores of Hawaii. The bricks were 'seeded' with Hypnea cervicornis sporelings and several other species of frondose algae grew on the bricks from spores or vegetative fragments. Heights of the fronds varied from about 8 to 48 mm at two months after transfer of bricks to the field. Heights of the conspicuous frondose algae recolonizing the denuded habitat at Diamond Head two months after crop destruction ranged from about 10 to 30 mm. Results of the study suggest that algae such as Acanthophora spicifera and Hypnea nidifica can propagate vegetatively which is significant should these seaweeds be cultivated for phycocolloid production or other uses. (EIS-Katz)
W78-08660

SEASONAL MOVEMENTS OF WHITE STURGEON (ACIPENSER TRANSMONTANUS) IN THE MID-COLUMBIA RIVER,
Battelle Pacific Northwest Labs., Richland, WA. Ecosystems Dept.
J. M. Haynes, R. H. Gray, and J. C. Montgomery.
Transactions of the American Fisheries Society, Vol 107, No. 2, p 275-280, 1978. 3 fig, 1 tab, 12 ref.

Descriptors: *Freshwater fish, *Seasonal, *Fish behavior, Movement, *Radio Communication Systems, Migration, Rivers, *Columbia River, Tracking techniques, Locating, Tagging, Research and development, Methodology, *Water temperature, *White sturgeon, Radio transmitters, Acipenser transmontanus.

Twenty-nine white sturgeon were instrumented in 1975 and 1976 with separately identifiable radio transmitters to study seasonal movements in the mid-Columbia River, southeastern Washington. Tagged fish remained in free-flowing areas of the river and were inactive in winter. Movements occurred in summer and early fall. Activity appeared related to water temperature and sturgeon size. (EIS-Klein)
W78-08677

ROOT SYSTEM OF SHRUB LIVE OAK IN RELATION TO WATER YIELD BY CHAPARRAL,
Rocky Mountain Forest and Range Experiment Station, Tempe, AZ. Forestry Sciences Lab.
For primary bibliographic entry see Field 3B.
W78-08734

PRELIMINARY EXPERIMENTS ON THE GROWTH OF KENAF (HIBISCUS CANNABINUS) FOR PAPER PULP PRODUCTION IN THE ORD IRRIGATION AREA, WESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Tropical Agronomy.
For primary bibliographic entry see Field 3F.
W78-08738

LONG-TERM BIOMASS DYNAMICS IN AN ARID CHENOPOD SHRUB COMMUNITY AT KOONAMORE, SOUTH AUSTRALIA,
Australian National Univ., Canberra. Dept. of Environmental Biology.
I. R. Noble.
Australian Journal of Botany, Vol 25, No 6, p 639-653, December, 1977. 8 fig, 1 tab, 30 ref.

Descriptors: *Australia, Arid climates, Vegetation, Photography, *Rainfall, *Biomass, Shrubs, *Desert plants, On-site investigations, Hydrologic data, *Sampling, Brush control, Evaluation, Vegetation establishment, Environmental effects, Revegetation, Forages.

The Koonamore Vegetation Preserve in South Australia has maintained records of vegetation for over 50 years. This study presents a method of estimating biomass from long-term, non-rigorously controlled photo-points. Changes in biomass were correlated with rainfall, suggesting that short-leved shrubs' growth pattern is accelerated by summer rains. Biomass dynamics for all species studied showed a pattern of large input impulses, followed by a slow decline in biomass. Study conclusions confirm the average above-ground biomass and productivity for the plant community studied was c. 90 gm-2yr-1 respectively, due in part to the presence of short-lived plants. The influence of grazing industry upon short-lived plants and shrubs is described. (Jewkes-Arizona)
W78-08747

RECOMMENDED DROUGHT AND SALT-RESISTANT ORNAMENTAL PLANTS,
Ben-Gurion Univ. of the Negev, (Beersheba (Israel). Div. of Plant Introduction and Applied Ecology.
For primary bibliographic entry see Field 3B.
W78-08752

2J. Erosion and Sedimentation

BASIN DYNAMICS, CHANNEL PROCESSES, AND PLACER FORMATION: A MODEL STUDY,
Victoria Univ., Wellington (New Zealand).
J. Adams, G. L. Zimpfer, and C. F. McLane.
Economic Geology, Vol 73, No 3, p 416-426, May 1978. 9 fig, 28 ref.

Descriptors: *Placer mining, *Alluvial channels, *Channel morphology, *Model studies, Scour, Sediment transport, Aggradation, Sediment yield, Hydraulic models, Watersheds(Basins), Mining, Mineralogy, Erosion, Braiding, Streams, Testing procedures, Analysis, Laboratory tests, Heavy minerals, Magnetite.

The problems of the role of basin dynamics, tectonics, and channel processes in the formation of placers has not been well understood. These problems were investigated in a miniature drainage basin subjected to rejuvenation. Sediment samples collected during the experiment showed the response of total sediment discharge and heavy mineral discharge to rejuvenation. Total sediment yield peaked shortly after rejuvenation began and then decayed exponentially. This decay does not characterize magnetite yield which was produced in discrete events separated by periods of little output. Samples within the source area indicated that magnetite was concentrated and stored on uplands and hillslopes as well as in the floodplain. Valley fill contained horizontal layers deposited as the channel shifted laterally and trough-shaped scour and fill deposits, which marked former channel courses. Within these deposits magnetite was concentrated on bedrock channel bottoms, on alluvial channel bottoms ('false bottoms'), and in similar positions within terrace deposits. Complex response dominates basin rejuvenation. Initially, placers are destroyed and transported from the basin. Aggradation then overloads channels and heavy minerals are stored. This is succeeded by degradation during which heavy minerals are concentrated and flushed from the basin. Superimposed upon this complex response are shorter periods of heavy mineral transport and storage controlled by internal geomorphic thresholds. In both cases, heavy mineral transport is controlled directly by channel activity. Storage occurs when the channel aggrades; and when the channel degrades, heavy minerals are concentrated in the channels and transported from the basin. (Humphreys-ISWS)
W78-08273

RESERVOIR SEDIMENTATION UNDER UNCERTAINTY: ANALYTIC APPROACH VERSUS SIMULATION,
Water Resources Center, Budapest (Hungary).
I. Bogardi, L. Duckstein, F. Szidarovszky, and M. Fogel.
Hydrological Sciences Bulletin, Vol. 22, No. 4, p 545-553, December 1977. 2 fig, 1 tab, 25 ref.

Descriptors: *Reservoir silting, *Sediment yield, *Reservoirs, Reservoir storage, Reservoir yield, *Risks, Reliability, Simulation analysis, Hydrology, Equations, Mathematics, Mathematical studies, *Uncertainty, Reservoir sedimentation.

Two methods were presented of estimating accumulated sediment yield stemming from erosion in a semiarid climate during a given time span, and the methods were compared from the viewpoint of the economic consequences evaluated within a Bayesian framework. The design of reservoirs requires the estimation of the random sediment volume Z accumulated over the lifetime of the project. An analytic and a simulation method were used to estimate the density function of Z and to calculate an economically optimal sediment storage space. A case study in Arizona was used to illustrate the methodology for the typical situation when only rainfall records are available. Both methods proved to be superior to the traditional procedure leaning on mean values. For the example considered, the two methods yielded commensurate results. It appears that, in a semiarid basin, the effect of parameter uncertainty on both random accumulated sediment volume and optimal sediment storage space may be considerably higher than that of natural uncertainty. (Lee-ISWS)
W78-08292

EROSION OF COHESIVE SOILS,
Stuttgart Univ. (West Germany). Inst. fuer Theoretische und Angewandte Physik.
J. Lambermont, and G. Lebon.
Journal of Hydraulic Research, Vol. 16, No. 1, p 27-44, 1978. 4 fig, 11 ref.

Descriptors: *Erosion, *Cohesive soils, *Turbulent flow, *Boundary processes, Shear stress, Sediment distribution, Bed load, Model studies, Mathematics, *Erosion flux, Cohesive sediment bed, Density distribution.

The erosion of visco-plastic cohesive soils under the action of a turbulent fluid flow was studied. The equations describing a sediment bed were discussed. To solve the equations, the density distribution in the bed must be known at some initial time. Experimental field studies and results from the ultracentrifuge provide a clear picture of the density distribution in sediment layers. The boundary condition between the bed-fluid interface was obtained from experimental observations. It was inferred that the instantaneous physico-chemical composition at the top of the bed is uniquely related to the bed shear stress during erosion. The solution for the stationary erosion flux under a constant shear stress was obtained. The erosion flux depends on the properties of the bed and the shear stess induced by the turbulent fluid flow. The theory was shown to agree very well with the experiments performed by Partheniades (1965). (Singh-ISWS)
W78-08294

CHANNEL EROSION IN SOUTHWESTERN LOUISIANA CANAL,
California Univ., Los Angeles. Dept. of Geography.
L. N. Doiron, and C. A. Whitehurst.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW2, Proceedings Paper 13772, p 201-213, May 1978. 10 fig, 2 tab, 20 ref.

Descriptors: *Bank erosion, *Aerial photography, Banks, Canals, Channel morphology, Channels, Erosion, Scour, Inland waterways, Stream erosion, Sediments, Suspended sediments, Vegetation effects, Navigable waters, *Trainasses, *Geologic processes, Tidal currents.

Geomorphic processes active in the man-made Southwestern Louisiana Canal were studied with the aid of color infrared and multiband imagery aerial phiotography and various field analysis techniques. The enlargement and shoaling of the canal were investigated to determine their causes and to quantify the rates of erosion and deposition in a man-made structure of historically known dimensions in the bi-directional tidal flow regions of an estuarine environment. (Roberts-ISWS)
W78-08298

ROSIONAL REMOVAL OF FALLOUT PLUONIUM FROM A LARGE MIDWESTERN ATERSHED,
rgonne National Lab., IL. Radiological and Enronmental Research Div.
or primary bibliographic entry see Field 4D.
'78-08549

ERTINENT CRITERIA FOR DESCRIBING HE DISSOLUTION OF GYPSUM BEDS IN LOWING WATER,
eorgia Coastal Plain Experimental Station, Tifon, Dept. of Agronomy.
or primary bibliographic entry see Field 2G.
'78-08558

TOCHASTIC PREDICTION OF SEDIMENT IELDS FROM STRIP MINE SPOILS OF THE RID SOUTHWEST,
rizona Univ., Tucson. School of Renewable latural Resources.
. E. Auernhamer, M. M. Fogel, L. H. Hekman, nd J. L. Thames.
n: Hydrology and Water Resources in Arizona nd the Southwest, Vol. 7. Proceedings, Meetings f the American Water Resources Association, rizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 33-40, 5 fig, 1 tab.

Descriptors: Erosion, Precipitation(Atmospheric), *Sediment yield, Erosion control, *Erosion rates, *Hydrologic data, *Mathematical models, *Land reclamation, Arizona, Watershed management, Stochastic processes, Coal mine wastes, Spoil banks.

Mathematical simulation of the erosion process is accomplished by using a time series of hydrologic parameters in a modified form of the universal soil loss equation. A parameter to account for antecedent moisture conditions improved the predictive success of the equation. The simulation predicts sediment yield from a stochastic sequence of precipitation events on an experimental watershed. This sediment model will be used as a component in a larger, more complex hydrologic simulation for use in determining optimum reclamation practices for strip mined areas in the arid southwest. Data from regarded strip mine spoils at the Black Mesa of Arizona are used in calibrating the model.
W78-08729

PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON SOIL EROSION AND SEDIMENTATION BY WATER.
American Society of Agricultural Engineers, St. Joseph, MI.
For primary bibliographic entry see Field 4D.
W78-08787

SOIL EROSION AND SEDIMENTATION BY WATER--AN OVERVIEW,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-08788

CURRENT SOIL EROSION AND SEDIMENT CONTROL TECHNOLOGY FOR RURAL AND URBAN LANDS,
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 4D.
W78-08789

POLITICAL, SOCIAL, AND ECONOMIC ASPECTS OF SOIL EROSION AND SEDIMENTATION CONTROL PROGRAMS,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 6E.
W78-08790

PREDICTING SOIL EROSION,
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 4D.
W78-08791

PREDICTING SEDIMENT YIELDS,
Agricultural Research Service Morris, MN. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 4D.
W78-08792

ESTABLISHING SOIL LOSS AND SEDIMENT YIELD LIMITS FOR AGRICULTURAL LAND,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W78-08793

SEDIMENTATION AND EROSION CONTROL IMPLICATIONS FOR WATER QUALITY MANAGEMENT,
Environmental Research Lab., Athens, GA. Technology Development and Applications Branch.
For primary bibliographic entry see Field 4D.
W78-08794

VEGETATIVE WATER EROSION CONTROL FOR AGRICULTURAL AREAS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W78-08795

MECHANICAL EROSION CONTROL FOR AGRICULTURAL AREAS,
Soil Conservation Service, Lincoln, IL.
For primary bibliographic entry see Field 4D.
W78-08796

PROBLEMS OF IMPLEMENTING EROSION CONTROL,
Iowa Soil Conservation Committee, Waterville.
For primary bibliographic entry see Field 4D.
W78-08797

EROSION AND SEDIMENT CONTROL IN URBANIZING AREAS,
Soil Conservation Service, College Park, MD.
For primary bibliographic entry see Field 4D.
W78-08798

EROSION AND SEDIMENT CONTROL FOR COAL SURFACE MINE AREAS,
Washington Irrigation and Development Co., Centralia.
For primary bibliographic entry see Field 4D.
W78-08799

EROSION AND SEDIMENTATION ON IRRIGATED LANDS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 4D.
W78-08800

2K. Chemical Processes

A NEW APPROACH TO 'HIGH SOLIDS' SAMPLE INTRODUCTION FOR FLAME ATOMIC ABSORPTION ANALYSIS,
Arizona Univ., Tucson. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-08223

DEVELOPMENT OF A SYSTEM FOR CONDUCTING INTERLABORATORY TESTS FOR WATER QUALITY AND EFFLUENT MEASUREMENTS,
FMC Corp., San Jose, CA. Advanced Products Div.
For primary bibliographic entry see Field 5A.
W78-08227

EFFLUENT MONITORING PROCEDURES: BASIC LABORATORY SKILLS - STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, MD.
For primary bibliographic entry see Field 5A.
W78-08233

OXYGEN CONSUMPTION AT THE SOIL-WATER INTERFACE IN A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-08403

TESTSETS FOR THE QUANTITATIVE ANALYSIS OF AQUEOUS SOLUTIONS WITH PERMANENT INDICATION (TESTSETS FUR DIE QUANTITATIVE ANALYSE WAESSRIGER LOESUNGEN MIT BLEIBENDER ANZEIGE),
For primary bibliographic entry see Field 5A.
W78-08467

THE NBS PROGRAM FOR STANDARDS FOR TRACE ORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08536

THE NBS PROGRAM FOR STANDARDS FOR TRACE INORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08537

THE HARMONIZATION OF THE MONITORING OF THE QUALITY OF INLAND FRESH WATER,
Department of the Environment, London (England).
For primary bibliographic entry see Field 5A.
W78-08548

THEORETICAL MODELING OF MIXED-ELECTROLYTE SOLUTION FLOWS FOR UNSATURATED SOILS,
Agricultural Research Organization, Bet Dagan (Israel). Div. of Soil Physics.
For primary bibliographic entry see Field 2G.
W78-08563

A SOIL COLUMN TENSION LYSIMETER THAT MINIMIZES EXPERIMENTAL EDGE EFFECTS,
Dartmouth Coll., Hanover, NH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2G.
W78-08565

HYDROGEOLOGY OF THE MEDICINE HAT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W78-08580

SPECTROGRAPHIC ANALYSIS OF WASTE WATER (ANALISIS ESPECTROGRAFICO DE AGUAS RESIDUALES),
Junta de Energia Nuclear, Madrid (Spain). Div. de Quimicay Medio Ambiente.
For primary bibliographic entry see Field 5A.
W78-08616

NATURE AND IMPACT OF TEMPERATURE AND MOISTURE IN ARID WEATHERING AND SOIL FORMING PROCESSES - A REVIEW.
Ghent Rijksuniversiteit (Belgium). Lab. for Physical Geography and Pedology.
For primary bibliographic entry see Field 2G.
W78-08755

RELATIVE MOVEMENT OF BROMIDE AND NITRATE IN SOILS UNDER THREE IRRIGATION SYSTEMS,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 2G.
W78-08756

EXCHANGE CAPACITY OF CALCIUM AND SODIUM SOILS AS DETERMINED BY DIFFERENT REPLACING CATIONS,
Technion-Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
For primary bibliographic entry see Field 2G.
W78-08757

THE EFFECTS OF PRECIPITATION ON AQUATIC AND TERRESTRIAL ECOSYSTEMS: A PROPOSED PRECIPITATION CHEMISTRY NETWORK, DEPT. OF ENVIRONMENTAL SCIENCES.
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5C.
W78-08762

2L. Estuaries

APPLICATION OF REMOTE SENSING TO THE CHESAPEAKE BAY REGION: VOLUME 1 - EXECUTIVE SUMMARY.
National Aeronautics and Space Administration, Greenbelt, MD. Goodard Space Flight Center.
For primary bibliographic entry see Field 5A.
W78-08232

A QUANTITATIVE STUDY OF THE DIFFUSE SOURCE LOADINGS OF CHESAPEAKE BAY, (PROGRESS REPORT),
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W78-08234

MONITORING WATER QUALITY BY REMOTE SENSING,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5A.
W78-08257

MODELING TECHNIQUES FOR ESTIMATING FECAL COLIFORMS IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5B.
W78-08278

NON-TIDAL VARIABILITY IN THE CHESAPEAKE BAY AND POTOMAC RIVER: EVIDENCE FOR NON-LOCAL FORCING,
Johns Hopkins Univ., Baltimore, MD. Chesapeake Bay Inst.
D. P. Wang, and A. J. Elliot.
Journal of Physical Oceanography, Vol 8, No 2, p 225-232, March 1978. 11 fig, 1 tab, 8 ref. NSF OCE74-08463.

Descriptors: *Water levels, *Estuaries, *Winds, *Chesapeake Bay, *Potomac River, On-site investigations, On-site data collections, Data processing, Variability, Fluctuations, Waterlevel fluctuations, Sea level, Weather, Atmosphere, Currents(Water), Mathematical models, Model studies, Non-local forcing, Non-tidal water variability.

Non-tidal variability in the Chesapeake Bay and Potomac River, and its relation to atmospheric forcing, was examined from two-month sea level and bottom current measurements. The dominant sea level fluctuations in the Bay had a period of 20 days, and were the result of up-Bay propagation of coastal sea level fluctuations generated by the alongshore winds. Consequently, water was driven out of the Bay by the northward/up-Bay wind and driven into the Bay by the southward/down-Bay wind, through the coastal Ekman flux. There were also large sea level fluctuations at periods of 5 and 2.5 days. The 5-day fluctuations were driven by both the coastal sea level changes and the local lateral winds (Ekman effect). The 2.5-day fluctuaitons were seiche oscillations driven by the local longitudinal winds. In the Potomac River, the sea level fluctuations were induced non-locally by motions in the Bay; the associated volume fluxes appeared to have been confined to the upper layer. The near-bottom currents were driven mainly by the surface slopes which were also set up non-locally by the longitudinal wind over the Bay. In general, the near-bottom current and sea level/volume flux fluctuations were not coherent. A notable exception, however, was found for the 2.5-day fluctuations, which were vertically coherent and showed significant upward phase propagation. (Sims-ISWS)
W78-08299

HYDROLOGIC AND ECOLOGIC INVENTORIES OF THE COASTAL WATERS OF WEST HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
E. A. Kay, R. H. F. Young, L. S. Lau, E. D. Stroup, and S. J. Dollar.
Technical Report No. 105, Water Resources Research Center, April 1977. (SEA Grant Cooperative Report) 94 p, 35 fig, 21 tab.

Descriptors: *Water resources, *Management, *Projects, *Coastal waters, *Hawaii, Hydrology, Ecology, Inventories, Oceanography, Biology, Data collections, Evaluation, *Effects, *Groundwater, *Discharge(Water), Coastal areas, Wave energy, Bays, Planning, Methodology, Monitoring.

The goal of this project was to provide information to the County of Hawaii and to the state for the intelligent management of the marine and coastal resources of West Hawaii, particularly the South Kohala and North Kona areas. This was accomplished through compilation of inventories of biological, hydrological, and some oceanographic data for four selected sites: Pauko, Waiulua, 'Anaeho'omalu, and Kiholo bays. Evaluation was made of existing hydrologic, geologic, oceanographic, and ecologic data in order to determine the volume and influence of groundwater discharge to coastal areas as well as the biological community structure in the near-shore waters. Research results have yielded a classification of the bays according to wave energy and groundwater intrusion. Poor circulation and high groundwater intrusion result in turbid conditions with communities of low diversity--a coastal situation suitable perhaps for a small boat harbor or marina, but undesirable for a marine park or preserve. These results provided an excellent reference point for planning the use or development of the study sites or areas of related hydrologic and ecologic conditions. The methodology and techniques employed can be adapted for monitoring other coastal zone sites in the state. (Graf-Cornell)
W78-08311

PREEMPTION AND THE ROLE OF STATE LEGISLATION IN THE COASTAL ZONE,
McCutchen, Black, Verleger and Shea, Los Angeles, CA.
For primary bibliographic entry see Field 6E.
W78-08330

FLORIDA KEYS COASTAL ZONE MANAGEMENT STUDY.
Florida Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council.
For primary bibliographic entry see Field 6B.
W78-08331

COASTAL ZONE MANAGEMENT,
For primary bibliographic entry see Field 6E.
W78-08333

COASTAL ZONE LAW AND POLICY,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W78-08338

WETLANDS CONTROVERSY: A COASTAL CONCERN WASHES INLAND,
For primary bibliographic entry see Field 6E.
W78-08342

A LEGISLATIVE-POLITICAL HISTORY OF THE COASTAL ZONE MANAGEMENT ACT OF 1972,
Wisconsin Univ.-Madison. School of Law.
For primary bibliographic entry see Field 6E.
W78-08355

PRELIMINARY LEGAL CONSIDERATIONS IN DEVELOPING ARTIFICIAL REEFS,
Texas A and M Univ., College Station. Dept. of Management.
For primary bibliographic entry see Field 6E.
W78-08357

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES: PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS' MEETING--OCTOBER 1976, TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-08359

ECOLOGIC STRESS IN A SUBTROPICAL COASTAL LAGOON: LAKE ST. LUCIA, ZULULAND,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 5C.
W78-08380

EFFECTS OF SALINITY AND DRAINAGE ON THE GROWTH OF THREE SALT MARSH GRASSES,
Louisiana State Univ., Baton Rouge. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-08401

SALT TOLERANCE IN THE HALOPHYTE SUAEDA MARITIMA (L.) DUM: INTERACTION BETWEEN ALUMINIUM AND SALINITY,
Sussex Univ., Brighton (England). School of Biological Sciences.

or primary bibliographic entry see Field 2I.
W78-08402

OXYGEN CONSUMPTION AT THE SOIL-WATER INTERFACE IN A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
L. L. Gallagher, and F. C. Daiber.
Chesapeake Science, Vol 15, No 2, p 248-250, December 1974. 1 fig, 1 tab, 10 ref.

Descriptors: *Earth-water interfaces, *Salt marshes, *Delaware, Seasonal, *Oxygen consumption, Measurement, Soils.

Oxygen consumption at the soil-water interface in a Delaware salt marsh was measured over the annual cycle. No significant difference between vegetation areas was detected, but summer rates were 2.5 times those in winter. Oxygen uptake by the cores of soil was relatively constant with seasonal temperature trends from 2C to 20C, but increased rapidly when the temperature rose to 30C. (Maroncelli-Mass)
W78-08403

PRIMARY PRODUCTION IN A LOUISIANA GULF COAST SPARTINA ALTERNIFLORA MARSH,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2I.
W78-08404

ANALYSIS OF ESTUARINE SOIL GRADIENTS IN SALT MARSHES OF THE SOUTHWESTERN NETHERLANDS WITH SPECIAL REFERENCE TO THE SCHELDT ESTUARY,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 5A.
W78-08407

STANDING CROPS OF FISHES OF AN ESTUARINE AREA IN SOUTHWEST LOUISIANA,
Louisiana Wildlife and Fisheries Commission, Grand Chenier.
W. G. Perry.
Presented at the 30th Annual Meeting, Southeastern Association of Game and Fish Commissioners, October 24-27, 1976, Jackson, Mississippi, 10 p. 4 fig, 5 tab, 14 ref.

Descriptors: *Estuaries, *Fish, *Standing crops, Rotenone, Louisiana, Mullets, Sampling, Anchovies, Menhaden, Red drum, Trawls.

Standing crop of estuarine fisheries, as determined by extensive rotenone sampling, ranged from 17.6 to 1,605 kg/ha; overall average was 393.8. The most abundant species in numbers were gulf menhaden, Brevortia patronus (54.6%); anchovies, Anchoa sp. (10.7%); and striped mullet, Mugil cephalus (6.6%). Of the 8,322 kg of fish collected during the study, red drum, Sciaenops ocellata, represented 32.2%, followed by menhaden (16%) and striped mullet (11.5%). First day rotenone samples were not sufficient for quantitating species abundance. Rotenone collections indicated that trawls were highly slective ($P<.01$). It is suggested that rotenone and trawling be used as complements in estuarine inventories. (Moroncelli-Mass)
W78-08409

ORGANOCHLORINE PESTICIDE AND POLYCHLORINATED BIPHENYL RESIDUES IN SELECTED FAUNA FROM A NEW JERSEY SALT MARSH---1967 VS. 1973,
Iowa Cooperative Wildlife Research Unit, Ames.
For primary bibliographic entry see Field 5G.
W78-08411

SPECIES COMPOSITION, STANDING STOCK, AND NET PRIMARY PRODUCTION OF A SALT MARSH COMMUNITY IN MISSISSIPPI,
Mississippi Univ., Mississippi State, Dept. of Biology.
B. C. Gabriel, and A. A. de la Cruz.
Chesapeake Science, Vol. 15, No. 2, p 72-77, June, 1974. 3 fig, 4 tab, 12 ref.

Descriptors: *Salt marshes, *Standing crops, Biomass, *Primary productivity, Seasonal, *Mississippi, *Species composition, Harvest method, *St. Louis Bay Estuary(Miss).

Square meter quadrat samples harvested monthly during 1971 to 1972 provided data on the species composition, standing stock, and net primary aerial production of a salt marsh community in St. Louis Bay Estuary, Mississippi. Although a total of 34 species of marsh plants were identified, Juncus roemerianus, Spartina cynosuroides, Scirpus americanus and Distichlis spicata were the most dominant in all the quadrats sampled. Maximum biomass of alive, dead, and partially decayed plants were observed in July, August and January, respectively. Community annual net production estimated by harvest method was 1051 g dry wt sq/m or 5012 ash-free Kcal sq/m. Total biomass obtained by reharvesting previously clipped quadrats in various ages of regrowth revealed a seasonal pattern of growth rate with a maximum during late summer and a productivity estimation of 1108 g dry wt sq/m or 5541 ash-free Kcal sq/m. (Maroncelli-Mass)
W78-08413

ABOVE-GROUND BIOMASS OF VASCULAR PLANTS IN A SUBARCTIC JAMES BAY SALT MARSH,
Canada Centre for Inland Waters, Burlington (Ontario).
W. A. Glooschenko.
Canadian Field-Naturalist, Vol. 92, No. 1, p 30-37, January-March, 1978. 3 fig, 2 tab, 20 ref.

Descriptors: *Biomass, *Rooted aquatic plants, *Subarctic, *Primary productivity, Marshes, Aquatic plants, *Canada, Coastal marshes, Wetlands, *James Bay(Ontario), Vegetation zones.

Vegetation studies including determination of species composition and cover were made along a transect in a subarctic salt marsh located on the southwestern coast of James Bay, Ontario, Canada. Eight vegetation zones were recognized from an intertidal colonization area dominated by Puccinellia phryganodes to the edge of a willow thicket at the landward end of the marsh complex. In each zone, above-ground biomass of vascular plants was determined by clipping at the time of peak biomass. Values ranged from an estimated low of 29 g/sq m dry weight on gravel beach ridges and 157 g/sq m in the mid-marsh to a high of 569 g/sq m in the zone nearest the willow thicket, which was dominated by Juncus balticus. A weighted-mean above-ground biomass for the transect, taking into account the biomass and width of these zones, was 357 g/sq m. (Stihler-Mass)
W78-08416

STUDIES ON THE POPULATION ECOLOGY OF THE SALT MARSH GASTROPOD BATILLARIA ZONALIS,
University of the Pacific, Dillon Beach, CA. Pacific Marine Station.
R. B. Whitlatch.
The Veliger, Vol. 17, No. 1, p 47-55, July, 1974. 6 fig, 4 tab, 14 ref.

Descriptors: *Population, *Ecology, *Gastropods, *Snails, *Salt marshes, Environment, Fluctuations, *California, *Batillaria zonalis, *Tomales Bay(California), Marsh pans.

Aspects of the life history of the salt marsh gastropod Batillaria zonalis were investigated for a period of two years. Population dynamics and aspects of its biology in two salt marsh localities in Tomales Bay, California, are described. The results of the study are discussed within the context of population stability in salt marsh communities. Variations in larvall recruitment and fluctuations in population density may be the result of local environmental conditions on the marsh. Juveniles in 1971 and 1972 settled only in the marsh pans of both salt marshes. No juveniles were recorded in any of the tidal creeks possibly due to the draining of the creeks at low tide and prolonged substrate exposure; the pans seldom drain completely. Small scale differences in other physical factors such as temperature, substrate characteristics, and salinity may also affect recruitment patterns, as well as variability in population abundance. Several possible mechanisms for reducing the effects of environmental fluctuations were noted: burial beneath the surface sediment; mobility by floating; cementation by glutinous threads to Salicornia pacifica stems 3 to 10 cm above the surface of the marsh; high resistance to dessication and salinity. (Maroncelli-Mass)
W78-08419

FACTORS INFLUENCING THE DISTRIBUTION OF VEGETATION OF THE COOPER RIVER ESTUARY,
Saint John's Univ., Jamaica, NY. Dept. of Biology.
R. Statler.
Castanea, Vol. 38, No. 1, p 18-24, March, 1973. 1 fig, 1 tab, 13 ref.

Descriptors: *Estuaries, *Salt marshes, *Freshwater marshes, *Salinity, Submergence, Vegetation, *Cooper River Estuary(SC), Vegetation zonation, *South Carolina.

The marshes of The Cooper River Estuary are categorized as three units: salt, brackish, and freshwater marshes. The vegetation of these marshes was sampled by means of the line intercept method during July, 1971. A surveyor's transit was used to determine the elevation range of each species above the species occupying the lowest portion of the marsh for 23 stations. Soil samples were taken and analyzed for chlorinity and salinity. Zonation of vegetation was most pronounced and distinct in salt marshes and less pronounced and distinct in less saline areas. Salinity limits the brackish and freshwater taxa from the more saline lower reaches of the river. Several taxa occupying the lowest zone of the three marshes are well adapted to long periods of submergence. (Maroncelli-Mass)
W78-08420

PROGRAM REVIEW PROCEEDINGS OF: ENVIRONMENTAL EFFECTS OF ENERGY RELATED ACTIVITIES ON MARINE/ESTUARINE ECOSYSTEMS.
Environmental Protection Agency, Washington, D.C. Office of Energy, Minerals, and Industry; and Environmental Protection Agency, Washington, D.C. Office of Research Development.
For primary bibliographic entry see Field 5C.
W78-08520

AN ECOLOGICAL CHARACTERIZATION OF THE CHENIER PLAIN OF SOUTHWESTERN LOUISIANA AND SOUTHEASTERN TEXAS: OBJECTIVES AND METHODOLOGIES,
Energy Resources Co., Inc., Cambridge, MA.
J. Harris.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 65-73, 1 fig.

Descriptors: *Environmental effects, *Water pollution effects, *Resources development, *Baseline studies, Coasts, Louisiana, Texas, Ecology, *Gulf Coast, *Outer Continental Shelf, *Chenier Plain, Ecological characterization.

The purpose of this program is to provide a more systematic procedure for both the examination of biological systems and the prediction of impacts on these systems. This new approach, termed 'ecological characterization,' is being applied first to the analysis of coastal systems. The distinguishing feature of the characterization, which makes it unique in comparison to conventional biological studies, inventories, and other environmental programs, is its emphasis on the functional and dynamic features of coastal systems. By studying these functional attributes of the system, we hope to come closer not only to understanding the driving forces of the represented ecosystems, but also to understanding how the system as a whole is affected by various resource development and environmental modifications. (See also W78-08520) (Sinha-OEIS)
W78-08526

THE CONSTRUCTION OF A CONCEPTUAL MODEL OF THE CHENIER PLAIN COASTAL ECOSYSTEM IN TEXAS AND LOUISIANA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources; Florida Univ., Gainesville. Center for Wetlands; and Energy Resources Co., Cambridge, MA.
L. M. Bahr, Jr., J. W. Day, Jr., and T. Gayle.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 75-92, 13 fig, 9 ref.

Descriptors: *Water pollution effects, *Baseline studies, *Model studies, Coasts, Ecosystems, *Outer Continental Shelf, *Chenier Plain, *Gulf Coast.

In its present form, the conceptual model is a hierarchy of nested models that divide the Plain into three levels of spatial, functional, and temporal resolution of the habitat, the basin, and the region. By focusing attention at the appropriate level, this hierarchy allows the characterization and analysis of the Chenier Plain and the handling of the four issues of spatial heterogeneity, functional complexity, time scale problems, and management needs. Ten natural habitats have been identified and mapped for the Chenier Plain: nearshore Gulf; inland open water; salt, brackish, intermediate, and fresh marsh; wetland forest; uplant forest; beaches; and cheniers and ridges. Large areas have been modified by human activity, which have been catalogued into four additional habitats as impounded marshes, pastures, rice and crop habitat, and urban habitat. (See also W78-08520) (Sinha-OEIS)
W78-08527

ENVIRONMENTAL ASSESSMENT OF NORTHERN PUGET SOUND AND THE STRAIT OF JUAN DE FUCA,
National Oceanographic and Atmospheric Administration, Seattle, WA.
For primary bibliographic entry see Field 5C.
W78-08530

EDGE WAVES AND SURF BEAT,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
A. J. Bowen, and R. T. Guza.
Journal of Geophysical Research, Vol. 83, No. C4, p 1913-1920, April 20, 1978. 8 fig, 13 ref. ONR N00014-75-C-0030, NSF ENG76-1489.

Descriptors: *Waves(Water), *Beaches, *Ocean waves, Coasts, Shores, Surf, Model studies, Hydraulic models, Flumes, Laboratory tests, Mathematical models, Resonance, Frequency, Oceanography.

Surf beat, wave motion at relatively low frequency (periods of 30-200 s), often is observed on beaches. However, even with modern instrumentation it is difficult to describe the spatial variation of the low-frequency motion; consequently, the relative importance of a number of suggestions, which, at least in theory, provide mechanisms for the generation of low-frequency energy, has never been established. Recent observations have reinforced the idea that edge waves, the free wave modes trapped at the shoreline, are a major component of low-frequency energy. One of the most interesting explanations of surf beat suggests that the beating between particular pairs of incoming waves leads to resonant growth of edge wave modes, which may then dominate the low-frequency spectrum. Empirical evidence is essential, as any theoretical development breaks down when the incoming wave break. To investigate the importance of this resonant interaction, the general interaction conditions were used to design laboratory experiments in which both resonant and non-resonant conditions were expected. The experimental results showed that the response at the beat frequency is stronger when the resonance conditions for edge wave growth are satisfied and that the response is in the form of the theoretically predicted edge wave mode, even when the incident waves are breaking. These results strongly suggest that surf beat is predominantly an edge wave phenomenon. (Sims-ISWS)
W78-08551

DYNAMIC RESPONSES OF FLOATING STRUCTURES,
Exxon Production Research Co., Houston, TX.
For primary bibliographic entry see Field 8B.
W78-08560

DIFFRACTION OF WAVES BY A WEDGE,
Case Western Reserve Univ., Cleveland, OH. Dept. of Earth Sciences.
For primary bibliographic entry see Field 8B.
W78-08561

RUNUP OF IRREGULAR WAVES ON PLANE SMOOTH SLOPE,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08562

WINTER CIRCULATION IN THE WESTERN GULF OF MAINE: PART I. COOLING AND WATER MASS FORMATION,
New Hampshire Univ., Durham.
W. S. Brown, and R. C. Beardsley.
Journal of Physical Oceanography, Vol. 8, No. 2, p 265-277, March 1978. 11 fig, 2 tab, 31 ref, 1 append. NSF DES75-03992, OCE76-02190.

Descriptors: *Water circulation, *Continental shelf, *Atlantic Ocean, *Gulfs, Winter, On-site investigations, Model studies, Mathematical models, Circulation, Oceans, Currents(Water), Ocean currents, Current meters, Cooling, Water cooling, Heat transfer, Salinity, Density, Water temperature, Estuaries, Oceanography, *Gulf of Maine.

The mean circulation on the northeast continental shelf in the region of the Gulf of Maine was discussed in terms of a simple box model, based on volume transports and mean salinities estimated from existing data. The results of this calculation indicated that warm salty water from the continental slope must mix with colder, fresher water at intermediate depths within the Gulf. Field measurements obtained as part of a study of the winter circulation in an offshore region in the western Gulf of Maine suggest that winter storms may be responsible for most of this vertical mixing. Ten 1-day hydrographic cruises were conducted between the passage of seasonal storms from November 1974 to January 1975. A description of the early winter evolution of the density field was obtained concurrently with moored measurements of current, temperature and bottom pressure, and coastal measurements of sea level and atmospheric variables. The principal vertical mixing process observed during this period was an intermittent overturning of the near-surface water caused by surface cooling by offshore winds. The observed vertical homogeneity suggests that the fresher near-surface Gulf of Maine water and the more saline deep basin water are frequently mixed during the early winter in the western region to produce Gulf of Maine Intermediate Water. (Sims-ISWS)
W78-08579

EFFECTS AND INTERACTIONS OF POLYCHLORINATED BIPHENYLS (PCB) WITH ESTUARINE MICROORGANISMS AND SHELLFISH,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5C.
W78-08637

CONTROLLED-ENVIRONMENT BIVALVE MOLLUSCAN MARICULTURE,
Delaware Univ., Newark. Coll. of Marine Studies.
G. D. Pruder, E. T. Bolton, and P. H. Sammelwitz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 833, Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Report No. DEL-SG-23-76, October 1976, 14 p, 5 fig, 8 ref.

Descriptors: *Aquiculture, *Methodology, *Oysters, Clams, *Commercial shellfish, Laboratory equipment, Mollusks, Growth, Reproduction, Delaware, Control system, *Mariculture, Controlled environment.

The Delaware Mariculture Project has as its objective the rapid development of commercial, closed-cycle, controlled-environment shellfish mariculture. The effort involves development of an efficient, reliable, and economical process and hardware system for raising selected bivalve molluscs from egg to marketable size. Suh a system must provide and maintain the physical, chemical, and biological conditions suitable for rapid growth of such commercially desirable bivalve molluscs as Crassostrea virginica (Gmelin), the Eastern oyster, and Mercenaria mercenaria (Linne), the hard clam. The status and direction of the project in 1976 is reviewed in this paper. (EIS-Katz)
W78-08644

REARING PACIFIC SALMON IN SALTWATER PONDS FERTILIZED WITH DOMESTIC WASTEWATER,
Humboldt State Univ., Arcata, CA.
For primary bibliographic entry see Field 5C.
W78-08645

REACTION OF ESTUARINE ECOSYSTEMS TO EFFLUENT FROM PULP AND PAPER INDUSTRY,
Aberdeen Univ. (Scotland). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-08667

SEASONAL LARVAL FISH ABUNDANCE IN WATERS OFF DIABLO CANYON, CALIFORNIA,
Pacific Gas and Electric Co., San Ramon, CA. Dept. of Engineering Research.
For primary bibliographic entry see Field 5C.
W78-08678

HE IMPORTANCE OF PREDATION BY RABS AND FISHES ON BENTHIC INFAUNA N CHESAPEAKE BAY,
irginia Inst. of Marine Sciences Gloucester oint.
. W. Virnstein.
cology, Vol. 58, p 1199-1217, 1977. 15 fig, 8 tab, 1 ref.

escriptors: *Predation, *Competition, Secondary productivity, *Commercial shellfish, Benthic fauna, Biological communities, Dominant organisms, *Crabs, *Plankton, *Larval rowth stage, *Growth rates, *Carrying capacity, Food abundance, Invertebrates, Sediments, Chesapeake Bay, *Blue crab, *Spot, Hogchoker.

he significance of large motile predators in controlling the distribution and abundance of the nacrobenthic invertebrates within the sediments the infauna) in a shallow subtidal sand community vas tested using manipulative field experiments. The blue crab (Callinectes sapidus) and 2 species of bottom-feeding fishes, spot (Leiostomus xanthurus) and hogchoker (Trinectes maculatus), were either excluded from or confined to small areas using wire mesh cages. Callinectes and Leiostomus effectively reduced infaunal densities; Trinectes did not. Densities of all infaunal species increased in exclosures, suggesting that their population densities under natural conditions are not controlled by competitive interactions. In this community, infaunal population sizes are limited by predation and not by food or space. Severe predation pressure and physical disturbances, particularly sediment instability, keep population levels far below the carrying capacity of the environment. Severe predation, and the rapid growth, short generation times, and rapid turnover rates of constituent populations suggest that such infaunal communities, despite a low standing crop, are an important food source for predator species important to man. (EIS-Deal)
W78-08692

FOOD CONCENTRATION AND STOCKING DENSITY EFFECTS ON SURVIVAL AND GROWTH OF LABORATORY-REARED LARVAE OF BAY ANCHOVY ANCHOA MITCHILLI AND LINED SOLE ACHIRUS LINEATUS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
E. D. Houde.
Marine Biology, Vol. 43, No. 4, 1977, p 333-341, 4 fig, 5 tab, 16 ref.

Descriptors: Environmental effects, *Stocking, *Food abundance, Population, Number fish per acre, Mortality, Larvae, *Growth rates.

Eggs of bay anchovy were stocked at densities ranging from 0.5 to 32.0 per liter and eggs of lined sole were stocked at 0.5 to 16.0 per liter. Food concentrations had clearly defined effects on both survival and the indices of growth and yield for both species. To obtain relatively consistent and high survival rates exceeding 40% at metamorphosis, it was found that food concentration should be 1000/l or higher. Results indicated that it is doubtful that survival would routinely exceed 75% for bay anchovies or 80% for lined sole even if food were offered in excess of 5000 prey/l. Reasonable numbers of larvae of the two species could be produced at 100 prey/l, but the relative variability in observed survival and growth among replicated experiments probably would be too high to allow treatment effects in bioassays or other experiments to be identified. (Chilton-ORNL)
W78-08769

THE EFFECTS OF SAND MOVEMENT ON INTERTIDAL SEAWEEDS AND SELECTED INVERTEBRATES AT BOUND ROCK, NEW HAMPSHIRE, USA,
New Hampshire Univ., Durham. Dept. of Botany and Plant Pathology; and New Hampshire Univ., Durham. Jackson Estuarine Lab.
For primary bibliographic entry see Field 5C.
W78-08774

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

PREPARATION OF WATER SAMPLES FOR ASBESTOS FIBER COUNTING BY ELECTRON MICROSCOPY,
Ontario Research Foundation, Mississauga.
E. J. Chatfield, R. W. Glass, and M. J. Dillon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 183, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600-4/78-011, January, 1978. 118 p, 44 fig, 42 tab, 27 ref, 1 append. 68-03-2389.

Descriptors: *Asbestos, *Analytical techniques, *Electron microscopy, *Ultrasonics, *Filtration, *Pollutant identification, Tailwater, Water pollution, Water quality, *Chrysotile, *Crocidolite, *Taconite, *Nuclepore filtration, *Millipore filtration, Concentrating techniques.

Procedures used by a number of laboratories for the analysis of asbestos fibers in water samples were investigated using standardized aqueous dispersions of chrysotile, crocidolite, and taconite tailings. Filtration problems when using polycarbonate filters (Nuclepore) were solved, and an optimum filtration technique was developed that permits microscopically uniform deposits to be obtained. Replicate analyses established fiber losses and reproducibility of five filter preparation techniques: (1) carbon-coated Nuclepore with Jaffe washer dissolution; (2) uncoated Nuclepore with Jaffe washer dissolution; (3) both 0.22 micrometer and 0.45 micrometer pore size Millipore, with Jaffe washer dissolution; (4) 0.45 micrometer pore size Milipore with condensation washer dissolution; (4) 0.45 micrometer pore size Millipore with condensation washer dissolution; and (5) Ontario Research Foundation (ORF) ashing technique. The carbon-coated Nuclepore technique had essentially zero fiber losses. The uniformity of the deposits on all the final electron microscope preparations was expressed quantitatively, and the most satisfactory performance was given by all of the Nuclepore techniques. Ultrasonic treatment at 20 kHz increased fiber concentrations of chrysotile suspensions but had no effect on crocidolite suspensions. (Seip - IPA)
W78-08263

3A. Saline Water Conversion

APPARATUS AND PROCESS FOR MEMBRANE FILTRATION,
Hoechst A.G., Frankfurt am Main (West Germany). (Assignee).
W. Saupe.
U.S. Patent No. 4,062,771, 11 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 965, no 2, p 637, December 13, 1977.

Descriptors: *Patents, *Desalination, *Water treatment, *Separation techniques, Water quality control, Water purification, Semipermeable membranes, Desalination apparatus, Filtration.

Devices for membrane filtration are suitable for the separation of lower-molecular and ionic portions. They serve for the selective separation or concentration of individual components of solutions, suspension, emulsions or dispersions, for example, for concentrating salt water and brackish water. There is a need for apparatus suitable for carrying out membrane filtration which has a high module packing density, which is easy to assemble, and which allows the membranes and the members which support them to be changed in a simple manner, and which operates with as low as possible a local excess concentration and deposition of solids, so that the flux, that is the quantity which permeates per unit of time and per unit of membrane surfaces, remains approximately constant. This invention provides an apparatus which comprises at least two support members of porous material arranged in series, an inlet for admission of liquid to be filtered to the first support member and an outlet for egress of concentration from the last suport member, each support member being provided with passageways to allow flow of liquid through the assembly of support members in sequence through a semipermeable membrane. The flow of liquid from one support to he next is only via the passageways. All parts of their surface to which liquid has access, both the outer walls of the members themselves and the internal walls of the passages, are covered with semipermeable membrane in order to ensure that only liquid which has passed through the membrane can enter the internal pores of the support member. (Sinha - OEIS)
W78-08586

3B. Water Yield Improvement

MANUAL IRRIGATION IN MIDDLE AMERICA,
Colorado State Univ., Fort Collins.
G. C. Wilken.
Agricultural Water Management, Vol. 1, No. 2, p 155-166, September, 1977. 7 fig, 8 ref.

Descriptors: *Irrigation practices, History, Semiarid climates, Water shortage, Dry farming, Mexico, Manual control, *Water transfer, Water utilization, Water supply, Wells, Water costs, *Economic justification.

Manual irrigation continues to be widely used in Middle America, particularly in semi-arid regions of Mexico. Report describes and evaluates effectiveness of two general types of manual irrigation, container and scoop. Reasons for continued use of both types of irrigation include: (1) economic returns are feasible as low water costs compensates for high expenditure of time and effort; (2) careful manual application of irrigation water eliminates most plant deaths from overwatering; and (3) manually irrigated fields do not require furrows or heavy retaining borders. (Jewkes-Arizona)
W78-08545

IMPACT OF RAINFALL ENHANCEMENT ON HYDROLOGY,
Kansas State Univ., Manhattan. Dept. of Civil Engineering.
J. J. Zovne, and D. H. Rogers.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13759, p 681-694, May 1978. 9 fig, 3 tab, 20 ref, 2 append.

Descriptors: *Weather modification, *Cloud seeding, *Rainfall, *Kansas, Effects, Model studies, Mathematical models, Watersheds(Basins), Rainfall intensity, Runoff, Recharge, Groundwater, Base flow, Evapotranspiration, Precipitation(Atmospheric), Hydrology, Meteorology.

Three watersheds in Kansas were investigated to determine the hydrologic effects of a large-scale rainfall augmentation program. The Kansas Watershed Model was used to compare historical with augmented moisture budgets. The augmentation scheme involved 75% increase for rainfalls less than 0.1 in.; 30% increase between 0.1 in. and 0.5 in.; 10% increase between 0.5 in. and 1.0 in.; and 10% decrease for rainfalls more than 1 in. The three watersheds yielded average increased rainfalls of more than 2 in. annually, of which greater

than 20% became runoff and greater than 70% evapotranspired. The additional runoff was mostly a result of increased base flow, and a major proportion of the increased evapotranspiration occurred during dry periods. Optimal benefits would accrue as a result of long-term seeding programs because of accumulated moisture carryover effects. (Sims-ISWS)
W78-08570

RESIDUAL WAXES FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
D. H. Fink.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 199-205, 1 fig, 5 tab, 12 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Coatings, *Soil management, Soil treatment, Runoff, Runoff coefficient, *Water conservation, Rainfall-runoff relationships, *Waxes.

This study was undertaken to compare the water harvesting potential of several residual waxes with that of refined paraffin. These residual waxes could possibly have advantages over refined paraffin as a soil treatment for water-harvesting catchments in that they are byproducts rather than an end product (constituting an energy savings), are slightly cheaper, and are more adhesive and less brittle. However, these residual waxes have high physical - chemical property variability which complicates testing for utility in water-harvesting. The lack of an easily obtainable 'characterization index' is a particular deficiency. Upon laboratory testing, several of the residual waxes were found to be superior to refined paraffin in water-repellancy, structural stability, erosion and freeze-thaw resistance and ozone and ultraviolet radiation effects. The need for further laboratory and field testing was noted. (Payton-Arizona)
W78-08731

VARIATION IN SOIL MOISTURE UNDER NATURAL VEGETATION,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W78-08733

ROOT SYSTEM OF SHRUB LIVE OAK IN RELATION TO WATER YIELD BY CHAPARRAL,
Rocky Mountain Forest and Range Experiment Station, Tempe, AZ. Forestry Sciences Lab.
E. A. Davis.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 241-248. 3 fig, 17 ref.

Descriptors: *Root systems, *Root development, Soil-water-plant relationships, Soil moisture, Root zone, *Water utilization, Distribution patterns, Subsoil, Moisture availability, Growth stages, *Water yield improvement, Vegetation effects, *Regolith.

The root system of shrub live oak (Quercus Turbinella) was studied in an initial effort to classify the major Arizona chaparral shrubs as potential users of soil water based on root system characteristics. This system was of the generalized type with a taproot, many deeply penetrating roots, and a strong lateral root system. Roots penetrated 21 feet to bedrock through cracks and fractures in the rocky regolith. A dense network of small surface laterals radiated from the root crown and permeated the upper foot of soil. Because of its root system, shrub live oak is well adapted to utilize ephemeral surface soil moisture as well as deeply stured moisture. Emphasis is on the importance of a knowlede of the root systems and depth of the regolith in planning vegetation conversions to increase water yield. (Payton-Arizona)
W78-08734

EFFECTS OF BRUSH TO GRASS CONVERSION ON THE HYDROLOGY AND EROSION OF A SEMIARID SOUTHWESTERN RANGELAND WATERSHED,
Agricultural Research Service, Tucson. AZ. Southwest Watershed Research Center.
For primary bibliographic entry see Field 4D.
W78-08735

RECOMMENDED DROUGHT AND SALT-RESISTANT ORNAMENTAL PLANTS,
Ben-Gurion Univ. of the Negev, (Beersheba (Israel). Div. of Plant Introduction and Applied Ecology.
M. Forti, J. Ben-Dov, and J. Pasternak.
Ben-Gurion University of the Negev, Research and Development Authority, 1977. 6 p. B GUNRDA-132-77.

Descriptors: Ecology, *Desert plants, Plant groupings, *Brackish water, Irrigation practices, *Salt tolerance, *Plant growth, *Saline soils, Environmental effects, Plant physiology, *Drought tolerance.

The recommened drought-resistant ornamental plants included trees, tall shrubs, shrubs, and dwarf shrubs, which have been grown and observed at the Institute for Applied Research for a twelve year period. The preferred salt-resistant ornamental plants had been grown at various locations throughout Israel in saline soils using brackish water irrigation for four years. Salt resistant plants were classified according to their ability to withstand poor drainage and bad aeration. Detailed lists of all drought-resistant plants and salt-resistant plants are included in the report. (Jewkes-Arizona)
W78-08752

3C. Use Of Water Of Impaired Quality

VEGETATIVE STABILIZATION OF SPENT OIL SHALES: VEGETATION, MOISTURE, SALINITY, AND RUNOFF - 1973-1976,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-08268

HYDRODYNAMIC DISPERSION DURING ABSORPTION OF WATER BY SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 2G.
W78-08557

CALIBRATION STABILITY AND RESPONSE TIME FOR SALINITY SENSORS,
Agricultural Research Service, Riverside, CA. Salinity Lab.
For primary bibliographic entry see Field 2G.
W78-08559

THEORETICAL MODELING OF MIXED-ELECTROLYTE SOLUTION FLOWS FOR UNSATURATED SOILS,
Agricultural Research Organization, Bet Dagan (Israel). Div. of Soil Physics.
For primary bibliographic entry see Field 2G.
W78-08563

DWARF WHEAT, GIANT CHANGES,
Agency for International Development, Washington, DC.
For primary bibliographic entry see Field 3F.
W78-08742

OBSERVATIONS OF SOIL WATER AND SALT MOVEMENT UNDER DRIP AND FLOOD IRRIGATION IN AN APPLE ORCHARD,
Commonwealth Scientific and Industrial Research Organization Merbein (Australia). Div. of Horticultural Research.
J. Groot Obbink, and D. McE. Alexander.
Agricultural Water Management, Vol 1, No 2, p 179-190, September 1977. 4 fig, 3 tab, 10 ref.

Descriptors: Soil water movement, Semiarid climates, Water utilization, *Irrigation systems, Salts, Sampling, Soil-water-plant relationships, Soil moisture, Flood irrigation, Surface irrigation, *Apples, *Orchards, On-site investigations, Water distribution(Applied), Water utilization, Australia, Water shortage.

Successful orchard management in an arid climate depends upon adequate application and distribution of water. Research experiments compared effects of drip and flood irrigation on soil moisture and salt movement in a mature apple orchard, with a semiarid climate in Australia. Part of an orchard, previously flood irrigated, was converted to drip irrigation in Ausust 1971 and maintained until May 1975. The remainder of the orchard was irrigated as before. Results suggested: (1) high salt concentrations were observed in soil layers in the drip irrigation experiment while lower, less variable salt concentrations were observed in the flood irrigation experiment; (2) sampling of the apple yields together with moisture and chloride content of leaves showed significant annual changes but no significant differences between treatments; (3) tree girths were smaller with drip irrigation; and (4) drip irrigation operated successfully for the trial period. (Jewkes-Arizona)
W78-08745

NATURE AND IMPACT OF TEMPERATURE AND MOISTURE IN ARID WEATHERING AND SOIL FORMING PROCESSES - A REVIEW.
Ghent Rijksuniversiteit (Belgium). Lab. for Physical Geography and Pedology.
For primary bibliographic entry see Field 2G.
W78-08755

3D. Conservation In Domestic and Municipal Use

HANDBOOK OF WATER RESOURCES AND POLLUTION CONTROL.
For primary bibliographic entry see Field 5D.
W78-08543

CU/U ORE-LEACHING ROUTE CUTS POLLUTION, TRIMS COSTS,
G. Parkinson.
Chemical Engineering, Vol. 85, No. 10, p 54-55, April, 1978. 1 fig.

Descriptors: *Uranium, *Copper, *Acid mine water, *Mine drainage, *Leaching, *Acid streams, Sulfur compounds, Construction materials, Cathodes, Solvent extractions, Design criteria, Solubility, Waste water treatment, Industrial wastes.

A thin layer copper and uranium ore leaching process has been developed by Holmes and Narver, Inc. of Orange, California, as an economical alternative to agitation leaching. The copper or uranium ore is spread in a layer 3 ft deep or less

d treated with sulfuric acid followed by shallow d leaching. The process will be used at a Chilean pper processing plant which will handle 2,600 etric tons ore/day and produce 45 metric tons thode copper/day. The plant will initially ocess ore with 80% acid soluble copper; the ore crushed and passed to a rotating drum for treat-ent with concentrated sulfuric acid. The sulfuric id-bearing ore is stored in a cure pile for 24 hrs fore it is deposited on acid-resistant concrete aching beds; the beds are sprayed with leach uor, followed by raffinate containing 7.5-9.0 liter to 5-6 g/liter, considered the optimum level r the solvent-extraction process. The thin layer ocess produces tailings with a moisture content about 15%, compared to the 50% content quired for disposal of tailings from conventional pper and uranium extraction methods. This eminates the need for extensive evaporation nds as the drier tailings can be piled to a height 35-40 ft or used to backfill mined-out areas. isk-FIRL)
78-08624

ROSION AND SEDIMENT CONTROL IN URANIZING AREAS,
oil Conservation Service, College Park, MD.
or primary bibliographic entry see Field 4D.
78-08798

E. Conservation In Industry

VATER CONSERVATION AND POLLUTION ONTROL IN COAL CONVERSION ROCESSES,
Vater Purification Associates, Cambridge, MA.
or primary bibliographic entry see Field 5G.
78-08228

LIME CONTROL METHOD,
Kurita Water Industries Ltd., Osaka (Japan). Assignee).
For primary bibliographic entry see Field 5G.
78-08595

PROCESS FOR TREATING WASTE WATER CONTAINING POLYVINYL ALCOHOL,
Sando Iron Works Co., Ltd. (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
78-08604

HIGH-EFFICIENCY BROWNSTOCK WASHER SYSTEMS--CONSIDERATIONS IN MEASURING LOSSES,
Chesapeake Corp. of Virginia, West Point.
For primary bibliographic entry see Field 5D.
78-08621

3F. Conservation In Agriculture

WEATHER AND WATER.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2B.
78-08245

DETERMINING THE USEFULNESS OF REMOTE SENSING FOR ESTIMATING AGRICULTURAL WATER DEMAND IN CALIFORNIA,
California Univ.-Berkeley. Remote Sensing Research Program.
R. N. Colwell.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-30551, Price codes: A04 in paper copy, A01 in microfiche. Semi-Annual Report, Space Sciences Laboratory Series 18, Issue 59, 1977. 65 p, 22 fig, 15 tab. NASA NSG 2207.

Descriptors: *Remote sensing, *Satellites(Artificial), *California, *Irrigation, *Agriculture, *Water demand, *Water supply, *Crop production, *Data collections, Analytical techniques, Statistics, Mapping, *Crop classification, *LANDSAT, Crop types, Spatial signature extension, Cropland.

Implementation of an operational methodology by which the California Department of Water Resources (DWR) can extract information from a LANDSAT-based remote sensing system to obtain irrigated acreage statistics is described. Techniques for specific crop type determination were tested in Kern County. Project accomplishments include: (1) review of DWR's land use survey requirements, specifically as to the need for crop-specific data, map formats, and statistica studies; (2) demonstration of the need to broadly regionalize the variety of environments in California for determination of an optimum mix of remote sensing techniques for each environment; (3) demonstration of the significant impact of spatial signature extension on the cost-effectiveness and transferability of remote sensing techniques; (4) a 1976 update map of Kern County cropland; and (5) LANDSAT crop keys for all major County crops. Multicropping was difficult to classify using the available imagery and manual techniques. Average manual classification accuracy and water demand group accuracy were 71% and 84%, respectively. Two digital data sets are being processed: conventinal LANDSAT image keys, were made to select optimum periods to discriminate fallow, small grans, and cotton from all other corps. Techniques developed in the study have been extended to a Sacramento test site for the 1976 crop season using DWR ground truth data. Multiyear extension in 1975 and 1976 are described; a comprehensive evaluation was performed during the 1977 crop season using data previously collected. (Seip-IPA)
W78-08256

WATER MOVEMENT IN BARE AND CROPPED SOIL UNDER ISOLATED TRICKLE EMITTERS: I. ANALYSIS OF BARE SOIL EXPERIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08313

IRRIGATION MANAGEMENT: AN INFORMATION SYSTEM APPROACH,
Lincoln Coll. (New Zealand).
I. J. Ritchie, J. B. Dent, and M. J. Blackie.
Agricultural Systems, Vol 3, No 1, p 67-74, January, 1978. 21 ref.

Descriptors: *Irrigation systems, *Planning, Distribution systems, Water shortage, Water supply, Arid climates, Water management(Applied), Crop production, *Wheat, Soil moisture, Water costs, Simulation analysis, Climatic data, Information retrieval, Flood irrigation, Sprinkler irrigation, Water allocation(Policy), *Water conservation.

A model irrigation information system was developed so that farmers and extension workers could determine its practical applications for farms in arid climates supporting both irrigated mixed crops and livestock. Two basic types of irrigation, sprinkler and flood, were investigated. Farmers were assisted in determining the total acreage to be irrigated. Water allocation planning included estimating water needed form both crops and livestock, regulating the limited irrigation water supply in relation to crop demands and climatic changes, and allocating daily water supply between crops and livestock. Potential with limited water supply; (2) Evaluation of irrigation programs by careful daily monitoring of irrigation practices for crops and animals. (Jewkes-Arizona)
W78-08369

LIVING WITH A RIVER: TRADITIONAL FARMERS OF THE RIO SAN MIGUEL,
Arizona-Sonora Desert Muzeum, Inc., Tucson.
T. E. Sheridan, and G. P. Nabhan.
The Journal of Arizona History, Vol 19, No 1, p 1-16, Spring, 1978. 18 ref. NSF-SOC-75-13-628 and NSF-BNS-77-0852.

Descriptors: *Water conservation, Land management, Mexico, Arid lands, Watershed management, History, *Water resources development, *Irrigation practices, Canals, Wells, Livestock, Human population, Water control, Water shortage, Subsistence, Crop production.

Historical research indicates the semiarid San Miguel Valley, located in Sonora, Mexico has been successfully farmed since prehistoric times. Careful watershed management, skillful irrigation practices and the wise choice of crops adapted to an arid climate have contributed to the continued successful farming of the region. Present day farmers practice subsistence farming and livestock raising, using many of the traditional methods of water conservation and land management of their ancestors, continuing use of shallow wells using river resources instead of deep groundwater pumping. (Jewkes-Arizona)
W78-08389

PLANT POPULATION AND ROW SPACING FOR IRRIGATED AND RAINFED OILSEED SUNFLOWERS (HELIANTHUS ANNUUS) ON THE DARLING DOWNS,
Queensland Wheat Research Inst., Toowoomba (Australia). Primary Industries Dept.
B. J. Radford.
Australian Journal of Experimental Agriculture and Animal Husbandry, Vol 18, No 90, p 135-142, February, 1978. 6 fig, 4 tab, 10 ref.

Descriptors: *Australia, Arid climates, Planting management, Moisture availability, *Irrigation effects, *Plant growth, Crop production, *Plant physiology, *Climatic data, *On-site data collections, *Plant populations, *Irrigation practices, *Soil-water-plant relationships, *Water requirements, Sunflowers, Row spacing.

Experiments were conducted to determine the optimum plant population and row spacing for oilseed sunflower crops grown under both irrigated and rainfed conditions on the Darling Downs, Australia. Three irrigated and four rainfed test trials were held from 1968-1969 to 1972-1973. Test results summarized: (1) experimental and cropping data for irrigated and rainfed trials, (2) moisture data, (3) time and degree days to 50 percent flowering and maturity, (4) effects of plant population and row spacing. Results suggested highest oil yields were obtained with plant populations of 50,000 to 100,000 plants ha-1 in irrigated trials and 40,000 to 60,000 plant ha-1 in rainfed trials. Rows 36cm. wide outyielded in five out of seven test trials. (Jewkes-Arizona)
W78-08395

WATER REQUIREMENTS OF AVOCADO IN ISRAEL, II. INFLUENCE ON YIELD, FRUIT GROWTH AND OIL CONTENT,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
E. Lahav, and D. Kalmar.
Australian Journal of Agricultural Research, Vol. 28, No. 5, p 869-877, September, 1977. 5 fig, 5 tab, 8 ref.

Descriptors: *Water conservation, Sprinkler irrigation, Crop response, Rates of application, *Plant growth, *Water management(Applied), *Water utilization, *Irrigation practices, *Irrigation effects, *Soil-water-plant relationships, *Plant physiology, Timing, *Consumptive use, *Water requirements, *Irrigation efficiency, *On-site tests, *Stone fruits, Avocados, Israel.

Detailed summary of a 6 year irrigation experiment on the avocado three was reported in a previous article. In this article, measurements of fruit growth and oil content of the avocado were discussed for avocado plantations with heavy soils using sprinkler irrigation systems. Tests suggested that continued irrigation over a period of years increased the avocado trees' rate of growth and fruit yield. The Hass cultivar appeared to make the maximum use of water. Recommended irrigation schedule was frequent irrigation in the summer and autumn, with no irrigation in the spring. Tests demonstrated that frequent irrigation only slightly increased the oil percentage in the fruit. Most favorable irrigation schedule recommended was a 21 day irrigation cycle, using approximately 6680 m3/ha water annually, with an additional estimated 6000 m3 water derived from winter rains. (Jewkes-Arizona)
W78-08422

PHYSICAL AND CHEMICAL CHANGES IN FRUIT OF SEVEN AVOCADO CULTIVARS AT MILDURA,
Victoria Dept. of Agriculture, Mildura (Australia). Horticultural Research Station.
B. M. El-Zeftawi.
Australian Journal of Agricultural Research, Vol 29, No 1, p 81-89, January, 1978. 5 fig, 14 ref.

Descriptors: *Australia, Irrigation practices, On-site data collections, *Analytical techniques, Evaluation, *Plant growth, *Plant growth substances, Fruit crops, *Stone fruits, Crop production, Arid lands, Avocados.

Experiments dealt with the expanding avocado industry in the irrigated area near Mildura, Victoria, 1974-1975. The tests were designed to determine and to evaluate changes before and after harvesting of 7 different avocado cultivars as indicators of the fruit's maturity. Similarities and differences between the cultivars were summarized, emphasizing the limitations of the experiments. Suggested conclusions indicated that moisture content and/or seed weight could be used by growers to estimate the oil content of the fruit and to select the optimum time for picking. On the basis of a minimum oil content of 8% as crude fat extract, tests suggested fruit could be picked from May to September. Under local conditions Zutano could best be picked in May, Fuerte in July, Hazzard in September, and other cultivars between July and September. (Jewkes-Arizona)
W78-08427

AGRICULTURAL WATER DEMANDS: PRELIMINARY RESULTS OF SILISTRA CASE STUDY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6D.
W78-08428

IRRIGATION EMITTER,
L. Spencer.
U.S. Patent No. 4,058,257, 9 p, 27 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 964, No. 3, p 834, November 15, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Mist irrigation, Irrigation efficiency, Application equipment, Flow control, Drip irrigation.

An irrigation emitter includes a fixed longitudinally extending passage wall element having a longitudinally extending restricted flow groove. A flexible longitudinally extending passage wall element overlies the fixed wall element contacting it along its side margins to define a flush passage. It is adapted to collapse against the fixed wall element to confine flow to the restricted flow groove. The irrigation emitter which with minimum change in parts, may be arranged for drip flow, trickle flow, mist spray or sprinkler spray during an irrigation flow cycle and, in each case, undergoes flush flow at the start and finish of a flow cycle. The mist or sprinkler spray discharge may also be arranged to produce spray patterns arranging from a segmental spray to a full circle spray. (Sinha-OEIS)
W78-08582

SPRINKLER HEAD SEALING APPARATUS,
Senninger Irrigation, Inc., Orlando, FL. (Assignee).
M. Healy.
U.S. Patent No. 4,062,494, 4 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 965, no 2, p 549, December 13, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Application equipment, Irrigation efficiency, Irrigation practices.

A rotatable head sprinkler apparatus incorporates a lower bearing seal between a swivel device for connection to a source of water under pressure, and a spindle connected through the swivel device to a self-powered rotary sprinkler head of the type used for irrigation. A bearing washer is formed into the swivel device and forms a coupling for a protective seal which prevents the entry of trash, or the like, into the area between the seal and the wear washer. (Sinha - OEIS).
W78-08584

TRACT-TAILORED CONTROL MEANS AND METHOD FOR CENTER-PIVOT IRRIGATION APPARATUS,
T. V. Olson, and C. G. Olson.
U.S. Patent No. 4,063,569, 8 p, 7 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 965, no 3, p 899, December 20, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Control systems, Timing, Rates of application.

The general object of this invention is to provide a tract-tailored control means for electric-drive and hydraulic-drive center-pivot irrigation apparatuses so that water applied per unit land-area from a solitary center-pivot apparatus can be controlled from sector to sector according to the peculiarities of the land tract to be irrigated. The tract-tailored control means generally comprises a primary-timer, and a secondary-timer, and perhaps too a tertiary-timer, etc., on the display panel and arranged in parallel branches along the electrical power-path, and togeter with patterned template or other tract-tailored automatic switching means program for causing the electric current to flow alternatively and exclusively through the appropriate timer and according to the pre-programmed exigiencies of the particular land tract to be irrigated with a solitary center-pivot apparatus. (Sinha - OEIS)
W78-08588

SUBTERRANEAN IRRIGATION SYSTEM,
E. R. Brandt.
U.S. Patent No. 4,065,926, 6 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 47 January 3, 1978.

Descriptors: *Patents, *Irrigation, *Subsurface irrigation, Irrigation systems, Irrigation efficiency, Irrigation practices, Grid pattern.

An irrigation system employs a grid pattern of interconnected flow passages which is interred beneath the surface of the area to which water, or any liquid, is to be applied. The grid pattern of flow passages is fed through an inlet using a gravity feed from the source of water. The grid is formed from two sheets of plastic which are heat sealed about their edges as well as within their center portion so as to form a series of perpendicularly oriented and intersecting lines of flow passages. It is through these passages that the water flows. Located at spaced intervals, and having specifically designed sizes directly proportional to their distance from the grid 'inlet' are apertures formed in the flow passages to permit water to escape to the soil being watered. (Sinha-OEIS)
W78-08601

A NEW DIELECTRIC SOIL MOISTURE METER FOR FIELD MEASUREMENT OF SOIL MOISTURE,
Technical Univ. of Prague (Czechoslovakia). Dept. of Irrigation and Drainage.
For primary bibliographic entry see Field 2G.
W78-08707

DEEP PLOWING, CURE FOR SODIC CLAYPAN,
Agricultural Research Service, Mandan, ND.
F. M. Sandoval, and F. C. Jacober.
Crops and Soils Magazine, Vol 29, No 7, p 9-10, April-May, 1977. 1 fig.

Descriptors: Soil investigations, Soil tests, Soil types, Soil treatment, Soil structure, Soil profiles, *Cultivation(Deep plowing), *Great Plains, *Alkaline soils, *Clay pan soils.

Sodic claypan soils are not desirable. More common names for this type of soil are scabland, scabspot land, or panspot land. How common are these soils. We have about 17 million acres in the Northern Great Plains. There are another 12 million acres to the north in the Canadian prairie provinces. (Skogerboe-Colorado State)
W78-08708

OUR NEWEST NATURAL RESOURCE--COMPACTION--GOOD AND BAD EFFECTS ON ENERGY NEEDS,
Agricultural Research Service, Morris, MN.
W. B. Voorhees, and J. G. Hendrick.
Crops and Soils Magazine, Vol 29, No 7, p 11-13, April-May, 1977. 1 fig.

Descriptors: Soil properties, *Soil compaction, Soil density, *Soil erosion, Runoff, Soil management, Soil structure, Soil physical properties, Bulk density, Crop production, Root growth.

Soil compaction caused by wheel traffic during normal farming operations can create serious erosion and water runoff problems, and can drastically restrict root growth and reduce crop yields. (Skogerboe-Colorado State)
W78-08709

ROUNDTABLE: IRRIGATION-FERTIGATION, WHEN SHOULD NITROGEN BE APPLIED TO CROPS AND IN WHAT FORM,
Minnesota Univ., St. Paul. Dept. of Soil Science.
A. C. Caldwell, L. S. Murphy, B. B. Tucker, R. A. Wiese, and J. C. Zubriski.
Crops and Soils Magazine, Vol 29, No 7, p 14-21, April-May, 1977. 5 fig.

Descriptors: *Nitrogen, Nutrients, *Fertilizers, Fertilization, Rainfall, Soil water, Soil moisture, Economics, *Application rates.

Various experiments of irrigation-fertilization are presented by five authoritative authors. The fertilization time frame and injection of fertilizers in irrigation water and the economics of fertilization are considered. (Skogerboe-Colorado State).
W78-08710

SHOULD YOU BE USING NITRAPYRIN,
Wisconsin Univ.-Madison. Dept. of Soil Science.
L. M. Walsh.

Crops and Soils Magazine, Vol 30, No 1, p 8-10, October, 1977. 1 fig, 2 tab.

Descriptors: *Nitrogen, *Fertilizers, Fertilization, Nutrients, Crop production, *Nitrapyrin, *N-Serve, Nitrogen compounds.

A new product called N-Serve (nitrapyrin) has been getting a lot of attention since its commercial introduction last fall. This product is designed to cut losses of nitrogen fertilizer. (Skogerboe-Colorado State)
W78-08711

SOLAR ENERGY TO POWER IRRIGATION PUMPS.
Agricultural Engineering, Vol 58, No 7, p 41-42, July, 1977. 2 fig.

Descriptors: Irrigation, *Irrigation practices, *Pumps, Pumping plants, Pumping, Solar radiation, *New Mexico, Electrical equipment, Electricity, Electrical power production, Electric power, *Solar energy power.

The sun powers the sump pump in the experimental irrigation system now operating at Gila Bend, Arizona. The system, developed by Battelle Memorial Institute with financial backing by Northwestern Mutual Life Insurance Company, delivers 10,000 gpm to 25,000 acres planted in cotton, wheat, barley, alfalfa and safflower. (Skogerboe-Colorado State)
W78-08712

CAN SUNSHINE POWER THE IRRIGATION PUMP,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
G. H. Abernathy, and T. R. Mancini.
Agricultural Engineering, Vol 58, No 10, p 39-40, October, 1977. 1 fig.

Descriptors: Irrigation, *Irrigation practices, *Pumps, Pumping, Solar radiation, *New Mexico, Electrical equipment, Electricity, Electrical power production, Electric power, *Solar energy power.

The Torrance County Land and Livestock Co. in New Mexico's Estancia Valley is the site of the new experimental solar-powered pumping plant funded by the State of New Mexico and ERDA. Sandia Laboratories engineered the pumping system. New Mexico State University will conduct the agricultural experiments. Three crops will be grown yearly. (Skogerboe-Colorado State)
W78-08713

A LOOK AT THE DRIP/TRICKLE INDUSTRY,
G. O. Fraser, Jr.
Water and Irrigation, p 5-11, 27-28, November, 1977. 5 fig, 2 tab.

Descriptors: Irrigation, Irrigation efficiency, *Irrigation practices, Water conservation, *Drip-trickle irrigation.

Leaders of the drip/trickle irrigation industry present their ideas regarding the state-of-the-art of this type of irrigation. (Skogerboe-Colorado State)
W78-08714

BUYING AUTOMATIC IRRIGATION,
S. Kennedy.
Weeds, Trees, and Turf, Vol. 16, No. 1, p 15, 18, January, 1977. 1 fig.

Descriptors: Irrigation, *Irrigation practices, *Irrigation systems, Irrigation efficiency, Automation, *Automatic control(Irrigation), Turf, *Ohio, Golf courses, Recreation facilities.

After 44 years with the same irrigation system, the Columbus Country Club decided to replace it. Superintendent Steven Kennedy tells how he went about doing so and offers some advice to superintendents who plan to replace their systems. (Skogerboe-Colorado State)
W78-08715

FREQUENT IRRIGATION MORE EFFICIENT,
Agricultural Research Service, Peoria, IL.
W. W. Martin.
Crops and Soils Magazine, Vol. 29, No. 5, p 10-12, February, 1977. 3 fig.

Descriptors: Irrigation, *Irrigation practices, Irrigation effects, *Soil water, Soil moisture, Fertilizers, Irrigation efficiency, *Sands, Water pollution control, Water conservation.

Frequent, light irrigations on sandy soil save water and the energy to pump it and also reduce the amount of fertilizer nitrogen moving below the reach of plant roots as a potential ground water pollutant. (Skogerboe-Colorado State)
W78-08716

DIMENSIONLESS SOLUTIONS OF BORDER-IRRIGATION ADVANCE,
California Univ., Davis. Dept. of Land, Air and Water Resources.
N. D. Katopodes, and T. Strelkoff.
ASCE Journal of the Irrigation and Drainage Division, Vol. 103, No. IR4, p 401-417, December, 1977. 14 fig, 11 ref, 2 append.

Descriptors: Hydraulics, Hydrodynamics, *Irrigation engineering, Mathematical models, *Surface irrigation, *Model studies, *Froude number, *Infiltration, *Kostiakov infiltration equation, *Flow deviation, *Border irrigation.

The equations of border-irrigation flow are written in dimensionless form and solved numerically at three different levels of mathematical approximation. For the advance phase three independent parameters exist: the Froude number based on normal depth, the dimensionless exponent of the Kostiakov infiltration equation, and a dimensionless parameter determining the deviation of flow conditions from normal. It is shown both by order of magnitude analysis and from the results of the numerical computation that the inertia terms in the governing equations are unimportant for border flow (Froude number approximately zero). The model governed by the remaining two parameters, the zero-inertia model, is used to generate dimensionless advance trajectories and related information for all practical combinations of these two parameters. An additional advance trajectory is computed focability of the latter. (Skogeboe-Colorado State)
W78-08717

WINTER'S DOCTRINE: A REVIEW,
Nevada Univ., Reno. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W78-08718

DESIGN OF DRIP IRRIGATION LINES WITH VARYING PIPE SIZES,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W78-08719

MODELING INFILTRATION UNDER MOVING SPRINKLER IRRIGATION SYSTEMS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08720

EXPERIMENTAL EVALUATION OF TWO INFILTRATION EQUATIONS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08721

THE CONTROL OF NITRATE AS A WATER POLLUTANT,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 5G.
W78-08723

ALTERNATIVE ENERGY SOURCES IN THE USSR,
Royal Swedish Academy of Science (Stockholm).
R. Grunbaum.
AMBIO, Vol. 7, No. 2, p 49-55, March - April, 1978. 6 fig, 22 ref.

Descriptors: *Winds, Alternative planning, Solar energy, Geothermal studies, Water resources development, *Arid lands, Water supply, Irrigation programs, *Energy conversion, Wind energy, *Desalinization processes, Free energy, Energy transfer, *USSR.

Alternative energy resource programs have been undertaken in the USSR, particularly in regions where conventional sources are too expensive or inconvient. Various uses of wind energy have included the generation of power for the pumping and desalinization of groundwater, and for farm irrigation equipment. Experiments suggested windpower could generate sufficient power to provide livestock in Central Asia with an adequate water supply under favorable conditions. Wind machines have been specially constructed to supply electrical energy for farm irrigation equipment in the Kazakh Republic. In the Kara-Kum desert, solar energy plants have provided power for the desaliniation of groundwater to supply water for livestock. Various potential uses of windpower, solar energy, tidal and geothermal energy discussed. (Jewkes-Arizona)
W78-08736

PRELIMINARY EXPERIMENTS ON THE GROWTH OF KENAF (HIBISCUS CANNABINUS) FOR PAPER PULP PRODUCTION IN THE ORD IRRIGATION AREA, WESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Tropical Agronomy.
I. M. Wood.
Austrlian Journal of Experimental Agriculture and Animal Husbandry, Vol. 18, No. 90, p 97-106, February, 1978. 3 fig, 9 tab, 13 ref.

Descriptors: *Australia, Arid climates, Analytical techniques, *Plant growth, *Crop production, Soil-water-plant relationships, Management, Water management(Applied), *Kenaf, Hibiscus cannabinus.

Two experiments during 1973 and 1974 at the Kimberley Research Station in arid Western Australia studied kenaf (Hibiscus cannabinus) grown for paper pulp production. Experiment 1 with cv. 2032 examined crop growth at 4 seeding rates, 2 row spacings and 4 times of sowing. In experiment 2, growth of cv. Guatemala-4 was followed at 2 sowing times. Study results indicated: (1) year-row growth of kenaf could be sustained by irrigation; (2) the best crop yield was 25.6 tons ha-1, achieved after 240 days from a July sowing of Guatemala-4; (3) dry matter yields from cv. C2032 were highest with narrow row spacing on 1.5 m beds with 5 rows spaced 20 cm. apart. Row spacing mainly effected yields of tops and foliage. A seeding rate of 15-20 kg ha-1 appeared to be optimum; and (4) ratooning of kenaf is feasible, provided plants are cut between 10 cm. and 30 cm. above ground level.

Plant recovery after cutting is highest at 30 cm. (Jewkes-Arizona)
W78-08738

MODERNIZING THE MASAI,
Agency for International Development, Washington, DC.
E. George.
Agenda, Vol 1, No 3, p 12-16, March 1978.

Descriptors: *Nomads, *Water resources development, Arid lands, Water supply, Land use, *Livestock, *Range management, Grazing, Cattle, Carrying capacity, Water requirements, *Water management(Applied), Multiple-purpose projects, *Institutions, *Tanzania, *Kenya, Africa.

Nomadic Masai herdsmen prefer their traditional methods of livestock grazing and searching for water sources. The Tanzania and Kenya governments have cooperated on a livestock development project with AID assistance. AID projects have encouraged a Masai village settlement program in areas capable of supporting agricultural development, and have provided technical training in modern methods of animal husbandry, range management, marketing, and disease control. AID programs have assisted with the development and operation of the Tanzania Livestock Marketing Company, the formation of 22 ranching associations, the opening of 6 veterinary centers, the building of access roads and the development of a land survey to determine grazing patterns and available water resources. Construction of small dams and wells are expected to provide more reliable water sources for livestock. (Jewkes-Arizona)
W78-08740

WATER AND NUTRIENT RESPONSE OF SEMI-DWARF WHEAT UNDER IMPROVED MANAGEMENT CONDITIONS IN PAKISTAN: AGRONOMIC AND ECONOMIC IMPLICATIONS,
Colorado State Univ., Ft. Collins.
J. B. Eckert, N. M. Chaudhry, and S. A. Qureshi.
Agronomy Journal, Vol 70, No 1, p 77-80, January-February, 1978. 2 fig, 3 tab, 6 ref. AID Contract AID/ta-c-1100.

Descriptors: *Land management, *Crop production, *Economic impact, *Wheat, *Water resources development, Social aspects, *Irrigation programs, *Irrigation effects, *Water management(Applied), *On-site tests, Plant growth, *Water utilization, Soil-water-plant relationships, *Irrigation practices, Water supply, Water conservation, Soil moisture, *Pakistan.

A series of experiments, conducted by Colorado State University agricultural research specialists, studied the plant growth of semi-dwarf wheat (Triticum aestivum L.), 1973-1975, at selected test sites in Lyallpur, Pakistan. Improvements made over traditional crop production included irrigation timing to minimize moisture stress during sensitive periods of plant growth, controlling amounts of water during each irrigation, and use of seed drills for row planting to control seed depth and spacing. Tests suggested wheat production could be maintained and/or improved by increasing the amount of fertilizer used and by reducing water used, provided that careful timing and control of irrigation programs was maintained. (Jewkes-Arizona)
W78-08741

DWARF WHEAT, GIANT CHANGES,
Agency for International Development, Washington, DC.
J. B. Eckert.
Agenda, Vol 1, No 4, p 9-15, April, 1978. 6 fig.

Descriptors: *Irrigation practices, Desalination processes, *Crop production, *Wheat, *Land reclamation, Water management(Applied), *Surface-groundwater relationships, Institutions, Planning, Evaluation, *Land management, *Water resources development, Research and development, Costs, *Governmental interrelations, *Land management, *Pakistan.

Pakistan's 1966 wheat crop production was 3.75 million tons. Through a series of land reclamation and improvement programs subsidized by AID loans and technical assistance, the Pakistan government encouraged farmers to plant dwarf wheat and to adopt new crop production techniques. Large-scale salinity control projects were undertaken to improve the land's productivity. Although Pakistan's annual wheat production had increased to 8.5 million tons by 1975, annual wheat production was still approximately 1 million tons by 1975, annual wheat production was still approximately 1 million tons less than the country's annual rate of consumption. Various marketing and distribution problems remained unsolved. In 1976, new AID assistance was authorized to assist Pakistan's government to purchase high-yield wheat seed, small scale farm equipment, fertilizer, and to develop project proposals to improve marketing techniques. (Jewkes-Arizona).
W78-08742

EFFECT OF GRAZED LUCERNE ON THE MOISTURE STATUS OF WHEAT GROWING SOILS,
New South Wales Dept. of Agriculture (Australia). Tamworth Agricultural Research Center.
I. C. R. Holford, and A. D. Doyle.
Australian Journal of Experimental Agriculture and Animal Husbandry, Vol 18, No 90, p 112-117, Feb. 1978. 3 fig, 1 tab, 1- ref.

Descriptors: *On-site tests, *Australia, *Wheat, Crop production, *Soil moisture, Soil moisture meters, *Water loss, *Soil management, *Soil water, *Soil-water-plant relationships, Soil analysis, Grazing, *Alfalfa, Arid lands, Water shortage.

Two experiments studied the effects of varying the duration of lucerne ley and subsequent wheat cropping on selected black and red brown earth soils in northern New South Wales. Limited soil moisture hampers both crop and pasture growth in this region. On the black earth site, test results indicated soil moisture at 150 cm. had not been recharged in 28 months after the plough-out. On the red brown earth site, soil water at 200 cm. was recharged within 18 months, after a drought enforced fallow immediately following the lucerne plough-out. Results of both soil studies suggested a four to five month period of fallow after the lucerne plough-out was inadequate for sufficent soil moisture to accumulate, without causing reduced wheat yields in the next harvest. (Jewkes-Arizona)
W78-08744

AT HOME ON THE RANGE IN KENYA,
Agency for International Development, Washington, D.C.
E. George.
Agenda, Vol 1, No 5, p 16-20, May, 1978.

Descriptors: *Kenya, Nomads, Administrative agencies, *Direct costs, *Direct benefits, Multiple-purpose projects, *Range management, *Arid lands, *Grazing, *Livestock, Carrying capacity, *Cattle, Project planning, Water resources development, Regional development, Evaluation, *Economic justification, *Governmental interrelations.

A five-year program, designed to improve Kenya's range management and cattle production, is discussed. With funding assistance from the International Association of the World Bank, AID, Canada and the United Kingdom, the Kenya Ministry of Agriculture reorganized the Kalaliut Range Block, containing approximately 14 million arid acres, into 7 ranges. Construction and/or improvement of watering pans and borehles was instituted to improve water supplies available t nomadic herders. Suggested improvements mad through the the project included: (1) constructio and maintenance of new watering pans an boreholes; (2) successful raising of 76000 cattle (3) development of new cattle markets; (4) con struction of dry weather boundaries, access road and firebreaks; and (5) study by 18 Kenyans fo advanced degrees in veterinary sciences in th United States. Future project planning include expansion of demonstration ranches and con tinued training of Kenyans in range/ranch manage ment. (Jewkes-Arizona)
W78-08748

A MODEL FOR FORECASTING WHEA PRODUCTION,
Vikram Sarabhai Space Center, Trivandrun (India).
K. A. P. Menon, and B. Bowonder.
Technological Forecasting and Social Change, Vo 11, No 3, p 261-271, March, 1978. 4 fig, 1 tab, 9 ref

Descriptors: *Wheat, *Crop production, Simula tion analysis, Planning, Arid lands, Costs, Rain fall-runoff relationships, Water supply, Wate shortage, Irrigation practices, *Forecasting Economic efficiency, *Model studies, Lan management, Water conservation.

A proposed model for forecasting wheat produc tion in arid regions of India considered the effect of irrigation, the use of fertilizer, the use of whea varieties with drought tolerance, rainfall varia tions, labor and the use of farm machinery. This projected model demonstrated how simulation analysis could be used to predict the production o wheat. Rainfall effects and unexpected drought conditions produced variations in soil moisture re tention and different levels in the water tables. Wheat production systems, emphasizing problems of wheat production and cultivation in India 1954-1972, were analyzed. Production costs, water conservation practices and crop productivity were compared. (Jewkes-Arizona)
W78-08751

THE EFFECT OF PLANT POPULATION, GROWING MEDIA, AND CARBON DIOXIDE CONCENTRATION ON THE GROWTH AND YIELD OF SOYBEANS GROWN IN A MODIFIED ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Agronomy.
C. Samimy, and M. A. Massengale.
Journal of the Arizona-Nevada Academy of Science, Vol 13, No 1, p 25-28, February, 1978. 4 fig, 2 tab, 15 ref.

Descriptors: Environmental control, Growth chambers, Greenhouses, Plant populations, *Plant growth, *Plant growth regulators, *Soybeans, *Carbon dioxide, *Environmental effects, Crop production, Relationships, *Arid lands, Water shortage.

Two experiments, begun in 1966, compared soybeans grown in specially controlled greenhouse environment with soybeans grown under field conditions. Rates of plant growth, plant yield and water need for optimum plant growth were contrasted. The Kino cultivar of soybeans (Glycine max. (L.) Merr.) was used for all experiments. Experiment results suggested: (1) plants grown under greenhouse conditions showed almost identical growth patterns for plant emergence, flowering and maturing as plants grown under field conditions; (2) plants grown under greenhouse conditions needed appoximately 64 percent as much water as plants grown under field conditions; and (3) highest soybean crop production was obtained with greenhouse plants grown in 1200 ppm CO2 and in pure sand (4:0). Application of carbon dioxide concentrations increased number of pods per plant. These experiments were part of a larger project at the Institute of Atmospheric Physics, University of Arizona, designed to provide fresh

ater, food, and energy to arid regions of the orld. (JewkesoArizona)
78-08753

ILLAGE EFFECTS ON WINTER WHEAT RODUCTION WHERE IRRIGATED AND DRY-AND CROPS ARE ALTERNATED,
outhwestern Great Plains Research Center, ushland, TX.
W. Unger.
gronomy Journal, Vol 69, No 6, p 944-950, ovember - December, 1977. 2 fig, 5 tab, 11 ref.

escriptors: *Wheat, *Crop production, rrigation programs, *Irrigation effects, *Dry rming, *Tillage, *Water conservation, Soil anagement, Water utilization, *Water storage, 'ater supply, *Soil-water-plant relationships, exas, Arid lands, Evaluation, On-site tests.

tudy was conducted at the USDA Southwestern reat Plains Research Center, Bushland, Texas, 971-1975, to determine if wheat yields could be ncreased where irrigated and dryland wheat crops re alternated on the same plots. Tillage methods ested included no-tillage, sweep and disc tillage. detailed summary compared various effects of ne cropping systems and tillage effects, together ith an evaluation of the combined effects of the ropping systems and the tillage methods on inter wheat production. Test results suggested: 1) dryland wheat yielded significantly more grain ith sweep or disc tillage in the irrigated and dry-and system than in the continuous dryland ystem; (2) sweep tillage was best method for ir-igated wheat; and (3) water efficiency was 8.5 ercent greater when irrigated and dryland crops ere alternated. Greater potential grain produc-ion was also possible when dryland and irrigated rops were alternated. (Jewkes-Arizona)
W78-08754

ESTABLISHING SOIL LOSS AND SEDIMENT IELD LIMITS FOR AGRICULTURAL LAND,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W78-08793

EGETATIVE WATER EROSION CONTROL FOR AGRICULTURAL AREAS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W78-08795

MECHANICAL EROSION CONTROL FOR AGRICULTURAL AREAS,
Soil Conservation Service, Lincoln, IL.
For primary bibliographic entry see Field 4D.
W78-08796

EROSION AND SEDIMENTATION ON IR-RIGATED LANDS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 4D.
W78-08800

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

OSO CREEK FLOOD CONTROL PROJECT AREA, NUECES COUNTY, TEXAS: A REPORT ON THE ARCHAEOLOGICAL AND HISTORI-CAL RESOURCES,
Texas Univ. at Austin, TX.
P. E. Patterson, and N. M. Lord.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 445, Price codes: A04 in paper copy, A01 in microfiche. Research Report No. 35, April, 1974. 60 p, 6 fig, 14 ref, append.

Descriptors: *Flood control, *Archaeology, *Texas, *Environmental effects, History, Land use, *Archaeological effects, Archaeological resources.

The results of a reconnaissance directed toward evaluating the archaeological and historical resources to be affected by proposed modifications for flood control on Oso Creek, Petronila Creek, and drainage ditches in the area of Robstown, Texas, are reported. An examination of the land surface in the study area yielded evidence of a total of 68 newly discovered and previously recorded sites. Ten archaeological sites will be affected by these proposed modifications. No significant historic sites were found within the study area. Recommendations are presented for the mitigation of the loss or damage of the archaeological resources that are endangered. No sites, prehistoric or historic, listed on, nominated to, or approved for submission to the National Register of Historic Places were found within the study area. (Seip-IPA)
W78-08229

STATE WATER CONSERVATION PROJECTS.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
For primary bibliographic entry see Field 6E.
W78-08235

REMOTE SENSING INPUTS TO LANDSCAPE MODELS WHICH PREDICT FUTURE SPATIAL LAND USE PATTERNS FOR HYDROLOGIC MODELS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
L. D. Miller, C. Tom, and K. Nualchawee.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-25607, Price codes: A03 in paper copy, A01 in microfiche. Report, May, 1977. 41 p, 22 fig, 10 tab, 9 ref.

Descriptors: *Land use, *Topographic mapping, *Urban mapping, *Urban hydrology, *Remote sensing, *Terrain analysis, *Model studies, *Hydrologic data, Analytical techniques, Watersheds, Colorado, Tropical regions, *Denver(Colo), Landscaping, *Landscape model studies, *Land use patterns, *Tropical hydrology, Thailand.

Landscape modeling organizes and overlays information from existing maps, tabular sources, and from the analysis of remote sensing imagery into a computer framework. This critical endeavor provides higher-order inputs to the hydrological analysis of an area. Landscape modeling with attendant inputs from remote sensing is illustrated by two case studies. Application to the Denver, Colorado, urban area typifies use of he procedure to predict future spatial evolution of man-induced land use patterns of an urban area which can assist in the simulation of future urban hydrographs. A tropical forest site in Thailand illustrates application to more natural watersheds as the basis for analysis of the hydrological implications of alteration of land cover; primitive watersheds subject to change due to natural (e.g., drought) or man-made (e.g., forest cutting) alteration can be modeled to yield map-like projections of the future distribution of each land use or cover. Remote sensing imagery subjected to proper computer analysis provides input to hydrological models and practical data bases for planning large and small-scale hydrological developments. Combining available remote sensing imagery with map information in the landscape model substantially improves these applications. Coincident, registered overlays of the map information upon multispectral remote sensing imagery of Landsat provide a basis for marked improvements in the accuracy of the computer interpretation of land use and land cover maps to be used directly in hydrological analysis. (Seip-IPA)
W78-08236

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley.
R. N. Colwell.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-31569, Price codes: A14 in paper copy, A01 in microfiche. Progress Report, Space Sciences Laboratory Series 18, Issue 44, May 31, 1977. 234 p, 92 fig, 40 tab, 61 ref, 7 append. NCL 05-003-404.

Descriptors: *Water supply, *Water demand, *California, *Remote sensing, Water resources, *Water resources development, Mapping, Social aspects, Political aspects, Procedures, Evaporation, Transportation, Precipitation(Atmospheric), Snowmelt, Agriculture, *Management, Procedural manuals, Cropland.

A multi-campus study investigated two aspects of California's water resources: (1) problems pertaining to water supply in northern California, and (2) problems pertaining to water demand in central and southern regions. The socioeconomic, cultural, and political considerations that relate to the management of California's water resources were studied. Modern remote sensing techniques and the preparation of procedural manuals for optimal utilization of remote sensing in the inventory and management of resources are described in detail. The application of remote sensing is described for several hydrologic parameters: evapo-transpiration, precipitation, snowmelt runoff, areal extent of snow, agricultural water demand, cropland information, and irrigation requirements. Software and hardware requirements and utilization are documented. Two special studies are presented: (1) Reaction to Reflections on the First Conference on the Economics of Remote Sensing Information Systems, and (2) The Increasing Need for Water Resource Information in California. (Seip-IPA)
W78-08244

WEATHER AND WATER.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2B.
W78-08245

THE STABILITY OF PARAMETER ESTIMATION IN THE GENERAL LINEAR MODEL,
Ireland Office of Public Works, Dublin.
For primary bibliographic entry see Field 2A.
W78-08282

TIME-SYNCHRONISED STAGE RECORDERS FOR THE MONITORING OF INCREMENTAL DISCHARGE INPUTS IN SMALL STREAMS,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W78-08284

SIMULATION OF THE HYDROLOGIC CYCLE USING ATMOSPHERIC WATER VAPOR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W78-08285

DILUTION GAUGING ON THE RECESSION LIMB: 2. THE INTEGRATION METHOD,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2E.

W78-08289

RESERVOIR SEDIMENTATION UNDER UNCERTAINTY: ANALYTIC APPROACH VERSUS SIMULATION,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 2J.
W78-08292

THE USE OF GEOMETRIC PROGRAMMING IN THE DESIGN OF AN ALGERIAN WATER CONVEYANCE SYSTEM,
Becht Corp., San Francisco, CA.
F. P. Wyman.
Interfaces, Vol. 8, No. 3, p 1-5, May 1978. 2 fig, append.

Descriptors: *Water projects, *Cost minimization, *Design, *Water conveyance, *Algeria, Optimization, Sensitivity analysis, *Geometric programming, Agriculture, Pipes, Diameter, Pumping stations, Feasibility, Economic efficiency, Mathematical models, Operations research, Irrigation water.

Algeria is presently involved in an ambitious program to improve its agricultural self-sufficiently. Geometric programming (GP), an engineering optimization tool, has been receiving increased academic attention and has had numerous suggestions for its use proposed; however, few actual applications of GP have been documented. This article reports an application of the technique and the effective use of a simple sensitivity analysis. The project considered will bring water to the inland Setif Region of Algeria from several rivers flowing north into the Mediterranean; it involves pumping water south, up over the mountains, directing it by a series of pipelines, tunnels, and pumping stations, to a set of retention reservoirs, and then distributing it to an agricultural irrigation system. The problem solved is to derive the least cost pipe diameter and number of pumping stations, given a specified flow rate, for selected segments of the pipeline system. Results show that a conservatively estimated savings of $50 million in project costs is expected as a result of the use of GP in designing a 27-kilometer agricultural water conveyance system in Algeria. (Graf-Cornell)
W78-08308

SOUTH DAKOTA'S RESPONSE TO THE 'WATER CRISIS': AN ANALYSIS OF ALTERNATIVES,
For primary bibliographic entry see Field 6E.
W78-08339

LEGISLATIVE AND JUDICIAL ATTENTION TO STREAM MODIFICATION: CHANNELIZATION, ITS EFFECTS AND ALTERNATIVES,
Syracuse Univ., NY. School of Law.
For primary bibliographic entry see Field 6E.
W78-08343

THE POTENTIAL EFFECTS OF CLEARING AND SNAGGING ON STREAM ECOSYSTEMS,
Kansas State Univ., Manhattan. Div. of Biology.
For primary bibliographic entry see Field 5C.
W78-08358

THE SANIBEL REPORT: FORMULATION OF A COMPREHENSIVE PLAN BASED ON NATURAL SYSTEMS,
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 6B.
W78-08398

ANALYSIS OF EXPENDITURES FOR OUTDOOR RECREATION AT THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM,
Oklahoma Agricultural Experiment Station, Stillwater.
For primary bibliographic entry see Field 6B.
W78-08424

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM; HYDROELECTRIC POWER GENERATION.
Institute for Water Resources (Army), Fort Belvoir, VA.
For primary bibliographic entry see Field 8C.
W78-08425

POPULATION CHANGE, MIGRATION AND DISPLACEMENT ALONG THE MCCLELLAN-KERR RIVER NAVIGATION SYSTEM,
Missouri Univ.-Columbia. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W78-08426

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 6B.
W78-08429

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT - REVIEW OF RECENT DEVELOPMENTS IN THE U.S.A.,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 6A.
W78-08430

HANDBOOK OF WATER RESOURCES AND POLLUTION CONTROL.
For primary bibliographic entry see Field 5D.
W78-08543

A NEW APPROACH TO FULLY GRAPHICAL (DIMENSIONAL) SOLUTION OF THE COLEBROOK-WHITE FUNCTION,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08552

CRITICAL FLOW IN RIVERS WITH FLOOD PLAINS,
LaLonde, Girouard, Letendre and Associates, Montreal (Quebec).
For primary bibliographic entry see Field 2E.
W78-08568

RIVER TRANSPORT MODELING FOR UNSTEADY FLOWS,
Sutron Corp., Arlington, VA.
For primary bibliographic entry see Field 2E.
W78-08569

EFFECT OF RESERVOIRS ON THE DEGREE OF RIVER RUNOFF REGULATION IN THE USSR,
V. A. Bakhriarov, and V. A. Veynert.
Soviet Hydrology: Selected Papers, Vol. 15, No. 3, p 179-183, 1976. 2 tab, 11 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol. 5, No p 53-62, 1975.

Descriptors: *Reservoirs, *River regulation, *Runoff, Europe, Effects, Storage, Rivers, Flow, River flow, Variability, Watersheds(Basins), Data processing, Runoff coefficient, Hydrology, *Reservoir operation, *USSR.

The natural runoff regime of all rivers reflects a certain degree of regulation in intra-annual and long-period runoff fluctuations. Regulation is increased by reservoirs. Virtually total runoff regulation to the long-period mean discharge can be achieved with very large useful reservoir storages. The useful reservoir storage required to achieve a given runoff regulation level depends on the irregularity of intra-annual and long-period runoff. The greater this irregularity, the greater the storage needed for a given degree of regulation. In one of the investigations of the rivers of the lowland part of the European USSR, intra-annual regulation (coefficient phi) was determined by multiple linear correlation. As an index of the degree of runoff regulation by reservoirs, the generally accepted regulation coefficient alpha which is the ratio of regulated discharge Q to long-period mean discharge Q, was used. For the 27 rivers that were studied with 92 accounted-for reservoirs with a total useful storage of 1076 cu km (with an annual runoff at outlet gaging stations of 2564 cu km), the regulation coefficient averaged 0.74. To increase the degree of regulation to 0.95, i.e., by 0.21, the total storage must be increased by 2354 cu km, or by a factor of 2 by comparison with the storage of the reservoirs taken into account. To regulate runoff in the 20 rivers on which there are no reservoirs and no reservoirs are planned, to alpha = 0.70 would require a total storage of 294 cu km and to alpha = 0.95 a storage of 1461 cu km for a total annual runoff at outlet gaging stations of 772 cu km. (Sims-ISWS)
W78-08571

METHOD FOR COMPUTING (BY COMPUTER) THE RETRANSFORMATION OF FLOOD RUNOFF HYDROGRAPHS FOR RIVERS REGULATED BY A CASCADE OF RESERVOIRS (AS EXEMPLIFIED BY THE VOLGA-KAMA CASCADE),
G. A. Shuvayev, and B. S. Tseytlin.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 133-137, 1976. 1 fig, 2 tab, 3 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 350-359, 1975.

Descriptors: *Hydrograph analysis, *Mathematical models, *Runoff, *Regulated flow, River flow, Flood flow, Hydraulics, Analysis, Analytical techniques, Hydrographs, Foreign research, Flood stages, Flood flow, Spring, *USSR(Volga-Kama Cascade).

The hydraulic method of retransforming hydrographs regulated by a cascade of reservoirs consists of computing the unsteady movement of the flood wave. Natural input hydrographs of the flood along the main trunk of a river, its major tributaries, and of lateral inflow were used as initial data, as well as the hydraulic and volumetric channel and floodplain characteristics within the stretch of the river being investigated. The unsteady movement of a flood wave was computed by the method of instantaneous regimes with allowance for the inertial terms of the dynamic equation. This method was based on the approximate solution in finite differences of differential equations of unsteady motion (St. Venant), represented by equations of dynamic equilibrium and continuity of flow. A comparison of the hydrographs computed for 1926 and 1937 with the observed hydrographs showed fairly close agreement. Tabulated were the tentative values of the corrections for floodplain accumulation in the Tetyshi-Volgograd reach of the Volga, by which the maximum discharges and runoff volume of the retransformed flood hydrographs at Volgograd city must be reduced. (Humphreys-ISWS)
W78-08572

REGIONALIZATION OF THE USSR ACCORDING TO COPHASED ANNUAL RIVER RUNOFF FLUCTUATIONS,
For primary bibliographic entry see Field 2E.

78-08573

VESTIGATION OF THE MAXIMUM RU-OFF OF RIVERS IN THE SOVIET FAR EAST,
or primary bibliographic entry see Field 2E.
78-08574

OMPUTATION OF THE RAIN RUNOFF OF NSTUDIED RIVERS IN THE USSR,
I. Chebotarev, and B. I. Serpik.
oviet Hydrology: Selected Papers, Vol. 15, No. p 86-90, 1976. 4 tab, 12 ref. Translated from ransactions of the IV All-Union Hydrologic Conrence (Trudy IV Vsesoyuznogo drologicheskogo s'yezda), Vol. 3, p 22-30, 1975.

escriptors: *Rainfall-runoff relationships, Vatersheds(Basins), *Runoff, *Peak discharge, ood discharge, Floods, Hydrology, ischarge(Water), Foreign research, Rational forula, Runoff coefficient, *Runoff forecasting, quations, Rivers, Mathematical models, *USSR, nstudied rivers.

wo groups of methods are used at the present me (1975) to compute maximum flood runoff: ethods based on genetic runoff formulas, and ethods based on empirical relations characterizg particular patterns under specific physioraphic conditions. Rivers with basin areas greater an 100-200 sq km are adequately covered by obervations, while there are very few data on rivers ith smaller basins. Therefore, one of the variants genetic formulas, i.e., the formula of limiting ruoff rate, was selected for computing the maxnum rain runoff of unstudied small rivers (50-200 km) and the empirical reduction formula for rger rivers. It is difficult and arbitrary to verify ie agreement between the maximum runoff rates mputed from the limiting runoff rate formula nd observed values because of the absence of fficiently reliable observational data on the maxnum runoff of small drainage basins. Comparison f the computed maxima with the maxima stablished from high water marks showed atisfactory agreement.--Humphreys-ISWS)
78-08575

ROBLEMS OF THE THEORY OF FLASH LOOD FORMATION IN THE RIVERS OF THE ERMAFROST ZONE,
or primary bibliographic entry see Field 2E.
78-08576

IETHOD OF LINING A WATERWAY OR ESERVOIR,
. A. Young.
.S. Patent No. 4,065,924, 4 p, 2 fig, 11 ref; Offiial Gazette of the United States Patent Office, ol 966, no 1, p 46, January 3, 1978.

escriptors: *Patents, Bodies of water, *Sealants, Seepage control, Seepage, Linings, Soil sealants, Vater control, Water loss.

method of lining a waterway or reservoir inludes laminating a layer of a flexible and liquid npervious material with a layer of fibrous materi, applying to the lamination to cover at least part f the surface of the waterway or reservoir with he bibrous material exposed, and applying to the xposed fibrous material a layer of a rigidly or emi-rigidly settable composition. The steps can e repeated successively and a join effected etween adjacent lining sections. The laminate ay have its flexible and liquid impervious materi of butyl, nitrole rubber, neoprene, etc, or cominations. The layer of fibrous material may be olyester, polypropylene, or nylon fiber. The igidly or semi-rigidly settable compsition may be ement, bitumen, asphalt or combinations or with n epoxy resin as a binder. One of the advantages s that if after the passage of time the concrete lining cracks then liquid will not escape into the surrounding ground because the flexible liquid impervious underlayer forms a barrier. (Sinha - OEIS)
W78-08599

UNDERGROUND DRAINAGE PIPE,
R. S. Auriemma.
U.S. Patent No. 4,065,925, 7 p, 10 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 46-47, January 3, 1978.

Descriptors: *Patents, *Subsurface drainage, *Controlled drainage, Drainage systems, *Drains, Subsurface drains, Storm drains, Pipes.

The invention relates to an underground drainage pipe of the type used to remove excess soil water. The underground drainage pipe includes a water-receiving trough, a roof covering the trough and joining the trough at the trough lips are wings extending outward and downward from the junction between the trough and roof. Water intake holes extend through the thickness of the trough beneath the wings. The wings prevent clogging of the intake holes. Additionally the pipe includes specialized strengthened junctions between the trough and roof which enable the pipe may be joined together in the field without impairing the fluid-carrying capacity or drainage capacity by integral interfitting joints. (Sinha-OEIS)
W78-08600

DRAINAGE LAW ASSISTS LAND DRAINAGE,
Guelph Univ. (Ontario). Dept. of Engineering.
For primary bibliographic entry see Field 6E.
W78-08722

PHASE II, ARIZONA STATE WATER PLAN: ALTERNATIVE FUTURES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W78-08725

A WATER SUPPLY DATA BASE,
Arizona Univ., Tucson. Management Information Systems.
For primary bibliographic entry see Field 7C.
W78-08726

ARIZONA WATER POLICY: CHANGING DECISION AGENDAS AND POLITICAL STYLES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6E.
W78-08727

AN ECONOMIC ANALYSIS OF THE CENTRAL ARIZONA PROJECT,
Arizona Univ., Tucson. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-08728

A UTILITY CRITERION FOR REAL-TIME RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, and R. Krzysztofowicz.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977. Las Vegas, Nevada, p. 207-218. 4 fig, 5 tab, 14 ref.

Descriptors: *Model studies, Water resources, Planning, *Administration, Mathematical models, Statistical models, *Risks, *Flood control, Water control, Water supply, *Reservoir operation, Reservoir releases.

A dual purpose reservoir control problem can be logically modeled as a game against nature. The first purpose of a reservoir is flood control under uncertain inflow, which corresponds to short range operation (SRO); the second purpose, which the present model imbeds into the first one, is water supply after the flood has receded, and corresponds to longrange operation (LRO). The reservoir manager makes release decisions based on his SRO risk. The trade-offs involved are described by a utility function constructed within the framework of Keeney's multi-attribute utility theory. The underlying assumptions appear to be quite natural for the reservoir control problem. To test the model, an experiment assessing the utility criterion of individuals was performed; results tend to confirm the plausibility of this approach. In particular, most individuals appear to have a risk-averse attitude for small floods and a risk-taking attitude for large floods. (Payton-Arizona)
W78-08732

REPLANTING PAKISTAN'S FOREST: TREE BY TREE.
Agency of International Development, Karachi (Pakistan).
For primary bibliographic entry see Field 4D.
W78-08737

4B. Groundwater Management

DIURNAL PERIODICITY IN GROUND-WATER RECHARGE RATES,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
S. N. Webb, and K. K. Watson.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 104, No IR1, Proceedings Paper 13613, March 1978. 2 fig, 1 tab, 11 ref.

Descriptors: *Groundwater recharge, *Groundwater, *Algae, *Permeability, *Pore pressure, *Diurnal, Frequency, Pore water, Pit recharge, Oxygen, Clogging, Artificial recharge, On-site tests, Hydraulic conductivity, *Australia.

In an investigation of the flow characteristics of a recharge pit used for artificial groundwater recharge purposes, diurnal variations of a cyclic nature were detected in the intake rate. The output from soil water pressure sensors installed between the base of the pit and the water table indicated similar cyclic variations. The maximum intake rate occurred regularly each day at approximately 2 a.m. - 3 a.m. and the minimum approximately 12 hr later. It was concluded that these variations are due to the activity of algae on the base of the pit and in the top layer of sand. Diurnal peaks and troughs of the algae oxygen production result in changes in the hydraulic conductivity of the profile. This would appear to be related to changes in the volume of the occluded oxygen which exists as bubbles in the soil pores. These reduce the flow area available for recharge and thus cause a reduction in the intake rate. (Visocky-ISWS)
W78-08274

SOLUTE TRAVEL TIMES TO WELLS IN SINGLE OR MULTIPLE LAYERED AQUIFERS,
Iowa Agriculture and Home Economics Experimental Station, Ames.
For primary bibliographic entry see Field 2F.
W78-08288

DETERMINATION OF AQUIFER PARAMETERS FOR A MULTIPLE WELL SYSTEM,
Middle East Technical Univ., Ankara (Turkey). Dept. of Engineering Sciences.
For primary bibliographic entry see Field 2F.
W78-08290

A MATHEMATICAL MODEL OF STRATIFIED GROUNDWATER FLOW,
Egyptian Desert Inst., Cairo. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08291

USE OF TRACERS TO CONFIRM GROUNDWATER FLOW,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-08296

UNDERGROUND RESERVOIRS TO CONTROL THE WATER CYCLE,
Food and Agriculture Organization of the United Nations, Rome (Italy).
R. P. Ambroggi.
Ground Water, Vol 16, No 3, p 158-166, May-June 1978. 6 fig, 3 ref.

Descriptors: *Groundwater, *Aquifers, *Recharge, *Water resources, Storage, Water storage, Pumping, Groundwater recharge, Natural recharge, Artificial recharge, Agriculture, Irrigation, Food abundance, Water supply, Water cycle.

At any one time perhaps 2/3's of the freshwater on the earth is held in underground reservoirs. These reservoirs could be much more intensively drawn on, to be refilled when water is plentiful. On a global scale, the problem facing mankind is not a lack of freshwater but a lack of efficient regimes for using the water that is available. The need to produce more food will continue, and the need can be met only by an assured supply of water in agricultural areas. The water deficit of 400 cu km that caused the food crisis of 1972 is insignificant when one considers that about 45,000 cu km of water is still in storage in the top 30 m of groundwater reservoirs. Mankind can solve the water problem if governments and decision makers are prepared to embark on the proper management of their water resources, particularly of their reserves of groundwater. Moreover, it is becoming technologically feasible to deal with such adverse developments as water deficiencies resulting from changes in weather patterns by initiating the large-scale and long-term control of the water cycle through groundwater reservoirs. (Sims-ISWS)
W78-08297

HYDROLOGIC AND ECOLOGIC INVENTORIES OF THE COASTAL WATERS OF WEST HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2L.
W78-08311

COMMAND POST AT ANDRADE,
G. G. Sykes.
The Journal of Arizona History, Vol 19, No 1, p 73-90, Spring, 1978.

Descriptors: *Colorado River, *Arizona, *Irrigation systems, Distribution systems, Irrigation districts, *California, Irrigation engineering, Irrigation canals, Discharge(Water), Flow system, Water delivery, Levels, Dams, History, Flood control, Imperial Valley.

From 1906 and throughout the 1930's the Andrade station served as headquarters of the Imperial Irrigation District. Located on the Colorado River near Yuma, Arizona, the Andrade station had the responsibility for regulating the flow of irrigation water diverted from the Colorado River at this point for delivery to the farm lands of the Imperial Valley, California. Levee construction for flood control was another important function of the station. This report summarizes significant problems occurring during the 1920's pertaining to passage of irrigation water and levee construction and maintenance. (Jewkes-Arizona)
W78-08371

GROUND WATER MANUAL, A GUIDE FOR THE INVESTIGATION, DEVELOPMENT, AND MANAGEMENT OF GROUND-WATER RESOURCES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 2F.
W78-08542

EXACT SOLUTIONS FOR TWO-DIMENSIONAL GROUNDWATER FLOW PROBLEMS INVOLVING A SEMI-PERVIOUS BOUNDARY,
Rijkswaterstaat, Rijswijk (Netherlands). Data Processing Div.
For primary bibliographic entry see Field 2F.
W78-08547

NITRATE, CHLORIDE AND DISSOLVED SOLIDS, OGALLALA AQUIFER, WEST TEXAS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 5B.
W78-08555

RESULTS OF PUMPING TESTS IN CRYSTALLINE-ROCK AQUIFERS,
Geraghty and Miller, Inc., Tampa, FL.
V. W. Uhl, Jr., and G. K. Sharma.
Ground Water, Vol. 16, No. 3, p 192-203, May-June 1978. 8 fig, 2 tab, 16 ref.

Descriptors: *Pumping, *Aquifer testing, *Crystalline rocks, Granites, Metamorphic rocks, Aquifer characteristics, Transmissivity, Graphical analysis, Data collections, Drawdown, Groundwater recharge, Leakage, Dewatering, Hydrogeology, Theis equation, India, Step tests, Rorabaugh method, Cooper-Jacob method, Non-Darcian flow.

The Evangelical Lutheran Church (E. L. C.) water Development Project, headquartered in Betul, Madhya Pradesh, India, had been involved since 1971 in developing groundwater supplies in the Satpura Hill Region of Central India. To date, over 400 wells have been drilled in crystalline rocks, and more than 100 of these wells have been pump-tested to determine aquifer hydrologic characteristics. Crystalline rocks crop out in roughly 20% of the Satpura Hill Region, and the main rock types are granite, gneiss, and schist. The controlled testing and detailed analysis of over 100 pumping tests provided an excellent opportunity to evaluate the applicability of standard analytical models for the analysis of pumping tests in crystalline-rock aquifers. Step-test data were analyzed by Rorabaugh's method and by a graphical method. The results indicated that well losses are significant in a number of wells tested and appear to be related to non-Darcian flow in the aquifer adjacent to a pumped well. Constant-rate pumping tests were used to determine aquifer transmissivity. Time-drawndown data were analyzed by the Cooper-Jacob Approximation to the Theis equation, and recovery data were analyzed by the residual drawdown method. (Visocky-ISWS)
W78-08556

IMPACT OF ENERGY DEVELOPMENT ON GROUND WATER,
American Society of Civil Engineers, New York. Hydraulics Div.
For primary bibliographic entry see Field 5B.
W78-08566

HYDROGEOLOGY OF THE MEDICINE HAT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
D. R. Stevenson, and D. M. Borneuf.
Report 75-2, 1977. 11 p, 2 tab, 21 ref. $2.00.

Descriptors: *Hydrogeology, *Canada, *Groundwater, Geologic mapping, Aquifers, Groundwater movement, Groundwater resources, Water wells, Pumping, Water yield, Transmissivity, Base flow, Geochemistry, Dissolved solids, *Alberta(Canada).

The Medicine Hat map area is predominantly flat, with rolling hills in the central, eastern, and northern parts of the region; the South Saskatchewan, Red Deer and Bow Rivers cut deeply incised valleys into the plains surface. The great majority of wells produce water from the Oldman Formation. However, a wide and deep bedrock valley which runs from the south central part of the map area to the northeast corner could possibly provide yields of 1 to 500 igpm (0.1 to 38 l/sec) from gravels resting on the bedrock. Total dissolved solids contents of groundwater over the map area vary from 1,000 to 3,000 mg/l. Water types are sodium bicarbonate in the channels, sodium sulfate in lowland surficial aquifers, calcium bicarbonate in uplands; deep Foremost Formation aquifers are of sodium sulfate type and brackish. (Visocky-ISWS)
W78-08580

WATER WELL MONITOR,
G. M. Campbell.
U.S. Patent No. 4,065,226, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 965, no 4, p 1438, December 27, 1977.

Descriptors: *Patents, *Water wells, *Water levels, *Water supply, Monitoring, Equipment.

The object of this invention is to provide a means by which the height of the water in a well may be indicated directly and read off easily. The invention provides means to shut off a motor driving a pump before the water level in the well falls below a safe level to protect the pump from burning out and/or pumping air, and means to return the motor or operative condition when the water level has risen sufficiently to resume pumping. The apparatus consists of float and weight means operating a depth indicator and a cutoff switch. (Sinha-OEIS)
W78-08593

OIL WELL OPERATION AND SALT-WATER INTRUSION: POLICY IMPLICATIONS,
Cities Service Oil Co., Charleston, WV.
For primary bibliographic entry see Field 5G.
W78-08617

MIGRATION OF EXPLOSIVES AND CHLORINATED PESTICIDES IN A SIMULATED SANITARY LANDFILL,
Construction Engineering Research Lab. (Army). Champaign, IL.
For primary bibliographic entry see Field 5B.
W78-08656

IRRIGATION WASTEWATER DISPOSAL WELL STUDIES-SNAKE PLAIN AQUIFER,
Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 5B.
W78-08724

PHASE II, ARIZONA STATE WATER PLAN: ALTERNATIVE FUTURES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W78-08725

LTERNATIVE ENERGY SOURCES IN THE SSR,
oyal Swedish Academy of Science (Stockholm).
or primary bibliographic entry see Field 3F.
/78-08736

C. Effects On Water Of Man's Non-Water Activities

HEMICAL CONTROL OF BRUSH AND EN-IRONMENTAL SAFETY OF ROADSIDE EGETATION MANAGEMENT CHEMICALS,
urdue Univ., Lafayette, IN. Dept. of Biological ciences.
or primary bibliographic entry see Field 5G.
/78-08224

EMOTE SENSING OF EFFECTS OF LAND SE PRACTICES ON WATER QUALITY,
Kentucky Univ., Lexington. Dept. Forestry.
or primary bibliographic entry see Field 5B.
/78-08237

TILIZATION OF WOOD RESIDUES FOR IIGHWAY SLOPE STABILIZATION IN NORTH CAROLINA,
North Carolina State Univ., at Raleigh. Highway Research Program.
or primary bibliographic entry see Field 4D.
/78-08581

MPACT OF NEARSTREAM VEGETATION ND STREAM MORPHOLOGTY ON WATER UALITY AND STREAM BIOTA,
llinois Univ. at Urbana-Champaign. Dept. of Ecology, Ethology and Evolution.
or primary bibliographic entry see Field 5G.
/78-08634

FFECTS OF BRUSH TO GRASS CONVERSION N THE HYDROLOGY AND EROSION OF A EMIARID SOUTHWESTERN RANGELAND ATERSHED,
gricultural Research Service, Tucson. AZ. outhwest Watershed Research Center.
or primary bibliographic entry see Field 4D.
/78-08735

ECLAMATION OF COAL-MINED LAND IN HE SOUTHWEST,
ocky Mountain Experiment Station, Denver, O.
. F. Aldon.
ournal of Soil and Water Conservation, Vol 33, o 2, p 75-79, March-April, 1978.

escriptors: *Land reclamation, Irrigation prac-ices, On-site tests, Arid climates, *Arizona, New Mexico, Vegetation, Revegetation, *Coal nines, Mulching, Fertilizers, Soil management, lant growth, Soil erosion, Water supply, Water esources development.

urrent problems in reclamation of arid coal-ined areas of the southwestern United States are ummarized, with emphasis on the Black Mesa rea of northeastern Arizona and San Juan Basin n northwestern New Mexico. Questions of soil rosion, arid climate, water resources, and evegetation are discussed. For arid mine spoils, uccessful revegetation techniques have included he planting of alkali sacaton, western wheatgrass, ourwing saltbush, Indian rice grass and pinyon ines. Plantings at experimental test sites are escribed, including suggested mulches, fertil-zers, and irrigation procedures to improve soil uality. (Jewkes-Arizona)
W78-08750

4D. Watershed Protection

BASIN DYNAMICS, CHANNEL PROCESSES, AND PLACER FORMATION: A MODEL STUDY,
Victoria Univ., Wellington (New Zealand).
For primary bibliographic entry see Field 2J.
W78-08273

SENSIBILITY OF PARAMETERS OF THE SSARR MODEL (SENSIBILITE DES PARAMETRES DU MODELE SSARR),
Hydro-Quebec, Montreal. Service Hydraulique.
For primary bibliographic entry see Field 2A.
W78-08293

THE ROAD TO EROSION--A CAUTIONARY TALE,
California Univ., Berkeley. Dept. of Conservation and Resource Studies.
R. N. Coats.
Environment, Vol. 20, No. 1, p 16-20, 37-38 (January-February, 1978). 1 fig, 1 tab.

Descriptors: *Erosion control, *Erosion, *California, *Environmental effects, *Forest watersheds, Silting, Sedimentation, Watersheds(Basins), Precipitation(Atmospheric), Clear-cutting, Sheet erosion, Gully erosion, Landslides, Stream erosion, Runoff, Sediments, Environmental control, Fisheries, Water resources development, Federal Water Pollution Control Act, Sediment control.

A combination of intense precipitation, high peak flows, human impacts, and structurally unstable rock has resulted in an extremely high erosion rate for te river basins of California's North Coastal Region. This article estimates the impact of human activity and explains the processes involved in erosion. There is an attempt to identify specific sources of sediment so that it can be controlled. The role of logging is discussed and it appears to be a substantial source of sediment. The environmental impacts of accelerated erosion have proven to be detrimental to fisheries, recreation, beneficial use of water, and possibly forest productivity. In an attempt to control future erosion, regulatory remedies have been implemented to halt the devastating impact of logging on natural resources. Most attempts to regulate private activities for the public good either prescribe certain behavior or prescribe certain standards. The article explores weahnesses of the Forest Practice Act and calls for future public subsidies to private land owners to insure proper regulation of activities that lead to high erosion rates. (Quarles-Florida)
W78-08332

EROSIONAL REMOVAL OF FALLOUT PLUTONIUM FROM A LARGE MIDWESTERN WATERSHED,
Argonne National Lab., IL. Radiological and Environmental Research Div.
D. G. Sprugel, and G. E. Bartelt.
Journal of Environmental Quality, Vol. 7, No. 2, p 175-177, April-June 1978. 2 tab, 28 ref.

Descriptors: *Erosion, *Sediments, *Plutonium, Watersheds(Basins), Sampling, Data processing, Sediment transport, Sorption, Soils, Soil erosion, Suspended solids, Runoff, Radioisotopes, Agriculture, Sedimentology.

The Great Miami River at Sidney, Ohio, drains a 1,401-sq km watershed which is generally flat and predominantly agricultural. Samples of river water collected over a wide range of flow and sediment loading conditions showed that the concentrations of 239, 240 Pu in filtered water and suspended sediment were fairly constant, which means of 0.15 fCi/liter for water and 14 fCi/g for suspended sediment. Plutonium concentrations in suspended sediment are somewhat higher than plow-layer soil concentrations, probably due to settling of larger soil particles in ponds and backwaters in the upper reaches of the river. Annual plutonium transport from the watershed by erosion averages 1.2 mCi, or 0.9 pCi/sq m, which is about 0.05% of the total plutonium in the watershed soil. The primary mechanism for plutonium removal is erosion of small soil particles to which the element is sorbed. (Sims-ISWS)
W78-08549

SEASONAL RUNOFF LOSSES OF NITROGEN AND PHOSPHORUS FROM MISSOURI VALLEY LOESS WATERSHEDS,
Agricultural Research Station, Lafayette, IN.
For primary bibliographic entry see Field 5B.
W78-08550

PREVENTION OF NITRATE LEAKAGE FROM THE HULA BASIN, ISRAEL: A CASE STUDY IN WATERSHED MANAGEMENT,
Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-08564

UTILIZATION OF WOOD RESIDUES FOR HIGHWAY SLOPE STABILIZATION IN NORTH CAROLINA,
North Carolina State Univ., at Raleigh. Highway Research Program.
W. B. Gilbert, and D. J. Osborne.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 956, Price codes: A05 in paper copy, A01 in microfiche. Report FHWA-NC-76-73, January 1976. 76 p, 9 fig, 9 tab, 68 ref. ERSD-110-73-3.

Descriptors: *Erosion control, *Highways, *North Carolina, *Mulching, *Bark, Wood wastes, Hardwood, Vegetation establishment, Fertilizers, On-site investigations, Bank stability, Bank protection, Erosion, Soil stabilization, Vegetation, Planting management, Bark mulch, Hardwood residues.

Use of organic mulch materials at seeding for erosion control on newly created highway slopes is a widely used technique with many materials being utilized. The most widely used mulch material in North Carolina is small grain straw held in place with an asphalt tack. Recent changes in crop rotations and crop varieties have combined to reduce the amount of available straw, prompting a search for other mulch materials. One of these, shredded hardwood bark, was evaluated in field plots for two years in the mountains, Piedmont, and Coastal Plain regions of North Carolina. Three experiments were conducted. The first, a development type study perfected equipment, and techniques and compared rates of application for effectiveness in controlling erosion and producing cover. The second, a seeding technique study using a standard rate of mulch, compared dates of seeding and over-versus underseeding. The third, was a comparison of results of pine bark with cambium mulch at a standard rate, overseeded and underseeded, to results of the second experiment. Additionally, cost and physical data were developed for shredded hardwood bark mulch. The optimum rate used was 35 cubic yards/acre. In each region of the state, bark mulch, whether late or early seeded, over- or underseeded, adequately controlled erosion and produced acceptable cover. Results were comparable to those obtained with straw mulch tacked with asphalt. (Sims-ISWS)
W78-08581

OUR NEWEST NATURAL RESOURCE--COMPACTION--GOOD AND BAD EFFECTS ON ENERGY NEEDS,
Agricultural Research Service, Morris, MN.
For primary bibliographic entry see Field 3F.
W78-08709

STOCHASTIC PREDICTION OF SEDIMENT YIELDS FROM STRIP MINE SPOILS OF THE ARID SOUTHWEST,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2J.
W78-08729

SOIL EROSION AND SEDIMENT CONTROL ON THE RECLAIMED COAL MINE LANDS OF THE SEMI-ARID SOUTHWEST,
Arizona Univ., Tucson. School of Renewable Resources.
T. R. Verma, J. L. Thames, and J. E. Mills.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 41-47. 1 tab, 3 fig, 10 ref.

Descriptors: *Soil erosion, Degradation, Land reclamation, *Arizona, *Revegetation, Strip mines, Spoil banks, *Watershed management, Monitoring, *Reclamation(Soil), Land development, *Sediment control, Coal mining, *Black Mesa(Ariz).

Extensive land disturbances due to strip mining are expected during the remainder of this century in the semi-arid southwest. Reclamation and revegetation of these areas is a slow process, primarily due to dry and harsh climatic conditions. Erosion and sediment losses are high. Monitoring of the soil erosion process is a crucial step in planning for a long lasting and stable rehabilitation of these disturbed areas. Erosion plots have been laid out to collect data for the universal soil loss equation for estimating soil loss from recontoured coal mine spoils. Effectiveness of different cultural and mechanical treatments for erosion control is also being evaluated. Since large-scale coal mining operations have just begun on the Black Mesa, Preliminary data could be very effective and useful in watershed management planning. (Payton-Arizona)
W78-08730

EFFECTS OF BRUSH TO GRASS CONVERSION ON THE HYDROLOGY AND EROSION OF A SEMIARID SOUTHWESTERN RANGELAND WATERSHED,
Agricultural Research Service, Tucson. AZ. Southwest Watershed Research Center.
J. R. Simanton, H. B. Osborn, and K. G. Renard.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 249-256, 4 fig, 3 tab, 19 ref.

Descriptors: *Rainfall-runoff relationships, Range grasses, Precipitation(Atmospheric), Runoff coefficient, *Vegetation effects, *Range management, Brush, Vegetation, Establishment, Browse utilization, Grasslands, *Carrying capacity, Mathematical studies, Linear regression, Erosion, Sediment yield, Semiarid climates.

Increased nutritional and economic demands for agricultural products have dictated the need for greater and more efficient use of western grass forage. Vegetation manipulation is the quickest and most economical means of increasing forage. However, the hydrologic effects must be taken into consideration before embarking on a large scale vegetation manipulated program. This study discusses the hydrologic and erosion changes measured from a 110-acre semiarid watershed which was converted from brush to grass by root plowing and seeding. Significant changes were observed in rainfall-runoff relationships as average summer runoff was considerably in excess of predictions. Sediment yield also varied, and both of these results were tied to the change in vegetative cover and post conversion rainfall conditions. (Payton-Arizona)
W78-08735

REPLANTING PAKISTAN'S FOREST: TREE BY TREE.
Agency of International Development, Karachi (Pakistan).
Agenda, Vol. 1, No. 5, p 5-11, May, 1978.

Descriptors: *Pakistan, Administrative agencies, Governmental interrelations, *Reforestation, *Watershed management, *Erosion control, Forest management, Runoff, *Social adjustment, Arid lands, Pine trees, Fruit crops, Project planning, Planting management, *Revegetation.

Development of watershed/reforestation projects in Pakistan's northwest frontier province is described. Reluctant cooperation by local farmers has been due to the widespread fear that these government programs were a prelude to government seizure of private property. Increased cooperation has been obtained by payment of food rations to farmers for trees planted on their own property. Suggested future project goals include expansion of tree-planting programs, construction of check dams and leveling of terraces to control soil erosion. (Jewkes-Arizona)
W78-08737

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NON-POINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5G.
W78-08758

PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON SOIL EROSION AND SEDIMENTATION BY WATER.
American Society of Agricultural Engineers, St. Joseph, MI.
Symposium held in Chicago, Illinois, December 12-13, 1977. 151 p, 25 fig, 17 tab, 275 ref.

Descriptors: *Soil erosion, Erosion, *Sedimentation, *Erosion control, Erosion rates, *Sediment control, Sediment discharge, Sediment load, *Sediment transport, Sedimentation, Sediments, Water pollution control, Water quality, Management, Technology.

This symposium presents, for the practitioner, the results of numerous research projects and investigations which focus upon defining appropriate technologies for alleviating soil erosion and sedimentation by water. Although agricultural erosion and sedimentation problems have received wide-spread attention for decades, the problem still persists. Massive changes in farm machinery, animal husbandry, and cropping have negated many methods of erosion control. New vegetative and mechanical methods for erosion control have been developed to solve problems in 1977. In recent years, besides experiencing an increased demand for clean water, there has been an increased demand for new construction and for minerals and new sources of fossil fuels. Technology has been developed to control erosion and sedimentation from surface mines and construction sites. (See W78-08788 thru W78-0880) (Skogerboe-Colorado State)
W78-08787

SOIL EROSION AND SEDIMENTATION BY WATER--AN OVERVIEW,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
G. R. Foster, and L. D. Meyer.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 1-13, 53 ref.

Descriptors: *Soil erosion, *Erosion control, Sediments, Rainfall, Water quality, Sediment load, Sediment transport, *Sediment control, *Sedimentation.

Soil erosion and sedimentation by water primarily involve the processes of detachment, transportation, and deposition of sediment by raindrop impact and flowing water. Erosion and sedimentation are major problems that reduce the productivity of cropland, degrade water quality, carry pollutin chemicals, and reduce the capacity of water conveyance structures. The erosion-sedimentation system is composed of upland and channel components. While the uplands act somewhat independently of the channels, the behavior of the channel is directly influenced by the upland inputs. Spatial and temporal variations in erosion are common with time lags in sediment yield as great as several decades. Climate, soil, topography, and land use are major factors influencing erosion and sedimentation. (See also W78-08787) (Skogerboe-Colorado State)
W78-08788

CURRENT SOIL EROSION AND SEDIMENT CONTROL TECHNOLOGY FOR RURAL AND URBAN LANDS,
Soil Conservation Service, Washington, DC.
R. E. Highfill, and L. W. Kimberlin.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12013, 1977. p 14-22, 28 ref.

Descriptors: Erosion, *Sediments, Water quality, Water resources, Agriculture, *Erosion control, Sediment load.

Erosion and sedimentation are important factors in managing land and water resources. Agricultural land, especially cropland, produces the largest amount of sediment annually. The next largest source of geologic erosion. Range and forest land and construction activities are about equal in the amount of sediment produced. Erosion control is important to maintan productivity on agricultural and forest lands and to aid in sediment pollution control. Procedures have been developed for predicting erosion and sediment yield. Technology is available to reduce the amount of erosion and sediment induced by water from most land areas. In some places, additional research or data are needed to improve the peformance of erosion control systems or reduce the cost, or both. The quality of installation and maintenance of erosion control measures is still one of the major problem areas. (See also W78-08787) (Skogerboe-Colorado State)
W78-08789

POLITICAL, SOCIAL, AND ECONOMIC ASPECTS OF SOIL EROSION AND SEDIMENTATION CONTROL PROGRAMS,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 6E.
W78-08790

PREDICTING SOIL EROSION,
Soil Conservation Service, Washington, DC.
L. W. Kimberlin, and W. C. Moldenhauer.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 31-42, 26 ref.

Descriptors: *Soil erosion, Erosion, *Erosion rates, *Sediment transport, Sedimentation, Sediments, *Forecasting.

Erosion of soil by water poses an increasing threat as needs for food and fiber production and space for social and economic necessities of a growing population add pressures to land resources. The Universal Soil Loss Equation (USLE) developed

hrough many years of cooperative efforts of the Agricultural Research Service, state experiment tations, and the Soil Conservation Service is a ighly useful tool for predicting sheet and rill ero- ion under various conditions of land use and nanagement. It is widely accepted and used by oil conservationists and others. However, there re some problems associated with its use and ome additional needs to supplement its use in the ield. (See also W78-08787) (Skogerboe-Colorado tate)
V78-08791

PREDICTING SEDIMENT YIELDS,
Agricultural Research Service Morris, MN. North Central Soil Conservation Research Center.
C. A. Onstad, C. K. Mutchler, and A. J. Bowie.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 43-58, 0 ref.

Descriptors: *Soil erosion, Erosion, Sediments, Sediment transport, Sediment load, Sediment discharge, Model studies, *Forecasting, *Sediment yield.

Sediment yield is the amount of soil transported from a drainage basin. Studies for predictions of sediment yield have general uses, which include the following. Simulations are used to extend a short-term sampling program to an adequate data base to predict future watershed response to various land-use alternatives and as an ordered sequence of steps in time and space so that information gaps can be identified. The specific needs for sediment yield prediction are so varied that no single model could meet them without a great loss of efficiency. These needs generally fall into the categories of length of model event time, area to be simulated, and sediment sources. At present, many sediment yield models are available for use or have been used for various purposes. (See also W78-08787) (Skogerboe-COlorado State)
W78-08792

ESTABLISHING SOIL LOSS AND SEDIMENT YIELD LIMITS FOR AGRICULTURAL LAND,
Ohio State Univ., Columbus. Dept. of Agronomy.
T. J. Logan.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 59-68, 1 fig, 3 tab, 31 ref.

Descriptors: *Agriculture, *Soil erosion, Erosion, Sedimentation, Sediment discharge, Sediments, Sediment load, *Sediment yield, *Soil loss.

Soil loss tolerance values, T-values, are currently based on annual gross erosion rates that can be tolerated and still maintain crop productivity. The major criterion used by Soil Conservation Service inestablishing these values which range from 1 to 5 tons acre (-1) year (-1) is topsoil depth. The assumptions on which this criterion is based are reviewed. Soil loss in relation to sediment and nutrient watershed yields is discussed and criteria which might be used to establish tolerance values for sediment and nutrient loss abatement programs are given. Soil loss Tolerances for sediment and nutrient loss reduction will likely be more restrictive than T-values and should be applied only to critical areas where the impact of these sources is greatest. (See also W78-08787) (Skogerboe-Colorado State)
W78-08793

SEDIMENTATION AND EROSION CONTROL IMPLICATIONS FOR WATER QUALITY MANAGEMENT,
Environmental Research Lab., Athens, GA. Technology Development and Applications Branch.
L. A. Mulkey, and J. W. Falco.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 69-90, 11 fig, 4 tab, 34 ref.

Descriptors: *Soil erosion, *Erosion control, *Water quality control, Sediment transport, Simulation analysis.

Erosion and sedimentation, including sediment transport through a watershed system, play important but complex roles in water quality management. The most meaningful way to evaluate the relative effectiveness of various erosion control methods for water quality management is via continuous simulation models. If water quality goal attainment is attempted by application of source controls within some specified technology limits (including costs), however, a more simplistic approach may be used for analysis of this nonpoint source of environmental pollution. This paper focuses on the latter technique, but also presents the results of more sophisticated analysis methods for illustrative purposes. (See also W78-08787) (Skogerboe-Colorado State)
W78-08794

VEGETATIVE WATER EROSION CONTROL FOR AGRICULTURAL AREAS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
J. V. Mannering, and C. R. Fenster.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 91-106, 3 fig, 11 tab, 27 ref.

Descriptors: *Soil erosion, *Erosion control, Sediment transport, Vegetation, *Vegetation effects.

Methods whereby vegetation can effectively control water erosion are presented. Both crop residues and their management as well as growing vegetation are considered. Crop residue factors that determine their erosion control effectiveness includes (a) the type of crop, (b) the amount and type of residues produced, (c) whether or not residues are removed or left on the field and (d) the effect of residue placement by tillage systems. (See also W78-08787) (Skogerboe-Colorado State)
W78-08795

MECHANICAL EROSION CONTROL FOR AGRICULTURAL AREAS,
Soil Conservation Service, Lincoln, IL.
J. L. Jeschke, R. C. Moe, and W. J. Carmack.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 107-115, 2 fig, 4 tab, 5 ref.

Descriptors: Soil erosion, Erosion, *Erosion control(Mechanical), *Agriculture, Terracing.

Mechanical erosion control is discussed as it relates to practice application on sloping cropland. Planning and design considerations for appliying terraces, grade stabilization structures, and debris basins are presented. Special emphasis is placed on the problems involved in designing these practices to be compatible with current farming techniques. The benefits of using topographic maps produced by aerial surveys in planning and design of these practices are also discussed. (See also W78-08787) (Skogerboe-Colorado State)
W78-08796

PROBLEMS OF IMPLEMENTING EROSION CONTROL,
Iowa Soil Conservation Committee, Waterville.
W. R. Hagen.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 116-124, 2 tab.

Descriptors: *Soil erosion, Erosion, *Erosion control, Sediment transport, *Soil conservation, Water conservation.

Personal involvement in soil and water conservation work on a farm, during the formation years of the soil conservation movement in the United States to the present is described. Experiences in problems of implementing erosion control are shown, as well as progress in spite of those problems. Current problems in erosion control include (1) only partial community acceptance (2) peer group pressure (3) unsuitable equipment (4) resistance to change (5) economic burdens and (6) damaging press coverage. To counteract these obstacles, the following recommendations are made: (1) continued use of accurate news releases (2) continued education on natural resource problems (3) election and appointment of public officials with a knowledge of and concern for natural resources (4) passage of land use legislation (5) imposing fines on blatant abusers of the land (6) giving tax incentives to landowners who practice conservation and (7) increasing government cost-sharing for establishment of permanent soil conservation practices. (See also W78-08787) (Skogerboe-Colorado State)
W78-08797

EROSION AND SEDIMENT CONTROL IN URBANIZING AREAS,
Soil Conservation Service, College Park, MD.
S. M. Boysen.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977, p 125-136, 7 fig, 8 ref.

Descriptors: *Soil erosion, Erosion, *Erosion control, *Sediment control, Sediments, *Urbanization, Cities, *Maryland.

The urban sediment control program in Maryland according to a recent United States Geological Survey report has caused a 60 to 80 percent reduction in construction site sediment yields between 1966 and 1974. The sediment control program, based on a set of basic principles, was developed and implemented beginning in Montgomery county in 1965. Technical principles for controlling erosion and sediment were also developed. The present state law requires that all development must have a sediment control plan approved by the soil conservation district before any construction begins. (See also W78-08787) (Skogerboe-Colorado State)
W78-08798

EROSION AND SEDIMENT CONTROL FOR COAL SURFACE MINE AREAS,
Washington Irrigation and Development Co., Centralia.
R. E. McCarthy.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 137-145, 1 fig, 1 tab.

Descriptors: Mining, *Water quality, *Mine drainage, Erosion, Soil erosion, *Erosion control, Sediments, *Sediment control.

The elimination of the impact of a major coal surface mine on the water quality of adjacent waterways through the use of drainage systems, settling ponds, and a monitoring system for dispensing polymer electrolytes for chemical flocculation of suspended sediment is described. (See also W78-08787) (Skogerboe-Colorado State)
W78-08799

EROSION AND SEDIMENTATION ON IRRIGATED LANDS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
J. A. Bondurant.

In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 146-151, 13 ref.

Descriptors: Erosion, *Soil erosion, *Irrigation, Surface irrigation, Sediments, *Sediment discharge, *Irrigated land.

Most erosion on irrigated land is caused by the irrigation itself. Surface irrigation--where water is applied directly to the surface as in furrow or border irrigation--can be very erosive. Data from southern Idaho show that large quantities of sediment may be generated within an irrigation system; however, less sediment may be returned to the river than is diverted with the water supply. Technology for reducing erosion from irrigated fields is available: irrigation systems may be modified or changed, fields may be leveled or profiled to nonerosive slopes, tillage operations can be reduced, vegetative filter strips and drain ditch elevation control will remove sediment, or sediment ponds may be used after runoff leaves the field. (See also W78-08787) (Skogerboe-Colorado State)
W78-08800

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ELECTRICAL DETECTION PROBLEMS IN WATER ANALYSIS BY SPARK SOURCE MASS SPECTROMETRY,
Virginia Univ., Charlottesville. Dept. of Chemistry.
W. W. Harrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 822, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-042, October, 1977. 42 p, 8 fig, 4 tab, 43 ref. R801829-03-0.

Descriptors: *Mass spectrometry, *Trace elements, *Inorganic compounds, *Instrumentation, Equipment, *Design, *Analytical techniques, *Water analysis, *Chemical analysis, *Pollutant identification, Spark source mass spectrometry, Control equipment, Equipment modification, Trace analysis.

Research on the development of control features to make spark source mass spectrometry (SSMS) more quantitative and easier to use is reported; the application of SSMS to water-related problems is detailed. If close attention is paid to experimental variables, SSMS can serve as a complementary technique to other analytical methods for obtaining qualitative and quantitative information concerning trace elements in water and related samples such as sediments and tissues. The development of instrumental additions to improve the operation and control of SMS procedures is described; control features added to the spectrometer allow analyses to be performed more conveniently and precisely. Because of its complexity and cost, widespread use of SSMS is precluded; it is recommended for use in large regional, state, or federal laboratories for materials that require complete elemental screening. Analytical data and procedures and equipment design are detailed; the application of SSMS to specific sample types is demonstrated. (Seip-IPA)
W78-08222

A NEW APPROACH TO 'HIGH SOLIDS' SAMPLE INTRODUCTION FOR FLAME ATOMIC ABSORPTION ANALYSIS,
Arizona Univ., Tucson. Dept. of Chemistry.
R. C. Fry, and M. B. Denton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 550, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 11, September, 1977, 19 p, 1 fig, 3 tab, 14 ref. NR 051-549, N00014-75-C-0513.

Descriptors: *Spectrometers, *Water analysis, *Analytical techniques, *Slurries, Aerosols, Design, *Pollutant identification, *Equipment, Instrumentation, Trace elements, Flame atomic absorption spectrometry, High solids nebulizer, Babington nebulization technique, Capillary pneumatic nebulizer, *Trace metals, Spectrochemical analysis.

Described is the direct, clog-free production of high density finely dispersed aerosols from highly complex samples through use of a special nebulizer design based on principles first developed by R. S. Babington. Application of this technique to sample introduction for atomic absorption spectrometry is described for matrices of combined high suspended solids content, increased viscosity, and elevated salt concentration. Copper and zinc are determined in whole blood, urine, sea water, evaporated milk concentrate, and tomato sauce with minimal sample preparation. (Seip-IPA)
W78-08223

DEVELOPMENT OF A SYSTEM FOR CONDUCTING INTERLABORATORY TESTS FOR WATER QUALITY AND EFFLUENT MEASUREMENTS,
FMC Corp., San Jose, CA. Advanced Products Div.
A. C. Green, and R. Naegele.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 274, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-031, June, 1977. 131 p, 16 fig, 18 tab, 109 ref, append. 68-03-2115.

Descriptors: *Testing, *Laboratory tests, *Testing procedures, *Quality control, *Water pollution, *Water quality, Water analysis, Effluents, Analytical techniques, Statistical models, Publications, *Pollutant identification, Interlaboratory testing program.

A dynamic system is developed for evaluating water pollution data and the laboratories which produce these data. The system consists of a plan for the design and implementation of an interlaboratory test program. A pilot test program is included to evaluate and to verify the complete program. Investigation of interlaboratory tests conducted in the past has identified deficiencies in their design and in the procedures by which they were conducted. The conclusions and recommendations are supported by an extensive literature review of previous interlaboratory tests and their methods for experimental design and for test data analysis. Eighteen EPA, State, and private laboratory agencies were visted. The comments, critiques, and suggestions of these agencies (obtained by questionnaire and by personal interview) have served to identify major difficulties and deficiencies in interlaboratory test programs generally; some specific causes of their failure to yield conclusive analytical and proficiency data are cited, and field investigations are described. The interlaboratory test program developed is presented; the functions and responsibilities of each agency are defined. Analytical methods and statistical procedures are specified for sample preparation, for data analysis, and for proficiency evaluation. (Seip-IPA)
W78-08227

MONITORING OF TRACE CONSTITUENTS DURING PCB RECOVERY DREDGING OPERATIONS: DUWAMISH WATERWAY,
Environmental Protection Agency, Seattle, WA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W78-08230

AN ANALYSIS OF EXPOSURE PANEL DATA COLLECTED AT MILLSTONE POINT, CONNECTICUT,
Massachusetts Inst. of Tech. Cambridge. Energy Lab.
For primary bibliographic entry see Field 5C.
W78-08231

APPLICATION OF REMOTE SENSING TO THE CHESAPEAKE BAY REGION: VOLUME 1 - EXECUTIVE SUMMARY.
National Aeronautics and Space Administration, Greenbelt, MD. Goodard Space Flight Center.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA CP-6, Price codes: A17 in paper copy, A01 in microfiche. Report No. NASA CP-6 Summary of Conference held Apirl 12-15, 1977, Berkeley Springs, WV, Coolfont Conference Center, April, 1978, 43 p.

Descriptors: *Chesapeake Bay, *Remote sensing, *Conferences, *Water quality, *Environmental control, Standards, Surveys, Equipment, Economics, Programs, Planning, Pollutant identification, *Environmental quality, Policies.

Recommendations that resulted from the Conference on the Application of Remote Sensing of the Chesapeake Bay Region and brief summaries of papers and reports of the working groups are presented. The Conference assembled representatives of Federal and State government agencies engaged in research on the condition and evolution of the Chesapeake Bay to compose a status report, to present current activities and future plans, and to recommend a long-range future course of policies and programs. Findings of the Conference were developed and presented by the attendees divided into six working groups, each of which filed a report containing conclusions and recommendations. Conference presentations, discussions, and reports document the availability of suitable remote sensing monitoring techniques for diagnosing, prescribing, and forecasting the conditios of the Chesapeake Bay. Conference recommendations are summarized under the following headings: (1) Intergroup cooperation/organization/coordination, (2) Environmental quality, (3) Geophysical and environmental surveys, (4) Standards, (5) Advanced sensor development, and (6) Funding. Complete papers, detailed discussions of some of the sessions, and the complete reports of the working groups are found in the Conference Proceedings, Volume 2. (Seip-IPA)
W78-08232

EFFLUENT MONITORING PROCEDURES: BASIC LABORATORY SKILLS - STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, MD.
W. T. Engel, J. H. Highby, and D. M. Wagner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 321, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-430/1-77-011, November, 1977. 123 p, 3 fig, 5 tab, 19 ref. 900501.

Descriptors: *Education, *Training, *Analytical techniques, *Pollutant identification, Effluents, *Monitoring, *Publications, *Laboratory equipment, *Chemical analysis, Measurement, Weight, Aqueous solutions, Volumetric analysis, Bacteria, Effluents, Mathematics, Micorbiology, *Laboratory Skills Manual, Procedures, Specialized training, Training devices, National Pollutant Discharge Elimination System, Chemical compounds.

A basic laboratory skills manual was designed for the treatment plant operator or technician who is required to monitor effluent discharges under a National Pollutant Discharge Elimination System

PDES) permit and who had little or no previous perience in laboratory work. The manual cons a review of basic mathematics which ides the metric system, whole numbers, cimals, formulas and percentage. The chemical oratory section contains applications and ocedures such as weighing techniques, use of oratory equipment, and preparation and standrdization of reagents. An introduction to basic crobiological techniques is also included. (Seip-A)
78-08233

QUANTITATIVE STUDY OF THE DIFFUSE URCE LOADINGS OF CHESAPEAKE BAY, ROGRESS REPORT),
nithsonian Institution, Edgewater, MD. Chesake Bay Center for Environmental Studies.
r primary bibliographic entry see Field 5B.
78-08234

TELLITE REMOTE SENSING STUDY OF HE TRANS-BOUNDARY MOVEMENT OF OLLUTANTS,
nvironmental Research Inst. of Michigan, Ann rbor.
r primary bibliographic entry see Field 5B.
78-08239

FFLUENT MONITORING PROCEDURES: ETALS ANALYSIS STAFF GUIDE FOR CONUCTING THE COURSE,
ational Training and Operational Technology enter, Cincinnati, OH.
Hallbach.
vailable from the National Technical Informaon Service, Springfield, VA 22161 as PB-275 393, rice codes: A07 in paper copy, A01 in microfiche. eport No. EPA-430/1-77/006, December, 1977. 8 p.

escriptors: *Metals, *Monitoring, *Training, Testing procedures, *Education, *Analytical chniques, *Water analysis, *Waste water treatent, Effluents, Publications, Testing, Measureent, *Pollutant identification, Effluent monitorg, Effluent analysis, Metals analysis, Measurement procedures.

guide is designed to be used by instructors to sist in the conduct of Effluent Monitoring rocedures: Metals Training course. It contains ourse planning and management information, inuding course plan and working schedules, traing resources, secretarial support, and instruconal package worksheets. (Seip-IPA)
78-08240

HERMAL REMOTE SENSING CALIBRATION ECHNIQUES,
alspan Corp., Buffalo, NY.
r primary bibliographic entry see Field 7B.
78-08241

VALUATION OF THE STANDARD SAMLING TECHNIQUE FOR SUSPENDED OLIDS,
nvironmental Protection Agency, Kansas City, S. Surveillance and Analysis Div.
. D. Reed.
vailable from the National Technical Informaon Service, Springfield, VA 22161 as PB-273 269, rice codes: A04 in paper copy, A01 in microfiche. eport No. EPA-907/9-77-001, 1977. 56 p, 19 fig, 9 f.

escriptors: *Suspended solids, *Sampling, Analytical techniques, *Resins, *Tagging, Copper, *Fluorescent dye, *Pollutant identificaon, Water analysis, Waste water treatment, Onte investigations, On-site tests, Copper tagging, luorescent tagging, Waste water sampling, Waste ater analysis, Field sampling.

The inconsistency of non-filterable suspended solids data resulting from automatic sampling equipment used by the Surveillance and Analysis Division of EPA was evaluated from a field sampling technique viewpoint. Resins and other solids of varying specific gravity and particle size were tagged with a metal salt or fluorescent material and added to a waste stream as a synthetic suspended solid to determine the collection efficiency of the samplers. Recovery of the metal salt or fluorescene was used as the indicator of solids recovery. A 832,000 liter/day (220,000 gallon/day) raw domestic wastewater flow was used to conduct the test. Recovery of solids in the hydraulic jump below the Parshall flume, and at the 0.6 depth in the approach channel above the flume was 25% below the theoretical homogeneous concentration indicated by the resin feed rate. The results indicate the need for a method of evaluating the wastewater characteristics for proper sample intake tube placement. (Seip-IPA)
W78-08242

FOLLOW-UP STUDY OF THE DISTRIBUTION AND FATE OF POLYCHLORINATED BIPHENYLS AND BENZENES IN SOIL AND GROUNDWATER SAMPLES AFTER AN ACCIDENTAL SPILL OF TRANSFORMER FLUIDS,
Environmental Protection Agency, Atlanta, GA. Air and Hazardous Materials Div.
For primary bibliographic entry see Field 5B.
W78-08255

MONITORING WATER QUALITY BY REMOTE SENSING,
California State Dept. of Water Resources, Sacramento.
R. L. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as E77-10194, Price codes: A04 in paper copy, A01 in microfiche. Final Report, NASA CR 154 259, July, 1977. 52 p, 15 fig, 2 tab, 12 ref. NAS 5-20945.

Descriptors: *Remote sensing, Satellites(Artificial), *California, *Water quality, *Monitoring, Aircraft, Mapping, Costs, *Pollutant identification, *LANDSAT, *San Francisco Bay(CA), *San Francisco Delta(CA), *Lake Tahoe(CA), Ground truth.

Results of a study to determine the applicability of remote sensing for evaluating water quality conditions in San Francisco Bay-Delta area and Lake Tahoe, California, are presented. Coincident ground truth was obtained during LANDSAT and U-2 flights and correlated with the remote sensing images to establish a data comparison base line. Images were analyzed for apparent surface anomalies which might indicate water quality problems. It is concluded that: (1) for most water quality monitoring applications, LANDSAT imagery is too infrequent and of too small a scale to be useful in routine monitoring programs; (2) imagery from U-2 and conventional aircraft can be effectively used to monitor gross water quality changes; (3) with the present state-of-the-art in image analysis and the large amount of ground truth needed, remote sensing has only limited application in monitoring water quality; (4) California water quality conditions are improving as a result of the Porter-Cologne Water Quality Act and provisions of P.L. 92-500; an (5) in complex and dynamic systems such as the San Francisco Bay and Delta, large amounts of ground truth data must be collected to support remote imagery; spatial and temporal variations of the parameters are so great that approaches other than synoptic (synchronized multi-point sampling) do not provide enough information to evaluate patterns observed in specific images. (Seip-IPA)
W78-08257

CHARACTERISTICS OF A 'HIGH SOLIDS' NEBULIZER FOR FLAME ATOMIC ABSORPTION SPECTROMETRY,
Arizona Univ., Tucson. Dept. of Chemistry.
R. C. Fry, and M. B. Denton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 551, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 12, September, 1977. 33 p, 13 fig, 1 tab, 5 ref. NR 051-549, N00014-75-C-0513.

Descriptors: *Aersols, *Spectrometers, *Instrumentation, *Design, Equipment, *Water analysis, *Pollutant identification, High solids nebulizer, *Flame atomic absorption spectrometry, Aerosol generation, Babington nebulization technique, *Spectrochemical analysis, Trace metals.

Studies are presented to characterize a new nebulizer methodology, which represents a system of similar concentration sensitivity, similar precision, superior operating range, simpler design, and far superior sample handling (high solids) capability as compared to the capillary pneumatic approach. High density, finely dispersed aerosols may be produced from solutions and slurries of elevated salt concentration, high solids content, and increased viscosity. The parameter to be improved on is the required sample size. Although the present one ml transient signal represents a considerable improvement over earlier high solids adaptations of the Babington principle, further improvements are needed to reduce the sample size requirement. At its present state of development, the high solids approach may be optimally used as an auxillary nebulizer for analysis of those materials (greater than or equal to one ml) which are too complex to pass through the capillary orifice of a standard pneumatic nebulizer. (Seip-IPA)
W78-08258

TRACE ANALYSIS OF ARSENIC BY COLORIMETRY, ATOMIC ABSORPTION, AND POLAROGRAPHY,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
L. H. Howe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 652, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA - 600/7-77-036, April, 1977. 37 p, 5 fig, 8 tab, 38 ref. E-AP 78BDH.

Descriptors: *Arsenic compounds, *Electric powerplants, Effluents, *Polarographic analysis, *Colorimetry, *Statistical methods, *Trace elements, Separation techniques, Analytical techniques, Spectrometry, Water quality, *Pollutant identification, Differential pulse polarography, *Atomic absorption spectrometry, Coal ash, Steam-electric generating plants, Coal ash ponds, Extraction.

A differential pulse polargraphy method was developed to determine arsenic at concentrations between 2 and 50 micrograms/l in water samples collected from ash ponds at coal-fired steam-electric power plants. Samples were digested in an acidic solution containing a molybdenum (VI) catalyst and the arsenic (V) was reduced to arsenic (III) by cuprous chloride. Arsenic was then isolated by solvent extraction with benzene, back-extracted into water, and quantified in 1 M hydrochloric acid by measuring the differential pulse polarographic current at about -.04 volts. The precision and accuracy of this polarographic method were compared to two standard methods (atomic absorption and colorimetry) for observations on replicate analyses of pure standard solutions, split samples from ash ponds, standard reference samples, and standard solutions spiked with potentially interfering elements. Seven replicate analyses at three concentrations showed that concentrations of arsenic can be determined precisely by either polarography, colorimetry, or

atomic absorption. A two-sample t-test on the means of the polarographic and colorimetric determinations showed (at the 0.05 level of significance) that the colorimetric method gives results negatively biased by 1 microgram/l at concentrations of 20 microgram/l and by 5 microgram/l at concentrations of 40 microgram/l. Paired-sample t-tests showed no significant difference at the 0.05 level among the methods for split samples. (Seip-IPA)
W78-08259

EVALUATION OF THE TECHNICON BLOCK DIGESTOR SYSTEM FOR TOTAL KJELDAHL NITROGEN AND TOTAL PHOSPHORUS,
Environmental Monitoring and Support Lab., Cincinnati, OH. Physical and Chemical Methods Branch.
M. E. Gales, Jr., and R. L. Booth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 027, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA - 600/4-78-015, February, 1978. 17 p, 2 fig, 9 tab, 5 ref.

Descriptors: Digestors, *Phosphorus, *Nitrogen, Analytical techniques, *Colorimetry, Equipment, *Automation, *Pollutant identification, Surface waters, Potable water, Waste water(Pollution), Industrial water, Industrial wastes, Domestic water, Domestic wastes, Organic compounds, Measurement, Block digestor, *Total Kjeldahl Nitrogen, Organic nitrogen, Organic phosphorus, Industrial waste water, Domestic waste water.

Technicon's Block Digestor method for the simultaneous determination of total phosphorus and total Kjeldahl nitrogen (TKN) has been evaluated and modified for the semi-automated determination of constituents in surface water, drinking water, and domestic and industrial wastes. This system consists of a block digestor that holds 40 digestion tubes and an Auto Analyzer for subsequent colorimetric analysis. Technicon's method can be used to determine organic nitrogen and phosphorus over a range of 0.1 to 20 mg per liter in water and wastewaters at a rate of 20 to 30 samples per hour. The digestion system employed is similar to one used by two other EPA laboratories where less sample is taken; however, the same ratio of sample to digestion solution is maintained. The recovery of 73% nitrogen from nicotinic acid shows that this system has the potential of giving higher results than the conventional manual TKN method. (Seip - IPA)
W78-08260

SITE SELECTION AND DESIGN FOR MINIMIZING POLLUTION FROM UNDERGROUND COAL MINING OPERATIONS,
Alabama Univ., University.
For primary bibliographic entry see Field 5G.
W78-08261

A USER'S GUIDE FOR REDEQL-EPA: A COMPUTER PROGRAM FOR CHEMICAL EQUILIBRIA IN AQUEOUS SYSTEMS,
Corvallis Environmental Research Lab., OR. Marine and Freshwater Ecology Branch.
S. E. Ingle, M. D. Schuldt, and D. W. Schults.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 149, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/3-78-024, February, 1978. 88 p, 17 fig, 6 tab, 11 ref.

Descriptors: *Computer programs, Data storage and retrieval, *Metals, *Equilibrium, *Chemical analysis, *Chemical reactions, *Aqueous solutions, Thermodynamic behavior, Hydrogen ion concentration, Oxidation, Chemical precipitation, *Pollutant identification, Ligands, Chemical equilibrium, Aqueous equilibrium, Metal complexes, Oxidation-reduction potential.

A user's guide for the REDEQL-EPA computer program for determining aqueous chemical equilibria among metals and ligands under various conditions of concentration, pH, and oxidation is presented. Aqueous equilibria for up to 20 metals and 30 ligands in a system are computed. The metals and ligands are selected from a list of 35 metals and 59 ligands for which thermodynamic data for complexes and solids have been stored in a data file. More data may be added by the user. The equilibria which the program considers include complexation, precipitation, oxidation-reduction, and pH-dependent phenomena. This guide allows use of the program without reference to the FORTRAN program. The capabilities and limitations of the program are discussed. The formats for input and explanation of output are given with examples illustrating the various program options, and common user errors are discussed. (Seip - IPA)
W78-08262

FIELD AND LABORATORY METHODS APPLICABLE TO OVERBURDENS AND MINESOILS,
West Virginia Univ., Morgantown. Coll. of Agriculture and Forestry.
A. A. Sobek, W. A. Schuller, J. R. Freeman, and R. M. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 495, Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA - 600/2-78-054, March, 1978. 204 p, 4 fig, 14 tab, 168 ref. R803508-01-0.

Descriptors: *Mine drainage, *Coal mines, *Overburden, Soils, *Chemical analysis, *Mineralogy, *Microbiology, *Soil chemical properties, *Soil physical properties, Chemical properties, Physical properties, *Analytical techniques, *Pollutant identification, On-site investigations, On-site tests, Laboratory tests, Water quality, Land use, Planning, Procedural manual, Field sampling, Mineralogic analysis, Microbiological analysis.

Chemical, physical, mineralogical, and microbiological procedures for the analysis of coal overburdens and the resultant minesoils are incorporated in a manual of step-by-step procedures on: (1) field identification of common rocks and minerals: (2) field sampling techniques; (3) processing of rock and soil samples; and (4) chemical, mineralogical, microbiological, and physical analyses of the samples. The methods can be used by mining companies, consultant firms, and State and Federal agencies to ensure mining efficiency, post-mining land and water quality, and long-range land use. Standardized definitions of essential rock, soil, chemical, mineralogical, microbiological, and physical terms are included to facilitate interdisciplinary communiciation. (Seip - IPA)
W78-08264

WATER QUALITY INDICES: A SURVEY OF INDICES USED IN THE UNITED STATES,
Environmental Protection Agency, Washington, DC. Office of Monitoring and Technical Support.
W. R. Ott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 057, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/4-78-005, January, 1978. 128 p, 9 fig, 23 tab, 61 ref, 6 append.

Descriptors: *Water quality, *Indexing, *Information retrieval, *Information exchange, *Federal Water Pollution Control Act, Water quality control, Indicators, *Water quality indices, Public Law 92-500, *Federal Water Pollution Control Act Amendments, Index utilization.

The extent of water quality index use in the U.S. is documented. The indices published in the literature and surveys of the States and interstate commissions are reviewed to determine: (1) which agencies are using indices, (2) the type of index being used, (3) the purpose of its use, and (4) the attitudes of agency personnel toward indices. One-fifth of the State and interstate agencies (12 out of 60) were classified as users of water indices. Of the 51 state agencies (including DC), 10 states (20%) were classified as index users. The National Sanitation Foundation Index was the most commonly used, by 7 of the 12 index users. The remaining agencies use Harkins' index or various user-developed indices. A total of 16 additional State and one interstate commission are planning to evaluate indices for possible future application or are developing or evaluating indices at the present time; these were classified as 'potential users'. Six new indices have been developed by water pollution control agencies; their mathematical structures are documented. The main purposes expressed by index users for applying their indices are preparation of the annual reports required by Section 305(b) of P.L. 92-500, public information and analysis of water quality trends. Most users feel that EPA should have a suggested index available (or a set of indices) for those agencies that wish to use a uniform index structure. There is clear evidence of a trend toward increased utilization of water quality indices. Several recommendations are included for meeting the needs of index users, attaining greater uniformity in water quality data analysis practices, and identifying future research needs. (Seip-IPA)
W78-08265

SOURCE ASSESSMENT: MAJOR BARIUM CHEMICALS,
Monsanto Research Corp., Dayton, OH.
R. B. Reznik, and H. D. Toy, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 756, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/2-78-004b, March, 1978. 138 p, 22 fig, 43 tab, 38 ref, 7 append. 68-02-1874.

Descriptors: *Chemical industry, *Air pollution, *Air pollution effects, *Pollution abatement, Environmental effects, *Pollutant identification, Standards, Effluents, Incineration, *Barium, *Barium chemicals industry, Air pollution sources, Air quality standards, Air emissions, *Air pollution abatement particulates, Barium sulfide, Barium carbonate, Barium chloride, Barium hydroxide, Barium sulfate, Sulfur oxide, Hydrogen sulfide, Nitrogen oxides, Calcines, Black ash rotary kilns, Scrubbers, Electrostatic precipitators, Dryers.

A study of air emissions, including particulates, sulfur and nitrogen oxides, carbon monoxide, hydrocarbons, barium compounds, and polynuclear organic materials, from the manufacture of major barium chemicals, is described. Compounds studied include: BaS, BaCO3, BaC12, Ba(OH)2, and BaS04. Major emission points are the black ash rotary kiln where barite ore is reduced to BaS, the hydrogen sulfide incinerator where byproduct H2S is burned, the exhaust from the Ba(OH)2 process, and final product dryers and calciners. To evaluate potential environmental effects, source severity(s) was calculated for each emission from each emission point. The highest values of S occurred for sulfide oxide emissions from the H2S incinerator (1.89), the black ash rotary kiln (1.51), and the Ba(OH)2 process exhaust (1.6), and for emissions of soluble barium compounds from product dryers and calciners (0.79-200). Several control devices reduce emissions. Scrubbers and baghouses are used on the black ash rotary kiln and on product dryers and calciners. A scrubber and an electrostatic precipitator are employed to control the exhaust from the barium hydroxide process. By-product H2S may be absorbed in caustic instead of being incinerated. (Seip-IPA)
W78-08266

IDENTIFICATION OF COMPONENTS OF ENERGY-RELATED WASTES AND EFFLUENTS,
Research Triangle Inst., Research Triangle Park, NC.
E. D. Pellizzari.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 203, Price codes: A22 in paper copy, A01 in microfiche. Report No. EPA-600/7-78-004, January, 1978. 500 p, 69 fig, 164 tab, 44 ref, 4 append. 68-03-2368.

Descriptors: *Organic compounds, *Solid wastes, *Pollutant identification, *Electric powerplants, *Thermal powerplants, *Oil shales, *Coal mines, Gas chromatography, Mass spectrometry, Analytical techniques, Aqueous effluents, Chemical elements, Coal liquefaction, Coal gasification, Coal-fired powerplants, Oil refineries, *Geothermal energy, Spark source mass spectrometry, Atomic absorption spectrophotometry.

A state-of-the-art review on the characterization of organic and elemental substances in energy-related liquid and solid effluents was conducted. Previous and ongoing research programs and reports were reviewed to summarize the existing and probable future data on chemical elements and organic compounds in solid waste and aqueous effluents from: (1) coal liquefaction and gasification plants, (2) coal-fired power plants, (3) oil-shale processors, (4) oil refineries, (5) coal mines and (6) geothermal energy. The reliability of existing information and the probability of accumulation of adequate data from current and past contracts and projects was evaluated according to preselected criteria. Based upon the absence of adequate data on the composition of energy samples, a chemical characterization program was conducted for several energy-related processes. The necessary preconcentrations and purification were performed on these samples and the volatile and semi-volatile and semi-volatile organic compounds were identified and quantified. Samples for organic and mercury analysis were subjected to a single analytical protocol in each case to permit comparison among samples. Organic constituents were analyzed by gas chromatography/mass spectrometry/computer. Elemental components were determined and measured by spark-source mass spectrometry for all the elements in the periodic chart through uranium with the exception of oxygen, helium, hydrogen, neon, krypton, xenon, radon, nitrogen and carbon. The analysis of mercury was performed by flameless atomic absorption spectrophotometry. (Seip-IPA)
W78-08267

MODELING TECHNIQUES FOR ESTIMATING FECAL COLIFORMS IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5B.
W78-08278

VIRUS SAMPLING IN WASTEWATER--FIELD EXPERIENCES,
Los Angeles County Sanitation District, Whittier, CA.
M. W. Selna, and R. P. Miele.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 103, No EE4, August 1977, p 693-705. 2 fig, 5 tab, 8 ref.

Descriptors: *Waste water(Pollution), *Sampling, *Viruses, *Recovery time, Adsorption, Efficiencies, Detection probability, Waste water treatment, Water reclamation, *Pollutant identification.

Membrane adsorption, chemical precipitation, and soluble alginate filtration methodologies have been combined in the development of a relatively simple yet sensitive procedure for detecting low concentrations of virus in wastewater. Techniques originally developed for sampling clean water were modified after initial attempts at wastewater sampling were unsuccessful. Each segment of the modified procedure has been repetitively tested in sampling various wastewater effluents seeded with Poliovirus 1. Virus recovery efficiency in each segment of the procedure is reported herein. Detection limits at each stage of sample processing are delineated. The procedure is being utilized in comparison with virus removal by various wastewater treatment systems. A major prerequisite of this study was the ability to detect low concentrations of both seeded and naturally occurring viruses in large volumes (20 gal to 100 gal) of treated wastewater. (Graf-Cornell)
W78-08303

EVALUATION AND IMPROVEMENT OF QUALITY CHARACTERISTICS OF URBAN STORMWATER,
New South Wales Univ., Kensington. (Austrialia). School of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-08310

FORMAT FOR ACQUIRING RAPID DATA ANALYSIS CAPABILITIES OF STORED DATA: MANIPULATION OF NATIONAL EUTROPHICATION SURVEY WATER QUALITY DATA,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Operations Div.
J. D. Bliss, M. J. Freidland, and J. Hodson.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-262 995, Price codes: A02 in paper copy, A01 in microfiche. EPA-600/4-76-057, Report November 1976. 13 p, 1 fig, 5 ref, 1 append.

Descriptors: *STORET, *Eutrophication, *Data processing, *Data storage and retrieval, *Computer programs, WYLBUR, Environmental Protection Agency, Data collections, National Eutrophication Survey, Computers, Nutrients, Lakes.

The STORET.TO.WYLBUR job control language was developed to convert raw data in EPA's STORET data storage and retrieval system to a standardized format to facilitate statistical evaluation and manipulation of National Eutrophication Survey data. STORET.TO.WYLBUR, effective for acquiring rapid analysis capabilities of STORET data, is usable by relatively inexperienced computer programmers. A user must be familiar with the mechanics of STORET retrieval, particularly PGM=RET, its associated options, and the more common WYLBUR editing commands. WYLBUR is an assigned name for a text 'editor' and remote job entry facility. The National Eutrophication Survey was initiated in 1972, and through it water quality data has been collected from over 800 U.S. lakes. More than two million data points have been generated. The STORET.TO.WYLBUR package was necessitated by the inadequacy of program options internal to STORET; the new package may be suitable for general use as another STORET internal program option. STORET.TO.WYLBUR converts data into EDIT format from the MORE file generated by the STORET raw data retrieval. Examples of the use of the package are given. (Lynch-Wisconsin)
W78-08377

ANALYSIS OF ESTUARINE SOIL GRADIENTS IN SALT MARSHES OF THE SOUTHWESTERN NETHERLANDS WITH SPECIAL REFERENCE TO THE SCHELDT ESTUARY,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
W. G. Beeftink, M. C. Daane, J. M. Van Liere, and J. Nieuwenhuize.
Hydrobiologia, Vol 52, No 1, p 93-106, 1977. 7 fig, 4 tab, 26 ref.

Descriptors: *Estuaries, Water pollution, Organic matter, Phosphates, Nitrogen, Potassium, Clays, Carbonates, Hydrogen Ion concentration, *Salt marsh soils, *Soil gradients, *Scheldt estuary(The Netherlands), The Netherlands, Microgradient, Macrogradient.

Studies on macro and microgradients in salt marsh soils of the Scheldt estuary are compared with data of some marshes in the Rhine-Meuse estuary. Soil parameters investigated are clay, carbonate, organic matter, pH, nitrogen, potassium and phosphate. The macrogradients are related to corresponding estuarine aquatic gradients. The hypothe sis that estuarine soil gradients can be reflections of similar aquatic gradients is affirmed for two gradients. Soil gradients of upstream increasing organic matter and phosphate contents have been found, relating significantly to corresponding aquatic gradients caused by river pollution. In the same direction gradients of decreasing nitrogen and potassium contents occur. A macrogradient in carbonate content was not found. Some microgradients in clay and carbonate contents are described, and relevant mututal relationships between the soil parameters are characterized. (Maroncelli-Mass)
W78-08407

HEAVY METALS IN WASTE WATERS FROM THE CITY OF ZURICH (SCHWERMETALLE IN DEN ABWAESSERN DER STADT ZUERICH),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewasserschutz, Zurich (Switzerland).
H. R. Hegi, H. R. Krahenbuhl, C. Liebi, P. V. Roberts, and A. Weber.
Gas-Wasser-Abwasser, Vol. 57, No. 11, p 799-804, 1977. 10 tab, 3 fig, 18 ref.

Descriptors: *Heavy metals, *Sewage effluents, *Influent streams, *Sewage sludge, *Lead, Cadmium, Chromium, Copper, Nickel, Zinc, Waste water treatment, Municipal wastes.

Heavy metal concentrations were monitored in influent and effluent from two waste water treatment facilities in Zurich, Switzerland. The heavy metals measured in daily and weekly influent, effluent, and sludge samples included: lead, cadmium, chromium, copper, nickel, and zinc. Influent concentrations averaged 0.2 mg/liter of chromium, copper, lead, and nickel; 0.5 mg/liter of zinc and 0.01 mg/liter of cadmium. Heavy metal removal by the treatment process averaged from 60-80%. Corresponding heavy metal concentrations were found in the digested sludge from the waste water treatment plants. Mean concentrations measured in the sludge were 3,000 mg/kg dry matter for zinc; 300-800 mg/kg dry matter for chromium, copper, nickel, and lead; and 20 mg/kg for cadmium. (Lisk-FIRL)
W78-08443

PROTON BINDING IN FULVIC ACID EXTRACTED FROM SEWAGE SLUDGE-SOIL MIXTURE,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
G. Sposito, K. M. Holtzclaw, and D. A. Keech.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1119-1125, 1977. 2 fig, 3 tab, 15 ref.

Descriptors: *Humic acids, *Fulvic acids, *Volumetric analysis, *Sewage sludge, *Soil chemical properties, Organic wastes, Soil analysis, Return flow, Potassium compounds, Organic acids, Sludge disposal.

Proton disassociation from sludge-derived fulvic acids was measured with potentiometric titrations conducted at 25C and pH 11 using potassium-fulvate solutions in a potassium ionic medium and hydrochloric acid. Using a model describing the titration curve of fulvic acid, formation functions and conditional protonation constants were calcu-

lated for the classes of acidic functional groups protonating between 3-11. Three functional groups of weak acids were evaluated for logarithmic protonation constants averaging 3.9, 6.5, and 9.4. The quantity of titratable protons within the functional groups decreased with increasing standing time between preparation of the fulvic acid solution and calculation of the titrametric curve. Data on the reversibility of the fulvic acid titrations was also collected. (Lisk-FIRL)
W78-08462

TESTSETS FOR THE QUANTITATIVE ANALYSIS OF AQUEOUS SOLUTIONS WITH PERMANENT INDICATION (TESTSETS FUR DIE QUANTITATIVE ANALYSE WAESSRIGER LOESUNGEN MIT BLEIBENDER ANZEIGE),
J. Gleisberg.
Zeitschrift fuer Wasser- und Abwasserforschung, Vol. 11, No. 1, p 13-27, 1978. 15 fig, 23 tab, 3 ref.

Descriptors: *Colorimetry, *Analytical techniques, *Testing procedures, *Chemical analysis, *Copper, Iron, Nickel, Sulfides, Titanium, Cobalt, Zinc, Sodium chloride, Waste water treatment, Municipal wastes.

The Aquanal test sets can quantify trace concentrations of various elements in aqueous solutions by colorimetric techniques. The single-use test kit, equipped with a sampling mechanism and a filter, mixes the sample solution with reagents to form colored cylindrical layers with lengths from 0.5-25 mm which are proportional to the solution concentration as measured on a gauged scale. Aquanal test sets can be used to detect cyanide, iron (III), cobalt (II), copper (II), nickel (II), sulfide, titanium (IV), vanadium (V), and zinc in concentrations of 0.5-10 mg/liter; test sets are available for detecting concentrations over a range of 5-100 mg/liter of cyanide, iron (II), cobalt (II), copper (II), nickel (II), and zinc. Salts can be measured over 50-3,000 mg/liter and 1,000-40,000 mg/liter as sodium chloride. The Aquanal test sets can provide cumulative concentrations, as well as the individual concentrations of elements in solution. Permissible levels of cations and anions in solution which may interfere with analyses are listed for each element. A series of control sets is available for calibration. The system is capable of documenting concentration changes over a certain time period and accumulating trace metals within a small volume of adsorbent. (Lisk-FIRL)
W78-08467

CRITICAL CONSIDERATIONS ON THE DETERMINATION OF EXTRACTABLE SUBSTANCES IN POLLUTED WATERS (CONSIDERAZIONI CRITICHE SULLA DETERMINAZIONE DI SOSTANZE ESTRAIBILI IN ACQUE INQUINATE),
Florence Univ. (Italy). Inst. of Analytical Chemistry.
P. C. Legittimo, E. B. Piccardi, and F. Pantani.
Rassegna Chimica, Vol. 29, No. 6, p 297-303, November-December, 1977. 4 fig, 7 ref.

Descriptors: *Solvent extractions, *Separation techniques, *Analytical techniques, *Pollutant identification, Organic compounds, Phenols, Surfactants, Spectrophotometry, Water analyses, Water chemistry, Water quality, Organic wastes, Waste water treatment.

Methods to extract, identify, and measure fatty substances in large volumes of waste water are examined in detail. Solvent extraction of fatty substances with chloroform is not satisfactory in the presence of nonionic surfactants because of the nearly complete coextraction. Benzene extracts only 20-25% of these surfactants and partially removes anionic surfactants and phenolics. A carbon adsorption method using chloroform for elution results in the nearly complete separation of nonionic surfactants along with fatty substances; anionic curfactants are eluted from the carbon only partially by chloroform. In the presence of phenolics, the chloroform eluate obtained after carbon adsorption must be analyzed spectrophotometrically; the distilled portion is discarded. (Takacs-FIRL)
W78-08468

THE EFFECT OF QUICK FREEZING ON THE CONTENT OF ORGANIC WATER CAPACITY SUBSTANCES (DIE WIRKUNG DES TIEFGEFRIERENS AUF DEN GEHALT AN ORGANISCHEN WASSERINHALTSTOFFEN),
U. Neis.
Zeitschrift fuer Wasser- und Abwasserforschung, Vol. 11, No. 1, p 3-7, 1978. 6 fig, 3 tab, 10 ref.

Descriptors: *Freezing, *Freeze-thaw tests, *Chemical oxygen demand, *Biochemical oxygen demand, *Carbon, Laboratory tests, Activated sludge, Analytical techniques, Storage, Preservation, Sampling, Waste water treatment, Municipal wastes.

The impact on waste water samples of quick freezing as a storage method was evaluated with respect to values of COD, BOD, and total organic carbon (TOC). Unfiltered samples of waste water from a preclarifier, an activated sludge tank, and a receiving stream were used in the study. One liter samples were quick frozen at -30C and retained for 8 and 16 days. BOD concentrations in the waste water samples which had been frozen for 8 and 16 days were noticeably lower 5 days after thawing than the concentration of an unfrozen sample. Of the samples which were frozen, the activated sludge effluent had the highest BOD concentration while the receiving stream sample exhibited the lowest values. COD concentrations in preclarified effluent decreased from the initial 137 g/cu m to a minimum of 112 g/cu m after 16 days of freezing; activated sludge liquor COD increased from 2,000 g/cu m to a maximum of 2,520 g/cu m after 8 days of freezing; and receiving water COD increased from an initial 17 g/cu m to 23 g/cu m after 16 days. The TOC values of preclarification effluent and the activated sludge liquor were not significantly affected by freezing. (Lisk-FIRL)
W78-08469

PROFILE-ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS IN SEWAGE SLUDGE BY GAS CHROMATOGRAPHY (GASCHROMATOGRAPHISCHE PROFILANALYSE DER POLYCYCLISCHEN AROMATISCHEN KOHLENWASSERSTOFFE IN KLARSCHLAMMPROBEN),
Biochemisches Inst. fuer Unweltearcinogene, Ahrensburg (West Germany).
G. Grimmer, H. Boehnke, and H. Borwitzky.
Fresenius Zeitschrift fuer Analytische Chemie, Vol. 289, No. 2, p 91-95, 1978. 2 fig, 1 tab, 6 ref.

Descriptors: Pollutant identification, *Aromatic compounds, *Gas chromatography, *Analytical techniques, *Organic compounds, *Sewage sludge, Profiles, Aluminum, Filtration, Mass spectrometry, Waste water treatment, Municipal wastes.

A profile analysis of polycyclic aromatic hydrocarbons in sewage sludge was performed with gas chromatography. A 25 ml source of cyclohexane was mixed with 45 ml of dimethylformamide and 5 ml of water; chromatography was performed with 10 mg of Sephadex LH20 in 50 ml of isopropanol; the cyclohexane was filtered on aluminum oxide. The polycyclic aromatic hydrocarbons were separated by gas chromatography with high performance columns and the signals were compared with internal standards. Five analyses of the sample for 18 main components yielded a variation coefficient of 1.6-11.3%. The retention time of the polycyclic aromatic hydrocarbons controlled the detection limit under amplification. The polycyclic aromatic hydrocarbons were detected in the range of 0.5-5.0 ng while benzo(a)pyrene was in the 1 ng range . Mass spectrometry in conjunction with the gas chromatography was considered unnecesary as the profiles of different sludges were similar. (Lisk-FIRL)
W78-08470

PERSISTENCE OF ENTEROVIRUSES IN SEWAGE SLUDGE,
Ontario Ministry of Health, Toronto. Lab. Services Branch.
T. P. Subrahmanyan.
Bulletin of the World Health Organization, Vol. 55, No. 4, p 431-434, 1977. 1 fig, 2 tab, 14 ref.

Descriptors: Pollutant identification, *Viruses, *Sludge digestion, *Sewage sludge, *Diseases, *Temperature, Analytical techniques, Volumetric analysis, Irrigation techniques, Sludge disposal, Waste water treatment, Municipal wastes.

The survival of viruses in sewage sludge was investigated under varying conditions of pH, temperature, and time in laboratory experiments. Titers of viruses in sewage sludge maintained at pH 6.0, 6.5, 7.5, 8.5, and 9.5 indicated that maximum enterovirus elution occurred at pH 9.5. Chloroform did not affect the infectivity of attenuated poliovirus type 1, coxsackievirus B5, and echovirus type 6. Viral concentrations in sewage sludge maintained at room temperature (22C) and at 4C were unchanged after 7 days and were smaller in amount after 14 days. Larger quantities of poliovirus survived at 4C than at 22C after 14 days. The survival of various enteroviruses in digested sludge at 22C was observed over a period of 12 weeks. Coxsackievirus A9 survived less than 2 weeks; coxsackievirus B2 and B4 survived less than 5 weeks; and coxsackievirus B5 survived the entire 12 weeks of the experiment. Echovirus type 6 was evident through the 10th week and type 9 survived through the 12 weeks. Virulent polio type 3 and vaccine polio type 1 persisted until the 8th week; polio vaccine type 3 and virulent polio type 1 were present in the 10th week. Echovirus type 6 survived 10 weeks while the echovirus type 9 was detected through the entire 12 weeks. The viruses survived longer in sludge than in another medium. Separate tests with reovirus type 2 demonstrated a survival period of 6 weeks. (Lisk-FIRL)
W78-08472

RELATION BETWEEN DEHYDRABILITY AND PROPERTIES OF SEWAGE SLUDGE (REPORT I) (GESUIODEI NO SHOSEIJO TO DASSEUISEI NI TSUITE),
M. Yokoyama, F. Nozawa, S. Toda, and Y. Kondo.
Ebara Infiruko Jiho, EBARA-INFILCO Engineering Review, No. 72, p 2-11, 1978. 3 fig, 9 tab.

Descriptors: *Dewatering, *Sludge treatment, *Capillary action, *Chemical analysis, *Analytical techniques, Capillary conductivity, Chemical precipitation, Lime, Polyelectrolytes, Physical properties, Waste water treatment, Municipal wastes.

Chemical and physical techniques were employed to measure the properties of digested and undigested sewage sludge. The dewaterability of sewage sludge was considered to be best described by the capillary suction time. Differences in concentrability and particle size were less apparent in tests with different sludges than in capillary suction time measurements. The capillary suction time index was used to determine the optimum rate of ferric chloride and slaked lime feed to sewage sludge during dewatering. Polyelectrolyte conditioning, which impeded the removal of the sludge cake and increased the water content of certain sludges, was not considered generally applicable. (Lisk-FIRL)
W78-08473

MICROSCOPIC OBSERVATION OF ACTIVATED SLUDGE APPLIED TO THE MONITORING OF TREATMENT PLANTS L'OBSERVATION MICROSCOPIQUES DES BOUES ACTIVEES APPLIQUE A LA SURVEILLANCE DES INSTALLATIONS D'EPURATION: TECHNIQUE D'ETUDE INTERPRETATION),
Montpellier-2 Univ. (France). Lab. de Genie Chimique, Traitement et Epuration des Eaux.
C. Drakides.
Techniques et Sciences Municipales-l'Eau, Vol 73, No 2, p 85-98, February, 1978. 18 fig, 16 ref.

Descriptors: *Activated sludge, *Analytical techniques, *Bioassay, *Sludge treatment, *Monitoring, Operation and maintenance, Microorganisms, Biodegradation, Flocculation, Bacteria, Organopleptic properties, Sewage treatment, Municipal wastes, Waste water treatment.

Observations of macroscopic and microscopic activated sludge characteristics are forwarded as a means of monitoring the operation of biological waste water treatment plants. Clear or slightly turbid supernatant (transparency of 40-80 cm or more) is considered indicative of efficient operation and low BOD and COD levels in the effluent. A high degree of purification is also represented by: the presence of a light, white flexible froth; the characteristic odor of moist earth; particles measuring 20-50 microns; non-filamentous free bacteria counts in the range of 10 to the 10th to 10 to the 11th/liter; and a diverse microfaunal assemblage in normal abundances.
W78-08475

TEEPOL AND TRITON MEDIA FOR THE ENUMERATION OF ESCHERICHIA COLI BY MEMBRANE FILTRATION,
Dundee Univ. (Scotland). Dept. of Civil Engineering.
A. A. Opara, D. D. Mara, and D. W. F. Wheater.
Water Research, Vol 11, No 11, p 949-954, 1977. 11 tab, 20 ref.

Descriptors: *E. coli, *Cultures, *Membrane processes, *Filtration, *Sewage bacteria, Analytical techniques, Membranes, Filters, Fermentation, Bacteria, Separation techniques, Waste water treatment, Municipal wastes.

More accurate techniques of E. coli enumeration in waste, river, and estuarine waters were investigated by varying the concentration of Teepol broth and modifying Triton agar broth for use with membrane filtration. False E. coli counts inaccurate by up to 25% have resulted from utilizing membrane-enriched Teepol broth at 44C. In this study, the concentration of basal Oxoid membrane-enriched Teepol broth was varied from 0-7%. A Triton agar broth containing 2 ml of the nonionic surfactant Triton X-100 was membrane-enriched for use in filtration. Control groups cultured in tryptone mannitol broth and for use in filtration. Control groups cultured in tryptone mannitol broth and tryptone lactose formate broth were retested using lactose peptone water and tryptone water when negative results occurred. Millipore membranes were used for filtration. False positive enumerations of E. coli were reduced from 0.4 to 0.2%. Enumeration errors were reduced to 6.8% when E. coli in 0.2% Triton in a membrane-enriched agar medium were filtered through membranes at 44C. (Lisk-FIRL)
W78-08476

COMPARISON OF ADSORPTION ELUTION METHODS FOR CONCENTRATION AND DETECTION OF VIRUSES IN WATER,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
B. Fattal, E. Katzenelson, T. Hostovsky, and H. In Shuval.
Water Research, Vol 11, No 11, p 955-958, 1976. 4 tab, 20 ref.

Descriptors: *Viruses, *Membrane processes, *Polyelectrolytes, *Chemical precipitation, *Aluminum, Filtration, Separation techniques, Pollutant identification, Diseases, Membranes, Waste water treatment, Municipal wastes.

Removal of poliovirus and enteroviruses from sewage was tested with aluminum hydroxide precipitation, cellulose nitrate membrane filtration and glycine buffer elution, insoluble polyelectrolyte treatment, and cellulose nitrate filtration with beef extract elution. The control aluminum hydroxide precipitation techniques recovered an average of 50% of the poliovirus. The cellulose nitrate membrane filter with glycerine buffer elution recovered an average of 65%. Seventy-seven per cent of the poliovirus was removed on the cellulose nitrate membrane filter with a 3% beef extract solution. The insoluble polyelectrolyte (PE 60) removed an average of 70% of the poliovirus. Enterovirus recovery from sewage averaged 40% with aluminum hydroxide precipitation, 111% with membrane filtration and beef extract elution, 67% on the membrane filter with glycerine buffer, and 80% with PE 60. In experiments with echovirus 7, poliovirus, and enterovirus seeded in tap water, recovery rates were higher than those from sewage. (Lisk-FIRL)
W78-08477

DETERMINATION OF TOCL BY ENRICHMENT ON POWDERED ACTIVATED CARBON AND FLOCCULATION (UNTERSCHUNGEN ZUR BESTIMMUNG DE ORGANISCH GEBUNDENEN CHLORS MIT HILFE EINES NEUARTIGEN ANREICHERUNGSVERFAHREN),
W. Kuhn, F. Fuchs, and H. Sontheimer.
Zeitschrift fuer Wasser- und Abwasserforschung, Vol 10, No 6, p 192-194, 1977. 2 fig, 3 tab, 3 ref.

Descriptors: *Chlorine, *Activated carbon, *Analytical techniques, *Flocculation, Alumimum, *Adsorption, Polymers, Organic wastes, Pollutant identification, Chlorination, Testing procedures, Measurement, Water analysis, Municipal wastes.

Enrichment of chlorine compounds on powdered activated carbon followed by flocculation was performed as a preliminary to pyrohydrolysis detection of total organic chlorine. Conventional concentration techniques for chlorine compounds utilized granular activated carbon is a miniature sampler unit. The described enrichment procedure employs powdered activated carbon for step-by-step adsorption of chlorine compounds at pH 5. Enrichment is followed by flocculation with 100 mg aluminum and 8 mg polymer at pH 6.5 for 10 min. The dectection range of this analytical technique is reported to be about 20 micrograms of total organic chlorine/liter. (Lisk-FIRL)
W78-08478

CONTROL TESTS AND KINETICS OF ACTIVATED SLUDGE PROCESS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W78-08482

RESULTS OF POLLUTION CONTROL OF THE RHINE WATER IN RHINELAND-PALATINATE (ERFOLGE BEI DER REINHALTUNG DES RHEINS IN RHEINLAND-PFLAZ),
Landesamt fuer Gewasserkunde, Mainz (West Germany).
For primary bibliographic entry see Field 5G.
W78-08496

A SHORT TERM STUDY ON THE POLLUTION OF TAPTI RIVER IN SURAT REGION,
S. V. Regional Coll. of Engineering and Technology, Surat (India).
R. N. Shelat, N. V. Vashi, and N. V. Subbayya.
Journal of the Institution of Engineers (India), Vol. 58, Part EN1, p 25-28, October, 1977. 5 fig, 1 tab, 4 ref.

Descriptors: *Water pollution sources, *Rivers, *Outlets, *Sampling, *Pollutant identification, Biochemical oxygen demand, *Chemical oxygen demand, Industrial wastes, Suspended solids, Sulfates, Chlorides, Sewage, Sewers, Domestic wastes, Municipal wastes, *India, Tapti River(Surat region).

Physical and chemical water quality parameters were recorded at 10 sampling stations along a 16-km portion of the Tapti River in the Surat region of India. Pollution sources along the river included a paper mill, a thermal power plant, municipal sewage, domestic sewage, and textile wastes. The pH of the river samples ranged from 6-8 with a temperature of 20-24 C. Other chemical parameter ranges included: 24-54 mg/liter chlorides, 17-52 mg/liter sulfates, 6.2-8.4 mg/liter dissolved oxygen, 40-280 mg/liter BOD, and 89-512 mg/liter COD. Total solids ranged from 48-344 mg/liter with suspended solid loads of 42-269 mg/liter. While the physical properties of the river water did not exceed Indian water quality standards, BOD values were higher than allowed at all sampling sites; chlorides exceeded standards near the municipal storm water outlet to the river. The pollutant levels were lower during the winter months. (Lisk-FIRL)
W78-08504

STUDIES ON THE TREATMENT OF NIGHT SOIL. VII. IDENTIFICATION OF BACTERIA ISOLATED FROM AEROBIC TREATMENT PLANT OF UNDILUTED NIGHT SOIL AND AMINO ACID UTILIZATION BY THESE BACTERIA (SHINYOSHORI NI KANSURU KENKYU (DAINANAHO)--MUKISHAKU SHINYO NO KOKUSEI SHORISHISETSU KARANO JOKASAIKIN NO BURNI RO SONO AMINO SAN BURKAINO),
Gifu Coll. of Pharmacy, (Japan). Dept. of Environmental Hygiene.
T. Ishikawa, J. Fukuyama, Y. Ose, and T. Sato.
Gifu Yakkadaigaku Kiyo, (Annual Proceedings of Gifu College of Pharmacy), Vol. 26, p 8-12, 1978. 1 fig, 2 tab, 12 ref.

Descriptors: *Bacteria, *Domestic wastes, *Amino acids, *E. coli, *Aerobic treatment, Sewage bacteria, Organic acids, Oxidation, Organic compounds, Waste water treatment, Analytical techniques, *Municipal wastes.

Amino acid utilization by bacteria isolated from undiluted domestic wastes was identified in aerobically-treated waste water. The domestic wastes were aerated in a series of four digestion tanks following grinding. The wastes were settled; excess sludge was removed; and the waste was diluted. Secondary aeration of the effluent was followed by final clarification and chlorination. Excess sludge from the sedimentation tank, secondary aeration tank, and clarifier was dewatered by centrifugation. Analyses of the treated effluent revealed the presence of Bacillus megaterium, Escherichia coli variety communior, and Staphylococcus epidermis. Oxidation of the amino acid, L-alanine, amounted to 75.2% by B. megaterium and 64.7% by E. coli variety communior. Other forms of amino acid utilization included: L-valine and L-leucine by B. megaterium; L-lysine HCL by E. coli; and L-aspartic acid and L-glutamic acid by E. coli and B. megaterium. The sulfur-bearing amino acids, L-methione and L-cystine, were not appreciably utilized by any of the bacteria isolated. (Lisk-FIRL)
W78-08505

BACTERIAL AEROSOLS RESULTING FROM SPRAY IRRIGATION WITH WASTEWATER,
Army Medical Bioengineering Research and Development Laboratory, Fort Detrick, MD.

H. T. Bausum, S. A. Schaub, M. J. Small, J. A. Highfill, and C. A. Sorber.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 359, Price codes: A07 in paper copy, A01 in microfiche. Technical Report 7602, June 1976. 143 p, 16 fig, 11 tab, 318 ref.

Descriptors: *Aerobic bacteria, *Aerosols, *Sprinkler irrigation, *Waste water disposal, *Coliforms, Mathematical models, Chlorination, Disinfection, Domestic wastes, Return flow, Application methods, Waste water treatment.

Air-borne bacteria resulting from spray irrigation with chlorinated and unchlorinated waste water were quantified in on-site investigations at Ft. Huachuca, Arizona and in laboratory experiments. Air sampling equipment was adapted for detection of the aerobic and indicator bacteria present in treated and untreated effluent from the army installation. Aerobic bacteria reached a maximum aerosol density of 1,630/cu m nearest the spray irrigation source; bacterial aerosols from chlorinated effluent were as high as 20/cu m close to the source. Coliforms comprised 0.5% of the total aerobic bacteria, with half of the coliform population represented by Klebsiella. Conditions of low wind, atmospheric stability, and darkness increased the aerosol densities of the bacteria. A mathematical model, used in conjunction with flourescein tracer data, predicted that 0.3% of the applied waste water aerosolized. With this aerosol figure, the model estimated that a downwind distance of 518-1,800 m from the source would be required to reduce air-borne bacteria to background levels. The diameter of viable aerosol bacterial aerosols averaged 4.5 micrometers, indicating that more than half were small enough for human aspiration. Laboratory tests determined the viability of enteric bacteria under varying humidity. (Lisk-FIRL)
W78-08518

SUBLETHAL EFFECTS OF PETROLEUM ON MACOMA BALTHICA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W78-08521

THE NBS PROGRAM FOR STANDARDS FOR TRACE ORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
H. S. Hertz, S. N. Chesler, and W. E. May.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 227-242, 12 fig.

Descriptors: *Pollutant identification, *Analytical techniques, *Water pollution, *Organic compounds, Baseline studies, Trace elements, *Outer Continental Shelf, Petroleum.

The National Bureau of Standards (NBS) is currently conducting a research program to develop standards for trace organic analysis in the marine environment. In this paper, the results of these analyses for petroleum-in-sediment and petroleum-in-biota reference materials, marker compounds, and concentration techniques for polar organic materials are summarized. (See also W78-08520) (Sinha - OEIS)
W78-08536

THE NBS PROGRAM FOR STANDARDS FOR TRACE INORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
I. L. Barnes, H. L. Rook, and T. J. Murphy.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 243-257, 6 fig.

Descriptors: *Inorganic compounds, *Pollutant identification, *Water quality, Monitoring, Baseline studies, Analytical techniques, Neutron activation, *Trace elements, *Outer Continental Shelf, Energy resources.

The Analytical Chemistry Division of the National Bureau of Standards (NBS) has been conducting a research program concerning the production of new standard reference materials and the determination of new materials that can be used as standards in the analysis of inorganic elements. This paper focuses on the use of raw materials, products, and residues of coal conversion and oil shale processes for possible standard reference materials; the development of standards for monitoring water quality associated with energy production; and the development of a resin disk preconcentration method and an improved analytical capability based on neutron activation. (See also W78-08520) (Sinha - OEIS)
W78-08537

STANDARDIZATION AND INTERCALIBRATION TECHNIQUES FOR MARINE MONITORING,
National Ocean Survey, Rockville, MD. Test and Evaluation Lab.
M. A. Basileo.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 259-269.

Descriptors: *Baseline studies, *Water quality standards, *Monitoring, *Water pollution, Environmental effects, Water quality, Calibration, Instrumentation, *Pollutant identification, *Outer Continental Shelf, Standardization, Intercalibration techniques.

The objective of this project is to develop standardization and intercalibration techniques to assess the quality of marine environmental data. The tasks within the project are directed towards developing the capability to define the uncertainties or error boundaries associated with data obtained from environmental measurement systems. The project is composed of two tasks: standards development and investigations. (See also W78-08520) (Sinha - OEIS)
W78-08538

THE UNDERWAY WATER SAMPLING SYSTEM,
National Ocean Survey, Rockville, MD. Engineering Development Lab.
C. D. Kearse, R. New, and D. Enabnit.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. 283-300, 2 fig.

Descriptors: *Water sampling, *Measurement, Instrumentation, Baseline studies, Data processing, Oil spills, Navigation, *Pollutant identification, *Outer Continental Shelf, Oceanographic data, Underway sampling, Thermal plumes.

An underway water sampling system (UWSS) to aid in characterizing and monitoring the regions subjected to energy-related pollution is a complete shipboard instrument system designed to acquire, measure, display, and store oceanographic, meteorological, and navigation data while the ship is continuously underway. The system has the following major components: a water measurement subsystem (a towed sensor array or instrumented undulating fish plus a water pumping system) designed to collect oceanographic data and water samples; a navigation, data handling, real-time processing, and display; and a current/depth measurement subsystem to remotely measure ocean currents. This paper summarizes the efforts to date, describes the present status of individual tasks, and discusses the future of the project. (See also W78-08520) (Sinha-OEIS)
W78-08540

SHIPBOARD ENVIRONMENTAL DATA ACQUISITION SYSTEM,
National Weather Service, Silver Spring, MD.
D. W. Downen, and R. R. Reynolds.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p. 301-304, 1 fig.

Descriptors: *Data processing, *Measurement, *Monitoring, *Weather forecasting, *Oil spills, Baseline studies, Water pollution, Environmental effects, Pollutant identification, Remote sensing, *Outer Continental Shelf, Data acquisition, Shipboard instrumentation, Petroleum, Oil transport, Shipboard Environmental Data Acquisition System(SEAS).

The National Weather Service is developing an automated environmental data observation system for shipboard use. Known as the Shipboard Environmental Data Acquisition System (SEAS), this system will provide real-time monitoring of meteorlogical and oceanographic parameters. It will be operated on board various ships (e.g., oil tankers, merchant ships), and the observed environmental data will be transmitted via satellite communications to NWS in Suitland, Maryland. The SEAS will provide routine observations from relatively data-sparse oceanic areas. Correlation of these data with additional environmental data will result in improved weather forecasts and warning services. Many energy and pollution-related activities will benefit from SEAS. It will be used as input to the oil spill concentration and trajectory forecast model currently under development used in providing more efficient clean-up operations in the event of a spill. (See also W78-08520) (Sinha-OEIS)
W78-08541

THE HARMONIZATION OF THE MONITORING OF THE QUALITY OF INLAND FRESH WATER,
Department of the Environment, London (England).
E. A. Simpson.
Journal of the Institution of Water Engineers and Scientists, Vol 32, No 1, p 45-56, January 1978. 3 tab, 16 ref.

Descriptors: *Pollutant identification, *Water quality, *Monitoring, *Coordination, *Water analysis, Freshwater, Networks, Sampling, Water sampling, Quality control testing procedures, Methodology, Reliability, Data processing, Control, Testing, Foreign countries, Foreign research, *Great Britain.

In the United Kingdom, the need to monitor the quality of all but the smallest rivers as they enter tidal waters has been established. Informtion is required both to satisfy international obligations and to provide information on river quality. To meet this need, the harmonized monitoring scheme was set up. A network of sampling points has been established which will allow all important rivers to be sampled points has been established which will allow all improtant rivers to be sampled at, or a little above, the tidal limit. A similar network has been established for major tributaries, with the sampling points being at the confluence or a little way up the tributary from it. Nearly all sampling points are associated with flow-gaging facili-

ies so that mass flow as well as concentration can e measured. The scheme lays great stress on the eed to produce results of known and adequate accuracy. To ensure that adequate accuracy is maintained, the harmonized monitoring scheme includes a continuing inter-laboratory calibration of articipating laboratories. The size of the scheme as made it necessary to use a computer to handle he volume of data produced and to define exactly he determinands measured. However, results are ought only for those determinands which are sigificant at the individual sampling points. Experience suggests that there may well be other equirements for the scheme which have not yet een identified. However, the scheme has been esigned to operate flexibly and to be capable of xtention as needed. (Humphreys-ISWS)
W78-08548

OPTICAL MONITORING OF EFFLUENT WATER POLLUTION-ESPECIALLY TO MEASURE PETROLEUM CONTAMINANTS IN WATER FROM TANKER HOLDS.
French Patent FR 2353-210. Issued January 27, 1978. Derwent French Patents Abstracts, Vol. A, No. 11, p 7, April, 1978.

Descriptors: *Oil wastes, *Ultraviolet radiaton, *Infrared radiation, *Patents, *Instrumentation, Measurement, Pressure head, Ships, Design data, Industrial wastes.

A patent has been issued for an oil pollutant monitoring device employing ultraviolet fluorescence and infrared irradiation. The system is utilized for detecting petroleum contamination in water. A sheet of water falls freely under a constant pressure head through a rectangular nozzle with extended sides. Ultraviolet fluorescence emitted by the water and ultraviolet and infrared irradiation absorbed by the water are used as a mearure of heavy and light petroleum contamination and suspended solids. The data is received on photocell-photomultipliers and transmitted to a recorder-controller which activates a recycling valve or alarm. The water in the nozzle is stabilized so that monitoring is not influenced by external vibrations or motion. (Lisk-FIRL)
W78-08553

APPARATUS FOR DETECTING PROPORTION OF OIL IN OIL/WATER MIXTURES,
Marine Construction and Design Co., Seattle, WA. (Assignee).
For primary bibliographic entry see Field 5G.
W78-08596

HYDROXYMETHANESULPHINATE SALTS AND RELATED DECOMPOSITON PRODUCTS IN WASTEWATER,
Florence Univ., (Italy). Inst. of Analytical Chemistry.
E. B. Piccardi, and P. L. Cellini.
Water, Air, and Soil Pollution, Vol. 9, No. 3, p 301-307, 1978. 2 fig, 13 ref.

Descriptors: *Analytical techniques, *Chemical wastes, *Textiles, *Bleaching wastes, *Oxidation, Pollutant identification, Polarograhic analysis, Volumetric analysis, Zinc, Sulfides, Sulfite liquors, Alkalinity, Chemical analysis, Waste water treatment, Industrial wastes.

Electroscan polarograhy was used to quantify HCHO, Zn, and sulfites during the decomposition of hydroxymethanesulfinate (HMS) contained in waste water from textile manufacturing. The HMS was purified to 98% for all experiments by recrystallization, washing with water and ethanol, and vacuum drying. A 35% formaldehyde solution was employed for acidimetric HMS analysis. Polarographic anodic waves were produced by the oxidation of the HMS ion in an alkaline electrolyte. A linear relationship between the limiting current and the HMS concentration was established in 0.1 or 1.0 M NaOH. S(-2), HMS, HCHO, and Zn(+2) were readily distinguished with a current-potential scan in 0.1 M NaOH. The concentrations of these products were calculated by polarographic techniques. Sulfites produced well defined waves in acidic solutions of 0.1-1.0 M nitrid acid; HMS, HCHO, and Zn were detected in the same sample when the solution was made Alkaline. HMS was indirectly identified through HCHO released in the I2 solution in the presence of high concentrations of S202(-2) and S204(-2). (Lisk-FIRL)
W78-08612

SPECTROGRAPHIC ANALYSIS OF WASTE WATER (ANALISIS ESPECTROGRAFICO DE AGUAS RESIDUALES),
Junta de Energia Nuclear, Madrid (Spain). Div. de Quimicay Medio Ambiente.
F. A. Alduan, and C. Capdevila.
Anales de Quimica, Vol. 74, p 43-47, January, 1978. 10 tab, 1 ref.

Descriptors: *Spectroscopy, *Heavy metals, *Electrodes, *Sodium, *Calcium, Chromium, *Pollutant identification, Copper, Iron, Manganese, Lead, Analytical techniques, Waste water treatment, Industrial wastes.

Lithium and thallium were evaluated as spectrochemical buffers to reduce the influence of sodium and calcium on spectrographic analysis of heavy metals in waste waters. Concentrations of up to 1,000 mg/liter sodium and 300 mg/liter calcium interfered wit analyses for chromium, copper, iron, manganese, and lead in waste waters using graphite spark excitation. Barium, cesium, indium, lanthanum, lithium, strontium, and thallium were tested as buffering agents to suppress the sodium and calcium interferences. A solution containing 50% lithium and 50% thallium increased the accuracy of the analysis by 25%. While sodium and calcium improved the line intensities of the heavy metals in waste water when graphite or gold electrodes were employed, they interfered with the line intensities when copper or silver electrodes were used. (Lisk-FIRL)
W78-08616

DETERMINATION OF BLACK LIQUOR SOLIDS CONTENT,
Combustion Engineering, Inc., Windsor, CT.
W. Nelson, and C. E. Thompson.
Tappi, Vol. 61, No. 5, p 108-109, May, 1978.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Analytical techniques, *Diatomaceous earth, *Solid wastes, Drying, Sands, Silicates, Equilibrium, Waste water treatment, Industrial wastes.

Surface extension of kraft black liquors with diatomaceous earth composed of 90% chemically inert silica prevented the formation of a surface crust and reduced the drying time in comparison with the TAPPI method of sand or Alundum extension to measure black liquor solids. The optimum combinations of ingredients for black liquor drying was 3 g of liquor with 50% solids content, 5 ml water, and 5 g diatomaceous earth. The equilibrium weight loss of the black liquor samples was reached after 4 hrs of drying at 105C, compared to 10 hours required for sand-extended liquor. The diatomaceous earth-extended liquor remaned powdery after drying; the sand-extended sample developed a hard crust. Five hours of drying at 105C was recommended to ensure complete drying. The diatomaceous earth-extension of the black liquor increased the accuracy of solids content calculations by an average of 2.5% (absolute) over the TAPPI recommended procedures. (Lisk-FIRL)
W78-08619

DETERMINATION OF POLYTHIONATES AND THIOSULPHATE IN MINING EFFLUENTS AND MILL CIRCUIT SOLUTIONS,
Canada Centre for Mineral and Energy Technology, Ottawa (Ontario).
R. Makhija, and A. Hitchen.
Talanta, Vol 25, No 2, p 79-84, 1978. 8 tab, 12 ref.

Descriptors: *Sulfite liquors, *Mine drainage, *Analytical techniques, *Volumetric analysis, *Colorimetry, Sodium compounds, Electrodes, Phenols, Mills, Mine wastes, Industrial wastes.

Mercuric chloride acidimetric titration was accurate for detecting polythionates and thiosulfate concentrations to 0.1 mg thio salt in mining effluents and mill circuit solutions. The acidimetric titration for potassium triand tetrathionate and sodium thiosulfate was compared with cnventional colorimetric analysis. In the absence of sulfite, 0.10-25 mg S203(-2) was diluted with 30 ml distilled H20 and stirred in the presence of pH electrodes. The mixture was titrated with 0.005 N H2S04 or NaOH to pH 4.3 or, in the presence of buffer species, to pH 8.2. Five ml of 2% mercuric chloride was added, followed by dropwise additions of 20% KI until the orange precipitate disappeared. The pH electrodes were replaced and the solution was titrated with NaOH or H2S04 to the pH 4.3 endpoint. In the presence of sulfite, 1 ml of 37-38% formaldehyde/mg of sulfite was added to the polythioate solution and titrated to pH 8.2 with NaOH. Concentrations of S203(-2) and polythionates were calculated according to the NaOH volume used during titration. Quantitative results for thio salt contained in mining effluents and mill circuit solutions were in agreement with colorimetric data. (Lisk-FIRL)
W78-08625

ACUTE TOXICITY OF DIISOPROPYLMETHYL PHOSPHONATE AND DICYCLOPENTADIENE TO AQUATIC ORGANISMS,
E G and G Bionomics, Wareham, MA.
For primary bibliographic entry see Field 5C.
W78-08631

LABORATORY EVALUATION OF THE TOXICITY OF NITROCELLULOSE TO AQUATIC ORGANISMS,
E G and G, Bionomics, Wareham, MA.
For primary bibliographic entry see Field 5C.
W78-08641

EFFLUENT MONITORING PROCEDURES: NUTRIENTS,
Environmental Protection Agency, Cincinnati, OH. Municipal Operations and Training Div.
A. D. Kroner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 290, Price codes: A14 in paper copy, A01 in microfiche. Report EPA 430/1-76-006, June 1976. 368 p.

Descriptors: *Nutrients, Phosphorous, Chemical oxygen demand, Nitrates, Nitrites, Nitrogen, Oil, Oxygen demand, Spectrophotometer, *Analytical techniques, Monitoring, *Methodology, *Effluent monitoring procedure, *Reference manual, *Calibration graphs, *Student reference manual, Nutrient reference manual.

A manual for students in a chemistry course designed for the treatment plant operator or technician who is required to monitor effluent discharges under a National Pollutant Discharge Elimination System permit and who has had little or no previous experience in wastewater analysis. The procedures are for phosphorous; chemical oxygen demand; Kjeldahl Nitrogen; Ammonia, Nitrate and Nitrite as Nitrogen; oil and Grease. Also procedures for related basic skills: Using a spectrophotometer and preparing calibration graphs. (EIS-Katz)
W78-08642

ENVIRONMENTAL SAMPLING IN THE PANAMA CANAL ZONE,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.
C. C. Roan, and J. H. Vinopal.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 765, Price codes: A02 in paper copy, A01 in microfiche. Pesticide Monitoring Special Study No. 44-0102-77, December 1976. 11 p, 3 tab.

Descriptors: *Pesticides, *On-site investigations, On-site survey, Water pollution effects, *Sampling, Water, Sediment, Soils, Aquatic environment, *Chlorinated hydrocarbon pesticides, *Organophosphorous pesticides, Carbamate pesticides, DDD, DDT, DDE, Chlordane, Dieldrin, Cyclodienes, *Panama Canal.

This is a report evaluating the pesticide residue data obtained from environmental samples of water, sediment, and soil collected during CY 73 - CY 75 from the Canal Zone for their adequacy in preparing an environmental pesticide profile. The water and sediment data do not indicate any significant contamination of the aquatic environment by persistent pesticides. The soil data, although not sufficiently complete, tentatively indicate that the disappearance of even persistent pesticides may be exceptionally rapid in the tropical climate of the Canal Zone. It was recommended that (1) biological specimens, including fish and nonmigratory birds collected during CY 77; and (2) additional soil samples be collected during CY 78 utilizing a stratified sampling plan. This report also discusses the nature and scope of pest management operations in the Canal Zone. (EIS-Katz)
W78-08643

A COMPUTER PROGRAM FOR THE ANALYSIS OF MACROINVERTEBRATE DATA FROM WATER QUALITY SURVEYS,
Army Armament Research and Development Command, Aberdeen Proving Ground, MD. Chemical Systems Lab.
P. A. Cimba, A. E. Asaki, J. G. Pearson, and E. S. Bender.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 383, Price codes: A03 in paper copy, A01 in microfiche. Army Armament Research and Development Command, Report PAA 5764114, May 1977. 30 p, 2 fig, 7 ref.

Descriptors: *Methodology, *Benthos, Invertebrates, Water quality, Data processing, *Aquatic populations, Aquatic productivity, Aquatic habitats, *Aquatic insects, Surveys, Computer programs, Analysis, *Analytical techniques, DICALC, *Species diversity, Absolute abundance, *Macroinvertebrate indices, Relative abundance.

Macroinvertebrate communities are commonly analyzed by calculating species diversity and relative abundance. With the modifications presented here, DICALC, using these widely accepted methods, permits the user to swiftly calculate species diversity and relative abundance. In addition, data can be expressed in standard density units (number of individuals per square meter). The additional calculations of relative efficiency, redundancy, and relative maximum and minimum help the user to identify peculiarities about the distribution of individuals in each sample. (EIS-Katz)
W78-08646

SENSITIVITY OF VERTEBRATE EMBRYOS TO BORON COMPOUNDS,
Kentucky Univ., Lexington. School of Biological Science.
For primary bibliographic entry see Field 5C.
W78-08647

A DIRECT METHOD FOR THE DETERMINATION OF PHENOL IN NATURAL WATERS,
Aberdeen Proving Ground, MD.
L. M. McCormack, A. Goodman, A. R. Jones, and A. Silvestri.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 155, Price codes: A02 in paper copy, A01 in microfiche. Edgewood Arsenal Technical Report ED-TR-76048, October 1976. 17 p, 4 tab, 11 ref.

Descriptors: *Pollutant identification, *Phenols, Water quality, *Analytical methods, *Laboratory tests, Methodology, Industrial wastes, Chemical reactions, *Chemical wastes, Chemical analysis.

A rapid, direct procedure for the determination of phenol, sensitive in the microgram range, has been devised utilizing a modification of the Berthelot reaction. The method is especially applicable to water samples and requires no extraction or distillation. Phenol, as the limiting factor, produces a strong indophenol blue color, which is linear in the range of 1 to 5 micro g/ml. Challenge of the method with 33 potential water pollutants shows good specificity for phenols. (EIS-Katz)
W78-08650

RECOMMENDATIONS OF THE EPA/NBS WORKSHOP ON THE NATIONAL ENVIRONMENTAL SPECIMEN BANK,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
H. L. Rook, and G. M. Goldstein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 983, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Health Effects, Research Series, Report EPA 600/1-77-020, April 1977. 54 p, 4 tab, 1 fig, 22 ref.

Descriptors: Metals, *Monitoring, Path of pollutants, *Methodology, Trace elements, Chromium, Laboratory tests, Chemical analysis, Chemical wastes, Biological properties, Activation energy, Neutron activation analysis, Research and development, *Research priorities, *National Environmental Specimen Bank, Analytical research, Activation analysis, Biological matrices, *Standard reference materials.

On August 19 and 20, 1976, the National Bureau of Standards and the U.S. Environmental Protection Agency co-sponsored a Workshop to review technical developments and to make recommendations on implementation of the National Environmental Specimen Bank. The Workshop consisted of a review session where past considerations were discussed; a technical session where recent analytical research relevant to the sample bank was abstracted and discussed; and a planning session where planning and design of a prototype banking system was outlined. The workshop concluded that with the ever increasing influx of new man-made substances into our ecosystem, that formalized, systematic approach is needed to assess the environmental impact of these substances on a national as well as international level. The technology to initiate a pilot banking program is presently available and was formulated into a five-year pilot bank program. This program will be evaluated at each stage of development. (EIS-Katz)
W78-08652

DEVELOPMENT OF A KIT FOR DETECTION OF HAZARDOUS MATERIAL SPILLS INTO WATERWAYS,
Edgewood Arsenal, Aberdeen Proving Ground, MD.
A. Silvestri.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 610, Price codes: A04 in paper copy, A01 in microfiche. Special Publication ED-SP-76023, August 1976. 81 p, 7 tab, 2 fig, 20 ref.

Descriptors: *Pollutant identification, *Water quality, Water pollution effects, *Path of pollutants, Acidity, Alcohols, Alkalinity, Ammonia, Chlorides, Chlorine, Color, Conductivity, Enzymes, Fluorides, Hardness(Water), Metals, Nitrates, Odor, Phenols, Phosphates, Sulfates, Turbidity, Spectrophotometer, Methodology, On-site-investigation, Detection of spills.

Edgewood Arsenal, under a program sponsored by the Environmental Protection Agency, Edison, NJ, has developed a kit to detect hazardous material spills into waterways. The purpose of the program was to develop a man-portable field kit able to detect (not necessarily identify) as many contaminants in water in as low a concentration as possible. A field kit was designed containing a spectrophotometer, conductivity meter, pH meter, and a variety of accessory equipment and reagents. Prototype kits were fabricated and delivered to the Environmental Protection Agency along with engineering drawings, parts lists and manuals. (EIS-Katz)
W78-08658

VALIDITY OF LABORATORY TESTS FOR PREDICTING COPPER TOXICITY IN STREAMS,
Environmental Protection Agency, Cincinnati, OH.
J. R. Geckler, W. B. Horning, T. M. Neiheisel, Q. H. Pickering, and E. L. Robinson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 867, Price codes: A10 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-76-116, December 1976. 191 p, 59 tab, 41 fig, 40 ref.

Descriptors: *Copper, Metals, *Toxicity, *Mortality, *On-site investigations, Water quality, Freshwater fish, Sunfish, Laboratory tests, Ohio, *Water pollution effects, Benthos, Aquatic environment, Reproduction, Bioassay, Environmental effects, Sewage effluent, Darters, *Shayler Run, LC50, *Acute toxicity, *Chronic toxicity, Copper ion, Newtown fish toxicology station, Median lethal concentration, Clermont County, Ohio.

A field study was conducted on Shayler Run, in Clermont County, Ohio, to determine the effects of copper on stream biota. Copper was added to the stream for 33 months to mantain a concentration of 120 micro g/l., a concentration that was expected to adversely affect some species of fish and not others. This natural stream received sewage effluent containing a variety of compounds known to affect acute copper toxicity. All but one abundant species of fish in the stream and four of the five most abundant macroinvertebrates were adversely affected by exposure to copper. Direct effects on fish were death, avoidance, and restricted spawning. To determine the usefulness of laboratory toxicity tests when establishing water quality criteria for an aquatic ecosystem, acute and chronic tests with copper were conducted at the Newtown Fish Toxicology Station and on-site at Shayler Run with stream species and the fathead minnow. The acute toxicity of copper varied widely because of the water quality variations in the stream. The chronic tests underestimated the in-stream toxicity by about two times because only the effects of copper on survival, growth, and reproduction were measured. Agreement between the predictions from laboratory toxicity tests and the observed effect is surprisingly close considering the measurement errors involved. (EIS-Katz)
W78-08670

AN ASSESSMENT OF SAMPLING MORTALITY OF LARVAL FISHES,
Nebraska Univ., Lincoln. School of Life Sciences.
For primary bibliographic entry see Field 5C.
W78-08686

POLAROGRAPHIC STUDIES OF THE NATURE OF CADMIUM IN SCALLOP, OYSTER, AND LOBSTER,
Fisheries and Marine Service, halifax (Nova Scotia).
C. L. Chou, J. F. Uthe, and E. G. Zook.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 409-413, 1978. 4 fig, 2 tab, 17 ref.

Descriptors: *Pollutant identification, *Cadmium, *Shellfish, *Oyster, *Lobster, *Spectrophotometry, *Polarographic analysis, *Proteins, *Animal metabolism, *Commercial shellfish, *Animal physiology, Chemical analysis, Biochemistry, Metals, *Scallop, Tissue analysis, Bioaccumulation, *Metallothioneins.

Levels of free and bound forms of cadmium were determined in raw shellfish by use of differential pulse polarography and atomic absorption spectrophotometry. Both scallop (various species) and American lobster (Homarus americanus) muscle tissues contain no free cadmium. Oyster (various species), on the other hand, had a considerable percentage (approximately 50%) of its total cadmium present as free cadmium, a phenomena as yet unexplained. The detection limit for free cadmium was approximately 0.05 micrograms/g raw tissue. (EIS-Deal)
W78-08688

TOLERANCES OF FISHES TO DISSOLVED GAS SUPERSATURATION IN DEEP TANK BIOASSAYS,
Battelle, Pacific Northwest Lab., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-08697

CHRONIC EFFECTS OF CADMIUM AND ZINC MIXTURES ON FLAGFISH (JORDANELLA FLORIDAE),
Environmental Research Lab., Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-08698

EFFECTS OF WATER-SOLUBLE OIL FRACTIONS ON METABOLISM, GROWTH AND CARBON BUDGET OF THE SHRIMP CRANGON CRANGON,
Marine Lab., Aberdeen (Scotland)
For primary bibliographic entry see Field 5C.
W78-08700

A WATER SUPPLY DATA BASE,
Arizona Univ., Tucson. Management Information Systems.
For primary bibliographic entry see Field 7C.
W78-08726

THE OSMOTIC CONCENTRATION OF THE BLOOD PLASMA OF PLAICE (PLEURONECTES PLATESSA) FROM THREE HABITATS OF DIFFERENT SALINITY,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 5C.
W78-08760

THE EFFECTS OF PRECIPITATION ON AQUATIC AND TERRESTRIAL ECOSYSTEMS: A PROPOSED PRECIPITATION CHEMISTRY NETWORK, DEPT. OF ENVIRONMENTAL SCIENCES.
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5C.
W78-08762

5B. Sources Of Pollution

TRACE METALS IN THE ENVIRONMENT,
New York Univ., NY. Task Force for Research Planning in Environmental Health Sciences (2nd).
H. L. Cannon, and H. W. Lakin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 428, Price codes: A04 in paper copy, A01 in microfiche. Report No. NIH/NIEHS - 77/022, December, 1976. 72 p, 129 ref. 1-R13-ES 01470-01.

Descriptors: *Public health, *Food chains, *Path of pollutants, *Soil contamination, *Vegetation, *Soil environment, Zinc, Arsenic compounds, Asbestos, Beryllium, Mercury, Nickel, Lead, Cadmium, Chromium, Copper, Molybdenum, Pollutant identification, *Trace metals, Environmental distribution, Essential trace elements, Toxin transport, Selenium.

The environmental distribution and the passage through the food chain of toxic elements and of essential trace elements that are known to cause health problems when a deficiency exists are addressed. Toxic elements discussed from the standpoint of their presence in the environment, their transport, and their effects on plants and people include: arsenic, asbestos minerals, beryllium, mercury, nickel, cadmium and lead. Trace elements essential to health that are discussed, are: zinc, selenium, chromium, copper and molybdenum. Interactions of various combinations of elements in soils, plants and humans are described. Following the discussion of each element, a list of recommendations for research necessary to gain a better understanding of these materials is provided. (Seip-IPA)
W78-08226

MONITORING OF TRACE CONSTITUENTS DURING PCB RECOVERY DREDGING OPERATIONS: DUWAMISH WATERWAY,
Environmental Protection Agency, Seattle, WA. Surveillance and Analysis Div.
J. N. Blazevich, A. R. Gahler, G. J. Vasconcelos, R. H. Rieck, and S. V. W. Pope.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 282, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA 910/9-77-039, August, 1977. 149 p, 37 fig, 65 tab, 19 ref, 6 append.

Descriptors: *Polychlorinated biphenyls, Aroclors, *Washington, *Trace elements, *Dredging, *Sediments, *Water pollution treatment, Bacteria, Filtration, Adsorption, *Pollutant identification, *Spills(Aroclor 1242), *Duwamish River(WA), Elutriate test.

The monitoring program conducted after a spill of 255 gallons of transformer fluid, Aroclor 1242, into the Duwamish River in Seattle, Washington, is described. A detailed evaluation is presented of data acquired prior to, during, and after recovery operations. An initial recovery effort conducted by EPA resulted in a 30% removal of the PCB. The Corps of Engineers removed the remaining Aroclor using a Pneuma dredge, thus increasing the total PCB recovered to approximately 92%. The second recovery effort was conducted without significant redistribution of toxic materials and bacteria associated with the dredged sediments. No appreciable amount of PCB returned from the disposal ponds to the river because of the design of the land disposal area and the use of a filtration-adsorption treatment unit. Water, which drained from the dredged spoils in the disposal pond, contaned some Mn, N-NH3, N-TKN, oil and grease, and total coliform, but only traces of Cd, Fe, Zn and total P. Apparently most of the pollutants and bacteria were associated with or scavenged by particulate matter and settled in the disposal ponds. Only small concentrations of toxic materials, nutrients, and suspended solids were observed to be released into the overlying river water during dredging operations. The release of pollutants from sediments during dredging could be only partially predicted by use of the elutriate test and evaluation of the interstitial water. The elutriate test was valid for most metals, nutrients, and oil and grease, but both tests failed to predict the amount of PCB released. (Seip-IPA)
W78-08230

A QUANTITATIVE STUDY OF THE DIFFUSE SOURCE LOADINGS OF CHESAPEAKE BAY, (PROGRESS REPORT),
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
D. L. Correll, M. A. Faust, J. W. Pierce, J. Stevenson, and K. Lomax.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 231, Price codes: A02 in paper copy, A01 in microfiche. Report No. NSF/RA - 761357, November, 1976. 13 p. Chesapeake Bay Research Consortium, Inc., Baltimore, MD. ENV7622045.

Descriptors: *Chesapeake Bay, *Nutrients, *Organic compounds, Land use, *Bacteria, *Mineralogy, *Water quality, *Instrumentation, *Monitoring, Pollutant identification, Water pollution, *Pollutant loading rates, Land use effects.

Research conducted by the Chesapeake Research Consortium during the period from December 1, 1975 to November 30, 1976 is reported. The research of organic and mineral particulates, and of indicators of bacterial pathogens on a seasonal basis, per unit of watershed area of a series of land use types prevalent in the Chesapeake Bay region; (2) test whether expedited land use mapping and area yield loading rates measured at intensive study locations can be used to calculate diffuse source loading of Chesapeake Bay from other control areas of its watershed; and (3) develop a tested methodology, of regional scope, for the prediction of land use effects via diffuse source pollution upon water quality in Chesapeake Bay. Described are the construction and instrumentation of the monitoring stations: Rhode River Watersheds, Choptank River Watersheds, and Patuxent River Watersheds. A status report on other program activities is included. (Seip-IPA)
W78-08234

REMOTE SENSING OF EFFECTS OF LAND USE PRACTICES ON WATER QUALITY,
Kentucky Univ., Lexington. Dept. Forestry.
D. H. Graves, and G. B. Coltharp.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-26581, Price codes: A08 in paper copy, A01 in microfiche. Final Report, May 31, 1977. 159 p, 30 fig, 25 tab, 23 ref, 4 append. NAS 8-31006.

Descriptors: *Land use, *Areal hydrogeology, Water quality, *Aerial sensing, *Aerial photography, Satellites(Artificial), *Forest watersheds, *Strip mines, *Vegetation, *Kentucky, Aircraft, Remote sensing, Cost analysis, Watershed management, Densitometry, Color additive viewing, *Landsat, *Land use change, Vegetation survey, *Cumberland Plateau(KY), Linear regression analysis.

An intensive 2-year study of 6 watersheds in the Cumblerland Plateau region of eastern Kentucky determined the utility of manual densitometry and color additive viewing of aircraft and LANDSAT transparencies for monitoring land use and land use change. The study area was comprised of reclaimed surface-mined land and forestland. Manual photo interpretation techniques stratified the study area into vegetation types. An intensive ground survey was undertaken to ascertain kind, size, and extent of vegetation present in each. Values obtained from subsequent densitometric sampling of NASA research aircraft and LANDSAT imagery were examined for correlation and predictability of corresponding vegetation types.

Densitometer filter-aperture combinations were examined for determination of vegetation classification success. Densitometric values were compared with sample water quality values obtained from the watersheds. Linear regression equations were derived for water quality-densitometry and water quality-percent disturbed land relationships. Manual densitometry of LANDSAT imagery merely provided discrimination between wholly forested and partially surface-mined watersheds, while that of seasonal color infrared imagery yielded good classification of 8 broad vegetation categories of forested and reclaimed surface mines. Some correlation between densitometric data and water quality parameters appears to exist. (Seip-IPA)
W78-08237

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
C. T. Wezernak, and D. R. Lyzenga.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 069, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/3-77-056, May, 1977. 17 p, 7 fig, 4 ref. R803671.

Descriptors: *Remote sensing, Satellites(Artificial), *Suspended solids, *Phytoplankton, Water circulation, *Water quality, Sampling, *Monitoring, *Pollutant identification, Chlorophyll, Secchi disks, Turbidity, Sediments, Surface waters, *Path of pollutants, Earth Resources Technology Satellite, LANDSAT, *Lake Erie, *Lake Huron, Surface circulation, Transparency, Phytoplankton blooms, Surface chlorophyll.

Limited analysis of ERTS (LANDSAT) data of the western basin of Lake Erie and the southern portion of Lake Huron was performed to depict the large-scale movement of water masses (as manifested in terms of suspended solids) and to demonstrate the use of ERTS data in large lakes monitoring. Such data, recorded on computer compatible tapes, were processed to display surface circulation features, surface suspended solids distribution, surface chlorophyll distribution, and secchi disc transparency. Four broad ERTS (LANDSAT) bands (spanning the spectral range 0.5 - 1.1 micrometer) offer a water quality measurements potential which is essentially restricted to suspended solids, turbidity, transparency, and the detection of phytoplankton blooms. Large variance in suspended sediment concentration constitutes an interference in the processing of data to display chlorophyll levels; since ambiguities cannot be resolved solely on the basis of LANDSAT data analysis, reference to ground truth measurements for calibration purposes is necessary. Data acquired from space and ship data are complimentary and neither can substitute for the other. Large area coverage provided from space can serve to provide unity to data collected by conventional point sampling and facilitate the interpretation of data collected by conventional methods. A continuing program of analysis of LANDSAT data for the two study areas is recommended. Repeat data under a variety of wind and lake-state conditions would contribute significantly to the information data base, facilitate interpretation of point sampled data, and aid in trend analysis. (Seip-IPA)
W78-08239

THERMAL REMOTE SENSING CALIBRATION TECHNIQUES,
Calspan Corp., Buffalo, NY.
For primary bibliographic entry see Field 7B.
W78-08241

THE MISSOURI LEAD STUDY: AN INTERDISCIPLINARY INVESTIGATION OF ENVIRONMENTAL POLLUTION BY LEAD AND OTHER HEAVY METALS FROM INDUSTRIAL DEVELOPMENT IN THE NEW LEAD BELT OF SOUTHEASTERN MISSOURI. VOLUME I,
Missouri Univ.-Rolla; and Missouri Univ.-Columbia.
E. Bolter, N. L. Gale, D. D. Hemphill, J. G. Jennett, and S. R. Koirtyohann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 242, Price codes: A24 in paper copy, A01 in microfiche. Final Progress Report, 1977. Wixson, B. G., Ed. 543 p, 104 fig, 85 yab, 224 ref. NSF AEN 74-29935-A01.

Descriptors: *Lead, *Mining, Environmental effects, *Missouri, *Heavy metals, *Trace elements, Water quality, Air quality, *Soil analysis, *Air pollution, Water pollution sources, *Analytical techniques, *Pollutant identification, Waste water treatment, Aquatic life, Vegetation effects, Water pollution effects, Toxicity, Chemical analysis, Mineralogy, Lead smelter, Lead refinery, *Lead mining.

A 7-year interdisciplinary research project to study trace contaminants associated with the production of lead in Missouri is summarized. Sources of trace metals in the environment were found to be associated with the mining-milling operations, transporting ores, and the smelter-refinery process. General topics include: (1) a description of the study area, (2) analytical techniques, (3) air quality, (4) soils and geochemical studies, (5) water quality studies, and (6) biological aspects of water quality. Specific subjects addressed include: (1) information storage and retrieval systems, (2) transport and distribution of heavy metal particulates around a primary lead smelter, (3) distribution patterns of heavy metals near sources, (4) chemical and mineralogical properties of baghouse and flue dusts, (5) formation of heavy metal-humic acid complexes in soils, (6) toxicity of milling reagents in the aquatic ecosystem, (7) sorption and desorption by soils, (8) industrial waste treatment, (9) physical-chemical water quality studies, (10) concentration of heavy metals in vegetation, (11) toxicity of reagents to aquatic life, and (12) the nature of the association between heavy metals and exposed biota. Biological effects of mine-mill waste treatment systems are contrasted for tailings ponds, recycling, and meander methods. (Seip-IPA)
W78-08243

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACTS FROM OIL SHALE DEVELOPMENTS,
TRW, Inc., Redondo Beach, CA. Environmental Engineering, Div.
For primary bibliographic entry see Field 5C.
W78-08246

TRANSURANICS IN NATURAL ENVIRONMENTS.
Energy Research and Development Administration, Las Vegas.
Available from the National Technical Information Service, Springfield, VA 22161 as NVO-178, Price codes: A99 in paper copy, A01 in microfiche. The Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics in Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, White, M. G., and Dunaway, P. B., Eds., June, 1977. 710 p, 120 fig, 113 tab, 1115 ref, 1 append.

Descriptors: *Radioactivity effects, *Radioisotopes, Environmental effects, *Absorption, *Digestion, *Distribution, Water pollution effects, Radioactive wastes, *Vegetation effects, *Soil contamination effects, *Aquatic environment, Statistics, Analytical techniques, Microorganisms, Animal pathology, Ecology, Pollutant identification, *Transuranics, *Plutonium, *Aquatic effects.

The symposium was planned to bring about a concerted review and evaluation of the current status of the environmental problem of transuranics and the associated body of information available to investigators involved in studies of environmental transuranics. The papers are divided into the following subject areas: (1) transuranics in terrestrial environments, including soils research; microorganism research; resuspension and particle research; vegetation research; and animal research, field and laboratory studies; (2) transuranics research in aquatic environments; (3) analysis methodology for transuranics; and (4) transuranics in statistics and modeling. Papers selected for publication are coauthored by scientists and other technical and professional people from several national laboratories, academic institutions, private corporations, and government agencies. (See W78-08249 thru W78-08254) (Seip-IPA)
W78-08248

TRANSURANIC SPECIATION IN THE ENVIRONMENT,
Oak Ridge National LAb., TN.
E. A. Bondietti, and F. H. Sweeton.
In: Transuranics in Natural Environments, the Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, p. 449-476, June, 1977. 6 fig, 5 tab, 39 ref.

Descriptors: *Radioactivity effects, *Vegetation effects, *Aquatic plants, Environmental effects, *Oxidation, *Absorption, *Distribution, Thermodynamics, Analytical techniques, Testing, Laboratory tests, Solubility, Uranium, *Transuranics, *Plutoniums, Oxidation states, Actinide oxidation, Actinide elements, Thorium.

The speciation of transuranium elements in the environment is discussed with particular emphasis on plutonium (Pu) and a focus on three areas: (1) the potential oxidation states of Pu in the environment as predicted by thermodynamic procedures; (2) oxidation states of Pu which have been evaluated in natural or laboratory solutions which have environmental relevance; and (3) the effect that oxidation state has on plant availability of the actinide elements. The thermodynamic evaluative approach is reviewed and examples are presented to exemplify the complexities of Pu chemistry in aqueous solutions. An example of the evaluation of Pu oxidation states (III, IV, V, and VI) in natural water is presented. The results, which indicate that Pu(III) and/or Pu(IV) dominated the soluble Pu fraction, are compared to a simple model involving the hydrolytic species of Pu(IV). Literature data are evaluated with respect to the Pu(IV) model. In all cases, the soluble concentrations of Pu in natural waters are in the reasonable agreement with the model. Dissolution studies with PuO2 are reviewed and data presented to demonstrate that oxidized Pu (Pu(V) and/or Pu(VI) species may be responsible for the relatively high Pu concentrations reported. The mechanism of oxidation appeared to be related to radiolytic effects. The plant uptake of transuranium elements is discussed and the influence of actinide oxidation state illustrated. Plutonium in one soil-plant uptake experiment resembled thorium more than uranium in plant availability. (See also W78-08248) (Seip-IPA)
W78-08249

DISTRIBUTION PATTERNS AND TRANSPORT OF PLUTONIUM IN FRESHWATER ENVIRONMENTS WITH EMPHASIS ON PRIMARY PRODUCERS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
L. D. Eyman, and J. R. Trabalka.

: Transuranics in Natural Environments, The evada Applied Ecology Group Symposium on e Dynamics of Transuranics by Terrestrial and quatic Environments, October, 1976, Gatlin- rg, TN. p. 477-487, June, 1977. 1 fig, 2 tab, 17 f.

escriptors: *Radioactivity effects, Aquatic en- ronment, *Primary productivity, Phytoplankton, *Algae, *Sediments, *Kinetics, ater pollution effects, Absorption, Digestion, Distribution, Radioactive wastes, Aquatic life, nalytical techniques, *Plutonium, Transuranics, *Radioactive transport.

he distribution and transport of plutonium (Pu) in quatic systems are reviewed with emphasis on e role of primary producers in transport ocesses. Terminology for expressing Pu concen- ation in aquatic biota that more clearly reflects e functional relationships that exist between iotic and biotic components is suggested. The ajor repository for transuranic elements entering quatic ecosystems is the bed sediment. Observed stribution coefficient (Kd) values for Pu across a ide spectrum of aquatic systems are surprisingly niform (about 100,000). Pu arrives at the sedi- ent as a result of association with and sub- equent settling of suspended particulate matter. hus, the major role of phytoplankton in Pu inetics in aquatic systems has been postulated to e one of Pu removal from the water column. Very igh affinity of Pu for particulate matter makes it fficult to use the traditional expression of Con- entration Factor (CF) as a measure of the ten- ency of biota to accumulate this element. A roposed term, Trophic Transfer Factor (TTF), elates concentrations observed in biota to that of he sediment. The underlying assumption is that, ue to the high Kd's, accumulation in tissues or or- anisms at higher trophic levels will be dominated y gut absorption rather than by direct uptake rom water. Pu in most freshwater systems is ransported predominately in association with uspended particulate matter. In some organically ich systems, a fraction of the hydrologically mo- ile Pu pool may be complexed or otherwise as- ociated with naturally occurring organic acids. lthough this association may result in increased nvironmental mobility, it does not appear to esult in increased availability to aquatic biota. See also W78-08248) (Seip-IPA)
V78-08250

PLUTONIUM-237: AN IMPORTANT RESEARCH TOOL FOR STUDIES OF ENVIRONMENTAL PLUTONIUM KINETICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
. R. Trabalka, and L. D. Eyman.
n: Transuranics in Natural Environments, The Nevada Applied Ecology Group Symposium on he Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlin- burg, TN, p. 489-503, June, 1977. 3 fig, 7 tab, 16 ef.

Descriptors: *Radioactivity effects, *Tracers, Channel catfish, *Absorption, *Digestion, Teleosts, Freshwater fishes, Radioactive wastes, Radioactive tracers, *Plutonium-237, Plutonium, Plutonium-237 citrate, Plutonium-237 ulvate, Plutonium-237 nitrate, Plutonium-237 ydroxide, Tissue analysis, Radioactivity as- similation, Biological assimilation, Kidneys, In- gestion.

The production and use of the photon-emitting sotope plutonium-237 (Pu-237) in investigations of he uptake, retention, and distribution of monomeric plutonium (IV) both in an aquatic ver- tebrate, the channel catfish, Ictalurus punctatus, and in a littoral aquatic micro-ecosystem, are detailed. The use of Pu-237 in environmental stu- dies is discussed. Chelation can either enhance or reduce the uptake of ingested Pu relative to plu- tonium hydroxide (monomer) in channel catfish. The highest observed retention (whole body) at 63 days was 3.8% of ingested dose for Pu-237 citrate, while retention of the fulvate was 0.6%. Reduced uptake of the fulvate complex is due either to its high molecular weight (greater than 10,000) or to its stability in metabolic systems. Increased uptake of Pu-237 citrate is attributable to instability of the complex in metabolic systems. Tissue distribution studies reveal that relatively little of intracardially injected Pu citrate was excreted. Blood clearance rates were similar to those found in small mammals, with the Pu being primarily associated with the plasma protein transferrin. The fractional body burdens in bone, liver, and kidney 17 days after injection were 31%, 24%, and 9% of the injected dose, respectively. High kidney burdens relative to mammals are expected, since the kidney functions as the major site of homopoiesis in teleosts. Absence of significant excretion indicates that a short half-life component of elimination following gut clearance in intracastric injection (gavage) studies is due to Pu labeling of the gut. A distribution coefficient of 90,000 was observed for sediment in a year-old aquatic microsm spiked with Pu-237 nitrate. A materials balance at 90 days post-spike provided the following estimates: 0.001% in water, 0.04% in biota, and over 99.9% in sediments. (See also W78-08248) (Seip-IPA)
W78-08251

DISTRIBUTION OF PU-238 AND PU-239, 240 IN AQUATIC MACROPHYTES FROM A MIDWESTERN WATERSHED,
Argonne National Lab., IL. Radiological and Environmental Research Div.
C. W. Wayman, G. E. Bartelt, and J. J. Alberts.
In: Transuranics in Natural Environments, The Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, p. 505-516, June, 1977. 6 tab, 10 ref.

Descriptors: *Radioactivity effects, *Aquatic plants, *Algae, *Absorption, *Digestion, *Cladophora, *Chlorophyta, *Phytoplankton, *Radioactive wastes, Water pollution effects, Plutonium, *Plutonium-238, *Plutonium-239, 240, Typha, Lemna, Potamogeton, Myriophyllum, *Great Miami River(OH), Radioactivity assimilation, Biological assimilation, Transuranics.

Aquatic macrophytes were collected in the Great Miami River, Ohio, above and below Miamisburg and in the canal and ponds, near the Mound Laboratory, which contain sediments of a high Plutonium (Pu) activity (about 1,000 - 1,000,000 times) relative to the river sediments. The aquatic plants from the Great Miami River have higher levels of Pu-238 downstream of Mound Laboratory than upstream. Cladophora concentrates plutonium more than the macrophytes, Potamogeton (pondweed) and Myriophyllum (water milfoil), which exhibit similar but lower total plutonium activities. Cladophora and macrophytes, Lemna (duckweed) and Typha (cattail), from the canal and ponds have elevated levels of Pu-238 which is attributed to higher levels in the sediments and water. Cladophora from the canal has higher total Pu-238 activity than Cladophora from the adjacent river; however, the canal algae have lower concentration factors. This may be indicating a saturation of surface sorption sites as opposed to active uptake by the plants. Typha and grass (grown in a dry canal bed) demonstrate that there is very little translocation of Pu-238 above the roots. Some differentiation, however, exists in Typha, with stems having slightly higher Pu-238 activities than spikes. Primary producers in an aquatic ecosystem are capable of scavenging and accumulating plutonium from the surrounding water and sediments to levels which are the highest observed in all biota. Concentration factors are reported and discussed with reference to possible modes of plutonium accumulation and distribution within the plants. (See also W78-08248) (Seip-IPA)
W78-08252

PU-238 AND PU-239, 240 DISTRIBUTION IN FISH AND INVERTEBRATES FROM THE GREAT MIAMI RIVER, OHIO,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W78-08253

EFFECT OF NATURALLY OCCURRING ORGANICS ON PLUTONIUM-237 UPTAKE BY ALGAE AND BACTERIA,
Savannah River Ecology Lab., Aiken, SC.
For primary bibliographic entry see Field 5C.
W78-08254

FOLLOW-UP STUDY OF THE DISTRIBUTION AND FATE OF POLYCHLORINATED BIPHENYLS AND BENZENES IN SOIL AND GROUNDWATER SAMPLES AFTER AN ACCIDENTAL SPILL OF TRANSFORMER FLUIDS,
Environmental Protection Agency, Atlanta, GA. Air and Hazardous Materials Div.
A. J. Smith, Jr., G. J. Moein, and P. L. Stewart.
Available from the National Technial Information Service, Springfield, VA 22161 as PB-273 984, Price codes: A02 in paper copy, A01 in micorfiche. Report, presented to he 1976 National Conference on Control of Hazardous Material Spills, New Orleans, LA, 1976. 16 p, 1 tab, 12 ref.

Descriptors: *Polychlorinated biphenyls, *Biodegradation, *Microbial degradation, *Soil contamination, *Water pollution effects, Water pollution, Environmental effects, *Degradation(Decomposition), *Pollutant identification, Analytica techniques, Climates, Weather, Soil dynamics, Tennessee, *Polychlorinated benzenes, *Askarel, Spills, Spill residues.

The technical aspects of the fate of spill residuals after cleanup and after a 3-year period are briefly described. The accidental spill of approximately 1500 gallons of askarel (Aroclor 1254), which occurred in March 1973 in a rural area of East Tennessee, resulted in the environmental contamination of two watersheds; the chemical was dispersed through the soil both horizontally and vertically. Biodegradation of this polychlorinated biphenyl (PCB) and the various effects of weather, climate, and soil dynamics are investigated. The effects on microbial populations are assessed. (Seip-IPA)
W78-08255

SITE SELECTION AND DESIGN FOR MINIMIZING POLLUTION FROM UNDERGROUND COAL MINING OPERATIONS,
Alabama Univ., University.
For primary bibliographic entry see Field 5G.
W78-08261

FIELD AND LABORATORY METHODS APPLICABLE TO OVERBURDENS AND MINESOILS,
West Virginia Univ., Morgantown. Coll. of Agriculture and Forestry.
For primary bibliographic entry see Field 5A.
W78-08264

PHOSPHATE ADSORPTION-DESORPTION CHARACTERISTICS OF SUSPENDED SEDIMENTS IN THE MAUMEE RIVER BASIN OF OHIO,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy.
D. B. Green, T. J. Logan, and N. E. Smeck.
Journal of Environmental Quality, Vol 7, No 2, p 208-212, April-June 1978. 3 fig, 3 tab, 15 ref.

Descriptors: *Phosphates, *Eutrophication, Water pollution, *Ohio, *Algae, *Phosphorous compounds, Fertilizers, Water properties, Water quality, Pollutants, Calcite, Surface runoff, Soil

erosion, Adsorption, Nuisance algae, Runoff, Nutrient removal, *Phosphate compounds, *Phosphate adsorption, *Phosphate desorption, *Maumee River Basin, *Suspended sediments, Langmuir adsorption isotherm.

Phosphorus (P) adsorption-desorption characteristics of Maumee River Basin suspended sediments were compared with those of Basin soils and stream bottom sediments. Suspended sediment contained more total P than either soils or bottom sediments. The increase in total P over soils is attributed to enrichment of P in sediment by selective erosion of fine particles and adsorption of P during fluvial transport. The suspended sediment had higher adsorption maxima than Basin soils, but lower than bottom sediments, and had lower adsorption energies than either soils or bottom sediments. Calcite content of the suspended sediments was correlated positively with total P, EPC (equilibrium P concentration), and P desorbed and negatively correlated with adsorption energy, implying that, although calcite is a sink for P, the adsorption is weak compared with other sites for P adsorption such as hydrous oxides of Fe and Al. (Henley-ISWS)
W78-08276

MODELING TECHNIQUES FOR ESTIMATING FECAL COLIFORMS IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
W. J. Kelch, and J. S. Lee.
Journal of the Water Pollution Control Federation, Vol 50, p 862-868, May 1978. 3 fig, 2 tab, 13 ref. NOAA 04615344004.

Descriptors: *Path of pollutants, *Coliforms, Water pollution, *Estuaries, *Mathematical models, *Bacteria, E coli, Microbiology, Water quality, Analytical techniques, Aquatic bacteria, Bays, Estuarine environment, Gulfs, Oceanography, Model studies, Aquatic environment.

Statistical models that predict the fecal coliform levels in an estuarine environment were developed using a computer assisted, multiple linear regression analysis program. Fecal coliforms isolated from Millipore HAWG Membranes were examined for their resistance to 12 antibiotics. Also, 135 independent variables were analyzed to determine their correlations with two dependent variables: bay fecal coliform count, and log bay fecal coliform count. Correlations were noted between these dependent variables and ambient temperature, precipitation, recreational use of the tributaries, antibiotic resistance levels, and fecal coliform counts in the tributaries. (Henley-ISWS)
W78-08278

EXPERIMENTS ON SURFACE BUOYANT JET,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
R. Wiuff.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13739, p 667-679, May 1978. 12 fig, 4 ref, 2 append.

Descriptors: *Jets, *Thermal pollution, *Water pollution, Laboratory tests, Flow , Velocity, Water temperature, Measurement, Entranment, Buoyancy, Froude number, Reynolds number, Density, Heated water, Plumes, Thermal plumes.

An experimental investigation of a surface buoyant jet was presented. The densimetric Froude number and the Reynolds number of the discharge channel were 3.6 and 33,000, respectively. Longitudinal and transverse velocities were measured by propellers and floating spheres and temperatures by thermistors. Measurements showed that the distributions of the longitudinal velocity in different cross sections were not similar. The same was observed for the density profiles. The influence of the damping effect on fluctuation measurements of the heat capacity of a thermistor and the resistance-capacity circuit in a propeller instrument was investigated. The fluctuation measurements were corrected according to the investigation. (Sims-ISWS)
W78-08280

MODEL FOR SHORE-ATTACHED THERMAL PLUMES IN RIVERS,
NALCO Environmental Sciences, Northbrook, IL.
P. P. Paily, and W. W. Sayre.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13762, p 709-723, May 1978. 8 figj, 1 tab, 18 ref, 2 append.

Descriptors: *Thermal pollution, *Rivers, *Powerplants, *Missouri River, Model studies, Mathematical models, Cooling water, Diffusion, Convection, Mixing, Turbulence, Temperature, Water temperature, Heated water, Flow, River flow, Streamflow, Water pollution, Plumes, Thermal plumes.

Side discharges of power plants thermal effluents into natural rivers cause the formation of thermal plumes, the shape and orientation of which depend upon both the discharge conditions and the ambient flow characteristics. When the turbulence level of the ambient flow is high, rapid vertical mixing is achieved between the effluent discharge and the river flow, and the thermal plume becomes shore-attached with the maximum temperatures within the plume occurring along the near shore. In order to determine the isotherm patterns within shore-attached thermal plumes, a solution of the depth-integrated steady-state convection-diffusion equation was obtained. The solution was cast in terms of space-cumulative discharge coordinates, thus allowing the inclusion of the effects of cross-channel flow induced by channel curvature in the model. (Sims-ISWS)
W78-08281

SOLUTE TRAVEL TIMES TO WELLS IN SINGLE OR MULTIPLE LAYERED AQUIFERS,
Iowa Agriculture and Home Economics Experimental Station, Ames.
For primary bibliographic entry see Field 2F.
W78-08288

USE OF TRACERS TO CONFIRM GROUNDWATER FLOW,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
D. B. Aulenbach, J. H. Bull, and B. C. Middlesworth.
Ground Water, Vol 16, No 3, p 149-157, May-June 1978. 16 fig, 1 tab, 8 ref.

Descriptors: *Tracers, *Groundwater flow, *Path of pollutants, *New York, *Sewage effluents, *Tritium, Rhodamine, Dye concentrations, Velocity, Infiltration, Sewage treatment, Saturated flow, *Lake George(NY).

Both rhodamine WT and tritium were found to be satisfactory tracers to determine the direction and velocity of flow of the secondary treated effluent from the Lake George Village Sewage Treatment Plant, New York. The effluent is applied to natural delta sand beds by the rapid infiltation technique. The average vertical velocity in the unsaturated portion of the sand bed was approximately 0.85 m/day (2.8 ft/day). The horizontal flow in the saturated aquifer reached between 10 and 12 m/day (33-40 ft/day°, The velocity appeared to decrease with distance from the sand infiltration beds, although this may have been the result of a change in direction of the major portion of the groundwater flow with the observation well not being in direct line of the direction of flow. Unfortunately, the dye could be traced only slightly less than half the distance from the sand infiltration beds to the seepage area adjacent to West Brook. Thus, a positive determination that the seepage consists primarily of sewage effluent, and the ultimate time of flow to the seepage could not be determined in this study. (Visocky-ISWS)
W78-08296

EVALUATION AND IMPROVEMENT OF QUALITY CHARACTERISTICS OF URBAN STORMWATER,
New South Wales Univ., Kensington. (Austrialia). School of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-08310

FACILITIES PLANNING SUMMARY, TITLE II, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 675, Price codes: A02 in paper copy, A01 in microfiche. January, 1974. 19 p, 4 fig.

Descriptors: *Planning, *Federal government, *Administrative agencies, *Waste water treatment, Facilities, Technology, Administration, Forcasting, Legislation, Programs, Future planning(Projected), Governmental interrelations, Federal Water Pollution Control Act, Water pollution, Waste water(Pollution), Comprehensive planning, Pollution abatement, Waste water disposal.

The Federal Water Pollution Control Act Amendments of 1972 affirmed the importance of planning, and contained new provisions to help achieve the importance of planning, and contained new provisions to help achieve the national objective of clean water. Thus summary describes the nature of the facilities planning process and the steps involved. The process basically involves stating and clarifying the problems, inventorying the existing systems, projecting future conditions, setting goals and objectives, developing alternatives to meet those goals, assessing the impacts of the alternatives to meet those goals, selecting plan elements, and developing implementation mechanisms. The objective of the 1972 Amendments is the application of the best practicable waste treatment technology, approached by treatment and discharge to receiving waters, treatment and reuse, and land application. If water quality standards cannot thus be met, additional measures providing for further pollutant reduction may be needed. Those include advanced waste treatment, temporary storage of treated effluent, and facilities include a problem statement, description of the proposed treatment works, and description of the complete waste water management system. (Molloy-Florida)
W78-08314

DETERMINATION OF KINETICS OF PHOSPHORUS MINERALIZATION IN SOILS UNDER OXIDIZING CONDITIONS,
Kansas State Univ., Manhattan. Dept. of Agronomy.
Y. V. Subbarao, and R. Ellis, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 594, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-180, August 1977. 63 p, 8 fig, 5 tab, 24 ref, 5 append. 1BC611, R803936.

Descriptors: *Phosphorus, *Kinetics, *Orthophosphates, *Soils, *Mineralization, *Sewage disposal, *Soil chemistry, Waste water disposal, Nutrients, Nutrient flux, Soil contamination, Sewage treatment, Eutrophication, Acid soils, Alkaline soils, Hydrogen ion concentration.

Reactions from adding orthophosphates to nine soils with widely different physical and chemical properties were studied to develop a better method of predicting phosphorus movement in soils used for sewage disposal. Conclusions: (1) Amorphous aluminum hydroxide or crystalline gibbsite controlled Al(+3) solubility in acid soils. (2) Soils with higher clay content fixed more phosphorus, while acid soils generally had more phosphorus fixation capacity than alkaline soils. (3) Monocalcium phosphate monohydrate in acid soils were transformed to compounds having higher solubility than variscite, which with time changed to crystalline variscite. (4) Several calcium compounds controlled phosphorus solubility when calcium orthophosphate, mono-(prim.) was added to neutral and alkaline soils. (5) Phosphorus applied at rates similar to those found near a fertilizer granule site saturated the soil zone with calcium orthophosphate, di-(sec.) and CaHPO4 in acid as well as alkaline soils. Intermediary compounds converted to crystalline variscite relatively rapidly at low phosphorus rates. Sandy soils should be avoided as waste disposal sites, due to the likelihood of high phosphorus movement, and hydroxyapatite should be present in alkaline soils to minimize phosphorus movement. (Lynch-Wisconsin)
W78-08378

FERTILIZER AND PESTICIDE MOVEMENT FROM CITRUS GROVES IN FLORIDA FLATWOOD SOILS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
R. S. Mansell, D. V. Calvert, E. H. Stewart, W. B. Wheeler, and J. S. Rogers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 889, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-700/2-77-177, August 1977. 133 p, 73 fig, 35 tab, 53 ref, 1 append. 1HB617, R800517.

Descriptors: *Soils, *Fertilizers, *Pesticides, *Citrus fruits, *Drainage, *Agricultural runoff, *Irrigation, *Water pollution sources, Runoff, Florida, Nutrients, Nutrient flux, Agriculture, Nonpoint pollution, 2,4-D, Terbacil, Herbicides, Chlorobenzilate acaricide, Phosphates, Nitrates.

Fertilizer and pesticide effects on water quality were measured for three test plots of citrus trees at Fort Pierce, Florida under different soil management treatments. The primary soil type was Oldsmar sand, a member of the sandy siliceous, hyperthermic family of Alfic Arsenic Haplaquods (Spodosol). Treatments included: (1) shallow-tilled to 15-cm depth (ST), (2) deep-tilled through mixing the top 105 cm with a trenching machine (DT), and (3) deep-tilled to 105 cm with 56 metric tons/ha dolomitic limestone mixed with the soil (DTL). Concentrations and discharge amounts of nitrate-nitrogen, phosphate-phosphorus, the herbicides 2,4-D and terbacil, and chlorobenzilate acaricide were determined in surface and subsurface drainage waters. Water flux from subsurface plastic drains spaced 18.3 m apart at a depth of 107 cm, as well as drawdown of the water table at the midplane between drains, was consistently greater from shallow-tilled than from deep-tilled plots following a storm or irrigation; drainage from DT was more rapid than from DTL. Average annual losses of nitrate-nitrogen in surface and subsurface drainage was 22.1% from ST, 3.1% from DT, and 5.4% from DTL plots of total nitrogen applied as fertilizer. The corresponding figures for phosphate-phosphorus were 16.9%, 3.6%, and 3.5%. Loss of nutrients in surface runoff was very low for all three plots. Deep tillage likewise decreased leaching losses of terbacil and 2,4-D, although magnitudes were smaller. (Lynch-Wisconsin)
W78-08379

TRANSFORMATIONS OF HEAVY METALS AND PLANT NUTRIENTS IN DREDGED SEDIMENTS AS AFFECTED BY OXIDATION REDUCTION POTENTIAL AND PH, VOLUME I: LITERATURE REVIEW,
Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 5C.
W78-08381

MINNESOTA WATER QUALITY: A REPORT TO THE CONGRESS OF THE UNITED STATES BY THE STATE OF MINNESOTA PURSUANT TO SECTION 305(B) OF THE FEDERAL WATER POLLUTION CONTROL ACT,
Minnesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5G.
W78-08387

A POSSIBLE MODEL FOR THE SURFACE-INDUCED HYDROLYSIS OF ORGANO PHOSPHORUS PESTICIDES ON KAOLINITE CLAYS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 2G.
W78-08391

SWIMMERS' ITCH IN NEW BRUNSWICK: DISTRIBUTION AND DESCRIPTION OF CAUSATIVE AGENT, CERCARIA CATASCOPII N.SP.,
New Brunswick Univ., Fredericton. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08394

HEAVY METALS IN WASTE WATERS FROM THE CITY OF ZURICH (SCHWERMETALLE IN DEN ABWAESSERN DER STADT ZUERICH),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewasserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5A.
W78-08443

SOIL PERCOLATION TESTS IN THE LAGOS AREA,
Lagos Univ. (Nigeria).
T. M. Aluko.
Public Health Engineer, Vol. 5, No. 6, p 152-155, 1977. 4 fig, 3 tab, 11 ref.

Descriptors: *Soil types, *Percolation, *Return flow, *Sewage effluents, *Sewage disposal, Mathematical models, Analytical techniques, Laterites, Waste water treatment, Domestic wastes.

An empirical formula relating percolation rates with permitted rates of sewage effluent application was applied to percolation test results from six soil sites in Lagos, Nigeria. The sandy-laterite test sites had percolation rates which varied significantly over the three days of testing. Considerable rate differences were recorded for tests sites that were 1 m apart. The allowable sewage loading rates for the six sites as calculated by the empirical formula were less than the standard loading rates defined by Nigerian building codes. Results of the empirical formula would indicate that loading rates on soakaway pits used for domestic waste disposal were excessive. It was concluded that the empirical formula developed for calculating allowable sewage application rates was not valid for Nigerian soil types and therefore, not a universally applicable formula. (Lisk-FIRL)
W78-08464

RIVER WATER QUALITY IN ESSEX DURING AND AFTER THE 1976 DROUGHT,
Essex Water Co., (England).
J. G. Slack.
Effluent and Water Treatment Journal, Vol. 17, No. 11, p 575-578, November, 1977. 2 fig, 3 tab, 2 ref.

Descriptors: *Water quality, *Rivers, *Waste water disposal, *Droughts, *Nitrates, Environmental effects, Chloride, Denitrification, Low flows, River beds, Precipitation(Atmospheric), Waste assimilative capacity, Boron, Waste water treatment, Flow profiles, Municipal wastes.

The impact of a 1976 drought on the water quality of sewage receiving rivers in Essex, England, was analyzed. River flows in the River Stour in July averaged 2.64 mgd, nearly the total quantity of sewage discharged to the river; the River Chelmer averaged 4.98 mgd, half of which consisted of sewage effluent. Sewage effluent in the rivers was monitored with boron measurements, an element that is not found naturally in river water. The concentration of chloride, discharged into the Stour at the rate of 7,000-8,000 lbs/day, downriver from the outlet source was much lower than expected during the very dry summer months. Similarly, nitrate in the sewage effluent, averaging 20 mg/liter, was reduced to one-tenth the initial concentration in the downstream river water, indicating biological denitrification. Nitrate and chloride concentrations increased significantly in the fall when rainfall increased. It was concluded that chloride and other sewage effluent constituents accumulated in the river beds during low flow periods and were washed from the bed with the increasing volume of clean water from rainfall; biological denitrification also increased during the low flow periods. (Lisk-FIRL)
W78-08491

THE MOVEMENT OF SEWAGE EFFLUENT THROUGH SOIL COLUMNS: THE MAJOR IONS (NA, CA, MG, CL, AND SO4),
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
E. De Jong.
Journal of Environmental Quality, Vol. 7, No. 1, p 133-136, January-March, 1978. 5 fig, 4 tab, 13 ref.

Descriptors: *Leaching, *Soils, *Sodium, *Calcium, *Magnesium, Chloride, Sulfates, Sands, Clays, Adsorption, Trickling filters, Sewage, Waste water treatment, Municipal wastes.

Laboratory experiments investigated the leaching of sodium, calcium, magnesium, chloride, sulfate, and potassium contained in sewage effluent through soil columns. One liter of sewage effluent contained 236 mg sodium, 19.6 mg potassium, 87 mg calcium, 53 mg magnesium, 204 mg chloride, and 387 mg sulfate. The effluent was introduced into the columns packed with 3 horizons of Asquith loamy sand and 1 horizon of Oxbow clay as flood or trickle flow at 7, 13, and 18C under dark conditions. The passage of sodium, calcium, magnesium, chloride, and sulfate ions was not significantly altered by temperature, soil structure, or application. Breakthrough curves demonstrated more rapid passage of the anions through the columns than predicted. This behavior was attributed to incomplete mixing of the effluent and soil. The passage of sodium, calcium, and magnesium was affected by exchange reactions; sodium and calcium approached equilibrium after 3 pore volumes leached, much sooner than magnesium. Cation breakthrough curves were altered by incomplete mixing, initial exchangeable and soluble cation concentrations, and the sum of the exchangeable cations. (Lisk-FIRL)
W78-08492

SPRAY IRRIGATION OF DOMESTIC SEWAGE IN THE BRAUNSCHWEIG SEWAGE ASSOCIATION - ENVIRONMENTAL POLLUTION OR SUCCESSFUL UTILIZATION OF SEWAGE. (DIE VERREGNUNG VON KOMMUNALEM ABWAESSERN IM ABWASSERVERBAND BRAUNSCHWEIG - UMWELTVERSCHMUTZUNG ODER SINNVOLLE ABWASSERVERWERTUNG),
Kiel Univ. (West Germany). Inst. fuer Wasserwirtschaft und Meliorationswesen.

H. Baumann, and A. Braun.
Wasser und Boden, Vol. 30, No. 3, p 63-67, 1978. 8 fig, 4 tab, 10 ref.

Descriptors: *Return flow, *Groundwater, *Nitrates, *Sprinkler irrigation, *Waste water disposal, Environmental effects, Path of pollutants, Waste assimilative capacity, Nutrient removal, Water pollution control, Municipal wastes, Waste water treatment.

The Braunschweig Sewage Association in West Germany performed tests on a 4,000 ha plot of brown podsol agricultural land to determine the extent of groundwater contamination by spray irrigation with municipal waste water. Water and soil analyses were also used to define the waste assimilative capacity of the soil. Permanganate consumption and BOD values disclosed that almost no organic substances in the spray-irrigated effluent reached the groundwater. Soil water analyses following a single application of excessive quantities (5,400 mm/ha) of municipal sewage by spray irrigation revealed that although the groundwater was contaminated at the irrigation site, only elevated nitrate levels were apparent after 350 m of transport from the site. Repeated applications of effluent reduced the waste assimilative capacity of the soil, especially during winter months when vegetation was not extensive. Effluent applications did leach sodium, potassium, and nitrate ions from the large quantities of synthetic fertilizers which had been applied to the area. This phenomenon was considered an important consideration in assessing the nutrient levels provided by spray irrigation. (Kroha-FIRL)
W78-08493

THE APPLICATION OF A TIME-SERIES-ANALYSIS IN WATER QUALITY MANAGEMENT (ANWENDUNG EINER ZEITREIHENANALYSE IN DER WASSER-GUETEWIRTSCHAFT),
Abteilung Siedlungswasserwirtschaft, Brunswick (West Germany) Inst. fuer Stadtbauwesen.
For primary bibliographic entry see Field 5G.
W78-08494

RESULTS OF POLLUTION CONTROL OF THE RHINE WATER IN RHINELAND-PALATINATE (ERFOLGE BEI DER REINHALTUNG DES RHEINS IN RHEINLAND-PFLAZ),
Landesamt fuer Gewasserkunde, Mainz (West Germany).
For primary bibliographic entry see Field 5G.
W78-08496

NEW PROSPECTS FOR SEWAGE DISPOSAL IN U P,
Irrigation Commission, Lucknow (India).
For primary bibliographic entry see Field 5E.
W78-08500

A SHORT TERM STUDY ON THE POLLUTION OF TAPTI RIVER IN SURAT REGION,
S. V. Regional Coll. of Engineering and Technology, Surat (India).
For primary bibliographic entry see Field 5A.
W78-08504

FATE AND EFFECTS OF CONTAMINANTS MARINE ECOSYSTEMS AND ORGANISMS,
National Oceanographic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 5C.
W78-08528

EFFECTS OF CHEMICAL USE IN OFFSHORE WELL-DRILLING OPERATIONS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-08533

THE CHEMISTRY AND ECOLOGICAL EFFECTS OF CHLORINATION OF SEAWATER: A SUMMARY OF EPA RESEARCH PROJECTS,
Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station; Miami Univ., FL. Div. of Chemical Oceanography.
For primary bibliographic entry see Field 5C.
W78-08534

POWER PLANT COOLING WATER CHLORINATION IN NORTHERN CALIFORNIA,
California Univ., Berkeley. Coll. of Engineering; and California Univ., Berkeley. School of Public Health.
S. Hergott, D. Jenkins, and J. F. Thomas.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 187-225, 34 fig, 22 ref.

Descriptors: *Chlorination, *Water pollution sources, *Water pollution effects, Powerplants, Toxicity, California, *Outer Continental Shelf, Ocean outfalls.

This study was conducted to determine the nature, levels, and persistence of chlorinated compounds in the discharges of five power plants in northern California. In-plant studies were conducted to understand the demands for chlorine in the cooling water system and to determine the levels reaching the receiving waters. Decay studies conducted at the outfalls, together with measurements of oxidant residuals in the receiving water, provide a base for estimating the persistence and zone of influence of the chlorinated compounds. It was determined that all effluents produced receiving water oxidant residual levels that would be predicted to demonstrate chronic toxicity to marine organisms; the receiving water from two plants (Hunters Point and Moss Landing) showed levels that would be predicted to demonstrate chronic toxicity to fresh water organisms. Acutely toxic levels to fresh water and marine organisms existed in the receiving waters at the Potrero site. (See also W78-08520) (Sinha - OEIS)
W78-08535

DEVELOPMENT OF OCEAN OIL SPILL CONCENTRATION AND TRAJECTORY FORECAST METHODS,
National Weather Service, Silver Spring, MD.
For primary bibliographic entry see Field 5C.
W78-08539

FLOW AGAINST DISPERSION IN NONADSORBING POROUS MEDIA,
California Univ., Davis. Dept. of Land, Air and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-08546

SEASONAL RUNOFF LOSSES OF NITROGEN AND PHOSPHORUS FROM MISSOURI VALLEY LOESS WATERSHEDS,
Agricultural Research Station, Lafayette, IN.
E. E. Alberts, G. E. Schuman, and R. E. Burwell.
Journal of Environmental Quality, Vol. 7, No. 2, p 203-208, April-June 1978. 6 tab, 21 ref.

Descriptors: *Phosphates, *Nitrogen, *Missouri, *Iowa, *Surface runoff, *Water quality, *Soil erosion, Fertilizers, Phosphorus compounds, Nutrient removal, Eutrophication, Water properties, Pollutants, Water pollution, Nitrogen compounds, Sediments, Agricultural runoff, Water pollution sources, *Nutrient loss, *Missouri Valley Loess Watersheds.

Seasonal losses of nitrogen and phosphorus in surface runoff were determined for a 7-year period from three corn-cropped watersheds in southwestern Iowa. Three seasonal periods were defined: fertilizer, seedbed, and establishment period from April through June (P1); reproduction and maturation period from July through November (P2); and residue period from December through March (P3). Most of the average annual total N and P losses were associated with the sediment portion of runoff and occurred during P1. The extreme susceptibility of the loess soils to erosion during P1 must be taken into account when designing conservation practices to control plants nutrient losses. Seasonal discharges of runoff, sediment, and nutrients were much lower from a level-terraced watershed than from two contour-farmed watersheds, which demonstrates the benefit of terracing in resource conservation. Average annual soluble N and P losses were quite low and never exceeded 1% of the annual fertilizer application. These losses were the highest during P3 from the contour-farmed watersheds. Water and sediment weighted nutrient concentrations were the highest from the contour-farmed watersheds during P3, when residues covered the soil surface. Leaching of soluble nutrients from the residue and the greater selectivity of the soil erosion process for the finer fractions of the soil (i.e., clay and organic material) during snowmelt runoff are probably the factors responsible. (Henley-ISWS)
W78-08550

STEADY STATE RIVER QUALITY MODELING BY SEQUENTIAL EXTENDED KALMAN FILTERS,
Utah Water Research Lab., Logan.
D. S. Bowles, and W. J. Grenney.
Water Resources Research, Vol. 14, No. 1, p 84-96, February 1978. 11 fig, 3 tab, 14 ref, 1 append.

Descriptors: *Water quality, *Utah, *Rivers, *Model studies, *Mathematical models, Pollutants, Water pollution, Biochemical oxygen demand, Nitrogen, Nitrogen compounds, Algae, Dissolved oxygen, Estimating equations, *Jordan River(Utah), Mathematical filters, Kalman filters.

Sequential extended Kalman filters (EKF) were applied as a technique for steady-state river water quality modeling. The approach was demonstrated by using water quality data collected over a 36.4-mi stretch of the Jordan River, Utah. Each EKF was used to represent a river reach in which hydraulic and quality characteristics were judged fairly uniform. Mean and variance boundary conditions between successive filters were adjusted to represent the effects of variance estimates of the system state (water quality parameters) and confidence intervals on these estimates were provided by combining two independent estimates of the system state. The independent estimates were based on (1) predictions from an 'internally meaningful' model of the stream transport processes and biochemical transformations, and (2) measurements of the water quality parameters. The estimates were combined by a weighting procedure based on uncertainties associated with each estimate. A smoothing algorithm also was applied in order that estimates from passes of the filter procedure in both the downstream and upstream directions could be combined. In this way, information contained in the measurements was used both upstream and downstream of the location of the measurement. The calibration capability of the filter procedure was demonstrated by simultaneous estimation of the state vector and one of the model coefficients. This capability also was used to estimate simultaneously the rate of lateral loading for one of the water quality parameters. Simultaneous estimation of coefficients of lateral loading was shown to increase the uncertainty associated with filter estimates because of the inclusion of uncertainty associated with these coefficients and lateral loading rates. (Sims-ISWS)
W78-08554

NITRATE, CHLORIDE AND DISSOLVED SOLIDS, OGALLALA AQUIFER, WEST TEXAS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
C. C. Reeves, Jr., and W. D. Miller.
Ground Water, Vol. 16, No. 3, p 167-173, May-June 1978. 8 fig, 1 tab, 7 ref.

Descriptors: *Nitrates, *Texas, *Chlorides, *Dissolved solids, Water distribution(Applied), Groundwater, Water quality, Distribution, Water supply, On-site investigations, *Ogallala aquifer(Texas), *Alkali lake basins, Saline cretaceous aquifers.

The distribution of nitrate, chloride ans dissolved solids from groundwater from the Ogallala aquifer in a 27-county area of west Texas illustrates widespread areas of poor water quality. Elements studied increased in concentration from northwest to southeast across the Southern High Plains. Northeast of a line from about Clovis, New Mexico, to Lubbock, Texas, nitrate tends to be less than 45 mg/1, chloride is less than 20 mg/1, and dissolved solids are less than 400 mg/1. However, southwest of this line, nitrate may exceed 60 mg/1 and in some areas exceeds 170 mg/1. Chloride commonly exceeds 500 mg/1 and may be more than 2000 mg/1, and dissolved solids usually exceed 1000 mg/1 and may be more than 8000 mg/1. Regional distribution may be the result of long-term migration of Ogallala groundwater, but the present water quality and distribution, as well as time, distance, stratigraphy, and permeability, suggest contamination of Ogallala groundwater by vertical rather than lateral migration. Most of the high nitrate values (more than 45 mg/1) occur in areas having sandy soils which have been intensively cultivated, thus leaching of nitrogen-based fertilizers is suspect. However, the high chloride and dissolved solids, which exist in essentially the some geographic area, probably represent vertical to local lateral seepage of saline water from large alkali lake basins and local vertical migration from saline Cretaceous aquifers. (Lee-ISWS)
W78-08555

PREVENTION OF NITRATE LEAKAGE FROM THE HULA BASIN, ISRAEL: A CASE STUDY IN WATERSHED MANAGEMENT,
Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-08564

IMPACT OF ENERGY DEVELOPMENT ON GROUND WATER,
American Society of Civil Engineers, New York. Hydraulics Div.
R. E. Aten, R. M. Alverson, R. W. Brooks, E. M. Cushing, and R. D. Johnson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY2, Proceedings Paper 13554, p 157-168, February 1978. 3 fig, 4 tab, 4 ref.

Descriptors: *Energy development, *Environmental effects, *Groundwater, Hydrology, Research and development, Waste disposal, Coals, Oil, Oil shales, Nuclear energy, Energy consumption, Energy levels.

A Task Committee (TC) of the Ground-Water Hydrology Committee was organized in 1975 by the Hydraulics Division, ASCE, to evaluate the 'Impact of Energy Development on Ground Water Resources.' The TC considered development to include all phases of the energy-use cycle from exploration through waste disposal. The purpose of the TC was to assemble information on the broad range of energy-related groundwater problems; to recommend what should be done about these problems; and to indicate research requirements to help alleviate the problems. Activities are proceedings in three phases. The first phase, which is reported herein, is to determine the more significant areas of likely impacts; the second phase is to identify means to evaluate these impact areas in greater detail; and the third phase is to prepare a recommended action program. (Visocky-ISWS)
W78-08566

WASTEWATER DISPOSAL FROM TWO-DIMENSIONAL DIFFUSER,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
For primary bibliographic entry see Field 5E.
W78-08567

APPLICATION OF THE UNIFIED TRANSPORT MODEL TO THE MOVEMENT OF PB, CD, ZN, CU, AND S THROUGH THE CROOKED CREEK WATERSHED,
Oak Ridge National Lab., TN.
J. K. Munro, Jr., R. J. Luxmore, E. L. Begovich, K. R. Dixon, and A. P. Watson.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/NSF/EATC-28, Price codes: A05 in paper copy, A01 in microfiche. Report ORNL/NSF/EATC-28, Sept 1976. 89 p, 22 fig, 10 tab, 26 ref.

Descriptors: *Meters, *Lead, *Cadmium, *Zinc, *Copper, *Sulfur, Water table, Mine wastes, Mine waters, Mineral industry, Mine drainage, Mining, Headwaters, Heavy metals, Soil chemistry, Soils, Soil water movements, Methodology, *Missouri, *Unified transport model, *Crooked Creek Watershed(MO), Soil Chemical Exchange of Heavy Metals.

Two versions of the Unified Tansport Model (UTM) have been used to simulate movement of Pb, Cd, Zn, Cu, and S through the Crooked Creek Watershed, a 1.3 mi.2 forested headwaters area adjacent to a mine and smelter in southeast Missouri. The Wisconsin Hydrologic Transport Model (WHTM) version was used to study accumulation of heavy metals in the soil and to simulate stream flow and heavy metal concentrations in the stream draining the watershed. The Terrestrial Ecology and Hydrology Model (TEHM) version was used to study heavy metal and SO2 effects on the vegetation by considering plant uptake in a plant growth and decomposition model. The Soil Chemical Exchange of Heavy metals (SCEHM) submodel in TEHM was used in a detailed comparison between results from a six-year simulation of heavy metal accumulation in the top soil layers and measured values. Agreement between simulated results from both versions of the UTM and measured values is satisfactory. (EIS-Katz)
W78-08628

IMPACT OF NEARSTREAM VEGETATION AND STREAM MORPHOLOGTY ON WATER QUALITY AND STREAM BIOTA,
Illinois Univ. at Urbana-Champaign. Dept. of Ecology, Ethology and Evolution.
For primary bibliographic entry see Field 5G.
W78-08634

ENVIRONMENTAL PATHWAYS OF SELECTED CHEMICALS IN FRESHWATER SYSTEMS. PART I: BACKGROUND AND EXPERIMENTAL PROCEDURES,
Stanford Research Inst., Menlo Park, CA.
W. R. Mabey, N. Bohonos, B. R. Holt, J. H. Smith, and S. S. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 PB-274 548, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/7-77-113, October 1977. 81 p, 9 tab, 8 fig, 44 ref.

Descriptors: *Methodology, *Path of pollutants, *Water pollution effects, Absorption, Hydrolysis, Degradation(Decompositional), Model studies, *Environmental effects, Environmental control, Bacteria, Sediments, Water quality, Oxygen, Eutrophication, Laboratory tests, Laboratory techniques.

This research was initiated to develop environmental exposure assessment procedures that can be used to predict the pathways of potentially harmful chemicals in freshwater environments. The approach is based on three premises: (1) the overall rate of disappearance of a chemical from the aquatic environment is controlled only by the dominant transformation and transport processes, (2) these processes can be studied independently in the laboratory, and (3) the laboratory data can be extrapolated to the rates of volatlization, photolysis, oxidation, hydrolysis, and biotransformation as well as the sorption partition coefficient of natural sediments and on a mixture of four bacteria. Two models have been used to extrapolate the laboratory results to the environment. (EIS-Katz)
W78-08635

EFFECTS AND INTERACTIONS OF POLYCHLORINATED BIPHENYLS (PCB) WITH ESTUARINE MICROORGANISMS AND SHELLFISH,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5C.
W78-08637

EFFECTS OF THERMAL DISCHARGES ON PHYSICO-CHEMICAL PROCESSES AND WATER QUALITY, VISTULA RIVER, POLAND,
Institute of Meteorology and Water Management, Warsaw (Poland).
For primary bibliographic entry see Field 5C.
W78-08639

CONSIDERATIONS RELATING TO TOXIC SUBSTANCES IN THE APPLICATION OF MUNICIPAL SLUDGE TO CROPLAND AND PASTURELAND (A BACKGROUND SUMMARY),
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
F. D. Kover.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 006, Price codes: A03 in paper copy, A01 in microfiche. Report EPA 560/8-76-004, Nov. 1976. 24 p, 4 tab, 65 ref.

Descriptors: *Heavy metals, *Polychlorinated biphenyls, *Cadmium, Trace elements, Path of pollutants, *Sludge, *Sludge disposal, Food chain, Toxicity, Municipal wastes, *Pastures, *Municipal sludge, *Sludge-amended soils, Sludge uptake, Cropland.

This report presents background information pertinent to an assessment of the potential health hazards from toxic substances when disposing/utilizing municipal sludge on agricultural lands, particularly croplands and pasturelands where products enter the human food chain. (EIS-Katz)
W78-08651

RECOMMENDATIONS OF THE EPA/NBS WORKSHOP ON THE NATIONAL ENVIRONMENTAL SPECIMEN BANK,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08652

DISPERSION STUDY OF BURIED ELEMENTAL MERCURY,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 5E.
W78-08655

MIGRATION OF EXPLOSIVES AND CHLORINATED PESTICIDES IN A SIMULATED SANITARY LANDFILL,
Construction Engineering Research Lab. (Army). Champaign, IL.
K. A. Conley, and W. J. Mikucki.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A030 453, Price codes: A03 in paper copy, A01 in microfiche. Construction Engineering Research Laboratory, Technical Report N-8, September 1976. 47 p, 9 tab, 13 fig, 20 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *DDT, *DDD, *DDE, Industrial wastes, Sanitary engineering, Landfills, Migration, Migration patterns, Methodology, *Leachate, *Leaching, Solid wastes, Soils, *Path of pollutants, *Explosives, Vertical migration, Horizontal migration, *TNT.

This report presents results of a series of tests to determine whether the hazardous substances of DDT and TNT will leach from or migrate through a simulated sanitary landfill. DDT and two of its degradation products, DDD and DDE, were not recovered from samples of the leachates tested. Analysis of soil core samples showed some vertical migration and very little horizontal migration. TNT analysis in leachates was accomplished by applying a sensitive method of analysis--pulse polarography. Fewer than five parts per billion of TNT were found in leachates from soil systems. TNT was detected in core samples from a soil/solid waste system, but not from a soil system. It is theorized that some channelization of flow occurred. (EIS-Katz)
W78-08656

UPTAKE OF ORGANIC SUBSTRATES BY CYCLOTELLA CRYPTICA (BACILLARIOPHYCEAE): EFFECTS OF IONS, IONOPHORES AND METABOLIC AND TRANSPORT INHIBITORS,
Toronto Univ. (Ontario). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-08659

HEAVY METALS IN MUSSELS (MYTILUS GALLOPROVINCIALIS) FROM THE GULF OF LA SPEZIA AND FROM THE PROMONTORY OF PORTOFINO, ITALY,
Genoa Univ. (Italy). Inst. of General and Inorganic Chemistry.
For primary bibliographic entry see Field 5C.
W78-08661

A STUDY ON THE MERCURY CONTENT IN MUSCLES OF THE FISH FAMILY CARANGIDAE FROM THE FISHING GROUNDS OFF THE COAST OF NORTH-WEST AFRICA,
Institute of Marine Food Technology, Szczecin (Poland).
For primary bibliographic entry see Field 5C.
W78-08662

AN EXPERIMENTAL APPROACH IN STUDYING THE INFLUENCE OF MERCURY ON A NORTH SEA COASTAL PLANKTON COMMUNITY,
Central Lab., TNO, Delft (Netherlands).
For primary bibliographic entry see Field 5C.
W78-08664

ACCUMULATION OF POLYCHLORINATED BIPHENYLS IN THE COCKLE CERASTODERMA EDULE AND THE TELLIN MACOMA BALTHICA,
London Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-08666

REACTION OF ESTUARINE ECOSYSTEMS TO EFFLUENT FROM PULP AND PAPER INDUSTRY,
Aberdeen Univ. (Scotland). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-08667

SELECTIVE UPTAKE OF 55FE FROM SEAWATER BY ZOOPLANKTON,
Oregon Coll. of Education, Monmouth.
For primary bibliographic entry see Field 5C.
W78-08673

THE EFFECTS OF VEGETATION REMOVAL BY GRASS CARP ON WATER CHEMISTRY AND PHYTOPLANKTON IN INDIANA PONDS,
Purdue Univ., Lafayette, IN. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W78-08681

TISSUE UPTAKE, SUBCELLULAR DISTRIBUTION, AND METABOLISM OF 14CH3HGCL AND CH3(203)HGCL BY RAINBOW TROUT, SALMO GAIRDNERI,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Physiology.
For primary bibliographic entry see Field 5C.
W78-08690

TOXICITY AND BIOACCUMULATION OF CADMIUM AND LEAD IN AQUATIC INVERTEBRATES,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-08695

FACTORS AFFECTING METHYL AND INORGANIC MERCURY DYNAMICS IN MUSSELS AND SHRIMP,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5C.
W78-08699

DIMENSIONLESS SOLUTIONS OF BORDER-IRRIGATION ADVANCE,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 3F.
W78-08717

IRRIGATION WASTEWATER DISPOSAL WELL STUDIES-SNAKE PLAIN AQUIFER,
Idaho Dept. of Water Resources, Boise.
W. G. Graham, D. W. Clapp, and T. A. Putkey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 762, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/3-77-071, June, 1977. 51 p, 8 fig, 22 tab, 13 ref.

Descriptors: Runoff, *Idaho, Irrigation, Irrigation effects, *Aquifers, Water quality, Groundwater, Water pollution, Path of pollutants, *Waste disposal wells, *Waste water disposal, *Agricultural runoff, *Snake River Plain aquifer(Idaho).

Drain wells are used to dispose of excess irrigation and surface runoff water from approximately 320,000 acres of agricultural land within the eastern Snake River Plain area of southern Idaho. The impact of this practice on the underlying Snake River Plain aquifer, the primary source of potable water for approximately 140,000 people, was not understood. Thus, an investigation was initiated to evaluate the impact of irrigation disposal well practices on the water quality of the Snake Plain aquifer. (Skogerboe-Colorado State)
W78-08724

POLLUTANT CONTRIBUTIONS FROM IRRIGATION SURFACE RETURN FLOWS,
Max C. Fleischmann College of Agriculture, Reno, NV.
W. W. Miller, J. C. Guitjens, C. N. Mahannah, and H. M. Joung.
Journal of Environmental Quality, Vol 7, No 1, p 35-40, January-March 1978. 2 fig, 5 tab, 10 ref.

Descriptors: Water pollution effects, *Water quality control, Water quality, *Water pollution sources, Water supply, Irrigation water, Surface-groundwater relationships, *Nevada, *Return flow, Water chemistry, Oxidation, On-site investigations, Water sampling, *Flood irrigation.

Four study sites, located in the Carson River Basin, Nevada, containing approximately 500,000 acres irrigated by surface flooding, were selected for a 2 year investigation of causes and sources of irrigation surface return flow pollution and the interrelationships among pollution components. Irrigation applications and surface return flows were metered, net applied water was computed, and volume of infiltrated water was determined, based on water sampling and laboratory analysis of DO, BOD, TDS, NO3, -N, TN, PO4-P, and TP. Phosphate content was determined via the persulfate digestion method. Filterable orthophosphate was determined by the ascorbic acid method. Study conclusions suggest: (1) BOD, and to a less extent, P4-P, are identified as major pollutants; (2) significant decrease in DO is noted as water moves from head to tail; (3) diffuse subsurface return flows appear to be sources of certain pollutants for surface water; and (4) water quality differences may be attributed in part to changes in water quantities, suggesting the need for further investigation. (Jewkes-Arizona)
W78-08743

RELATIVE MOVEMENT OF BROMIDE AND NITRATE IN SOILS UNDER THREE IRRIGATION SYSTEMS,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 2G.
W78-08756

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NONPOINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5G.
W78-08758

ROLE OF SEDIMENT IN THE PERSISTENCE OF ENTEROVIRUSES IN THE ESTUARINE ENVIRONMENT.
Baylor Coll of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5C.
W78-08781

THE RISE AND FALL OF MIREX,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-08782

AQUATIC ENVIRONMENTAL SAFETY ASSESSMENT FOR A NONPHOSPHATE DETERGENT BUILDER,
Proctor and Gamble Co., Cincinnati, OH. Environmental Safety Dept.
For primary bibliographic entry see Field 5C.
W78-08783

5C. Effects Of Pollution

CHEMICAL CONTROL OF BRUSH AND ENVIRONMENTAL SAFETY OF ROADSIDE VEGETATION MANAGEMENT CHEMICALS,
Purdue Univ., Lafayette, IN. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5G.
W78-08224

TRACE METALS IN THE ENVIRONMENT,
New York Univ., NY. Task Force for Research Planning in Environmental Health Sciences (2nd).
For primary bibliographic entry see Field 5B.
W78-08226

AN ANALYSIS OF EXPOSURE PANEL DATA COLLECTED AT MILLSTONE POINT, CONNECTICUT,
Massachusetts Inst. of Tech. Cambridge. Energy Lab.
R. T. Brown, and S. F. Moore.
Avaliable from the National Technical Information Service, Springfield, VA 22161 as PB-275 251, Price codes: A07 in paper copy, A01 in microfiche. Report No. MIT-EL 77-015, July 1977. 119 p, 17 fig, 13 tab, 24 ref, append.

Descriptors: Aquatic life, *Environmental effects, *Powerplants, *Cooling water, *Discharge(Water), *Thermal pollution, Water pollution effects, *Connecticut, Exposure panels, Boring aquatic organisms, Multivariate hypothesis, Cluster analysis, Factor analysis, Statistical power analysis.

Results of a comprehensive analysis of data collected as part of exposure panel (small pine boards backed by transite, submerged just below low tide level which are colonized and inhabited by a community of boring organisms) experiments at the Northeast Utility Service Company Millstone Power Station in Connecticut are reported. Study objectives were: (1) to identify, develop, and carry out alternative quantitative analyses of the exposure panel data which test hypotheses of ecological effects of the powerplant, and (2) to identify and propose changes in the present design of the experiment which can improve the information content and/or cost-effectiveness of the study. Analytical methods of determining community composition and abundance are detailed. The exposure panel experiment yields data relevant to testing hypotheses regarding environmental effects of power plant cooling water intake and discharge. The total number of species (S) occurring on 12-month exposure panels is an ecologically meaningful parameter which can be statistically analyzed but contains limited information on community composition. The probability of detecting changes of three species or more in S with the existing data is 0.9 or larger; detection periodicities can be detected in the number of species occurring on 12-month exposure panels; this effect accounts for about 20% of the observed variability at these sites. The sample of species occurring on any given panel consists of about 10 commonly occurring species plus 6-10 randomly occurring rare species. Recommendations include: replicate testing and analysis, reduction of maximum exposure time, and a complete cost effective analysis. (Seip-IPA)
W78-08231

THE MISSOURI LEAD STUDY: AN INTERDISCIPLINARY INVESTIGATION OF ENVIRONMENTAL POLLUTION BY LEAD AND OTHER HEAVY METALS FROM INDUSTRIAL DEVELOPMENT IN THE NEW LEAD BELT OF SOUTHEASTERN MISSOURI. VOLUME I,
Missouri Univ.-Rolla; and Missouri Univ.-Columbia.
For primary bibliographic entry see Field 5B.
W78-08243

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACTS FROM OIL SHALE DEVELOPMENTS,
TRW, Inc., Redondo Beach, CA. Environmental Engineering, Div.
K. W. Crawford, C. H. Prien, L. B. Baboolal, C. C. Shih, and A. A. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 283, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-069, July, 1977. 173 p, 25 fig, 39 tab, 158 ref. 68-02-1881.

Descriptors: *Oil shales, Environmental effects, Research priorities, Research and development, Technology, *Industrial wastes, Effluents, *Air pollution, Water pollution, *Water quality, *Solid wastes, Monitoring, *Water pollution sources, *Pollutant identification, Colorado, Utah, Oil shale extraction, Oil shale refining, Piceance Basin(CO), Yellow Creek Basin(CO), Unita Basin(UT).

A summary of the status of oil shale technologies and development activities and the nature and resources of pollution from oil shale development and their potential impacts on the physical environment is presented; research priorities are established. Included in the report are: (1) an introduction and summary of the Preliminary Environmental Assessment (PEA); (2) a brief review of oil shale extraction and retorting technologies, including the history, technology, development plans, and environmental programs of the major contenders for commercial development; (3) a review of the sources and nature of pollution from shale oil operations, including the pollutant inventories presented by the various developers for air, liquid, and solid waste emissions; (4) a description of the baseline environmental conditions and a discussion of the potential environmental impacts of the various technologies and developments; (5) a brief review of shale oil upgrading and refining experiences to date, and of waste streams and hazards associated with refining and handling of shale oil; and (6) a summary of monitoring projects and studies which have been or are being conducted in the Piceance and Unita Basins, and which are relevant to oil shale development. (Seip-IPA)
W78-08246

TRANSURANICS IN NATURAL ENVIRONMENTS.
Energy Research and Development Administration, Las Vegas.
For primary bibliographic entry see Field 5B.
W78-08248

TRANSURANIC SPECIATION IN THE ENVIRONMENT,
Oak Ridge National LAb., TN.
For primary bibliographic entry see Field 5B.
W78-08249

DISTRIBUTION PATTERNS AND TRANSPORT OF PLUTONIUM IN FRESHWATER ENVIRONMENTS WITH EMPHASIS ON PRIMARY PRODUCERS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W78-08250

PLUTONIUM-237: AN IMPORTANT RESEARCH TOOL FOR STUDIES OF ENVIRONMENTAL PLUTONIUM KINETICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W78-08251

DISTRIBUTION OF PU-238 AND PU-239, 240 IN AQUATIC MACROPHYTES FROM A MIDWESTERN WATERSHED,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W78-08252

PU-238 AND PU-239, 240 DISTRIBUTION IN FISH AND INVERTEBRATES FROM THE GREAT MIAMI RIVER, OHIO,
Argonne National Lab., IL. Radiological and Environmental Research Div.
G. E. Bartelt, C. W. Wayman, S. E. Groves, and J. J. Alberts.
In: Transuranics in Natural Environments, The Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, p. 517-529, June, 1977. 1 fig, 5 tab, 20 ref.

Descriptors: *Radioactivity effects, *Radioactive wastes, *Absorption, *Digestion, Water pollution effects, *Crayfish, *Carp, Freshwater fish, *Shellfish, Minnows, Shad, Goldfish, Clams, Aquatic life, Fish, Ohio, Plutonium, *Plutonium-238, *Plutonium-239, 240, *Great Miami River(OH), Radioactivity assimilation, Biological assimilation, Tissue analysis, Feeding, GAstrointestinal tract, Transuranics.

Samples of minnows, shad, goldfish, carp, crayfish, and clams were taken from the Great Miami River in the vicinity of Miamisburg, Ohio; activities of plutonium (Pu-238 an Pu-239, 240) are reported for these organisms. Distributions were determined for plutonium between the gastrointestinal tract and the remainder of the organisms in carp and between the shell and soft parts of crayfish. Fish collected below the effluent discharge pipe of Mound Laboratory show a substantial increase in Pu-238 activity, apparently independent of their feeding behavior. The activities in carp gastrointestinal tracts are much higher than in carp bodies, presumably due to sediment found in the gut. It appears that there is little transfer of plutionim across intestinal walls of carp into body tissues. Crayfish collected downstream of Mound Laboratory show elevated levels of Pu-238 particularly in soft tissues as opposed to shell. Activities of Pu-238 in crayfish tend to increase during an effluent pulse. A size-dependent relationship may exist in crayfish with larger size classes having lower activities per unit weight than smaller size classes, possibly due to the difference in relative surface area of the shell and gills. The results are discussed with regard to the spatial distribution of the organisms around Miamisburg and the tissue distribution within the animals. (See also W78-08248) (Seip-IPA)
W78-08253

EFFECT OF NATURALLY OCCURRING ORGANICS ON PLUTONIUM-237 UPTAKE BY ALGAE AND BACTERIA,
Savannah River Ecology Lab., Aiken, SC.
J. P. Giesy, Jr., D. Paine, and L. W. Hersloff.
In: Transuranics in Natural Environments., The Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, p. 531-543, June, 1977. 4 tab, 43 ref.

Descriptors: *Radioactivity effects, *Organic compounds, *Scenedesmus, *Aquatic, *Algae, *Aquatic bacteria, *Absorption, Distribution,

Ponds, South Carolina, Pollutant identification, Plutonium, *Plutonium,237, *Aeromonas hydrophila, Total organic carbon, Radioactive uptake, Skinface Pond.

The effects of naturally occurring organics on plutonium-237 (Pu-237) uptake by two species of algae and bacteria (Secnedesmus obliquus and Aeromonas hydrophila) were investigated. Organics were concentrated from Skinface Pond, near Aiken, South Carolina, and separated by membrane ultrafiltration into four nominal diameter size fractions: FI greater than 0.0183; FII less than 0.0183, more than 0.0032; FIII less than 0.0032, greater than 0.0009; FIV less than 0.009 micrometers. Each fraction was introduced into S. obliquus and A. hydrophila cultures at concentrations equal to those found in nature to determine their effects on incubations. Initial plutonium concentration in each flask was 0.0011 micro Curie/ml Pu-237(4+) (NO3)4. Tota organic carbon (TOC) in the pond was 31.1 mg/l (approximately 4 times the world average for rivers and typical of southeastern aquatic systems). More than 80% TO was comprised of FIII and FIV. FI and FII significantly reduced uptake by S. obliquus; FIII, which contained 36% of the TOC, had no significant effect on uptake by S. obliquus, while FIV significantly increased it. A similar trend was observed for uptake by A. hydrophila; FI and FII reduced uptake below that in tryptic soy broth medium alone. No polymerization was observed in these experiments; less than 5% of the plutonium was lost by plating to glass flask, with plating losses less in flasks containing organics. (See also W78-08248) (Seip-IPA)
W78-08254

FOLLOW-UP STUDY OF THE DISTRIBUTION AND FATE OF POLYCHLORINATED BIPHENYLS AND BENZENES IN SOIL AND GROUNDWATER SAMPLES AFTER AN ACCIDENTAL SPILL OF TRANSFORMER FLUIDS,
Environmental Protection Agency, Atlanta, GA. Air and Hazardous Materials Div.
For primary bibliographic entry see Field 5B.
W78-08255

PHOSPHATE ADSORPTION-DESORPTION CHARACTERISTICS OF SUSPENDED SEDIMENTS IN THE MAUMEE RIVER BASIN OF OHIO,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-08276

MODELING EFFECTS OF AQUATIC PLANTS IN RIVERS.
Ministry of Works and Development, Hamilton (New Zealand).
J. C. Rutherford.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE4, p 575-591, August 1977. 6 fig, 5 tab, 18 ref.

Descriptors: *Water quality, *Aquatic plants, *Dissolved oxygen, *Rivers, Effects, *Photosynthesis, *Respiration, Thermal powerplants, Prediction, Biomass, Measurement, Mathematical models, Equations, Systems analysis, Simulation analysis.

When oxygen levels in polluted rivers are modeled, the effects of aquatic plant respiration and photosynthesis are usually represented by a single term. Such a simple approach suffers the disadvantage that it does not permit the relative contributions of the different communities of plants to be separately assessed. A more flexible approach is described in which the effect of three important plant communities on the dissolved oxygen levels is represented by a separate term, each one being dependent on the measured or estimated biomass of that community. The calibration of such a model is described for the Waikato River, New Zealand, where the phytoplankton were shown to be the principal contributors to the oxygen production and consumption. The model is then used to predict the effects of the discharge of the cooling water from a proposed power station on the dissolved oxygen levels in the river. (Graf-Cornell)
W78-08300

PROJECTIONS OF PHOSPHORUS LEVELS IN WHITE LAKE,
Hydroscience, Inc., Westwood, NJ.
W-S. Lung, and R. P. Canale.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE4, p 663-676, August 1977. 7 fig, 3 tab, 15 ref, 3 append.

Descriptors: *Eutrophication, *Lake rehabilitation, *Simulation analysis, *Phosphorus, *Water quality control, *Mathematical models, Sewage, Diversion, Programs, Management, Evaluation, Sediments, Tributaries, Flow, *Michigan, Equations, Systems analysis, *White Lake(Mich).

A preliminary mathematical model of phosphorus was used to evaluate different lake rehabilitation schemes for improvement of water quality in White Lake, Michigan. Model calculations indicate that phosphorus loss to the sediments and phosphorus removal by the tributary flow are two key processes responsible for rapid system response under reduced phosphorus loading rates. The sediments had little effect on the initial recovery following load reduction but play an important role in determining the ultimate equilibrium concentrations of phosphorus. Rehabilitation schemes such as aeration and circulation result in additional improvement in water quality beyond that provided by the present sewage diversion project alone. Additional reduction of phosphorus concentrations could be achieved by control of nonpoint sources which constitute about 80% of the total input to the lake. (Graf-Cornell)
W78-08304

MATHEMATICAL METHODS TO EVALUATE ENTRAINMENT OF AQUATIC ORGANISMS BY POWER PLANTS,
National Power Plant Team, Ann Arbor, MI.
For primary bibliographic entry see Field 8I.
W78-08312

THE POTENTIAL EFFECTS OF CLEARING AND SNAGGING ON STREAM ECOSYSTEMS,
Kansas State Univ., Manhattan. Div. of Biology.
G. Richard Marzolf.
For sale by the Superintendent of Documents, U. S. GPO , Washington, D.C. 20402 and Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 177, Price codes: A03 in paper copy, A01 in microfiche. Fish and Wildlife Service, Col., MI., Office of Biological Services, National Stream Alteration Project, Rep. FWS/OBS 78/14, Jan 1978. 31 p, 4 fig, 1 tab, 112 ref.

Descriptors: Streams, *Stream improvement, *Channel improvement, Plankton, Fish, *Debris removal, *Vegetation canopy, *Clearing(Streams), *Snagging(Streams), Canopy, Habitats, Reviews, Organic matter.

Clearing and snagging, the removal of obstructions from streams to increase the channel's capacity to convey water, is conducted to drain floodplains for agriculture, to protect citizens from floods, or to maintain navigable waterways. This review examines the widely held contention that such stream alteration reduces fish populations and is otherwise detrimental to the use of stream ecosystems. It was prepared for use in assessing the ecological impact of clearing and snagging projects. Because of the lack of direct quantitative evidence about clearing and snagging effects, the mechanisms involved in producing the effects are discussed indirectly as potential effects. Recent concepts of stream ecosystem function relate the functions of different groups of stream organisms to organic matter synthesis and degradation in various sizes and types of streams. This review emphasizes the roles obstructions (typically removed by clearing and snagging) exert on these stream ecosystem functions. Recent literature allows one to identify potential effects of clearing and snagging on stream function. Some effects are obvious when viewed in this process-oriented context, while others are less clear. For example, an obvious potential effect of clearing and snagging would be to decrease the rate at which organic matter loads are degraded by the stream system. A less obvious potential effect would be the effects of clearing and snagging on the plankton in streams. The depression of fish populations by clearing and snagging potentially occurs in two ways: (1) through alteration of the nature and abundance of organisms utilized by fishes as food, and (2) by direct effects of fish behavior (territoriality) and reproduction (spawning areas). This review identifies some potential ecological impacts of clearing and snagging, but does not yield quantitative predictions of the impacts. Pertinent recent literature on stream ecosystem function is reviewed and has much application in impact assessment. Parameters which could be measured for quantitatively evaluating the ecological effects of specific clearing and snagging projects are described.
W78-08358

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES: PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS' MEETING--OCTOBER 1976, TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-08359

A LOG OF THE VERDE THE 'TAMING' OF AN ARIZONA RIVER,
Northern Arizona Univ., Flagstaff. Center for Intergrated Studies.
J. W. Byrkit.
The Journal of Arizona History, Vol 19, No 1, p 31-54, Spring, 1978. 26 ref.

Descriptors: *Arizona, Dams, River basin development, Water supply, *Watershed management, Planning, River regulation, History, Water rights, Water resources development, Water utilization, Water pollution effects, Irrigation practices, Water management(Applied), *Deterioration, Water shortage, Environmental effects.

The history of human habitation of the Verde Valley in north central Arizona is summarized, suggesting that at least five civilizations have lived in the area and all left due to insufficient water resources. Since the 1860's Americans have exploited the Verde River's Water supply for ranching, farming, and additional water for southwest Arizona, particularly the Phoenix area. Verde river pollution, due to railroad construction along the river and the copper mining and smelting at Clarkdale, is described. Various irrigation projects, wildlife depletion in Verde Valley, the effects of overgrazing and the present day population is threatened by the continued expanded use of its watershed resources. Present day use of the Verde River's resources include hydroelectric power stations in Childs and Glen Canyons, a reservoir in Blue Ridge Lake, the Horseshoe and Bartlett dams. Although the proposed Orme Dam was eliminated from the Central Arizona Project in 1977, other alternative plans for the use of the Verde and Salt Rivers watersheds continue to endanger the existence of the Verde River. (Jewkes-Arizona)

W78-08373

WHO KILLED THE GILA,
Florida Univ., Gainesville.
H. F. Dobyns.
The Journal of Arizona History, Vol 19, No 1, p 17-30, Spring, 1978. 49 ref.

Descriptors: *Arizona, *New Mexico, *River basin development, *Deterioration, Erosion, History, Irrigation practices, Water utilization, Water resources development, Watershed management, Dams, Water supply, Environmental effects, Arid lands, Land management, Social aspects.

Research suggests the deterioration of the Gila River, located in New Mexico and Arizona, was begun in the late seventeenth century by the Spanish introduction of cattle and horses to the Northern Pima Indians, living in the arid Gila River watershed. Nineteeth century Anglo-Americans accelerated the Gila River's watershed erosion, motivated by economic gain. Significant destructive watershed practices are summarized and include: (1) Silver and gold mining, resulting in water pollution and land erosion; (2) Construction of irrigation canals and poorly constructed diversion dams resulting in bank erosion; (3) Fur trapping, exterminating the beaver population; (4) Indiscriminate timber cutting for wood and fuel, eliminating the trees as control of water runoff. Twentieth century construction of the Roosevelt Dam on the Salt River, and the Coolidge Dam on the Gila River, resulted in the loss of abundant fish, water fowl, gamebirds and game animals from the lower and middle Gila River and the lower Salt River. (Jewkes-Arizona)
W78-08375

COMPARISON OF THE PHOTOSYNTHETIC CHARACTERISTICS OF THREE SUBMERSED AQUATIC PLANTS,
Florida Univ., Gainesville. Dept. of Agronomy.
T. K. Van, W. T. Haller, and G. Bowes.
Plant Physiology, Vol. 58, No. 6, p 761-768, December 1976. 6 fig, 4 tab, 33 ref.

Descriptors: *Aquatic weeds, *Photosynthesis, *Eurasian water milfoil, *Coontail, *Hydrilla verticillata, *Florida, Submerged plants, Ceratophyllum demersum, Myriophyllum spicatum, Cabomba caroliniana, Carbon dioxide, Light, Enzymes, Carbon, Macrophytes, Oxygen.

The low light requirement of Hydrilla verticillata may help explain its competitive success over Ceratophyllum demersum (coontail) and Myriophyllum spicatum (Eurasian water milfoil) in certain Florida freshwaters. As photosynthetic mechanisms of submersed macrophytes are poorly known, this study was designed to compare those mechanisms in the three plants. Hydrilla and Ceratophyllum had carbon dioxide compensation points of 44 and 41 macroliters/liter, respectively, while the value for Myriophyllum was 19. Relatively high carbon dioxide compensation points under 1% O2 indicated that some dark respiration occurred in the light. Inhibition of photosynthesis by O2 was less than with terrestrial carbon-3 plants. Glycolate oxidase activity was 12.3-27.5 micromoles O2/mg chl/hr, compared with 78.4 for spinach. Light saturation of photosynthesis occurred at 600-700 microeinsteins/sq m/sec in each species grown under full sunlight. Hydrilla had the lowest light compensation point, and required the least irradiance to achieve the half-maximal photosynthetic rate. Field measurements in a Hydrilla mat indicated that in afternoon free carbon dioxide dropped to zero, and O2 rose to over 200% air saturation. Most photosynthetic activity occurred in morning when free carbon dioxide was highest and O2 and solar radiation lowest. Light- and carbon dioxide-saturated photosynthetic rates for the three plants were 50-60 micromoles °2/mg chl/hr at 30C. (Lynch-Wisconsin)
W78-08376

FORMAT FOR ACQUIRING RAPID DATA ANALYSIS CAPABILITIES OF STORED DATA: MANIPULATION OF NATIONAL EUTROPHICATION SURVEY WATER QUALITY DATA,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Operations Div.
For primary bibliographic entry see Field 5A.
W78-08377

DETERMINATION OF KINETICS OF PHOSPHORUS MINERALIZATION IN SOILS UNDER OXIDIZING CONDITIONS,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-08378

FERTILIZER AND PESTICIDE MOVEMENT FROM CITRUS GROVES IN FLORIDA FLATWOOD SOILS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 5B.
W78-08379

ECOLOGIC STRESS IN A SUBTROPICAL COASTAL LAGOON: LAKE ST. LUCIA, ZULULAND,
California Univ., Los Angeles. Dept. of Geography.
A. R. Orme.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 815, Price codes: A02 in paper copy, A01 in microfiche. Geoscience and Man, Vol 12, June 20, 1975, p 9-22. 13 fig, 12 ref. Office of Naval Research N00014-69-A-0200-4035.

Descriptors: *Lake St Lucia(South Africa), *Ecosystems, *Ecology, *Lagoons, *Sedimentation, *Zululand, Subtropic, Coasts, Environmental effects, Erosion, Salinity, Water level fluctuations, Estuaries, Mfolozi Lagoon(South Africa), Republic of South Africa, Natal, Lakes, Aquatic life, Breeding.

Lake St. Lucia, the remnant of the largest coastal lagoon created by the protohistoric Flandrian transgression along the Zululand coast, South Africa, has undergone physical changes which pose a threat to the survival of the entire lagoonal ecosystem. Five thousand years of sedimentation, segmentation, and reed-swamp encroachment have caused the disappearance of adjacent Mfolozi lagoon and reduced Lake St. Lucia from 912 sq km to a shallow lagoon of 312 sq km. Originally 112 km long and over 40 m deep, the latter is now only 40 km long and less than two m deep. Present sedimentation rates are two-three times the mean rate for the past 5000 years, in part a response to increased erosion further inland. In addition, periodic low water levels and high salinities reflect diminished discharge from water sheds affected by erratic rainfall, irrigation, forestation, and drainage diversions. Frequent closure of the estuary by strong littoral drift of the coast's massive sand barriers inhibits free exchange of water and biota between the lagoon and the Indian Ocean. The threat to the entire ecosystem is especially critical because the lagoon contains the most southerly populations of several plants and animals characteristic of tropical Africa. Mangroves are locally near extinction, and many birds, fish, and other life forms have ceased to breed; salt-tolerant species are replacing freshwater aquatics. (Lynch-Wisconsin)
W78-08380

TRANSFORMATIONS OF HEAVY METALS AND PLANT NUTRIENTS IN DREDGED SEDIMENTS AS AFFECTED BY OXIDATION REDUCTION POTENTIAL AND PH, VOLUME I: LITERATURE REVIEW,
Louisiana Agricultural Experiment Station, Baton Rouge.
R. A. Khalid, R. P. Gambrell, M. G. Verloo, and W. H. Patrick, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-041 468, Price codes: A11 in paper copy, A01 in microfiche. Contract Report D-77-4, May 1977, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. 221 p, 3 fig, 4 tab, 414 ref. DMRP Work Unit No 1C05. DACW39-74-C-0076.

Descriptors: *Reviews, *Heavy metals, *Dredging, *Oxidation-reduction potential, *Hydrogen ion concentration, *Nutrients, Spoils, *Bibliographies, Poisons, Trace elements, Sediment-water interfaces, Lead, Cadmium, Mercury, Arsenic, Selenium, Iron, Nitrogen, Phosphorus, Sulfur.

A review of 414 previous studies on the occurrence and chemistry of selected trace metals and plant nutrients in sediment-water systems, with emphasis on pH and oxidation-reduction effects, concludes that changes in the physicochemical nature of sediments could enhance release of toxicants or biostimulants. The study was undertaken to assess effects of disposal of dredged materials; too few studies of actual operations have been conducted, however, to draw broad conclusions regarding effects on water quality. Toxicants and nutrients included were lead, cadmium, mercury, arsenic, selenium, copper, zinc, manganese, iron, nitrogen, phosphorus, and sulfur. Where dredging activities have resulted in minimal change in metal ion concentration, some regulating processes influenced by oxidation-reduction reactions are possibly activated as others are inactivated. Adsorption and release reactions in disturbed sediment-water systems are frequently not of the magnitude predicted from metal-ligan solubilities and thermodynamic considerations of simple aqueous systems; but it is apparent that pH and redox potential do influence the availability of metals and plant nutrients by affecting regulatory processes. The second volume of this two-part study contains reports on laboratory investigations of pH and oxidation-reduction effects in sediment-water systems at four locations. (Lynch-Wisconsin)
W78-08381

BACTERIOLOGICAL STUDIES OF THE MESOTROPHIC LAKE JASNE,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
W. Donderski, and E. Strzelczyk.
In: Acta Universitatis Nicolai Copernici, Limnological Papers, No 10, p 15-27, 1977. 5 fig, 2 tab, 30 ref.

Descriptors: *Lake Jasne(Poland), *Mesotrophy, *Bacteria, *Distribution, *Nutrient requirements, *Eutrophication, Lakes, Nutrients, Microbiology, Trophic level, Amino acids, Ammonia, Starches.

The distribution, nutritional requirements, and biochemical activity of bacteria in mesotrophic Lake Jasne, Poland, were studied from samples collected in April, July, and November 1973. Bacteria, most numerous in spring and autumn, were also greater in surface waters of the littoral than pelagic zones, possibly due to organic substances and bacteria washed in from the soil surrounding the lake and to aquatic vascular plants growing near shore which may provide food through excretion of organic substances. Bacteria were dominated by nonsporing rods (up to 93%). Amino acid-requiring bacteria or those which grow best in the presence of amino acids and vitamins were predominant among nutritional groupings of bacteria, and were most numerous in summer and autumn. In terms of biochemical activity, ammonifiers were most numerous, particularly in surface waters in summer and autumn. Starch-hydrolyzing bacteria accounted for up to 44% of the isolates studied. Sulfate-reducing bacteria made up 6-64% of all bacteria, with maximum development in summer at a depth of 10 m. Water

samples for the study were taken at five stations in the littoral zone and one in the pelagic zone. Lake Jasne is situated in the Ilawa Lakeland, has a surface area of 10.7 ha, a maximum depth of 20 m, and a mean depth of 8.1 m. Five biochemical tests were made with bacterial isolates. (Lynch-Wisconsin)
W78-08382

PRIMARY PRODUCTION OF THE PLANKTON IN LAKE JEZIORAK,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
B. Bogaczewicz-Adamczak.
In: Acta Universitas Nicolai Copernici, Limnological Papers, No 10, p 29-39, 1977. 3 fig, 2 tab, 12 ref.

Descriptors: *Phytoplankton, *Lake Jeziorak(Poland), *Eutrophication, *Primary productivity, *Photosynthesis, Lakes, Algae, Trophic level, Biomass, Osmosis, Species composition.

A 1972 investigation relating primary production to species composition/biomass of phytoplankton in eutrophic Lake Jeziorak, Poland, concluded: (1) production amounts depend on the biological/physiological character of the phytoplankton; (2) diatoms are highest in photosynthesis; (3) cyanophytes increase biomass through osmotrophy as well as photosynthesis; (4) comparison with other years indicates 1972 was a year of low productivity; (5) allochthonous organic substances play an important part in Lake Jeziorak. Phytoplankton samples for primary production observations were collected at one station at the lake's maximum depth (11 m). Water temperature, transparency, and light penetration were so measured. In the study, 104 algal taxa were identified as Cyanophyta (19), Euglenophyta (6), Pyrrophyta (4), Chrysophyta (30), and Chlorophyta (45). Jeziorak phytoplankton composition is characterized by a few species which are abundant and occur frequently, and a larger group of species which contribute little to total biomass. Cyanophytes dominate throughout the growing season and reach maximum development in summer. During spring circulation algal biomass is uniformly distributed; in summer phytoplankton concentrate near the surface, with maximum concentration at a depth of 1-3 m. At the end of the growing season there is a steady turnover of phytoplankton in the entire water column. (Lynch-Wisconsin)
W78-08383

INTRODUCTORY INVESTIGATIONS ON THE STRATIFICATION OF THE UNDERGROUND ORGANS OF MACROPHYTES IN LAKE JEZIORAK,
Nicholas Copernicus Univ. of Torun (Poland). Dept. of Systematics and Plants Geography.
M. Rejewski.
In: Acta Universitatis Nicolai Copernici, Limnological Papers, No 10, p 59-88, 1977. 2 fig, 10 tab, 27 ref.

Descriptors: *Lake Jeziorak(Poland), *Macrophytes, *Roots, *Rhizomes, *Benthic flora, *Eutrophication, Lakes, Distribution, Aquatic plants, Phragmites communis, Scolochloa festucacea, Heleocharis palustris, Glyceria aquatica, Scoenoplectus lacustris, Helophytes, Littoral.

A study of the vertical distribution of roots and rhizomes of five aquatic macrophytes in the bottom of eutrophic Lake Jeziorak, Poland, showed that 96.9% of rhizomes and 82.8% of roots (as dry weight) were concentrated in the 15-cm surface layer. These macrophytes make up an estimated 88% of the total biomass of helophytes in the littoral zone of the lake. Phragmites communis, Heleocharis palustris, and Scolochloa festucacea show remarkably shallow root penetration, the bulk of the roots reaching less than 5 cm into the bottom. At 15 cm only a small percentage of root biomass is found: S. festucacea 6.1%, H. palustris 6.6%, and P. communis 6.9%. Roots of a second group, which includes Glyceria aquatica and Schoenoplectus lacustris, reach far deeper, with 20% of the root biomass of G. aquatica and 25.9% of S. lacustris below 15 cm. Over 90% of the total rhizome biomass of H. palustris and S. lacustris is concentrated in the top 5 cm, with virtually none below 15 cm. Further research is needed to measure physical factors (wave action, bottom structure, shore-bank morphology) which influence littoral distribution of plants whose rhizomes translocate to basin bottoms. Additionally, research is needed into the apparent ability of helophytes to utilize circulating mineral compounds to a far greater degree than previously assumed. (Lynch-Wisconsin)
W78-08384

THE PRODUCTION OF PERIPHYTONIC ALGAE IN LAKE TYNWALD,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
A. Oleksowicz.
In: Acta Universitatis Nicolai Copernici, Limnological Papers, No 10, p 41-51, 1977. 4 tab, 20 ref.

Descriptors: *Lake Tynwald(Poland), *Algae, *Periphyton, *Primary productivity, Species composition, Organic matter, Biomass, Lakes, Oedogonium, Epithemia, Respiration, Chlorophyta, Bacillariophyceae, Cyanophyta, Nutrients.

In an investigation of the structure, biomass, and primary production of periphytic algae in Lake Tynwald, Poland, some 250 species of periphytic algae were identified, a small number compared with other periphytic communities. Periphyton are important in animal feeding cycles. Great variation in biomass and primary production was found from 1973 to 1974; biomass was 24 kcal/sq m in 1973 and 0.933 kcal/sq m in 1974, and primary production was 2342.2 kcal/sq m/200 days in 1973 and 43.79 kcal/sq m/200 days in 1974. Despite this variability an Oedogonio-Epithemietum litoralae community exists in the lake. Low production and biomass in 1974 was due to insufficient development of the community. Maximum primary production observed was 52.21 kcal/sq m/day in August 1973; the minimum was 0.554 kcal/sq m/day in November 1972. The respiration rates in 1972 and 1974 were almost identical (in the range 0-482-1.74 kcal/sq m/day), but in 1973 respiration was 17.46 kcal/sq m/day. Microscopic glass plates attached to a wooden frame and submerged in the lake at a depth of about 40 cm (half the length of the submerged part of the reed stems) were used to collect the periphyton specimens. Most abundant groups were Chlorophyta, Bacillariophyceae, and Cyanophyta. Located among fields, meadows, and farm buildings of Tynwald village, the lake is enriched with nutrients through rainfall and inflow of subsurface waters. (Lynch-Wisconsin)
W78-08385

DISTRIBUTION, PRODUCTION AND DYNAMICS OF DEVELOPMENT OF THE HELEOCHARIS PALUSTRIS (L.) ROEM. ET SCHULT. IN THE JEZIORAK LAKE,
Nicholas Copernicus Univ. of Torun (Poland). Dept. of Systematics and Plant Geography.
M. Rejewski.
In: Acta Universitatis Nicolai Copernici, Limnological Papers, No 10, p 89-106, 1977. 8 fig, 4 tab, 16 ref.

Descriptors: *Heleocharis palustris, *Lake Jeziorak(Poland), *Eutrophication, *Waves(Water), *Distribution patterns, *Primary productivity, Lakes, Aquatic plants, Ecology, Seasonal, Stems, Roots, Rhizomes, Biomass, Littoral, Helophytes, Bottom sediments.

Resistence of Heleocharis palustris to wave action helps it successfully compete with other helophytes in areas of Lake Jeziorak, Poland, that are permanently subjected to waves, and correspondingly encourages location of the plant in such areas. Human intervention in lake management further enlarges the territory occupied by this species. The strongly eutrophic lake, one of the largest in the country with an area of 32.3 sq km, is a polymictic basin with low transparency (0.9-2.0 m) and slight alkalinity (pH 7.5-8.5 during the growing season). Yearly production of stems and subterranean parts of H. palustris was 7.3 tons/ha dry mass (24.3 million kcal/ha). Single-species patches of H. palustris occupy a total area of 19,324 sq m, with a mean area of the patches of 205.6 sq m, and a mean water depth of 38.6 cm. H. palustris grows on hard, gravely-sandy bottoms, with a preponderance of middle and fine sands (mean 40.7 and 35.7%), at a slight inclination (average 2-3 degrees). Statistically positive correlation was found between biomass and fine sand and dust content of the bottom. Single-species patches amount to a biomass of 11,275 kg/ha; stems account for 2365 kg/ha and underground parts 9360 kg/ha. Stem ash content is relatively low; during the growing season it amounts to an average of 9.5%, with a higher percentage in new stems (12%). Ash content of roots is about 50% of dry mass during the growing season. (Lynch-Wisconsin)
W78-08386

EFFECTS OF DREDGING ON AQUATIC ORGANISMS--WITH SPECIAL APPLICATION TO AREAS ADJACENT TO THE NORTHEASTERN PACIFIC OCEAN,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
G. R. Snyder.
Marine Fisheries Review, Vol 38, No 11, p 34-38, November 1976. 2 fig, 2 tab, 17 ref.

Descriptors: *Dredging, *Pacific Ocean, *Pacific Northwest US, *Spoils, *Environmental effects, *Aquatic life, *Ultimate disposal, *Eutrophication, Oceans, Rivers, Estuaries, Hydraulic equipment, Equipment, Hopper dredging, Pipeline dredging, Turbidity, Sediments, Toxins, Heavy metals, Nutrients, Primary productivity.

The effects of dredging and spoils on aquatic organisms is discussed in relation to operations in the U.S. Pacific Northwest. Sediment removal causes mechanical effects, turbidity, effects on larval development and settlement, and may produce lethal hydrogen sulfide levels. Gutterhead dredging has the most serious consequences, destroying vegetation and removing organisms. Hydraulic dredging uproots all vegetation, which may take a year to recolonize. Clamshell dredging leaves depressions in the substrate having DO and hydrogen sulfide levels inadequate for fish or benthic invertebrates. Turbidity and sediment load affect primary energy production. Effects of material disposal include: (1) loss of organisms through incompatibility of dredging and disposal sites; (2) burial of organisms; (3) turbidity; (4) anoxia; and (5) toxic chemical release. Such fixed epifauna as oysters perish when covered by sediment, though some benthic invertebrates can survive burial under up to 1 m of material. High turbidity can cause death to organisms from suffocation, can disrupt primary productivity and community structure, and can increase oxygen demand. No far-reaching effects of deposition of off-shore sediments as beach fill have been reported. Release of nutrients and toxic materials appear to accompany resuspension of bottom materials. (Lynch-Wisconsin)
W78-08388

SWIMMERS' ITCH IN NEW BRUNSWICK: DISTRIBUTION AND DESCRIPTION OF CAUSATIVE AGENT, CERCARIA CATASCOPII N.SP.,
New Brunswick Univ., Fredericton. Dept. of Biology.
M. E. Scott, and M. D. B. Burt.
Canadian Journal of Zoology, Vol 54, No 12, p 2200-2207, December 1976. 2 fig, 3 tab, 41 ref. National Research Council of Canada A2358.

Descriptors: *Swimmers' itch, *Schistosome dermatitis, *New brunswick(Canada), *Lakes, *Cercaria catascopii, *Human diseases, *Water pollution effects, *Swimming, Lymnaea catascopium catascopium, Physa gyrina, Canada, Worms, Snails, Gastropods, Recreation, Magaguadavic Lake(New Brunswick-Canada), Lake Utopia(New Brunswick-Canada), Chamcook Lake(New Brunswick-Canada).

The cause of swimmers' itch (schistosome dermatitis) in recreational lakes in New Brunswick, Canada, was found to be a new species of trematode worm, Cercaria catascopii, whose snail hosts are Lymnaea catascopium catascopium and Physa gyrina. Seven snail species were collected during the summers of 1974-76 in 18 lakes. Of 2016 specimens collected, 220 (10.9%) were infected with larval Digenea. Schistosome cercariae were found in L. catascopium and P. gyrina in Magaguadavic Lake, Lake Utopia, and Chamcook Lake. Three natural cases of schistosome dermatitis were observed during the study, all from Magaguadavic Lake, and one was reported from French Lake. P. gyrina has not previously been reported east of Ontario. Cercariae from P. gyrina could not be differentiated from those from L. catascopium on morphometric grounds, but in view of the usual strict host specificity of schistosomes, identification of these cercariae as belonging to the same species must remain tentative. The present material does not agree sufficiently well with any known Cercaria spp. to warrant identification with any one. The prevalence of swimmers' itch in New Brunswick appears greater than is apparent from the literature. This paper includes morphological description and a table of schistosome furcocercariae from freshwater snails in North America. (Lynch-Wisconsin)
W78-08394

PRIMARY PRODUCTION IN A LOUISIANA GULF COAST SPARTINA ALTERNIFLORA MARSH,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2I.
W78-08404

ORGANOCHLORINE PESTICIDE AND POLYCHLORINATED BIPHENYL RESIDUES IN SELECTED FAUNA FROM A NEW JERSEY SALT MARSH---1967 VS. 1973,
Iowa Cooperative Wildlife Research Unit, Ames.
For primary bibliographic entry see Field 5G.
W78-08411

STREAM CHANNELIZATION IMPACTS ON SONGBIRDS AND SMALL MAMMALS IN VERMONT,
Massachusetts Univ., Amherst. Ddpt. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 5G.
W78-08412

ANIMAL DISEASE HAZARDS OF SLUDGE DISPOSAL TO LAND: OCCURRENCE OF PATHOGENIC ORGANISMS,
Northumbrian Water Authority, Gosforth (England).
V. A. Argent, J. C. Bell, and M. Emslie-Smith.
Water Pollution Control, Vol. 76, p 511-516, 1977. 5 tab, 31 ref.

Descriptors: *Pathogenic bacteria, *Sewage sludge, *Salmonella, *Worms, *Sludge digestion, Return flow, Sludge disposal, Mycobacterium, Nematodes, Sewage bacteria, Waste water treatment, Municipal wastes.

Laboratory studies investigated the presence of worm eggs, salmonella, and Mycobacterium tuberculosis in raw, primary digested, and secondary digested sludge which was to be applied to land. The raw sludge was anaerobically digested at about 32C for 37 days. The sludge underwent secondary digestion for 33 days before it was applied to land. Sludge samples were obtained at each point in sludge processing. No trematode, nematode, or cestode ova were detected in 20 raw sludge samples, 33 primary digested sludge samples, or 33 secondary digested sludge samples. Raw sludge obtained from 28 small treatment plants did not contain worm eggs. Mycobacterium tuberculosis was undetected in 10 digested sludge samples, although non-pathogenic Mycobacterium terrae was identified. Out of 33 samples of secondary digested sludge to be applied to land, 22 samples were positive for salmonella with 9 serotypes identified. Four serotypes of salmonella were detected in 6 of 9 raw sludge samples and 12 out of 13 mixed samples contained 13 serotypes. Samples of raw sludge from the 28 small treatment plants showed 9 instances of salmonella as evidenced by 7 serotypes. The quantity of salmonella in raw sludge was less than 105/100 cu cm; the number of salmonella found in digested sludge ranged from 10-161/100 cu cm. (Lisk-FIRL)
W78-08463

INFECTIOUS DISEASE HAZARDS OF LAND-SPREADING SEWAGE WASTES,
Agricultural Research Service, Beltsville, MD. Biological Waste Management and Soil Nitrogen Lab.; and Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
W. D. Burge, and P. B. Marsh.
Journal of Environmental Quality, Vol. 7, No. 1, p 1-9, January-March, 1978. 3 tab.

Descriptors: *Sludge disposal, *Return flow, *Sewage bacteria, *Viruses, *Diseases, Disinfection, Chlorination, Sprinkler irrigation, Domestic wastes, Waste water treatment, Waste water disposal, Municipal wastes.

Human diseases associated with land application of sludge, pathogen movement, pathogen viability, and disinfection are discussed in a literature review. Common infectious pathogens found in sewage include bacteria, protozoa, helminthic parasites, and viruses. Outbreaks of the diseases associated with forms of these pathogens have been directly traced to irrigation practices of sewage sludge, domestic wastes, and treated waste water disposal. Contamination of water supplies and consumption of raw vegetables and shellfish grown in the presence of sewage are the major means of transfer of sewage-related diseases to humans. Effects of sewage-borne pathogens on irrigation and treatment plant operators have been negligible. Percolation of waste water through certain soil types can remove amoeba cysts, helminth ova, and some bacteria and viruses; surface runoff of waste water poses a potential hazard. Heat drying, liming, composting, irradiation, and pasteurization have been found to be more effective than chlorination in pathogen removal. Pathogen-bearing aerosols from sprinkler irrigation of waste water can be reduced by modification of irrigation equipment and by establishing of a buffer zone of trees and shrubs. (Lisk-FIRL)
W78-08490

THE APPLICATION OF A TIME-SERIES-ANALYSIS IN WATER QUALITY MANAGEMENT (ANWENDUNG EINER ZEITREIHENANALYSE IN DER WASSERGUETEWIRTSCHAFT),
Abteilung Siedlungswasserwirtschaft, Brunswick (West Germany) Inst. fuer Stadtbauwesen.
For primary bibliographic entry see Field 5G.
W78-08494

CHLORINATION: ASSESSING ITS IMPACT,
C. Winklehaus.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2354-2357, December, 1977.

Descriptors: *Chlorination, *Disinfection, *Sewage bacteria, *Ozone, *Environmental effects, Public health, Enteric bacteria, Waste water disposal, Sewage treatment, Toxicity, Potable water, Industrial wastes, Organic compounds, Coliforms, Epidemiology, Waste water treatment, Municipal wastes.

The 'Second Conference on Water Chlorination: Environmental and Health Effects' was held in Gatlinburg, Tennessee, during November 1977 under the sponsorship of the Oak Ridge National Laboratory, the U.S. Environmental Protection Agency, and the U.S. Department of Energy. Topics covered by the 65 papers presented during the conference included: freshwater systems, marine systems, toxicity, trihalomethanes, waste water disinfection, industrial wastes, health effects, alternatives, and legislation. An EPA overview of the regulatory aspects of chlorination cited as responsible for the reduction in the increased use of chlorine. EPA officials favored improving water and waste water treatment processes used prior to disinfection as a means of reducing the disinfectant doses required to achieve adequate pathogen control. EPA-sponsored projects on alternatives to chlorine, such as ozone and bromine chloride, were highlighted during a separate session. Papers on the health-related aspects of chlorination focused on the carciongenicity and mutagenicity of chlorinated waters as evidenced by epidemiological studies. (Lisk-FIRL)
W78-08498

FINAL ENVIRONMENTAL IMPACT STATEMENT--CITY OF JACKSONVILLE, FLORIDA WASTEWATER MANAGEMENT FACILITIES, ARLINGTON-EAST SERVICE DISTRICT.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5D.
W78-08506

THE EFFECT OF TEMPERATURE ON THE GROWTH OF ACINETOBACTER CALCOACETICUS,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W78-08509

PROGRAM REVIEW PROCEEDINGS OF: ENVIRONMENTAL EFFECTS OF ENERGY RELATED ACTIVITIES ON MARINE/ESTUARINE ECOSYSTEMS.
Environmental Protection Agency, Washington, D.C. Office of Energy, Minerals, and Industry; and Environmental Protection Agency, Washington, D.C. Office of Research Development.
Report EPA-600/7-77-111, (OEMI-77-025), October 1977, 304 p. Compiled by Clinton Hall and Walter Preston.

Descriptors: *Water pollution effects, *Environmental effects, *Energy, *Ecosystems, *Estuarine environment, Pollutant identification, Monitoring, Path of pollutants, Ecology.

The Report of the Interagency Working Group on Health and Environmental Effects of Energy Use, completed in November 1974, recommended an integrated environmental sciences research pro-

gram addressing needs in five major areas: Pollutant Characterization and Monitoring; Environmental Transport Processes; Health Effects; Ecological Effects; and Entegrated Assessment. This compilation represents the proceedings from the review session for the marine and estuarine portion of the Interagency Energy-Environment Research and Development Program--crosscutting the pollutant characterization and monitoring, environmental transport processes, and ecological effects subareas. (See W78-08521 thru W78-08541).
W78-08520

SUBLETHAL EFFECTS OF PETROLEUM ON MACOMA BALTHICA,
Alaska Univ., College. Inst. of Marine Science.
M. S. Stekoll, L. E. Clement, and D. G. Shaw.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 1-17, 5 fig, 3 append.

Descriptors: *Environmental effects, *Water pollution effects, *Clams, *Oil pollution, *Bioindicators, Intertidal areas, *Alaska, Pollutant identification, *Outer Continental Shelf, Petroleum, Sublethal effects, *Macoma balthica.

The bivalve mollusc Macoma balthica has previously been proposed as an indicator of oil pollution. This small clam was selected for study because of its wide distribution and abundance in Alaskan intertidal environments. Macoma balthical is a surface deposit feeder and suspension feeder, which would make it likely to concentrate both suspended and stranded oil that might occur following a spill. Such concentrated oil in the clams might be further distributed throughout the ecosystem via migrating birds that feed on M. balthica. It was the purpose of this investigation to show that M. balthica. is able to concentrate oil from an oil-sea water dispersion and to ascertain what effects the oil might have on membrane-bound enzymes and other physical and chemical parameters of the clams. (See also W78-08520) (Sinha - OEIS)
W78-08521

THE BENTHIC COMMUNITY OF A NATURAL OIL SEEP IN THE SANTA BARBARA CHANNEL,
California Univ., Livermore. Lawrence Livermore Lab.
R. B. Spies, P. H. Davis, and T. M. Distler.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-025, October 1977. p. 19-34, 9 fig, 23 ref.

Descriptors: *Oil pollution, *Benthos, *Water pollution effects, Seepage, *California, *Outer Continental Shelf, Natural seepages, Chronic pollution, *Santa Barbara Channel(CA)

Little information is available on the effects of petroleum hydrocarbons on soft bottom benthic communities. Since spills occur unpredictably and are ephemeral in behavior, the systematic study of their effects is extremely difficult. Sources of chronic hydrocarbon pollution should provide a more stable setting for studying such effects. If the best estimates of input rates of petroleum hydrocarbons to the marine environment are examined, it can be seen that chronic sources exceed accidental sources. The profuse offshare oil seeps of the Santa Barbara Channel provide an excellent natural laboratory for such a study. The abundance of bacteria in association with the active seepage suggests that petroleum hydrocarbons are being utilized as an extra carbon source. Measurements and experiments are needed to clarify the effects and fate of petroleum hydrocarbons in the benthic community. (See also W78-08520) (Sinha - OEIS)
W78-08522

ACUTE AND CHRONIC STUDIES WITH WATERFOWL EXPOSED TO PETROLEUM HYDROCARBONS,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
M. P. Dieter.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 35-43, 6 fig, 4 ref.

Descriptors: *Water birds, *Water pollution effects, *Oil pollution, *Food chains, *Maryland, *Outer Continental Shelf, Aves.

The research program at Patuxent has been evaluating the biological effects of petroleum hydrocarbons on all stages of the waterfowl life cycle. These studies include: (1) the hatchability of eggs exposed to oils; (2) the development of ducklings fed oil from the day of hatch; and (3) reproduction in adult water fowl fed oil. The third study is complemented by another where adult waterfowl were fed a chemically defined mixture representative of the concentration and type of aromatic compounds present in oil. In addition, experiments have been initiated to evaluate biological responses to petroleum hydrocarbons incorporated via the food chain. Analytical development is proceedings in concert with all of these biological studies. (See also W78-08520) (Sinha-OEIS)
W78-08523

ACCUMULATION AND BIOLOGICAL EFFECTS OF COPPER AND CADMIUM ON MARINE SHELLFISH,
National Marine Fisheries Service, Beaufort, NC, Beaufort Lab.; and National Inst. of Environmental Health Sciences, Research Triangle Park, NC.
D. W. Engel, and B. A. Fowler.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 45-56, 8 fig, 12 ref.

Descriptors: *Water pollution effects, *Metals, *Copper, *Cadmium, Shellfish, Estuaries, *Outer Continental Shelf.

To approximate acute pollution situations, shellfish are being labeled with metals (copper and cadmium) over extended periods of time, and the labeled meat will be used in the production of a 'toxic' rat diet that represents more nearly a natural situation. The data presented in this report, along with corollary information currently being generated in the laboratory, indicate that the chemical species of an element determines its pharmacological and toxicological effects on aquatic organisms. The t oxicity of copper to algae and fish eggs and larvae was shown to be related to the 'free' cupric ion, and that the complexation of copper is by organic chelators and the degree of complexation is pH dependent. Cadmium, on the other hand, is complexed by chloride, an inorganic ligand, and the degree of complexation is independent of pH and the dissolved organic load in the water. Thus, it seems reasonable to continue research on the effects of metals, copper, cadmium, and arsenic, using well-defined chemical systems. Through the use of defined chemical systems it may be possible to demonstrate the mechanisms of action of metallic pollutants on marine and estuarine shellfish. (See also W78-08520) (Sinha - OEIS)
W78-08524

ECOLOGICAL CHARACTERIZATION: AN AID TO DECISION MAKING,
Fish and Wildlife Service, Bay Saint Louis, MS. Office of Biological Services.
H. D. Tait.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 57-64, 2 fig.

Descriptors: *Baseline studies, *Environmental effects, *Water pollution effects, Coasts, Beaches, *Outer Continental Shelf, Gulf Coast.

Ecosystem studies by the U.S. Fish and Wildlife Service (FWS) and funded through the 'EPA energy program' are now operational in four major coastal areas: Chenier Plain area of southeast Texas and southwest Louisiana, Pacific Northwest, Sea Island-Carolinian, and Maine. In this report, the rationale behind these studies, the progress to date, and the work projected for 1977 are reviewed. Unless policy decisions reflect ecological reality, the nearshore and onshore areas will receive the brunt of the ecological impacts of expanding energy programs. This is true, whether it be outer continental shelf (OCS) oil and gas development, tidal power, power plants, superports for supertankers, or geopressure energy extraction. The direct impact and the indirect effects must be considered. Some of the decisions and needs for information associated with the OCS oil and gas program are considered. (See also W78-08520) (Sinha-OEIS)
W78-08525

AN ECOLOGICAL CHARACTERIZATION OF THE CHENIER PLAIN OF SOUTHWESTERN LOUISIANA AND SOUTHEASTERN TEXAS: OBJECTIVES AND METHODOLOGIES,
Energy Resources Co., Inc., Cambridge, MA.
For primary bibliographic entry see Field 2L.
W78-08526

FATE AND EFFECTS OF CONTAMINANTS MARINE ECOSYSTEMS AND ORGANISMS,
National Oceanographic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
D. A. Wolfe.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 93-106, 11 ref.

Descriptors: *Water pollution effects, *Ecosystems, *Biota, *Resources development, *Baseline studies, Oil pollution, Polychlorinated byphenyl, Metals, Sediments, Fish, *Outer Continental Shelf, Petroleum.

The general objectives of the National Oceanographic and Atmospheric Administration's energy resources project on fate and effects are to identify and conduct laboratory and field research studies that will facilitate the assessment of potential environmental impacts from petroleum releases in coastal marine ecosystems. This effort does not have a site-specific orientation, however it is expected that the results of the process-oriented studies will have broad applicability to environmental problems in widely separated geographic areas. The efforts of this project on fate and effects were oriented mainly toward establishment of suitable in-house analytical support capability for NOAA's overall environmental program and the planning for future studies on fate and effects. In addition, laboratory studies were undertaken on the interactive effects of petroleum and polychlorinated biphenyl (PCB) exposure in fish and on the interactions of petroleum and metals in seawater-sediment systems. (See also W78-08520) (Sinha-OEIS)
W78-08528

LABORATORY AND FIELD STUDIES ON THE LONG-TERM EFFECTS OF PETROLEUM

HYDROCARBONS ON BENTHIC MARINE INVERTEBRATES,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
J. W. Anderson, R. Riley, and R. M. Bean.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p. 107-132, 11 fig, 15 ref.

Descriptors: *Benthos, *Oil pollution, *Sediments, *Water pollution effects, Invertebrates, Alaska, Washington, *Outer Continental Shelf, Petroleum hydrocarbons, Depuration.

As a result of oil production from the Alaskan outer continental shelf, the Pacific Northwest is one of the areas of the United States most likely to receive increased inputs of petroleum hydrocarbons (PHC) from transport, port operations, and refining. To define more clearly the potential for petroleum to exert significant long-term environmental effects in marine sediments, studies on the fate of crude oil in sediments are being conducted. This paper presents data on the uptake of numerous PHCs by three species present in contaminated sediment held for a long period (40 days) in the natural environment. The final aspect of this research concerns the natural rates of hydrocarbon depuration from oiled sediment and the effects of these compounds on the recruitment of benthic invertebrates. (See also W78-08520) (Sinha - OEIS)
W78-08529

ENVIRONMENTAL ASSESSMENT OF NORTHERN PUGET SOUND AND THE STRAIT OF JUAN DE FUCA,
National Oceanographic and Atmospheric Administration, Seattle, WA.
H. Harris.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 133-142, 1 fig.

Descriptors: *Resources development, *Water pollution effects, *Baseline studies, *Environmental effects, Oil pollution, *Washington, *Outer Continental Shelf, Petroleum development, *Puget Sound, *Strait of Juan de Fuca.

The environmental assessment of Northern Puget Sound and the Strait of Juan de Fuca is a 5-year study that addresses the potential marine environmental and ecological consequences of the intensified petroleum activities anticipated for the next decade. The biological program has focused initially on three communities particularly susceptible to damage from floating oil: the intertidal biota, the nearshore fishes, and the plankton. Since the Puget Sound ecosystem has not been subjected to exposure to massive amounts of petroleum, concentrations of hydrocarbons are presumed to be very low. Baseline levels will be determined throughout the region. The oceanographic program began in February-April 1976 with the deployment of current meter arrays in the Strait of Juan de Fuca near Port Angeles and wind recorders at strategic locations throughout the region. Data from this deployment have been processed, and analysis is underway. In another study, the seasonal and spatial occurrence of suspended solids is being determined as well as their sorptive characteristics relative to selected petroleum constituents. The principal vehicle for dissemination of information will be a series of interpretive monographs on various aspects of the Puget Sound ecosystem/environment. (See also W78-08520) (Sinha - OEIS)
W78-08530

ENVIRONMENTAL ASSESSMENT OF AN OFFSHORE OIL FIELD: A PROGRESS REPORT,
National Marine Fisheries Service, Galveston, TX. Southeast Fisheries Center.
R. J. Berry, and E. D. McRae.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 143-152, 3 fig.

Descriptors: *Baseline studies, *Environmental effects, *Oil pollution, *Ecosystems, *Resources development, *Texas, Shrimp, Fishing, Recreation, *Buccaneer Oil Field(Tex), *Outer Continental Shelf, Petroleum development, Environmental assessment, *Gulf of Mexico.

The area selected for study is the Buccaneer Oil Field located about 53 km (32 miles) south of Galveston. This field was chosen because it is isolated from other production areas and has been in operation long enough to allow development of climax communities. Situated in commercial shrimping grounds, it is a focal point for recreational fishing and diving activities. Objectives of the study are to compare ecosystems in the vicinity of a producing field with those in nearby unaltered areas and to identify changes attributable to pollutants and the presence of structures. (See also W78-08520) (Sinha - OEIS)
W78-08531

A STANDARD PROGRAM FOR ENVIRONMENTAL IMPACT ASSESSMENT: PHASE I--ICHTHYOPLANKTON SAMPLING,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 6G.
W78-08532

EFFECTS OF CHEMICAL USE IN OFFSHORE WELL-DRILLING OPERATIONS,
Environmental Research Lab., Gulf Breeze, FL.
N. L. Richards.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 161-173, 10 fig, 6 ref.

Descriptors: *Water pollution sources, *Baseline studies, *Chemical wastes, *Resources development, Ecology, Pollutants, Water pollution effects, Fish, Invertebrates, *Outer Continental Shelf, Offshore drilling, Drilling muds.

Data on the effects of chemical use in offshore well-drilling operations are very limited. Policy decisions are currently based on static, 96-hr LC50 determinations, observations of divers, and theoretical models of pollutant dispersion. A limited research program on drilling-fluid constituents has been initiated at the Gulf Breeze Laboratory to provide a better data base as one component in the evaluation of the relative hazard of using alternative drilling mud constituents and to develop better laboratory methods for xenobiotic evaluation. Choices among the multitude of alternative chemicals available for well-drilling operations can be based on better toxicological information. Hard data on effects might also eliminate unjustified concern about effects of certain chemicals, which, in fact, may be safely used in well-drilling activities. (See also W78-08520) (Sinha - OEIS)
W78-08533

THE CHEMISTRY AND ECOLOGICAL EFFECTS OF CHLORINATION OF SEAWATER: A SUMMARY OF EPA RESEARCH PROJECTS,
Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station; Miami Univ., FL. Div. of Chemical Oceanography.
W. P. Davis, D. P. Middaugh, and J. H. Carpenter.
In: 'Program Review 'Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 175-186, 29 ref.

Descriptors: *Waste disposal, *Water pollution effects, *Chlorination, *Environmental effects, Baseline studies, Sewage wastes, *Outer Continental Shelf, Ocean dumping.

The results of ongoing research projects on the effects of chlorination on marine ecosystems from 1975 are summarized. Studies reveal that both halogenated and nonhalogenated compounds are produced from chlorination of waters rich in organic compounds from natural productivity. Chlorination efor disinfection of effluents from muncipal treatment plants entering marine environments seems to be a need baesed on myth or fear of pathogens. It is far from certain that chlorination controls viral pathogens, and marine waters are rarely implicated in pathogenic transmission. Therefore, chlorination practices must be carefully examined on the basis of real need. (See also W78-08520) (Sinha - OEIS)
W78-08534

POWER PLANT COOLING WATER CHLORINATION IN NORTHERN CALIFORNIA,
California Univ., Berkeley. Coll. of Engineering; and California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5B.
W78-08535

THE NBS PROGRAM FOR STANDARDS FOR TRACE ORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08536

THE NBS PROGRAM FOR STANDARDS FOR TRACE INORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08537

STANDARDIZATION AND INTERCALIBRATION TECHNIQUES FOR MARINE MONITORING,
National Ocean Survey, Rockville, MD. Test and Evaluation Lab.
For primary bibliographic entry see Field 5A.
W78-08538

DEVELOPMENT OF OCEAN OIL SPILL CONCENTRATION AND TRAJECTORY FORECAST METHODS,
National Weather Service, Silver Spring, MD.
C. S. Barrientos.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 271-282. 1 fig.

Descriptors: *Oil spills, *Oil pollution, *Forecasting, *Water quality control, Water pollution, Model studies, *Path of pollutants, *Outer Continental Shelf, Trajectory forecast, Oil transport

Although contingency plans to prevent damage by oil pollution have been devised, there is an urgent need to develop methods to forecast movements and the behavior of the pollutant. In the case of oil spills, viable methods are required to predict the

oil movement. The objective of this program is to develop a numerical model to predict the concentrations and trajectories of petroleum in the open ocean (not in bays or estuaries). Concentration will be forecast as a function of space and time. The proposed model will cover various kinds of sources, i.e., continuous point leakage, individual spill, or spill added to a general background level of known variable concentrations. The model will include wind, wave, and current forecasts on a small scale in time and space not ordinarily included in the present atmospheric weather forecast system. Forecasting techniques will be developed for these variables. Additionally, trajectory models will require as input oceanic variables, including depth, coastal geometry, and physical properties of the water. These oceanic variables will be used in the development. (See also W78-08520) (Sinha-OEIS)
W78-08539

THE UNDERWAY WATER SAMPLING SYSTEM,
National Ocean Survey, Rockville, MD. Engineering Development Lab.
For primary bibliographic entry see Field 5A.
W78-08540

SHIPBOARD ENVIRONMENTAL DATA ACQUISITION SYSTEM,
National Weather Service, Silver Spring, MD.
For primary bibliographic entry see Field 5A.
W78-08541

IMPACT OF ENERGY DEVELOPMENT ON GROUND WATER,
American Society of Civil Engineers, New York. Hydraulics Div.
For primary bibliographic entry see Field 5B.
W78-08566

APPLICATION OF THE UNIFIED TRANSPORT MODEL TO THE MOVEMENT OF PB, CD, ZN, CU, AND S THROUGH THE CROOKED CREEK WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W78-08628

TOXIC EFFECTS OF MILITARY WASTEWATER EFFLUENT,
Texas Tech Univ., Lubbock. Water Resources Center.
R. M. Sweazy, F. L. Rose, and C. L. Baugh.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 795, Price codes: A05 in paper copy, A01 in microfiche. Final Report WRC-77-1, February 1977. 71 p, 10 tab, 19 fig, 9 ref.

Descriptors: *Toxicity, *Salamanders, Animal physiology, Biochemistry, Sewage, *Water pollution effects, Sewage effluents, Sewage disposal, Path of pollutants, Oil pollution, Lakes, Playas, Texas, Playa Lakes, *Tumors, *Carcinogens, Polycyclic aromatic hydrocarbons, Ambystoma tigrinum, Diesel oil, Asphalt, Enzymes.

A population of tiger salamanders, Ambystoma tigrinum, inhabiting a playa lake receiving treated domestic sewage were found to have a high incidence of tumors. Research was aimed at determining the causative agent, of the tumors, determining the transmittability of the tumors and to determine if conventional water treatment unit operations, coagulation, and sedimentation, filtration and chlorination would reduce the tumor incidence. Although no specific tumorigenic agent was positively identified, there was evidence to suggest that polycyclic aromatic hydrocarbons were the tumorigenic agents. Sources of these compounds, diesel oil and asphalt, were known to have been applied to the playa lake. It was also determined that the conventional water treatment unit operations employed had no effect on tumor incidence. (Els-Katz)
W78-08629

REPRODUCTIVE STUDIES WITH DIISOPROPYLMETHLY-PHOSPHONATE IN RATS,
Army Armament Research and Development Command. Aberdeen Proving Ground, MD. Chemical Systems Lab.
J. F. Hardisty, R. J. Pellerin, R. K. Biskup, and J. H. Manthei.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 454, Price codes: A03 in paper copy, A01 in microfiche. Technical Report ARCSL-TR-77037, May 1977. 43 p, 3 tab, 6 fig, 9 ref, Appendices.

Descriptors: *Public health, Water quality, *Water pollution effects, *Water pollution sources, Water sources, Water supply, Bioassay, Mammals, *Organophosphorus compounds, Reproduction, Pathology, Laboratory animals, Water consumption, *Diisopropymethylphosphonate, Fertility index, Gestation, Lactation, Postnatal development.

A single-generation reproductive study in the rat was performed to evaluate the potential hazard of diisopropylmethylphosphonate (DIMP) when consumed orally with drinking water. One group of 20 females and 20 male rats received laboratory water and served as a control group. Two groups (of 20 female and 20 male rats each) received laboratory water containing 10 and 1000 ppm DIMP, respectively. The exposure period consisted of the entire reproductive cycle of the Fo parents. Both the Fo parents and the F1 offspring were evaluated for adverse effects. There were no statistically significant differences between data from the control group and the treatment groups. There was no evidence of adverse effects upon the reproductive cycle of the rat when exposed to 10 or 1000 ppm DIMP in the drinking water. (EIS-Katz)
W78-08630

ACUTE TOXICITY OF DIISOPROPYLMETHYL PHOSPHONATE AND DICYCLOPENTADIENE TO AQUATIC ORGANISMS,
E G and G Bionomics, Wareham, MA.
R. E. Bentley, G. A. Leblanc, T. A. Hollister, and B. H. Sleight, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 750, Price codes: A06 in paper copy, A01 in microfiche. Army Medical Research and Development Command, Washington, D.C., Contract No. DAMD-17-75-C-5073, Final Report, July 1976, 98 p, 46 tab.

Descriptors: *Bioassay, *Mortality, Toxicity, Laboratory tests, Freshwater fish, Minnows, Daphnia, *Organophosphorus compounds, Aquatic animals, Laboratory animals, Juvenile fish, Sunfish, Midges, Channel catfish, Rainbow trout, Algae, *Diisopropylmethyl Phosphonate, *Dicyclopentadiene, Fathead minnow, Bluegill, Sunfish.

The acute toxicity of diisopropylmethyl phosphonate (DIMP) and dicyclopentadiene (DCPD) was studied utilizing aquatic organisms representing several trophic levels in an aquatic ecosystem. DCPD was found to be approximately 10X more toxic than DIMP. The eggs and 7-day old fry of the fathead minnow were the life stages least susceptible to DCPD and DIMP, respectively. Increasing hardness and pH 8.0 appeared to decrease slightly the toxicity of DIMP while the toxicity of DCPD was not significantly altered by varying water quality parameters. (EIS-Katz)
W78-08631

USE OF EXPOSURE UNITS FOR ESTIMATING AQUATIC TOXICITY OF ORGANOPHOSPHATE PESTICIDES,
Environmental Research Lab.-Duluth, MN.
D. T. Allison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 796, Price codes: A03 in paper copy, A01 in microfiche. Ecological Research Series, EPA-600/3-77-077, July 1977. 24 p, 6 tab.

Descriptors: *Methodology, *Pesticides, *Organophosphorus pesticides, Bioassay, *Toxicity, Mortality, Freshwater fish, Water pollution effects, *Diazonin, Statistical methods, Hydrolysis, Laboratory tests, Laboratory annals, *Exposure units, *Chronic toxicity, Flagfish, Jordanella floridae.

Environmental water concentrations of organophosphate pesticides can be expected to fluctuate widely due to use patterns and rapid hydrolysis. This study investigated some relationships of exposure concentrations, duration and periodicity to the chronic toxicity of diazinon to flagfish (Jordanella floridae). Effects were compared on the basis of 'exposure units' (exposure concentration x exposure duration). Treatments at equivalent exposure units caused similar overall effects on the test populations regardless of the life stages exposed or exposure duration per se. The hypothesis is proposed that exposure units could be used to estimate the environmental impact of fluctuating water concentrations of organophosphate pesticides over a wide range of concentration, duration and periodicity. (EIS-Katz)
W78-08632

TOXAPHENE: CHRONIC TOXICITY TO FATHEAD MINNOWS AND CHANNEL CATFISH,
Fish and Wildlife Service. Columbia, MO. Fish-Pesticide Research Lab.
F. L. Mayer, Jr., P. M. Mehrle, Jr., and W. P. Dwyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 695, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-069, June 1977. 38 p, 17 tab, 4 fig.

Descriptors: *Channel catfish, *Freshwater fish, *Toxicity, Bioassay, Minnows, Laboratory tests, Mortality, Reproduction, Pathology, Growth rate, *Chlorinated hydrocarbon pesticides, Pesticide toxicity, Pesticides, Water pollution effects, Fish eggs, Larvae, *Fathead minnow, Chronic effects, Continuous exposure, Toxaphene.

Fathead minnows (Pimephales promelas) and channel catfish (Ictalurus punctatus) were continuously exposed to several toxaphene concentrations (13-630 ng/l) in flow-through diluter systems for 8 to 10 months. Growth and backbone quality of adult fathead minnows were decreased at 97 and 173 ng/l exposures, but adult channel catfish were not affected by toxaphene. Effects on reproduction were observed only in channel catfish in the 630 ng/l concentration: the period from pairing to spawning was increased and the amount of gelatinous matrix surrounding the eggs was reduced. Survival of fathead minnows was not affected by toxaphene, but the no-effect concentration for fry growth and bone quality was below 54 and 97 ng/l, respectively. Channel catfish fry survival and growth were reduced in the 299 and 630 ng/l exposures, and bone quality was altered in concentrations as low as 72 ng/l. The maximum toxaphene accumulation from water to fish was 69,000 times in fathead minnows and 50,000 times in channel catfish. Toxaphene was excreted very slowly in both species. (EIS-Katz)
W78-08633

ENVIRONMENTAL PATHWAYS OF SELECTED CHEMICALS IN FRESHWATER SYSTEMS. PART I: BACKGROUND AND EXPERIMENTAL PROCEDURES,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5B.
W78-08635

ENVIRONMENTAL REQUIREMENTS AND POLLUTIN TOLERANCE OF COMMON FRESHWATER CHIRONOMIDAE,
Florida Agricultural and Mechanical Univ., Tallahassee. Lab. of Aquatic Entomology.
W. M. Beck, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 105, Price codes: A12 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Monitoring Series, Report EPA-600/4-77-024, April 1977. 260 p, 230 tab, 29 ref.

Descriptors: *Aquatic insects, *Aquatic environment, Aquatic animals, *Environment, Larvae, Salinity, Hydrogen ion concentration, Nutrients, Biochemical oxygen demand, Oxygen, Water temperature, Benthos, Turbidity, Review, *Environmental requirements, Pollution tolerance, *Freshwater chironomids, *Chironomidae, Specific habitat.

Data on the environmental requirements and pollution tolerance of 230 taxa of freshwater chironomids were compiled from 33 references. This compilation was prepared to assist biologists in evaluating data from macroinvertebrate samples collected for the assessment of water quality. The following parameters were considered: developmental stage, pH, salinity, nutrients, degradable dissolved organics, oxygen, temperature, Turbidity, current, general habitat, specific habitat, seasonal distribution. (EIS-Katz)
W78-08636

EFFECTS AND INTERACTIONS OF POLYCHLORINATED BIPHENYLS (PCB) WITH ESTUARINE MICROORGANISMS AND SHELLFISH,
Maryland Univ., College Park.
R. R. Colwell, and G. S. Sayler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 103, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA-600/3-77-070. 45 p, 17 tab, 6 fig, 40 ref. June 1977.

Descriptors: *Aroclor, *Polychlorinated biphenyl, Marine microorganisms, *Marine bacteria, *Water pollution effects, Path of pollutants, Oysters, *Chesapeake Bay, Estuarine environment, Estuaries, Public health, Commercial shellfish, *Biodegradation, *PCB-resistant bacteria, Shellfish, Depuration, PCB contamination.

The role of estuarine bacteria in the mobilization, transport, and removal of polychlorinated biphenyls (PCB) was investigated in estuarine environments. A main objective of this investigation was to determine a secondary impact of PCB contamination of estuarine systems. The specific secondary effect was the PCB-stress-induced accumulation and depuration of enteric bacteria by shellfish, i.e., the Chesapeake Bay oyster, Crassostrea virginica. For this report, bacteria uninhibited by PCB, but capable of growth in the presence of PCB, are defined as PCB-resistant. In this regard, PCB-resistant bacteria were found to be distributed ubiquitously throughout estuarine and marine environments sampled in this study. The residence time of PCB in estuarine and marine environments is concluded to be sufficiently long to induce stress upon estuarine animals. (EIS-Katz)
W78-08637

EFFECTS ON TEMPERATURE ON HATCHING SUCCESS AND SURVIVAL OF LARVAE IN THE WHITE BASS,
Environmental Research Lab.-Duluth, MN.
J. H. McCormick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 098, Price codes: A02 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA-600/3-77-075, June 1977. 12 p, 2 tab, 19 ref.

Descriptors: *Water temperature, *Bioassay, Laboratory tests, Methodology, *Mortality, Fish eggs, *Fish reproduction, Bass, *White bass, Water pollution effects, *Thermal stress, *Thermal pollution, Thermal power, Larvae, Fish physiology, Embryonic growth stages.

To determine temperature effects of hatching of white bass (Morone chrysops) embryos, sample lots of fertilized eggs were exposed to 10 constant temperatures, 6 through 30C. Embryos exposed before gastrulation were more sensitive to extreme temperatures than those exposed after closure of the blastophore. The percentage of normal larvae hatched from embryos exposed before gastrulation was not significantly impaired over the temperature ranged 18-26C (P greater than 0.05). When first exposed after blastophore closure the range of temperatures allowing unimpaired hatching was extended to 14-26C (P greater than 0.05). Normal larvae hatched at 14-28C from embryos exposed before gastrulation and at 10-28C when exposed after blastop closure, but at the extremes in significantly reduced numbers (P less than 0.05). Hatching took place 4.5 days after fertilization when incubation at 14C and 1 day after fertilization at 26C. (EIS-Katz)
W78-08638

EFFECTS OF THERMAL DISCHARGES ON PHYSICO-CHEMICAL PROCESSES AND WATER QUALITY, VISTULA RIVER, POLAND,
Institute of Meteorology and Water Management, Warsaw (Poland).
J. Dojlida.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 804, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA-600/3-77-074a, June 1977. 161 p, 42 tab, 40 fig, 41 ref.

Descriptors: *Water temperature, *Thermal power plants, *Thermal pollution, Thermal water, *Thermal stress, Effluents, Water quality, On-site investigations, Thermal stratification, Dissolved oxygen, Nitrites, Sediments, *Vistula River, Poland, *Koezienice Power Plant(Poland), Thermal regime, Thermal plume, Field investigation.

A study on the influence of thermal water discharge from the Koezienice power plant on thermal regimes and water quality of the Vistula River was carried out between January 1973 and December 1975. Results of field survey of the thermal plume indicate that under non-extreme conditions of low flow and full capacity operation (1) the maximum stretch influence of heated water was 50 km and (2) theoretical models for estimation of average temperature of cross-sections downstreams are adequate. The influence of thermal water discharge on water quality was small and shown manly by decrease in dissolved oxygen and increase in nitrite concentration. Data are presented on effects on biochemical processes and size distribution of fine suspended sediments. Formula are developed to determine permissible river to temperature to meet dissolved oxygen criteria. (EIS-Katz)
W78-08639

EFFECTS OF MANGANESE AND THEIR MODIFICATION BY HEXAMETAPHOSPHATE,
Environmental Protection Agency, Cincinatti, OH.
R. J. Bull.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 264, Price codes: A03 in paper copy, A01 in microfiche. Environmental Health Effects Research Series, Report EPA 600/1-77-024, May 1977. 20 p, 2 tab, 5 fig, 23 ref.

Descriptors: *Manganese, *Public health, *Toxicity, Laboratory studies, Laboratory tests, Laboratory animals, *Potable water, *Water quality, Water pollution, Water pollution effects, Pathology, Biochemistry, *Dopamine, *Sodium hexametaphosphate, Corpus striata, Parkinson's disease.

The ability of oral Mn++ to produce the depletions of dopamine in corpus striata characteristic of the Parkinson-like syndrome in manganese workers was examined in rats. Mn++ failed to affect dopamine levels at concentrations of up to 2000 mg/liter of drinking water and six months of continuous exposure. A second objective of this work was to study the biological interactions between Mn++ and sodium hexametaphosphate ((NaPO3)6) administered simultaneously in drinking water. Some evidence was obtained that high concentrations of (NaPO3)6 depleted tissue Mn++ and produced decreased body weight gains over the experimental period. Similarly, Mn++ in high concentrations resulted in decreased growth of weanling animals. Stoichiometric combinations of Mn++ and ((NaPO3)6) prevented the decreased rate of growth produced by either agent alone. On the basis of these results, we conclude that Mn++ in drinking water presents little hazard in terms of central nervous system involvement in a homogeneous population. (EIS-Katz)
W78-08640

LABORATORY EVALUATION OF THE TOXICITY OF NITROCELLULOSE TO AQUATIC ORGANISMS,
E G and G, Bionomics, Wareham, MA.
R. E. Bentley, G. E. LeBlanc, T. A. Hollister, and B. H. Sleight, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 749, Price codes: A03 in paper copy, A01 in microfiche. Army Medical and Research Development Command, Washington, D.C. Contract No. DAMD-17-74-C-4101, Final Report September 1977. 33 p, 8 tab, 1 fig, 9 ref.

Descriptors: *Toxicity, *Bioassay, Mortalities, *Laboratory tests, Water pollution effects, Freshwater fish, Algae, Sediments, Aquatic insects, Water quality standards, Phytoplankton, Midges, Industrial wastes, *Selenastrum capricornutum, *Chironomids, Nitrocellulose, Munitions.

The acute toxicity of nitrocellulose was studied utilizing aquatic organisms representing several different trophic levels in aquatic ecosystems. No acutely toxic effects of nitrocellulose were observed among any of the fish, invertebrate or algal species tested except with the green alga Selenastrum capricornutum. Studies with sediments containing nitrocellulose indicated no adverse effects among chironomid populations exposed to 540 mg nitrocellulose/kg of sediment over two generations. Based on an application factor of 0.1 and an EC50 of 579 mg/l for the most sensitive aquatic organism tested (Selenastrum capricornutum), a water quality criteria of 50 mg/l is proposed for the protection of freshwater aquatic life. (EIS-Katz)
W78-08641

EFFLUENT MONITORING PROCEDURES: NUTRIENTS,
Environmental Protection Agency, Cincinnati, OH. Municipal Operations and Training Div.
For primary bibliographic entry see Field 5A.
W78-08642

ENVIRONMENTAL SAMPLING IN THE PANAMA CANAL ZONE,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.
For primary bibliographic entry see Field 5A.
W78-08643

REARING PACIFIC SALMON IN SALTWATER PONDS FERTILIZED WITH DOMESTIC WASTEWATER,
Humboldt State Univ., Arcata, CA.
G. W. Allen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 381, Price codes: A05 in paper copy, A01 in microfiche. Report HSU-SG-10, November 1976. 92 p, 39 tab, 24 fig, 19 ref.

Descriptors: *Salmon, *Aquiculture, *Sewage, *Methodology, Chinook salmon, Rainbow trout, Sockeye salmon, Coho salmon, Juvenile fish, Ponds, *California, Sewage disposal, *Sewage treatment, Sewage lagoons, Water quality, Mortality, Feeding habits, Growth rates, Saltwater ponds, *Humboldt Bay, Arcata, California.

Two 0.15-hectare ponds using mixtures of treated domestic wastewater and seawater were used to rear juvenile salmonids without supplemental feeding. Ponds are located within the periphery of an oxidation pond located on the north arm of Humboldt Bay, Humboldt County, Arcata, California. Forced air and surface spray systems of pond aeration and mixing of pond waters were employed to maintain water quality. Fingerling coho salmon (Oncorhynchus kisutch) and rainbow trout (Salmo gairdneri) were reared together using both ponds. Polyculture of coho and rainbow trout at about 5 fish per square meter planting density resulted in survival rates of 55-85% and a total fish production rate of about 200 kg/ha/yr in both ponds. Survival of chinook salmon was low due to an unusual loss of fry early in the experiment apparently from a combination of supersaturation of the blood with oxygen and/or high pH values. (EIS-Katz)
W78-08645

SENSITIVITY OF VERTEBRATE EMBRYOS TO BORON COMPOUNDS,
Kentucky Univ., Lexington. School of Biological Science.
W. S. Birge, and J. A. Black.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 085, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 560/1-71-008, April 1977. 66 p. 33 tab, 5 fig, 42 ref.

Descriptors: *Bioassay, Rainbow trout, Channel catfish, Amphibians, Frogs, Toads, Water pollution effects, *Toxicity, Mortality, *Boron, Laboratory tests, Freshwater fish, Birds, Methodology, *Boric acid, Leopard frog, Fowler's toads, LC50.

Developmental stages of rainbow trout, channel catfish, goldfish, leopard frog, and Fowler's toad were treated in a continuous flow system with boric and borax concentrations ranging from 0.001-300 ppm boron. Exposure was initiated subsequent to fertilization and maintained through 4 days posthatching, using water with hardness levels of 50 and 200 ppm CaC03. Expressed in ppm boron at 4 days posthatching, LC1 values for trout, catfish, and goldfish were 0.1, 0.5, and 0.6 for boric acid in soft water, 0.001, 0.2 for boric acid in hard water, 0.07, 5.5, and 1.4 for borax in soft water, and 0.07, 1.7, and 0.9 for borax in hard water. LC50 values in ppm for trout, catfish, and goldfish were 100, 155, and 46 for bric acid in soft water, 79, 22, and 75 for boric acid in hard water, 27, 155, and 65 for borax in soft water and 54, 71, and 59 for borax in hard water. The LC50 values for amphibian embryos and larvae ranged from 47 for borax in soft water to 145 for boric acid in soft water. By comparison, boron LC50 values for chick embryos, treated by yolk injection, were 1.0 and 0.5 ppm for boric acid and borax, respectively. (EIS-Katz)
W78-08647

POTENTIAL EFFECTS ON AQUATIC RESOURCES OF PROCESSING AND/OR CONVERSION OF IOWA COAL,
Iowa Cooperative Fishery Research Unit, Ames.
F. I. Barrett, and R. J. Muncy.
Available from the National Technical Information Service, Springfield, VA 22161 as IS-ICP-32, Price codes: A05 in paper copy, A01 in microfiche. Final Report to Fish and Wildlife Service, Report IS-ICP-32, Oct. 1976. 68 p, 1 tab.

Descriptors: *Iowa, *Coal, *Coal mines, *Coal mine wastes, Aquatic environment, Aquatic populations, Environmental effects, Trace elements, *Bibliographies, *Mineral industry, Mining.

A bibliographic research study (584 citations) was completed which is useful for those engaged in coal research, coal composition, conversion or processing or aquatic impact from coal processing. A purpose of the bibliography was to identify sources of information as to major and minor elements and compounds within and from coal. (EIS-Katz)
W78-08648

ECOSYSTEM PROCESSES AND ORGANIC CONTAMINANTS: RESEARCH NEEDS AND AN INTERDISCIPLINARY PERSPECTIVE,
Institute of Ecology, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08649

ON THE DYNAMICS OF EXPLOITED POPULATIONS OF TISBE HOLOTHURIAE (COPEPODA, HARPACTICOIDA),
Biologische Anstalt Helgoland, Hamburg (Germany, FR.). Lab. Suelldorf.
M. Hoppenheit.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol. 29, p 503-523, 1977. 32 ref, 8 fig, 8 tab.

Descriptors: *Copepods, *Cadmium, *Toxicity, Exploitation, *Aquatic populations, *Bioassay, *Aquatic animals, Water pollution effects, Environmental effects, Density, Metals, Laboratory tests, Mortality, Crustaceans, Plankton, Absorption, Tisbe, *Sublethal effects.

A total of 30 weekly exploited populations of the harpaticoid copepod Tisbe holothuriae were exposed to 148 or 222 micro g Cd++/l, combined with exploitation rates of 10, 30, 50, 70 or 90% under conditions of surplus food supply. During the observation period, most populations exhibited distinct U-shaped density trends. Addition of Cd++ prolonged and reinforced the downward trends present in the initial periods of the experiments. If population densities, both in control and test populations, fell short of a certain value, the age structures shifted in favour of the nauplii. More pronounced reductions in population densities of the test populations did not result in increased elevations of the nauplius fraction. Within 23 weeks (or 20 generations), the effect of Cd++ on population density was counteracted by an acclimation process. No relationship could be established between exploitation rate and observed effects. Erroneous assumptions on the adaptability of parametric methods had led to invalid statements on the dispersion of data published in previous papers in this series. These statements have been revised. Possible limitations of the significance of the results obtained are discussed in some detail. (EIS-Katz)
W78-08653

FISH CULTURE WITH GRADIENTS IN OXYGEN CONTENT EXPLOITING THEIR OWN RESPIRATORY CONSUMPTION (IN JAPANESE),
Kagoshima Univ. (Japan). Lab. of Fishing Technology.
T. Yonemori, and Y. Tanaka.
Memoirs of the Faculty of Fisheries, Kagoshima University, Vol. 26, p 173-178, 1977. 4 fig, 2 tab, 2 ref.

Descriptors: *Dissolved oxygen, *Oxygen, *Tilapia, *Respiration, *Aeration, *Growth rates, *Aquiculture, *Freshwater fish, Environmental effects, Fish physiology, Metabolism, Aerobic conditions, Fish management, Water quality.

In order to prepare groups of experimental fish for a further study on swimming power measurement, a 60 days culture using Tilapia mossambica was designed. The apparatus was composed of tanks, siphons, filters, and a submersible pump arranged to form a circulating system. Prior to the fish culture, a preliminary test without fish and aeration was executed and it was concluded that there was no oxygen dissolution into the system. The culturing test was carried out keeping a group of 25 Tilapia in each 200 l tank, and D.O. values for each tank were recorded daily. In this experimental culture, D.O. values for each tank were significantly ordered. According to the conclusion from the preliminary test, the differences in D.O. value between each tank were considered to be caused by their own respiratory consumption. Therefore, oxygen consumption for each group was calculated as follows: Group B: 168.3 ml/kg/hr at D.O. condition of 20 ml/l; Group C: 142.3 ml/kg/hr at D.O. condition of 1.2 ml/l; Group D: 108.1 ml/kg/hr at D.O. condition of 0.6 ml/l. Oxygen consumption for Group A may be calculated by setting a reservoir between the aerating tank and tank A. (EIS-Katz)
W78-08654

UPTAKE OF ORGANIC SUBSTRATES BY CYCLOTELLA CRYPTICA (BACILLARIOPHYCEAE): EFFECTS OF IONS, IONOPHORES AND METABOLIC AND TRANSPORT INHIBITORS,
Toronto Univ. (Ontario). Dept. of Botany.
J. A. Hellebust.
Journal of Phycology, Vol. 14, p 79-83, 1978. 3 tab, 1 fig, 30 ref.

Descriptors: *Diatoms, Biochemistry, *Metabolism, *Sodium chloride, *Ions, *Absorption, *Inhibitors, *Enzymes, *Mode of action, *Biological membranes, *Membrane processes, Salts, Inhibition, Aquatic microorganisms, Aquatic algae, Plankton, Nutrients, Carbohydrates, *Cyclotella, *Glucose uptake, *Metabolic inhibitors.

The uptake of glucose and amino acids by the euryhaline diatom Cyclotella cryptica does not appear to be related to proton gradients. Instead, the transport system for these organic solutes show a strong requirement for the presence of NaCl. The relationship between uptake and NaCl concentration is hyperbolic, with optimal uptake rates being approached at 100 mM NaCl. High concentrations of KCl cause strong reductions in uptake rates. The (Na+, K+)-stimulated ATPase inhibitor anabain has no effect on glucose uptake, whereas the diphenolic glucoside phlorizin and its aglucone phloretin are strongly inhibitory. The proton translocating uncoupler CCCP (carbonylcyanide m-chlorophenyl hydrazone) and the ATPase inhibitor DCCD(dicyclohexylcarbodiimide) both almost completely abolish glucose transport, and low concentrations of the ionospheres monensin and valenomycin strongly inhibit glucose uptake, by the diatom. The requirement of high external NaCl concentrations for glucose transport, and the inhibitory effect on transport of the Na+-specific ionophore monensin are consistent with a coupling of Na+ and organic substrate transport, but could

also be explained by a Na+ requirement for glucose binding to a transport carrier, and/or a possible interference with energy producing reactions associated with a monensin-induced collapse of the normal Na+ gradient. (EIS-Katz)
W78-08659

HEAVY METALS IN MUSSELS (MYTILUS GALLOPROVINCIALIS) FROM THE GULF OF LA SPEZIA AND FROM THE PROMONTORY OF PORTOFINO, ITALY,
Genoa Univ. (Italy). Inst. of General and Inorganic Chemistry.
R. Capelli, V. Contardi, B. Fassone, and G. Zanicchi.
Marine Chemistry, Vol 6, p 179-185, 1978. 12 ref. 3 tab, 2 fig.

Descriptors: *Mussels, *Heavy metals, *Cadmium, *Chromium, *Mercury, *Manganese, *Lead, *Zinc, *Path of Pollutants, Invertebrates, Mollusks, Shellfish, Absorption, Spectrophotometry, Metals, Water pollution effects, Bioindicators, Monitoring, Marine animals, Bioaccumulation, Tissue analysis, *La Spezia(Italy), *Promontory of Portofino(Italy).

In different samples of Mytilus galloprovincialis Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, and Zn were determined by AAS. The mussels were taken from 11 sites in the Port of La Spezia. Typical concentration ranges (micro g/g dry weight) were as follows: Cd, 2.0-6.8; Co, 0.8-3.2;, Cr, 5.8-19.5; Cu, 6.9-33.7; Hg, 0.15-0.38; Mn, 11.8-37.8; Ni, 1.3-10.9; Pb, 13.9-44.6; and Zn, 203-379. Other samples were collected at 4 sites on the Promontory of Portofino and the following values were obtained: Cd, 0.8-1.1; Co, 2.6-2.9; Cu, 3.3-4.2; Hg, 0.09-0.15; Mn, 6.3-9.1; Ni, 1.2-2.4; Zn, 120-140. (EIS-Katz)
W78-08661

A STUDY ON THE MERCURY CONTENT IN MUSCLES OF THE FISH FAMILY CARANGIDAE FROM THE FISHING GROUNDS OFF THE COAST OF NORTH-WEST AFRICA,
Institute of Marine Food Technology, Szczecin (Poland).
A. Chodyniecki, M. Kurpios, M. Protasowicki, and J. Babinska.
Acta Ichthyologica et Piscatoria, Vol 6, No 2, p 118-124, 1976. 3 tab, 9 ref.

Descriptors: *Mercury, *Absorption, *Marine fish, Weight, *Heavy metals, Path of pollutants, Metals, Fish, Commercial fish, Commercial fishing, Water pollution effects, Africa, Tissue analysis, *Trachurus, *Carangidae, Muscle tissue.

The mercury content in muscles was determined for 171 fishes belonging to three species of the family Carangidae. Significant differences in the content of this element were found between the species. Moreover, as regards the horse mackerel (Trachurus trachurus) no correlation was detected between the weight of fishes and the amount of mercury and no difference in the level of this element between males and females. (EIS-Katz)
W78-08662

AN ATTEMPT TO REAR RAINBOW TROUT (SALMO GAIRDNERI RICH., 1863) IN A TEMPERATURE CONTROLLED TANK,
Institute of Ichthyology, Szczecin (Poland). Dept. of Hydrozoology.
L. Szlauer, and Z. Piesik.
Acta Ichthyologica et Piscatoria, Vol 6, No 2, p 125-135, 1976. 7 ref, 3 tab, 1 fig.

Descriptors: *Rainbow trout, *Aquiculture, *Water temperature, *Mortality, *Oxygen, *Methodology, *Design, *Habitats, *Fish diseases, Trout, Sport fish, Salmonids, Fish farming, Temperature, Productivity, Seasonal, Thermal stress, Aquatic productivity, Fish management, Water quality.

Rainbow trout were kept for 1 year in a tank of 2.5 cubic capacity, protected from overheating in summer and heated in winter. No water change was applied during the culture period. The fisheries were cultured and showed good weight increments: the average weight of an 18-month old specimen was 193.3 g. (EIS-Katz)
W78-08663

AN EXPERIMENTAL APPROACH IN STUDYING THE INFLUENCE OF MERCURY ON A NORTH SEA COASTAL PLANKTON COMMUNITY,
Central Lab., TNO, Delft (Netherlands).
J. Kuiper.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol 30, p 652-665, 1977. 7 fig, 4 tab, 44 ref.

Descriptors: *Plankton, *Biological communities, *Mercury, *Water pollution effects, *Environmental effects, *Growth rates, On-site investigations, *Primary productivity, *Aquatic microorganisms, *Algae, *Sediments, Phytoplankton, Zooplankton, Laboratory tests, Productivity, Methodology, Monitoring, Diatoms, Copepods, Adsorption, Path of pollutants, Analytical techniques, *Plastic bag method.

The development of North Sea coastal plankton communities in four simultaneously filled plastic bags was followed for one month. To obtain a concentration of 5 ppb in the water phase a single dose of mercuric chloride was added to two of the bags. This addition had a close impact on the development of the phytoplankton, while that on the zooplankton and the decomposers was less clear. In the course of the experiment, methylation of the added mercury proceeded in the sediment in the bags. The 'plastic bag method' seems to be a suitable tool in toxicological research. (EIS-Katz)
W78-08664

HOMING OF MORPHOLINE-IMPRINTED BROWN TROUT, SALMO TRUTTA,
Wisconsin Univ.-Madison. Lab. of Limnology.
A. T. Scholz, J. C. Cooper, R. M. Horrall, and A. D. Hasler.
Fishery Bulletin, Vol. 76, No. 1, p 293-295, 1978. 1 fig, 2 tab, 8 ref.

Descriptors: *Brown trout, *Salmonids, *Fish behavior, *Spawning, *Odor, *Fish migration, *Trout, Migration, Life cycles, Fish reproduction, Fish establishment, Sport fish, Fish hatcheries, Animal behavior, *Homing Cues, *Morpholine.

Eighteen-month-old hatchery-raised brown trout were exposed to a synthetic chemical, morpholine, for 40 days and the stocked in Lake Michigan. During the spawning migration the fish homed to a simulated home stream which was scented with morpholine. Over 17% of the treated fish were recovered from the simulated home stream compared to 1% of a control group released with the treated fish. To locate the scented stream morpholine fish searched a distance of at least 13km. Since the life cycle of migratory brown trout is similar to that of coho salmon and rainbow trout, the study was conducted to determine if the odor imprinting could be extended to brown trout. (EIS-Katz)
W78-08665

ACCUMULATION OF POLYCHLORINATED BIPHENYLS IN THE COCKLE CERASTODERMA EDULE AND THE TELLIN MACOMA BALTHICA,
London Univ. (England). Dept. of Zoology.
W. J. Langston.
Marine Biology, Vol. 45, p 265-272, 1978. 22 ref, 3 fig, 3 tab.

Descriptors: *Arochlor, *Polychlorinated biphenyls, *Crustaceans, *Invertebrates, *Sea water, *Absorption, *Bioassay, *Chlorine, *Path of pollutants, *Chemical properties, *Mollusks, Chlorinated hydrocarbon pesticides, Monitoring, Laboratory tests, Halogens, Gas chromatography, Shellfish, *Cerastoderma, *Macoma, Bioaccumulation, *Cockles.

Two species of marine bivalve, Cerastoderma edule and Macoma balthica were exposed to particles contaminated with three commercial polychlorinated biphenyl (PCB) mixtures, Arochlors 1242, 1254, and 1260. The accumulation of PCB in bivalve tissue was monitored for periods of up to 40 days. In addition to measuring total PCB concentrations, which reached 60 ppm of Arochlor in M. balthica, the fate of individual PCB homologues of different chlorine content, ranging from 2 to 8 chlorine atoms per biphenyl molecule, was also determined. Selective accumulation of PCBs with 5 chlorine atoms per biphenyl molecule occurred, whilst isomers of very low and very high molecular weights were accumulated at much slower rates. (EIS-Katz)
W78-08666

REACTION OF ESTUARINE ECOSYSTEMS TO EFFLUENT FROM PULP AND PAPER INDUSTRY,
Aberdeen Univ. (Scotland). Dept. of Microbiology.
N. J. Poole, R. J. Parkes, and D. J. Wildish.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol. 30, p 622-632, 1977. 23 ref, 10 fig, 1 tab.

Descriptors: *Pulp wastes, Pulp and paper industry, *Estuaries, *Biodegradation, *Water pollution sources, *Oxygen demand, *Primary productivity, *Water pollution effects, *Light penetration, *Lignins, *Water temperature, Estuarine environment, Waste water pollution, Light, Cellulose, Effluents, Organic compounds, Sulfides, Sediments, Toxicity, Tidal waters, Impoundments, Seasonal, Aquatic microorganisms, Ecosystems, *L'Etang River(Canada), *Lignosulphonate.

A major problem associated with the discharge of pulp or paper-mill effluent into shallow estuarine ecosystems, such as the upper L'Etang in Canada or in the Don in Scotland, is the development of anoxic conditions in water column and sediment. The effluent modifies the balance, within the ecosystem, between the supply of, and demand for, oxygen. The lignosulphonate component of pulp-mill effluent blocks transmission of light energy to photosynthetic green plants. The oxygen demand is increased by the microbial degration of the additional organic matter in water and sediment. The addition of cellulose pulp fibre to he sediment also results in an increase in the concentration of their metabolic by-product, sulphide. The oxidation of sulphide exerts an additional oxygen demand on the system, which is an important factor in the development and maintenance of anoxic conditions. It is suggested that temperature is an important factor in controlling the release of sulphide from the sediment into the overlying water and in modifying the toxicity of sulphide towards the bacterial populations and, therefore, the capacity of the ecosystem to cope with the effluent. (EIS-Katz)
W78-08667

THE INVASTION OF ASIATIC CLAM, CORBICULA MANILENSIS IN THE NEW RIVER, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
J. H. Rodgers, Jr., D. S. Cherry, J. R. Clark, K. L. Dickson, and J. Cairns, Jr.
The Nautilus, Vol. 91(2), p 43-46, 2 tab, 10 ref, April 25, 1977.

Descriptors: *Virginia, *Mollusks, Freshwater, *Benthos, *Thermal power plants, Thermal water, *Clams, Water temperature, *Thermal pollution,

*Asiatic clam, Corbicula manilensis, *New River(Va), *Glen Lyn(Va), Coal fired generating plant(Va).

Corbicula manilensis appears to have successfully invaded the New River at Glen Lyn, Giles County, Virginia in 1975. Mean population densities of 18 Corbicula, m-2 were recovered downstream from a coal-fired generating plant while 29 individuals m-2 were found immediately upstream. This seems to be the present limit of Corbicula immigration in the New River as no speciments were taken from sampling sites farther upstream. (EIS-Katz)
W78-08668

EFFECTS OF ELEMENTAL PHOSPHORUS ON THE BIOTA OF YELLOW LAKE, PINE BLUFF ARSENAL, ARKANSAS, MARCH 1974 - JANUARY 1975,
Edgewood Arsenal, Aberdeen Proving Ground, MD. Ecological Research Office.
J. G. Pearson, E. S. Bender, D. H. Taormina, K. L. Manual, and P. F. Robinson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 925, Price codes: A06 in paper copy, A01 in microfiche. Technical Report EO-TR-76077, December 1976. 124 p, 39 tab, 23 fig, 56 ref.

Descriptors: *Water pollution effects, *Macroinvertebrates, *Arkansas, *Lakes, *Phosphorus, Oligochaetes, Limnology, Industrial wastes, *Aquatic environment, Aquatic population, Public health, Path of pollutants, Seasonal, Methodology, Data processing, *Elemental phosphorus, Macroinvertebrates, Species diversity, *Statistical analysis, Limnodrilus.

The effect of wastewaters contaminated with elemental phosphorus on the biota of a shallow lake was investigated during a year. The wastewaters were discharged from a white phosphorus munitions-filling facility at Pine Bluff Arsenal, Arkansas. Species abundance and distribution of benthic macroinvertebrates were affected by the concentration of elemental phosphorus in the water and sediments of a shallow Arkansas lake which received wastewater from a munitions filling operation. Samples were collected from 18 stations in a 200-acre lake for macroinvertebrate sediment analyses and water chemistry. From species diversity, cluster analysis, and the index of biotic similarity, seasonal and spatial patterns of macroinvertebrates distribution were identified and compared. (EIS-Katz)
W78-08669

VALIDITY OF LABORATORY TESTS FOR PREDICTING COPPER TOXICITY IN STREAMS,
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-08670

EFFECTS OF SUSPENDED SEDIMENT ON FISH EGGS AND LARVAE: A LABORATORY ASSESSMENT,
Envirosphere Co., Norcross, GA.
A. H. Auld, and J. R. Schubel.
Estuarine and Coastal Marine Science, Vol. 6, p 153-164, 1978. 1 fig, 11 tab, 17 ref.

Descriptors: *Suspended solids, *Sediment transport, *Sediment load, *Estuarine environment, *Fish eggs, *Larval growth stage, *Fish reproduction, *Mortality, *Toxicity, *Yellow perch, *Herring, *Striped bass, *Dredging, Sediments, Water pollution sources, Estuaries, Chesapeake Bay, *Shad.

Eggs and larvae of 6 species of anadromous and estuarine fish indigenous to the Chesapeake Bay were exposed to concentrations of suspended sediment ranging from a few mg 1-1 to 1000 mg 1-1 to determine the effects of different concentrations on hatching success and short term survival. The egg experiments indicated that concentrations of up to 1000 mg 1-1 did not significantly affect the hatching success of yellow perch, blueback herring, alewife or American shad eggs. Concentrations of 1000 mg 1-1 significantly reduced (P less than 0.05) the hatching success of white perch and striped bass, but lower concentrations did not. Experiments with larvae indicated that concentrations of greater than or equal to 500 mg 1-1 significantly reduced (P less than 0.05) the survival of striped bass and yellow perch larvae exposed for 48-96 h. American shad larvae appeared to be less tolerant than the other two species tested. Concentrations greater than or equal to 100 mg 1-1 significantly reduced the survival of shad larvae continuously exposed for 96 h. The significance of these results are discussed relative to natural and man-induced changes in sediment loading of estuaries. (EIS-Deal)
W78-08671

EFFECTS OF LOW TEMPERATURE ON THE SURVIVAL AND BEHAVIOR OF THREADFIN SHAD, DOROSOMA PETENENSE,
Oak Ridge National Lab., TN. Environmental Sciences Div.
J. S. Griffith.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p 63-70, 1978. 2 fig, 3 tab, 17 ref.

Descriptors: *Water temperature, *Mortality, *Toxicity, *Fish physicology, *Heat resistance, *Water cooling, *Thermal stress, *Fish behavior, *Entrainment, *Cold resistance, Ecology, Fish populations, *Threadfin shad, *Shad, *Dorosoma, *Impingement.

Laboratory studies assessed the effects of gradual and rapid decreases in temperature on 9-14-cm long threadfin shad collected from a tributary of the Tennessee River. Fish acclimated to 15C and exposed to temperatures cooling 1C each 72 hours decreased in feeding activity and schooled less compactly beginning at 9C. At lower temperatures they lost orientation and were insensitive to external stimuli, and none survived exposure to 4C. Threadfin shad exposed to sudden cooling (2 to 5C decreases in 4 hours) lost equilibrium in proportion on the magnitude of temperature decrease if minima of 4 to 6C were reached. Cold-shocked fish that had lost equilibrium of 0.2, 30, and 90 minutes before being returned to warmer water experienced mortalities of 32, 79, and 94%, respectively. (EIS-Deal)
W78-08672

SELECTIVE UPTAKE OF 55FE FROM SEAWATER BY ZOOPLANKTON,
Oregon Coll. of Education, Monmouth.
C. D. Jennings.
Marine Science Communications, Vol. 4, No. 1, p 49-58, 1978. 1 tab, 13 ref.

Descriptors: *Iron, *Absorption, *Zooplankton, *Plankton, *Metabolism, *Stable isotopes, *Radioisotopes, *Radioecology, *Diatoms, Ecosystems, Sea water, Pacific Ocean, *Selective absorption.

Iron-55 was measured in water and mixed zooplankton collected in the South Pacific Ocean. The ratios of the specific activity of 55Fe (pCi/g Fe) between plankton and water from the same locations appear to be about 100, which suggests that zooplankton took up 55Fe in preference to stable iron in the South Pacific Ocean. (EIS-Deal)
W78-08673

INTERACTIONS OF TOXAPHENE AND VITAMIN C IN CHANNEL CATFISH,
Fish and Wildlife Service, Columiba, MO. National Fisheries Research Lab.
F. L. Mayer, P. M. Mehrle, and P. L. Crutcher.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 326-333, 1978. 2 fig, 5 tab, 47 ref.

Descriptors: *Fish physiology, *Channel catfish, *Organic pesticides, *Vitamins, Biochemistry, Metabolism, Nutrient requirements, Catfishes, Organic compounds, Chlorinated hydrocarbon pesticides, Environmental effects, *Vitamin C, *Toxaphene, Bioaccumulation, Tissue analysis, Bone tissue, Histology, Detoxification.

The involvement of vitamin C as a cofactor in detoxification mechanisms of fish was investigated by feeding selected amounts of the vitamin in diets of fingerling channel catfish (Ictalurus punctatus) that were concurrently exposed to toxaphene. After 150 days of toxaphene exposure, backbone collagen was significantly decreased in fish fed diets containing 63 mg/kg of vitamin C. Spinal deformities were common among fish fed low vitamin C diets, but the incidence decreased as dietary vitamin C increased. Vitamin C concentrations in the backbone of toxaphene-exposed fish were significantly lower than in controls, suggesting that the insecticide caused a functional vitamin C deficiency in bone tissue. Effects of vitamin C and toxaphene interactions concerning mucous cell number, epidermal thickness, growth, bone development, and skin lesions were discussed. (EIS-Klein)
W78-08674

THE PREFERRED TEMPERATURES OF THE BROWN BULLHEAD, ICTALURUS NEBULOSUS, WITH PREFERENCE TO ITS ORIENTATION TO THE DISCHARGE CANAL OF A NUCLEAR POWER PLANT,
Ecological Analysts, Inc., Melville, NY.
F. P. Richards, and R. M. Ibara.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 288-294, 1978. 2 fig, 1 tab, 20 ref.

Descriptors: *Bullheads, *Water temperature, Thermal water, *Thermal stress, Catfishes, *Heated water, Fish behavior, Water quality, *Thermal pollution, Temperature, Discharge(Water), Environmental effects, Nuclear powerplants, *Brown bullhead.

Brown bullheads acclimated to temperatures between 3.5 and 28C and tested in a thermal gradient trough usually preferred water temperatures above their respective acclimation temperatures. Fish tended to gravitate toward higher temperatures the longer they remained in the gradient; final preferendum was 27.3C. Laboratory results were consistent with observed movements of Connecticut River brown bullheads into thermal discharge canal of a power plant during autumn. It appeared from both laboratory and field studies that a 'temperature trap' kept bullheads in the warm discharge canal during winter. However, brown bullheads left the canal in spring sooner than was predicted from temperature preference data alone. (EIS-Klein)
W78-08675

A TEMPERATURE ALGORITHM FOR MODIFYING BIOLOGICAL RATES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
K. W. Thornton, and A. S. Lessem.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 284-287, 1978. 4 fig, 1 tab, 14 ref.

Descriptors: *Water temperature, *Equations, Fish physiology, Mortality, Growth rates, Respiration, Research and development, Mathematical studies, Temperature, Metabolism, Methodology, *Algorithms, Biologica rates, Logistic equations.

An algorithm for modifying biological rates as a function of temperature was developed using the basic form of the logistic equation. Versions of this basic equation were used to modify growth,

respiration, and mortality rates as a function of four characteristic temperatures. (EIS-Katz)
W78-08676

SEASONAL LARVAL FISH ABUNDANCE IN WATERS OFF DIABLO CANYON, CALIFORNIA,
Pacific Gas and Electric Co., San Ramon, CA. Dept. of Engineering Research.
J. W. Icanberry, and J. W. Warrick.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 225-233, 1978. 2 fig, 1 tab, 43 ref.

Descriptors: *Growth stages, *Fish population, *Marine fish, *Seasonal, Fish eggs, Larvae, Productivity, Density, Sampling, Biomass, *California, Fish reproduction, Life cycles, Nuclear powerplants, Littoral, Systematics, Speciation, Coasts, Community development, Species composition, *Diablo Canyon(Calif).

A 15-month study was conducted to describe the seasonal changes of total larval fish densities, fish eggs densities, and species composition in the nearshore marine environment of Diablo Canyon, San Luis Obispo County, California. Samples were collected at an inshore and offshore station located 300 n and 1,500 m southwest of the seaward perimeter of Diablo Cove, respectively. There were no statistical differences in total larval fish densities and total fish egg densities between inshore and offshore stations. Statistical differences were found in two of the six most abundant taxa, Artedius spp. (greater densities found inshore) and Stenobrachius leucopsarus (greater densities present offshore). The greatest larval fish densities occurred January to March 1975. A peak fish egg density occurred in September 1975. A comparison of day and night hauls resulted in no statistically significant differences in densities or lengths of larval Sebastes spp. (EIS-Klein)
W78-08678

TOXICITY OF SILVER TO RAINBOW TROUT (SALMO GAIRDNERI),
Colorado Div. of Wildlife, Fort Collins. Research Center.
P. H. Davies, J. P. Goettl, Jr., and J. R. Sinley.
Water Research, Vol. 2, p 113-117, 1978. 2 fig, 4 tab, 17 ref.

Descriptors: *Salmonids, *Trout, *Rainbow trout, *Metals, *Toxicity, Growth stages, Fry, Fish reproduction, Spawning, Lethal limit, Water quality, Fish behavior, Growth rates, Mortality, Hardness(Water), Water properties, Environmental effects, Fish physiology, *Silver, Bioaccumulation.

The mean 96-h LC50's of silver with rainbow trout were 6.5 micrograms/liter and 13.0 micrograms/liter in soft and hard water, respectively. The long-term no effect concentration of silver added to water as silver nitrate was between 0.09 and 0.17 micrograms/liter after 18 months exposure in soft water. No mortalities occurred at 0.09 micrograms/liter, whereas 17.2% mortality occurred to fish exposed to 0.17 micrograms/liter. The no effect concentration did not reflect possible effects of silver on spawning behavior or reproductions. At concentrations of 0.17 micrograms/liter or greater, silver caused premature hatching of eggs and reduced growth rate in fry. The prematurely erupted fry were not well developed and frequently died. The growth rate of surviving fry was greatly reduced. (EIS-Klein)
W78-08679

CHRONIC TOXICITY OF HYDROGEN CYANIDE TO THE BLUEGILL,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
G. L. Kimball, L. L. Smith, Jr., and G. J. Broderius.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 341-345, 1978. 2 tab, 17 ref.

Descriptors: *Toxicity, *Elements(Chemical), Fish physiology, Life cycles, Growth stages, Fish eggs, Fry, Fish reproduction, Resistance, Environmental effects, Fish behavior, Laboratory tests, Water quality, Bioassay, *Hydrogen cyanide, *Cyanide, *Bluegill, Lepomis macrochirus, Survival.

The bluegill, Lepomis macrochirus, was subjected to various concentrations of hydrogen cyanide to determine the effects on long-term survival, growth, egg production, and egg hatchability. Intermittent-flow experiments were conducted using adults, juveniles, and newly hatched eggs in separate tests. Egg production was most sensitive to hydrogen cyanide, and the highest concentration with no adverse effects was below 5.2 micrograms/liter HCN. Fry survival through the first 6 weeks followed in sensitivity with the no-adverse-effect level occurring between 15.6 and 19.4 micrograms/liter HCN. (EIS-Klein)
W78-08680

THE EFFECTS OF VEGETATION REMOVAL BY GRASS CARP ON WATER CHEMISTRY AND PHYTOPLANKTON IN INDIANA PONDS,
Purdue Univ., Lafayette, IN. Dept. of Botany and Plant Pathology.
C. A. Lembi.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p 161-171, 1978. 1 fig, 6 tab, 29 ref.

Descriptors: *Phytoplankton, *Dissolved oxygen, *Carp, *Nutrients, *Potassium, *Dinoflagellates, *Phosphorus, *Nitrogen, *Herbivores, *Food chains, *Trophic level, *Biocontrol, *Eutrophication, Water chemistry, Water quality, Ecosystems, *Indiana, Ctenopharyngodon.

Water quality parameters and phytoplankton in ponds stocked with grass carp, Ctenopharyngodon idella (test ponds) and in control ponds were compared during the summers of 1975 and 1976. Grass carp rapidly consumed available aquatic vascular plants. Dissolved oxygen levels in test ponds remained high as long as bottom growths of the filamentous green alga, Spirogyra sp. were present, but consumption of this alga in addition to vascular vegetation led to significantly lower dissolved oxygen concentrations in the water directly above the sediments. The most consistently affected parameters were turbidity and potassium concentrations, both of which were significantly higher in test ponds. Phytoplankton populations consisting primarily of dinoflagellates were not affected by grass carp introduction. As much as 54% of the phosphorus and 42% of the nitrogen released by consumption of plants were incorporated into new fish tissue. Most of the phosphorus not taken up by the fish was sequestered into components other than water or phytoplankton. Estimated potassium incorporation into fish tissue was low (2.5% or less), and recovery in water was approximately 2- to 6-fold higher than phosphorus. Potassium in the water appeared to be an excellent indicator of vegetation consumption by grass carp. (EIS-Deal)
W78-08681

THE EFFECT OF METHYL PARATHION ON PREDATOR CHOICE OF TWO ESTUARINE PREY SPECIES,
University of West Florida, Pensacola. Faculty of Biology.
J. A. Farr.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p 87-91, 1978. 3 fig, 2 tab, 26 ref.

Descriptors: *Fish behavior, *Pesticide toxicity, *Animal behavior, *Killifishes, *Fundulus species, *Predation, *Minnows, *Shrimp, *Insecticides, *Organophosphorous pesticides, *Toxicity, *Prey fish, Path of pollutants, Water pollution effects, *Methyl parathion, *Parathion, Sub-lethal effects, Species diversity.

Fundulus grandis, the gulf killifish, was provided a prey choice of grass shrimp, Palaemonetes pugio, and juvenile sheepshead minnows, Cyprinodon variegatus. Fundulus grandis consumed a greater proportion of grass shrimp when both prey species were exposed to the pesticide methyl parathion when prey were not exposed. The relative number of shrimp eaten increased with the concentration of methyl parathion. Such an effect in an estuary could result in altered species composition and species diversity. (EIS-Deal)
W78-08682

FIELD AND LABORATORY AVOIDANCE REACTIONS BY BLUE CRABS (CALLINECTES SAPIDUS) TO STORM WATER RUNOFF,
Florida State Univ., Tallahassee. Dept. of Biological Science.
R. A. Laughlin, C. R. Cripe, and R. J. Livingston.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p 78-86, 1978. 2 fig, 4 tab, 27 ref.

Descriptors: *Crabs, *Animal behavior, *Hydrogen ion concentration, *Acidic water, Clear-cutting, Lumbering, Runoff, *Storm runoff, *Acidity, *Juvenile growth stage, Crustaceans, Water pollution sources, Water pollution effects, *Avoidance reactions, *Blue Crabs, *Callinectes.

A combined field and laboratory study was conducted to determine the avoidance reactions of blue crabs to highly colored, acidic runoff from clear-cut timber areas above a productive north Florida estuary. Blue crabs of two age groups showed marked laboratory avoidance of runoff (pH4.6, 5.8) and of test water with experimentally reduced pH. Within the pH range 4.5-7.0, there was an inverse relationship between pH and avoidance. Water color appeared to play a minor role in the avoidance reactions. Field data gave divergent results. Small crabs were abundant in areas characterized by pH levels strongly avoided under laboratory conditions. Large crabs, however, were conspicuously absent from such areas in the field, indicating possible avoidance. Factors other than pH were thought to be functional in the field distribution of the crabs. This study indicates that laboratory experiments without associated field studies may cause misleading results if they are applied to a determination of impact criteria. (EIS-Deal)
W78-08683

ACUTE TOXICITY AT ANNACIS ISLAND PRIMARY SEWAGE TREATMENT PLANT,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
J. A. Servizi, D. W. Martens, and R. W. Gordon.
Progress Report No. 38, 1978. 12 p, 3 tab, 13 ref.

Descriptors: *Toxicity, Mortality, Bioassay, *Sockeye salmon, Juvenile fish, *Sewage chlorination, Chlorine, Laboratory tests, Water pollution effects, *Sewage disposal, *Sewage effluents, Nitrites, Metals, Surfactants, Ammonia, *Canada, Vancouver, British Columbia, *Dechlorinated primary sewage, Oncorhynchus.

Continuous flow and static bioassays of dechlorinated primary sewage were conducted at Annacis Island sewage plant using fingerling sockeye salmon (Oncorhynchus nerka). Geometric mean survival time (GMST) was determined using undiluted effluent and survival during 96 hr exposure to a range of dilutions was measured. Acute toxicity was greater during continuous flow than during static bioassays. In addition, acute toxicity was greater during dry weather than during wet weather flow conditions. Mortalities were usually 100% during bioassays of 65% v/v dechlorinated sewage but no mortalities occurred at 10% v/v. Results were compared with acute toxicities measured at three other primary sewage treatment plants in the Greater Vancouver Sewerage and Drainage District, plus primary plants in San Francisco and Seattle. Summation of toxic units at-

tributed to anionic surfactants, un-ionized ammonia, cyanide, nitrite and metals measured failed to account for all the acute toxicity measured. (EIS-Katz)
W78-08684

MERCURY FEEDING SCHEDULES: EFFECTS ON ACCUMULATION, RETENTION AND BEHAVIOR IN TROUT,
Idaho State Univ., Pocatello. Det. of Psychology.
A. M. Hartman.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 369-375, 1978. 4 tab, 16 ref.

Descriptors: *Salmonids, *Mercury, *Fish physiology, *Rainbow trout, Bioassay, Path of pollutants, Fish behavior, Metabolism, Analytical techniques, Toxicity, Feeds, *Bioaccumulation, Feeding schedules, Tissue analysis, *Ceresan, Ethyl-mercury.

Rainbow trout were exposed to 0.5 and 2.0 micrograms/g doses of ethyl-mercury 'Ceresan' daily for one year and 2.5 and 10 micrograms/g doses delivered every 5th day of feeding during the year. In another study, dose levels from 5.0 to 25.0 micrograms/g Ceresan were administered. At the lower doses, mercury concentrations in muscle were similar to the average daily index of dose for 6 months. At 9 months the concentration showed a breakdown of the effect in all groups except for the group fed the lowest mercury concentration. Both dose level and scheduling influenced the mercury concentration in muscle. At the higher concentrations, the muscle mercury concentration was dose related. Beyond performance on the learning task, there was no evidence of impairment of general behavior nor any indication of physical debilitation. Loss of mercury from the tissues appeared to be fairly rapid. (EIS-Klein)
W78-08685

AN ASSESSMENT OF SAMPLING MORTALITY OF LARVAL FISHES,
Nebraska Univ., Lincoln. School of Life Sciences.
G. F. Cada, and G. L. Hergenrader.
Transactions of the American Fisheries Society, Vol. 107, p 269-274, 1978. 2 fig, 3 tab, 9 ref.

Descriptors: *Nuclear powerplants, *Mortality, *Larval growth stage, Freshwater fish, Growth stages, Methodology, Productivity, Population, Equations, Toxicity, Sampling, Data collections, Water pollution sources, Aquatic life, Discharge(Water), *Missouri River, Effluents, Plankton.

High mortalities of larval fishes were observed not only in the discharge collections of two nuclear power plants on the Missouri River but also in control samples taken upriver from the plants where no entrainment effects were possible. Therefore, entrainment mortality generally could not be demonstrated. A technique was developed which indicated that a significant portion of the observed mortality above the power plants was the result of net-induced sampling mortality, and a direct relationship existed between observed mortality and water velocity in the nets when sampling at the control sites, which was described by linear regression equations. When these equations were subsequently used to remove the effects of wide differences in sampling velocities between control and discharge collections, significant entrainment mortality was noted in all cases. The equations were also used to derive estimates of the natural mortality of ichthyoplankton in this portion of the Missouri River.
W78-08686

PARALYTIC TOXINS IN THE DINOFLAGELLATE GONYAULAX EXCAVATA AND IN SHELLFISH,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
A. W. White, and L. Maranda.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 397-402, 1978. 2 fig, 3 tab, 23 ref.

Descriptors: *Toxins, *Algal toxins, *Dinoflagellates, *Bioassay, *Fluorometry, *Animal physiology, *Shellfish, *Growth rates, *Mussels, *Clams, Chemical analysis, Biochemistry, *Gonyaulax, *Mya, *Modiolus, *Saxitoxin.

Paralytic toxins were examined quantitatively in a culture of Gonyaulax excavata and in shellfish by the standard mouse bioassay and by an alkaline peroxide oxidation-fluorometric assay for saxitoxin (STX). The dinoflagellate probably contains at least three toxins, including STX, which represents 3-20% of the total toxin load. In toxic shellfish from nature and in shellfish fed G. excavata under controlled conditions the relative amounts of toxins differed from those in G. excavata, suggesting toxin interconversions and interferences with the chemical assay by other toxins than STX. The consistency in the relationships between bioassay and chemical assay results for clam samples was fair, although the chemical assay measured from 16 to 48% of the bioassay. The chemical assay is questionable as an indicator of total toxin content, and unitl further data ae accumulated the mouse bioassay is considered more reliable for measuring paralytic, G. excavata toxins in shellfish.
W78-08687

POLAROGRAPHIC STUDIES OF THE NATURE OF CADMIUM IN SCALLOP, OYSTER, AND LOBSTER,
Fisheries and Marine Service, halifax (Nova Scotia).
For primary bibliographic entry see Field 5A.
W78-08688

PH-INDUCED CHANGES IN BLOOD LEAD OF LEAD-EXPOSED RAINBOW TROUT (SALMO GAIRDNERI),
Canada Centre for Inland Waters, Burlington (Ontario).
P. V. Hodson, B. R. Blunt, and D. J. Spry.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 437-445, 1978. 5 fig, 1 tab, 17 ref.

Descriptors: *Hydrogen ion concentration, *Rainbow trout, *Lead, *Toxicity, *Fish physiology, *Animal metabolism, *Juvenile growth stage, *Absorption, Water chemistry, *Mortality, *Biological membranes, Permeability, *Membrane processes, *Equilibrium, Path of pollutants, Water pollution effects, Blood, *Bioaccumulation, Tissue analysis.

Blood of juvenile rainbow trout exposed to lead in water showed increasing lead concentrations as pH of the test water decreased from 10.0 to 6.0. A decrease in pH by 1.0 unit from any reference pH resulted in an increase of blood lead by a factor of 2.1. Since sublethal lead toxicity in related to uptake, these results suggest that toxicity increases as pH decreases. Control experiments indicated that reactions of lead with inorganic constituents of the test water were complete within 3 h and that blood lead was at equilibrium with water lead within 48-hr. Therefore, at the time of the blood sampling in the pH experiment, both lead complexation processes in the exposure system, plus lead uptake and release from the blood, were at equilibrium. (EIS-Deal)
W78-08689

TISSUE UPTAKE, SUBCELLULAR DISTRIBUTION, AND METABOLISM OF 14CH3HGCL AND CH3(203)HGCL BY RAINBOW TROUT, SALMO GAIRDNERI,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Physiology.
K. R. Olson, K. S. Squibb, and R. J. Cousins.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 4, p 381-390, 1978. 2 fig, 5 tab, 46 ref.

Descriptors: *Absorption, *Mercury, *Tracers, *Rainbow trout, *Cytological studies, *Proteins, *Enzymes, *Fish physiology, *Animal metabolism, *Radioactivity techniques, *Biochemistry, Path of pollutants, Chromatography, *Methylmercury, Gills, *Tissue analysis, *Bioaccumulation, *Inorganic mercury, *Metallothionein, *Detoxification.

Uptake, whole tissue, and subcellular distribution of methylmercury (MeHg) by rainbow trout was studied during, and in three-2-wk intervals following a single 24-h exposure to 14CH3HgCl and CH3(203)HgCl. Gills contained approximately 10 times as much MeHg as any other tissue after 24-hr exposure whereas concentrations were lowest for brain and skeletal muscle. In the 2-wk period following exposure, gill MeHg concentrations decreased to levels comparable with most other tissues. Methylmercury in most other tissues increased and then decreased during the subsequent 4-wk period. Methylmercury levels in brain, skeletal muscle, and gonad were highest at 6 wk. During the 6-wk interval following MeHg exposure, the percent mercury as inorganic mercury (Hg++) increased in gill, kidney, and liver, and to a lesser extent in all other tissues except skeletal muscle. (EIS-Deal)
W78-08690

UTILIZATION OF SWINE MANURE IN A POLYCULTURE OF ASIAN AND NORTH AMERICAN FISHES,
Illinois Natural History Survey, Kinmundy.
D. H. Buck, R. J. Baur, and C. R. Rose.
Transactions of the American Fishereis Society, Vol. 107, No. 1, p 216-222, 1978. 6 tab, 16 ref.

Descriptors: *Aquiculture, *Farm wastes, *Carp, *Channel catfish, *Biochemical oxygen demand, *Domestic animals, *Bass, *Dissolved oxygen, *Recycling, Farm lagoons, *Phytoplankton, *Nutrients, *Waste disposal, Freshwater fish, Water quality, Ecosystems, Food chains, Eutrophication, *Chinese Fish Culture System.

Chinese methods of fish culture were evaluated for potential use in animal waste management, pollution control, and the production of protein. Two ponds were stocked with grass carp, silver carp, northern largemouth bass, channel catfish, and the hybrid of bigmouth buffalo female, and black buffalo male. One pond (0.127 hectare) received the total wastes from five growing pigs (about 39 pigs/hectare of water area), the other pond (0.121 hectare) received the wastes from eight pigs (66 pigs/hectare). Two consecutive lots of pigs were fattened during the study. Over a fish-growing period of about 170 days the net increments in fish biomass were 2,971 kg/hectare in the 0.127-hectare pond and 3,834 kg/hectare in the 0.121-hectare pond. A beneficial influence by the fish on water quality was indicated by continuously adequate levels of dissolved oxygen, and final biochemical oxygen demands in the range of 8-12 mg/liter. (EIS-Deal)
W78-08694

TOXICITY AND BIOACCUMULATION OF CADMIUM AND LEAD IN AQUATIC INVERTEBRATES,
Environmental Research Lab.-Duluth, MN.
R. L. Spehar, R. L. Anderson, and J. T. Fiandt.
Environmental Pollution, Vol. 15, p 195-208, 1978. 7 fig, 1 tab, 32 ref.

Descriptors: *Toxicity, *Absorption, *Cadmium, *Lead, *Metals, *Invertebrates, Aquatic animals, Insects, Aquatic insects, Snails, Gastropods, Mayflies, Amphipoda, Aquatic life, Metabolism, Animal physiology, Lethal limit, Heavy metals, Water quality, Mortality, Analytical techniques, Animal behavior, Life cycles, *Bioaccumulation.

Cadmium toxicity and lead toxicity to four species of insects (Pternoarcys dorsata, Hydropsyche betteni, Brachycentrus sp. and Ephemerella sp.), one snail (Physaintegra) and one amphipod (Gammarus pseudolimnaeus) were determined during 28-day exposures. The 28-day LC50 values for cadmium-exposed snails and lead-exposed amphipods were eleven and four times lower than the 7- and 4-day (96 h) values for these metals, respectively. Lowest effect concentrations obtained after 28 days for cadmium-exposed mayflies (Ephemerella sp.) and snails and lead-exposed amphipods were similar to those affecting fish exposed over their complete life cycle in water of similar quality. Lethal threshold concentrations were not observed for species exposed to either metal, indicating that possible effects could occur at lower concentrations during longer exposure periods. Cadmium and lead concentrations in the animals tested generally increased with increasing water concentrations and were up to 30,000 and 9000 times greater than corresponding metal concentrations in the water. (EIS-Klein)
W78-08695

ACUTE TOXICITY OF AMMONIA AND NITRITE TO CUTTHROAT TROUT FRY,
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
R. V. Thurston, and R. C. Russo.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 361-368, 1978. 6 fig, 3 tab, 35 ref.

Descriptors: *Toxicity, *Salmonids, *Trout, *Cutthroat trout, *Ammonia, *Nitrites, Lethal limit, Fry, Fish physiology, Nitrogen compounds, Bioassay, Rainbow trout, Analytical techniques, Bioaccumulation, Tissue analysis.

The toxicity of ammonia and of nitrite was tested on cutthroat trout (Salmo clarki) fry for periods up to a month in flow-through bioassays. Median lethal concentration (LC50) values for ammonia were 0.5-0.8 (mg/l-NH3) for 96 h and 0.3-0.6 for 36 days. Nitrite LC50 values (mg/l-NO2-N) were 0.5-0.6 for 96 h, and 0.4 for 36 days. Tissues of fish exposed for 29 days to 0.34 mg/l NH3, evidenced degenerative changes in gills, kidneys, and livers. Cutthroat trout fry were comparable to rainbow trout (S. gairdneri) fry in their susceptibility to acute toxicity from aqueous ammonia and nitrite. (EIS-Klein)
W78-08696

TOLERANCES OF FISHES TO DISSOLVED GAS SUPERSATURATION IN DEEP TANK BIOASSAYS,
Battelle, Pacific Northwest Lab., Richland, WA.
D. H. Fickeisen, and J. C. Montgomery.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 376-381, 1978. 5 fig, 1 tab, 5 ref.

Descriptors: *Toxicity, *Supersaturation, *Fish physiology, *Gases, Mortality, Fish diseases, Freshwater fish, Suckers, Cutthroat trout, Hydrostatic pressure, Compressibility, Water pressure, Water properties, Resistence, Water quality, Bioassay, Sculpins, *Dissolved gases, Mountain whitefish, Largescale sucker, Torrent sculpin, Gas bubble disease.

Four species of fish were tested for tolerance to dissolved atmospheric gas supersaturation in 10-day bioassays. Based on median times to death at four levels of gas saturation, the fish displayed the following increased order of tolerance: mountain whitefish (Prosopium williamsoi) less than cutthroat trout (Salmo clarki) less than largescale sucker (Catostomus machrocheilus) less than torrent sculpin (Cottus rhotheus). Increasing hydrostatic pressure due to water depth reduced the levels of saturation of dissolved gases and increased survival. Torrent sculpins typically developed large bubbles of gas which caused them to float and would contribute indirectly to death. (EIS-Klein)
W78-08697

CHRONIC EFFECTS OF CADMIUM AND ZINC MIXTURES ON FLAGFISH (JORDANELLA FLORIDAE),
Environmental Research Lab., Duluth, MN.
R. L. Spehar, E. N. Leonard, and D. L. DeFoe.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 354-360, 1978. 2 fig, 2 tab, 26 ref.

Descriptors: *Metals, *Toxicity, *Cadmium, *Zinc, Lake Superior, Freshwater fish, Resistence, Life cycles, Lethal limit, Mode of action, Water quality, Mortality, Laboratory tests, Environmental effects, Bioassay, *Flagfish, *Bioaccumulation, Jordanella floridae, Synergistic effects.

Flagfish were exposed to cadmium and zinc as individual metals and as mixtures (4.3-8.5 micrograms Cd/liter and 73.4-139 micrograms Zn/liter) through one complete life cycle in Lake Superior water (45 mg/liter total hardness). Cadmium and zinc did not act additively at sublethal concentrations when combined as mixtures; however, a joint action of the toxicants was indicated. Effects on survival showed that the toxicity of cadmium and zinc mixtures was little if any greater than the toxicity of zinc alone. Mechanisms of zinc toxicity in this test were similar to those in previous chronic tests of individual metals, indicating that the presence of cadmium did not influence the mode of action of zinc. Comparisons between metal residues in fish exposed to each individual metal or to the metal mixtures showed that the uptake of one metal was not influenced by the presence of the other. (EIS-Klein)
W78-08698

FACTORS AFFECTING METHYL AND INORGANIC MERCURY DYNAMICS IN MUSSELS AND SHRIMP,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
S. W. Fowler, M. Heyraud, and J. La Rosa.
Marine Biology, Vol. 46, p 267-276, 1978. 5 fig, 5 tab, 26 ref.

Descriptors: *Mussels, *Shrimp, *Mercury, *Metals, Bioassay, Radiochemical techniques, Invertebrates, Mollusks, Metabolism, Absorption, Laboratory tests, Benthic fauna, Analytical techniques, *Methyl mercury, *Bioaccumulation, *Tissue analysis, Elimination, Lysmata seticaudata, Mytilus galloprovincialis.

Radiotracer experiments were designed to study the effect of certain factors on the accumulation and loss of methyl mercury in mussels and benthic shrimp. Methyl mercury was accumulated from both food and water to a greater degree than inorganic mercury by both mussels and benthic shrimp. Smaller mussels tended to concentrate more mercury than larger individuals. Greater mercury accumulation and more rapid elimination at higher temperatures was noted for mussels. Methyl mercury residues were eliminated by both species more slowly than those of the inorganic form. Enhanced methyl mercury elimination was noted for the group of mussels maintained in their natural environment as compared with those held in the laboratory. (EIS-Klein)
W78-08699

EFFECTS OF WATER-SOLUBLE OIL FRACTIONS ON METABOLISM, GROWTH AND CARBON BUDGET OF THE SHRIMP CRANGON CRANGON,
Marine Lab., Aberdeen (Scotland)
R. R. C. Edwards.
Marine Biology, Vol 46, p 259-265, 1978. 5 fig, 2 tab, 18 ref.

Descriptors: *Shrimp, *Oil, *Toxicity, *Organic compounds, Invertebrates, Animal physiology, Metabolism, Respiration, Growth rates, Carbon, Water temperature, Mortality, Analytical techniques, Bioassay, *Crangon crangon, *Water-soluble Oil Fractions, Carbon budget, Crude oil, Bioaccumulation.

Juvenile shrimp, Crangon crangon L., were maintained in water-soluble crude oil fractions at 10, 15, and 20C. During chronic exposure to oil fractions, a reduction in respiration and growth rate occurred which was related to strength of the extract. Mortality increased with strength of oil fraction and was highest at 20C. Calculation of carbon budgets indicated that the extract reduced net carbon turnover at each temperature. Physiological consequences resulting from exposure to the oil fraction were discussed. (EIS - Klein)
W78-08700

ARE ALGAE TOXIC TO HONEY BEES,
Agricultural Research Service, Tucson, AZ.
R. J. Barker.
Journal of the Arizona Academy of Science, Vol 12, No 2, p 84-85, June, 1977. 10 ref.

Descriptors: *Bees, *Insect resistance, Cyanophyta, *Algal poisoning, *Algal toxins, Anabaena, Analytical techniques, Testing procedures, Laboratory tests, Arizona, Sonoran Desert.

Previous water studies have attributed deaths of honey bees, Apis mellifera L., to poisoning by toxic algae. Under controlled conditions, this laboratory experiment evaluated the effect of feeding certain forms of algae to honey bees. Findings indicated A. flos-aquae toxin and plant scum, from pond water in the Sonoran Desert containing other algae, did not harm bees even when they were fed 10,000 mg/kg. Tolerance shown by bees to toxins of A. flos-aquae might permit bees to transport algal toxins from ponds to the honey comb, possibly leading to the accumulation of algal toxins in honey. (Jewkes-Arizona)
W78-08746

THE OSMOTIC CONCENTRATION OF THE BLOOD PLASMA OF PLAICE (PLEURONECTES PLATESSA) FROM THREE HABITATS OF DIFFERENT SALINITY,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
A. G. Vlasblom, K. F. Vaas, and W. Rozing.
Netherlands Journal of Sea Research, Vol. 11, No. 2, 1977, p 168-193, 4 fig, 5 tab, 11 ref.

Descriptors: Environmental effects, *Salinity, Temperature, Fish, Sea water, Brackish water, Size, Salt tolerance, *Plaice, Lakes, *Netherlands, Lake Greveling(Neth), Lake Veere(Neth), Water pollution effects.

Osmotic concentration of the blood plasma of plaice from Lake Greveling and Lake Veere were compared with those of plaice from the coastal North Sea from August 1971 to December 1973. Salinity was highest in the North Sea and lowest in Lake Veere. Plaice were found to be hyposmotic to the surrounding water with the osmotic concentration usually decreasing and never increasing with the length of the plaice. The influence of temperature on the total and the electrolyte osmotic concentration was stronger in plaice from the North Sea than in those from the lakes. This resulted in seasonal fluctuation in plasma osmotic vaues being more pronounced in the sea even though temperatures in the sea fluctuated less than in the lakes. The interaction between temperature and salinity changed with length of the plaice with the interaction being strongest in fish from the North Sea and weakest in fish from Lake Veere. It was concluded that plaice that have lived longest in an unusual environment of abnormal salinity show the weakest reaction to changes in environmental factors. (Chilton-ORNL)
W78-08760

THE EFFECTS OF PRECIPITATION ON AQUATIC AND TERRESTRIAL ECOSYSTEMS: A PROPOSED PRECIPITATION CHEMISTRY NETWORK, DEPT. OF ENVIRONMENTAL SCIENCES.
Virginia Univ., Charlottesville.
J. N. Galloway, and E. B. Cowling.
Journal of the Air Pollution Control Association Vol. 28, No. 3, March 1978, p 229-235, 5 fig, 4 tab, 41 ref.

Descriptors: *Environmental effects, Air pollution, *Air pollution effects, Aquatic environment, *Precipitation(Atmospheric), *Chemistry of Precipitation, Measurement, Management, Networks, Pollutant identification.

The major purpose is to describe the changing chemistry of precipitation and its effects of terrestrial and aquatic ecosystems. The paper discusses the concept of sensitive areas and the need to identify them on a regional basis. It is emphasized that, due to the changing chemistry of precipitation, there is a need for a network of precipitation measuring stations in the U.S. and Canada to provide information about changes in the deposition of beneficial nutrient elements as well as potentially injurious substances. (Chilton-ORNL)
W78-08762

EFFECTS OF CORNSTARCH AND DEXTROSE ON OYSTERS,
Virginia Inst. of Marine Science. Gloucester Point.
K. W. Turgeon, and D. S. Haven.
The Veliger, Vol. 20, No. 4, April 1978, p 352-358, 5 tab, 27 ref.

Descriptors: Environmental effects, *Foods, *Oysters, Management, Market value, Water pollution effects, Food supplement, *Cornstarch, *Dextrose.

The purposes were to define the minimum quantity of particulate carbohydrate (in the form of partially hydrolyzed cornstarch) necessary to produce a measurable increase in glycogen content, tissue weight, shell height, underwater shell weight and total volume of oysters; to determine if the effect of starch varied with season; to eliminate some of the confusion concerning the uptake and utilization of dextrose. Results showed that effects of carbohydrate supplements on glycogen levels varied with season. Comparison of cornstarch and dextrose results showed that cornstarch was the better supplemental food and this effect was most noticeable in the fall. Cornstarch had no influence on shell height, underwater shell weight and total volume at any season. It was concluded that the influence of cornstarch as a supplement for oysters is limited to glycogen content and tissue size with the major influence being on glycogen levels. (Chilton-ORNL)
W78-08767

EFFECTS OF DREDGED SPOILS ON SELECTED MICROBIAL ACTIVITIES IN LAKE COLUMN SIMULATORS,
Waterloo Univ. (Ontario). Dept. of Biology.
E. A. Smith, C. I. Mayfield, and P. T. S. Wong.
Water, Air, and Soil Pollution, Vol. 8, 1977, p 417-428, 1 fig, 2 tab, 37 ref.

Descriptors: Environmental effects, Water pollution, *Dredging, Turbidity, *Water pollution effects, Aquatic microbiology, Aquatic environments, *Microbial activity.

Dredged spoils (DS) were added to lake column simulators as slurries 5 days of each week for 9 week at loading rates of 0.33, 3.3, and 33 g/day. The continued addition of DS to the epilimnetic regions of the lake column simulators had a stimulatory effect on microbial activities and the stimulation was approximately proportional to the loading rates of DS. The influence of DS on P32-P04 uptake and on C14-acetate mineralization in water was most pronounced immediately following loading. A three-fold increase in heterotrophic activity during a 1 h incubation at 20C was seen following addition at the 33 g/day loading rate. DS resulted in an increase in levels of N2-fixation. Results suggest that the introduction of DS into a water mass will produce an overall short-term stimulation of microbial activities but that DS may have a significant influence on the movement on C, N, and P in aquatic ecosystems receiving continuous loadings. (Chilton-ORNL)
W78-08768

FOOD CONCENTRATION AND STOCKING DENSITY EFFECTS ON SURVIVAL AND GROWTH OF LABORATORY-REARED LARVAE OF BAY ANCHOVY ANCHOA MITCHILLI AND LINED SOLE ACHIRUS LINEATUS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2L.
W78-08769

THE EFFECTS OF SAND MOVEMENT ON INTERTIDAL SEAWEEDS AND SELECTED INVERTEBRATES AT BOUND ROCK, NEW HAMPSHIRE, USA,
New Hampshire Univ., Durham. Dept. of Botany and Plant Pathology; and New Hampshire Univ., Durham. Jackson Estuarine Lab.
M. A. Daly, and A. C. Mathieson.
Marine Biology, Vol. 43, No. 1, 1977, p 45-55, 11 fig, 2 tab, 37 ref.

Descriptors: *Environmental effects, *Sediments, *Sands, *Sand bars, Movement, Geomorphology, Intertidal areas, Invertebrates, Aquatic plants, Sediment distribution, *New Hampshire, Seaweeds.

Four types of sand variations were observed at Bound Rock: diurnal, neap-spring, storm, and a major summer sand inundation. The distribution and abundance of the major benthic plants and animals showed pronounced fluctuations which were interrelated with sand fluctuations of the area. Mytilus edulis, Balanus balanoides and Porphyra umbilicalis were at their lower limits at the time of highest summer sand elevations. Opportunistic annuals and perennial psammophytic species dominated highly abraded rock surfaces in the lower intertidal zone. It was concluded that the low species diversity of seaweeds at Bound Rock was due to unstable environmental conditions and a limited number of habitats. Psammophytic species showed a variety of morphological and reproductive adaptations to sandy habitats such as regeneration of upright fronds from their bases and incomplete alternation of generations. (Chilton-ORNL)
W78-08774

SOME ASPECTS OF THE PHYSIOLOGY OF ARENICOLA MARINA (POLYCHAETA) EXPOSED TO FLUCTUATING SALINITIES,
Natural Environment Research Council, Bangor (Wales). Marine Invertebrate Biology Unit.
S. E. Shumway, and J. Davenport.
Journal of the Marine Biological Association of the United Kingdom, Vol. 57, No. 4, November 1977, p 907-924, 17 fig, 3 tab, 21 ref.

Descriptors: Environmental effects, *Salinity, Invertebrates, Animal physiology, Hydrogen ion concentration, *Arenicola marina, *Lugworms, Worms.

Laboratory tests showed that lugworms react to dilution of water by becoming inactive and compressing themselves at the bottom of their burrow. The overlying water is tested periodically by the organism and normal activity is resumed when the salinity returns to the initial concentration. The results indicate that A. marina is an osmotic and ionic conformer, but that it can control the concentration of its body fluids by the means described. The coelomic fluid pH of both burrowed and non-burrowed lugworms exposed to gradual and abrupt salinity profiles showed an inverse relationship to the salinity change. (Chilton-ORNL)
W78-08778

ECOLOGICAL EXPERIMENTS WITH SARGASSUM MUTICUM,
Glasgow Univ. (Scotland). Dept. of Botany.
T. A. Norton.
Journal of the Marine Biological Association of the United Kingdom, Vol. 57, No. 1, February 1977, p 33-43, 2 fig, 7 tab, 23 ref.

Descriptors: *Environmental effects, Temperature, Salinity, *Growth rate, *Marine plants, Drying, Distribution, Resistance, *Sargassum muticum, Ecology, *Japanese seaweed, *San Juan Island(Wash), *Washington.

An investigation was made of the distribution of S. muticum in the San Juan Islands, its tolerance to extreme environmental conditions, and the resilience of its recovery after exposure to sublethal stresses. It was found that upward extension of the seaward into the littoral zone is limited by its susceptibility to desiccation and insolation in summer and to frosting in winter. Sublethal exposures to these conditions tends to retard the subsequent growth of the plants and the degree of retardation was found to increase with severity and duration of exposure. Low salinities and temperatures also tended to reduce growth rate. (Chilton-ORNL)
W78-08779

HYDROGEN PRODUCTION BY ANABAENA CYLINDRICA: EFFECTS OF VARYING AMMONIUM AND FERRIC IONS, PH, AND LIGHT,
California Univ., Livermore. Lawrence Livermore Lab.
T. W. Jeffries, H. Timourian, and R. L. Ward.
Applied and Environmental Microbiology, Vol. 35, No. 4, April 1978, p 704-710, 4 fig. 24 ref.

Descriptors: Environmental effects, Physiological ecology, Plant physiology, Algae, Nutrition, *Hydrogen ion concentration, *Cyanophyta, Ammonium, *Ions, *Light, Photosynthesis, Biophotolysis, *Anabaena cylindrica.

The objectives of this study were to determine optimal nutritional and physiological conditions necessary for continuous, stable hydrogen production by blue-green algae. Cultures sparged with argon gas produced hydrogen continuously for 30 days under limited light conditions and for 18 days under elevated light conditions in the absence of exogenous nitrogen. The addition of ammonium was found to suppress hydrogen production. The effects of iron and pH on hydrogen production were investigated and it was found that high iron concentrations increased the rate of hydrogen production with the most constant increase in the rate being obtained in the presence of elevated iron under alkaline conditions. (Chilton-ORNL)
W78-08780

ROLE OF SEDIMENT IN THE PERSISTENCE OF ENTEROVIRUSES IN THE ESTUARINE ENVIRONMENT.
Baylor Coll of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
E. M. Smith, C. P. Gerba, and J. L. Melnick.
Applied and Environmental Microbiology, Vol 35 No. 4, April 1978, p 685-689, 4 fig, 1 tab, 24 ref.

Descriptors: Environmental effects, *Water pollution effects, Sewage, *Viruses, *Sediments, Estuarine environment.

Untreated sediment and estuarine water were used in this investigation into the survival of echovirus 1, coxsackieviruses B3 and A9, and poliovirus 1. Viruses were found to survive for prolonged periods in sediments but not in the overlaying waters. This high affinity of marine sediment for virus adsorption and the detection of virus in sediments near sewage outfalls suggest the importance of sediment in viral pollution. The major factors suggested to influence virus survival are temperature, salinity, pH, microbial population, and chemical agents. (Chilton-ORNL)
W78-08781

THE RISE AND FALL OF MIREX,
Canada Centre for Inland Waters, Burlington (Ontario).
K. L. Kaiser.
Environmental Science and Technology, Vol. 12, No. 5, May 1978, p 520-528, 3 fig, 4 tab, 27 ref.

Descriptors: Environmental effects, *Water pollution effects, *Pesticides, Aquatic environment, Food chains, Absorption, *Toxicity, *Persistence, Lakes, *Lake Ontario, *Niagara River, *St. Lawrence River, Legislation, *Mirex.

The use of mirex and findings on the persistence and toxicity of this pesticide are reviewed. Studies showed that mirex contaminated the biota of the entire Lake Ontario. Results of sediment studies indicated that the Niagara River was a major carrier of mirex into Lake Ontario. Mirex was also reported in fish from the upper St. Lawrence River. Indications are that mirex is moving up the food chain in Lake Ontario. In an aquatic model ecosystem it was demonstrated that when mirex is removed from the exposure to potentially degrading conditions to lake sediments, it is likely to persist indefinitely. New control legislation has been passed which it is hoped will prevent the recurrence of an environmental invasion by persistent, toxic compounds having long-lasting and hazardous effects on the environment. (Chilton-ORNL)
W78-08782

AQUATIC ENVIRONMENTAL SAFETY ASSESSMENT FOR A NONPHOSPHATE DETERGENT BUILDER,
Proctor and Gamble Co., Cincinnati, OH. Environmental Safety Dept.
A. W. Maki, and K. J. Macek.
Environmental Science and Technology, Vol. 12, No. 5, May 1978, p 573-580, 4 fig, 6 tab, 29 ref.

Descriptors: Environmental effects, *Water pollution effects, *Safety, Assessments, *Detergents, Phosphates, Aquatic life.

The purpose was to develop an aquatic safety assessment program for the evaluation of risk to aquatic organisms associated with the use of Type-A zeolite in detergent formulations. Type-A zeolite is empirically similar to naturally occurring clay materials. Experiments showed that this zeolite is nontoxic at projected environmental levels to aquatic species representing three major trophic levels of freshwater and marine aquatic communities and does not contribute to the eutrophication potential of surface waters. The material is efficiently removed from wastewater through conventional waste treatment processes. It was concluded that zeolite used as nonphosphate builder for heavy duty detergents would have no significant environmental impact. (Chilton-ORNL)
W78-08783

PHOSPHORUS FERTILIZATION OF SUNFISH PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
F. Lichtkoppler, and C. E. Boyd.
Transactions of the American Fisheries Society, Vol. 106, No. 6, 1977, p 634-636, 2 tab, 5 ref.

Descriptors: Environmental effects, *Fertilization, Crop response, Fish, Fish farming, Stocking, *Sunfishes, Ponds, *Phosphorus.

This study was designed to compare the effect on sunfish production of 4.5 and of 9 kg/hectare/application of P205 using seven replication per treatment. Results suggested that phosphorus fertilization rates for ponds on wooded watersheds may be reduced from 9 to 4.5 kg/hectare/application of P205 without significant reduction in sunfish production. However, the 9 kg/hectare/application rate gave numerically greater means (not statistically significant) in both studies. Therefore, it is suggested that heavily fished woodland ponds stoched with bass and sunfish should still be fertilized at the 9 kg/hectare/application rate. (Chilton-ORNL)
W78-08785

AGRICULTURAL BY-PRODUCTS AS SUPPLEMENTAL FEED FOR CRAYFISH, PROCAMBARUS CLARKII,
Louisiana State Univ., Baton Rouge. Fisheries Section.
J. C. Goyert, and J. W. Avault, Jr.
Transactions of the American Fisheries Society, Vol. 106, No. 6, 1977, p 629-633, 3 tab, 14 ref.

Descriptors: *Fish farming, Foods, *Nutrients, Agriculture, *Byproducts, *Growth rates, Sexual maturity, *Crayfish, Louisiana, *Aerobic conditions, Monitoring, *Carbon:Nitrogen ratios.

This study was undertaken to determine the value of certain agricultural plant by-products as nutrient sources for crayfish culture and to determine whether their nutritional utility is related C:N ratios. Two studies were conducted, the first having a duration of 65 days and the second a duration of 48 days. In both studies, reasonable growth and survival was seen but sexual maturation occurred at a small size. Significant differences in both length and weight increases were found with different foods. Ranking of feeds according to crayfish growth from highest to lowest was dried sweet potato vines, sweet potato trimmings, aged rice stubble, aged rye hay, aged soybean stalks, and aged sugarcane stalks. There were pronounced changes in the C:N ratios of decomposing plant by-products. Except for dried sugarcane stalks and tree leaves, all by-products attained C:N ratios of less than 17:1 in a 3-month period of storage in water. (Chilton-ORNL)
W78-08786

5D. Waste Treatment Processes

EFFLUENT MONITORING PROCEDURES: METALS ANALYSIS STAFF GUIDE FOR CONDUCTING THE COURSE,
National Training and Operational Technology Center, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-08240

EVALUATION OF THE STANDARD SAMPLING TECHNIQUE FOR SUSPENDED SOLIDS,
Environmental Protection Agency, Kansas City, KS. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-08242

HYDRAULIC DESIGN FOR COMBINED SEWER DIVERSION,
Worcester Polytechnic Inst., MA. Alden Research Lab.
For primary bibliographic entry see Field 8B.
W78-08269

DENITRIFICATION USING THIOSULFATE AND SULFIDE,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
J. J. Bisogni, Jr., and C. T. Driscoll, Jr.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE4, p 593-604, August 1977. 3 fig, 6 tab, 10 ref.

Descriptors: *Waste water treatment, *Anaerobic processes, *Bacteria, *Denitrification, *Sulfur, Water pollution, Sanitary engineering, Equations.

Autotropic denitrification using enriched cultures of Thiobacillus denitrificans was investigated. Thiosulfate and sulfide were used as electron donors in laboratory scale denitrification systems. The stoichiometric ratio of the amount of sulfur electron source (sulfide or thiosulfate) needed to reduce a given amount of nitrate was determined. This ratio (called the consumptive ratio, Cr) is concluded to be approximately 1.35 on an electron equivalent basis. The systems were tested under dynamic loading conditions to assess overall operational stability. In all experiments, denitrification proceeded efficiently. It is concluded that autotropic denitrification using sulfide or thiosulfate has potential as a wastewater treatment process. (Graf-Cornell)
W78-08301

SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE,
Alcorn State Univ., Lorman, MS.
H. E. Grier, G. C. Gupta, and S. C. Tiwari.
Journal of the Environmental Division, Proceedings of the American Society of Civil Engineers, Vol 103, No EE4, p 551-556, August 1977. 7 fig, 8 tab, 7 ref.

Descriptors: *Waste water treatment, *Agricultural wastes, *Overloads, *Nitrates, *Waste recycling, *Effluents, Waste disposal, Land fill, Salts, Suspended solids, Removal, Ammonia, Biochemical oxygen demand, Chlorides, Efficiencies.

Swine waste aerobic lagoon effluent was sprinkled overland and the runoff water was collected. Both the waste effluent and the runoff water were analyzed for nitrate, ammonia, chloride, suspended solids, BOD, and specific conductance. Removal efficiency of nitrate dropped from 62% to 32%, on prolonged disposal of swine waste effluent, in 6 months. Data for suspended solids and specific conductance support these results for nitrate removal efficiency. Removal efficiencies for ammonia and chloride were higher and showed a very small decrease with time. BOD removal efficiency was 95% throughout the 6-month period of the study. The system showed signs of 'overloading' for nitrate removal but not for BOD removal. (Graf-Cornell)
W78-08302

VIRUS SAMPLING IN WASTEWATER--FIELD EXPERIENCES,
Los Angeles County Sanitation District, Whittier, CA.
For primary bibliographic entry see Field 5A.
W78-08303

FACILITIES PLANNING SUMMARY, TITLE II, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-08314

SUSPENDED SOLIDS LIMITATIONS FOR WASTEWATER TREATMENT PONDS.
Environmental Protection Agency, Washington, DC.

For primary bibliographic entry see Field 5G.
W78-08325

DREDGED MATERIAL DENSIFICATION AND TREATMENT OF CONTAMINATED DREDGED MATERIAL,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W78-08374

GROWTH OF WATER HYACINTHS IN TREATED SEWAGE EFFLUENT,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5G.
W78-08410

RAINFALL ANALYSIS FOR THE DESIGN OF STORM SEWERS IN BOMBAY,
Associated Industrial Consultants, Bombay (India).
For primary bibliographic entry see Field 2B.
W78-08433

EXPERIMENTAL STUDY OF DISCHARGE SIPHONS OF PUMPS IN THE PROJECT OF THE URBAN SEWER SYSTEM OF MONTREAL (ETUDE EXPERIMENTALE DES SIPHONS DE DECHARGE DES POMPES DANS LE CADRE DU PROJET D'ASSAINISSEMENT DE LA COMMUNAUTE URBAINE DE MONTREAL),
Sphere d'Assainissement des Eaux, Montreal (Quebec).
For primary bibliographic entry see Field 8C.
W78-08434

HUMAN PATHOGENS AS POTENTIAL HEALTH HAZARDS IN THE REUSE OF WATER,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Virology and Immunology.
For primary bibliographic entry see Field 5F.
W78-08435

HYPOCHLORITE GENERATION AT A WATER POLLUTION CONTROL PLANT,
Amherst Town Engineer's Office, NY.
R. Doan, Jr., and A. S. Haimes.
Public Works, Vol. 109, No. 1, p 48-51, January, 1978. 2 fig, 1 tab.

Descriptors: *Disinfection, *Sodium compounds, *Chlorination, *Ion exchange, *Electro-chemistry, Anodes, Cathodes, Tertiary treatment, Treatment facilities, Brines, Generators, Waste water treatment, Municipal wastes.

Two hypochlorite generators producing chlorine for disinfection of effluent have been included in the design of the 24 mgd waste water treatment plant in Amherst, New York. The Amherst plant will provide secondary and tertiary treatment, as well as postchlorination and prechlorination of effluent. Two 5,000 lg/day Ionics Inc. Cloromat hypochlorite generators will produce an 8% sodium hypochlorite solution from rock salt and brine. As 2,900-3,900 lbs chlorine/day are required by the Amherst plant, in-plant generation of sodium hypochlorite was considered safer than transporting chlorine to the plant. Production of the 8% solution costs a total of $3,345,100, while the required chlorine would cost $5,880,900 if purchased. The Cloromat system, consisting of electrochemical cells containing ion-selective membranes, generates chlorine gas from sodium chloride brine in a titanium-coated anode compartment. The mild steel cathode generates hydroxide ions from water and mixes them with sodium ions from the anode to form caustic solution and hydrogen. Chlorine gas is removed from the brine and hydrogen from the caustic solution by gas-liquid separators. These residuals are reacted to generate sodium hypochlorite which is stored in two 6,000 gal storage tanks. The 100 gpm of cooling water required by the Cloromat system will be supplied by a cooling tower for make-up water. (Lisk-FIRL)
W78-08436

MAINTAINING DIGESTER BALANCE MAKES FOR ENERGY CONSERVATION.
Public Works, Vol. 109, No. 2, p 82-83, February, 1978.

Descriptors: *Methane, *Gases, *Sludge digestion, *Power system operation, *Activated sludge, Treatment facilities, Methane bacteria, Sodium compounds, Lime, Alkalinity, Waste water treatment, Municipal wastes.

A method for utilizing sludge digester gas to operate equipment has been developed for the Bay Park waste water treatment plant on Long Island, New York. The 60 mgd treatment facility generates enough methane to furnish the energy requirements of the plant at an estimated power savings of $430,000 over a two-yr period. Odors generated by the activated sludge process with diffused aeration are collected for ozonation treatment. Optimum conditions for methane gas production in the digestors are created by maintaining pH above 6.8, volatile acids below 280 mg/liter and alkalinity above 2,500 mg/liter. The daily dry sludge load of 14 tons generates 500,000 cu ft of digester gas which is stored in a Horton gas sphere. The digester gas is maintained between 92-94 F by engine cooling water that is passed through heat exchangers. An imbalance in optimum conditions for methane production is rectified with the addition of 2,000-2,500 lbs of sodium bicarbonate and a small addition of lime to the grease pit; the grease pit is pumped and cleaned before its contents are discharged to the digester. Enough digester gas is produced daily to operate the three 1,300 hp and one 700 hp diesel turbines which supply plant power. (Lisk-FIRL)
W78-08437

PERFORMANCE OF CIRCULAR FINAL CLARIFIERS AT AN ACTIVATED SLUDGE PLANT,
Metropolitan Sanitary District of Greater Chicago, IL.
W. L. Munch, and J. A. Fitzpatrick.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 265-276, February, 1978. 10 fig, 2 tab, 10 ref.

Descriptors: *Activated sludge, *Settling basins, *Hydraulic models, *Solid wastes, *Separation techniques, Suspended solids, Hydraulics, Effluent streams, Performance, Waste water treatment, Municipal wastes.

The performance of a 38 m-diam circular center-feed clarifier was evaluated under varying conditions of hydraulic and solids loading at an activated sludge treatment facility in Chicago, Illinois. Limiting the effluent flow to 0.66 cu m/sec with a 30% return rate allowed a maximum solids loading rate for efficient clarification of 146 kg/sq m/day at a mixed liquor concentration of 2,500 mg/liter. Higher flow rates were possible when the mixed liquor content was decreased. A higher solids loading rate was accommodated by the clarifier when the hydraulic loading rate was maintained below 0.83 cu m/sec, verifying the dependence of solids loading on hydraulic load. An increase in the thickness of the sludge blanket, occurring at hydraulic loading in excess of 0.83 cu m/sec at a 30% return, threatened the solids separation efficiency of the clarifier. Sludge blanket level, solids settleability, and hydraulic loading reportedly had a greater impact on clarifier solids separation performance than shock hydraulic loading. The actual maximum solids loading rate was significantly lower than the theoretical maximum. (Lisk-FIRL)
W78-08438

SLUDGES AND SIDESTREAMS GO HAND-IN-HAND,
Camp Dresser and McKee Inc., Walnut Creek, CA.
A. A. Kalinske.
Water and Wastes Engineering, Vol. 15, No. 2, p 25-27, February, 1978. 1 ref.

Descriptors: *Effluent streams, *Pollutants, *Sludge treatment, *Byproducts, *Stabilization, Anaerobic conditions, Aerobic treatment, Sludge digestion, Lime, Incineration, Drying, Landfills, Return flow, Chlorinated hydrocarbon pesticides, Electrolysis, Electrodialysis, Reverse osmosis, Ion exchange, Waste water treatment, Municipal wastes.

The characteristics of waste water sidestreams generated by sludge stabilization, thermal disposal, drying, composting, landfilling, land application, and advanced waste water treatment are discussed. Stabilization of sludge by aerobic, anaerobic, lime, or heat treatment can produce a waste stream with BOD concentrations ranging from 1,200-10,000 mg/liter, phosphorus levels from 150-700 mg/liter, and ammonia-nitrogen contents from 400-1,000 mg/liter. Thermal destruction of sludge, which is conditioned with polymers or lime and ferric chloride to reduce soluble BOD, produces gaseous emissions which are scrubbed with water. These sidestreams, containing volatile organics, are treated with chemical coagulation and settlement before discharge. Leachate from drying beds contains high concentrations of BOD and ammonia which should be prevented from percolating into aquifers or washing out with surface run-off. Composting of sludge can result in a sidestream of waste water resulting from storm water runoff; total enclosure of compost sites and collection of runoff are recommended. Pathogens, heavy metals, and chlorinated hydrocarbons are present in leacheates from landfill disposal of sewage and industrial sludges. Sewage sludge applied to land contains toxic metals and organics that are solubilized by rainwater which carries the toxins into surface and groundwater. Waste water sidestreams are generated by advanced treatment such as carbon adsorption, electrodialysis, and ion exchange or reverse osmosis. (Lisk-FIRL)
W78-08439

CLEVELAND PUSHES TO MEET STRICT EFFLUENT LIMITATIONS,
Cleveland Regional Sewer District, OH.
For primary bibliographic entry see Field 5G.
W78-08440

OZONE PLANT IMPROVES EFFICIENCY AND ECONOMY OF WASTEWATER TREATMENT,
Ozonair Corp., San Francisco, CA.
K. Stopka.
Water and Sewage Works, Vol. 125, No. 4, p 54-59, April, 1978. 4 fig, 9 tab.

Descriptors: *Ozone, *Disinfection, *Design criteria, *Oxidation, *Aeration, Waste water treatment, Absorption, Odor, Municipal wastes, Industrial wastes, Oxygenation, Dissolved oxygen, Sludge treatment, Water treatment, Organic wastes.

A three-month field testing program was used to evaluate ozone concentrations and dosages in waste water treatment. The study also examined the feasibility of using ozone in small quantities as a source of nascent oxygen in aeration. Air enriched with 5 mg/liter ozone was applied to effluent in a contact vessel for 15 min of equalization and 30 min of treatment time. The oxygen supplied by the ozone stimulated the growth of aerobic organisms and suppressed the growth of anaerobes

When the ozone dosage was increased to 10 mg/liter, the enhanced bioflocculation effect was replaced by sterilization. The higher solubility of ozone/air mixtures was reported by reduced air requirements, energy expenditures, and contact times to below those required for aeration or pure oxygenation. Ozone treatment at a concentration of 2% by weight was considered to be effective for deodorization in municipal and industrial waste treatment. Criteria were recommended for the design of an ozone plant, covering such topics as air preparation, ozone-producing electrode specifications, air moisture, and ozone contractor performance. (Lisk-FIRL)
W78-08441

A NOVEL CLARIFIER FOR DILUTE PROCESS STREAMS,
P. J. Flynn, and J. D. Boadway.
Industrial Water Engineering, Vol. 15, No. 1, p 19-22, January-February 1978. 7 fig, 1 tab, 3 ref.

Descriptors: *Centrifugation, *Separation techniques, *Filtration, *Design data, Equipment, Tertiary treatment, Suspended solids, Industrial wastes, Effluent streams, Waste water treatment, Municipal wastes.

The Vortex Clarifier, an automatic batch centrifuge developed by Queen's University, Kingston, Ontario, and Bird Machine Co., Inc., was found effective in reducing suspended solids of 1,000 ppm or less in municipal and industrial waste streams. The Vortex Clarifier separates the waste stream which is moved axially between two rotating cylinders. The settling vanes and bowl, which rotate at the same speed, create a fixed vortex in the liquid passing through a separator for particulate migration toward the bowl wall. The settling vanes enhance the removal of fine particles, reducing the internal turbidity in the liquid vortex. Sufficient accumulation of particulate matter enacts the solids discharge cycle. The Vortex Clarifier reduced suspended solids in a mixed municipal and industrial waste stream at a 12 mgd municipal treatment plant by 80%. Suspended solids levels in the filtrate from two vacuum filters were reduced by 97%. Polishing of secondary clarifier overflow by the centrifuge unit reduced suspended solids from 15-24 ppm to 5-8 ppm. Suspended solids in an industrial waste stream containing talc and water were reduced by 97% in the clarifier and by 91% for the settling tank effluent. (Lisk-FIRL)
W78-08442

REMOVAL OF HEAVY METALS VIA OZONATION,
Syracuse Univ., NY.
R. L. Shambaugh, and P. B. Melnyk.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 113-121, January, 1978. 10 fig, 2 tab, 27 ref, 1 append.

Descriptors: *Mathematical models, *Analytical techniques, *Heavy metals, *Ozone, *Filtration, Chemical precipitation, Manganese, Lead, Nickel, Zinc, Cobalt, Oxidation, Waste water treatment, Municipal wastes.

Rate constants were calculated for the second-order reaction of aqueous ozone with free and complexed heavy metals. The rate constants were dependent upon ozone concentrations determined by ozone transfer between gas and liquid, the reaction of ozone with free or complexed metals, and the degradation of ozone in the aqueous solution with respect to pH. Ozonation of heavy metals was examined for ethylenediaminetetracetic acid (EDTA)-complexed manganese, cadmium, nickel, and lead, and uncomplexed lead, manganese, zinc, nickel, cobalt, and barium. Ozone contact times of 10 min were sufficient to break down the EDTA-complexed metals. Uncomplexed metals with high oxidation states were rendered less soluble after 1 min of ozonation. The second-order rate constant for the ozonation of uncomplexed lead and other metals was estimated to be greater than 1 billion cu cm/mole-sec. The reaction rate of ozone with the EDTA-complexed metals was an order of magnitude faster than for ozonation of the EDTA alone. (Lisk-FIRL)
W78-08444

ENHANCEMENT OF PHOSPHORUS REMOVAL THROUGH IRON COGULATION FOLLOWING LIME PRECIPITATION,
Consoer, Townsend and Associates, Chicago, IL.
P. V. Cavagnaro, S. W. Work, E. R. Bennett, and K. D. Linstedt.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 95-100, January, 1978. 5 fig, 2 tab, 8 ref.

Descriptors: *Nutrient removal, *Chemical precipitation, *Lime, *Iron, *Phosphorus, Pilot plants, Flocculation, Coagulation, Sludge treatment, Waste water treatment, Municipal wastes.

Lime and iron coagulant additions to waste water were tested as a means of removing phosphorus and reducing sludge and lime quantities. Lime was added to unchlorinated secondary effluent in doses of 50, 100, 150, 200, 300, and 400 mg/liter, followed by ferric chloride in doses of 0, 1.0, 2.1, 4.2, 6.2, and 8.5 mg/liter. The treatment process consisted of rapid mixing with the coagulant conditioners, followed by flocculation and settling. Particulate phosphorus was completely removed at all of the lime dosage rates used in conjunction with iron 360 mg/liter lime without ferric chloride additions reduced total phosphorus to 0.7 mg/liter. The same total phosphorus concentration was achieved with 180 mg/liter lime when 4.1 mg/liter ferric chloride was added. The quantity of sludge generated from lime treatment without iron was 2.5 tons/million gal which was reduced to 1.2 tons/million gal with iron coagulations. The lime and ferric chloride additions significantly improved suspended solids removal and had a slight effect on COD and bacteria reductions. (Lisk-FIRL)
W78-08445

AN OVERVIEW OF LAND TREATMENT FROM CASE STUDIES OF EXISTING SYSTEMS,
Cold Regions Research and Engineering, Lab., Hanover, NH.
For primary bibliographic entry see Field 5E.
W78-08446

50 YEARS' EXPERIENCE OF SLUDGE DEWATERING.
For primary bibliographic entry see Field 5E.
W78-08447

A NEW METHOD OF WASTEWATER TREATMENT: INTERMITTENT SUBMERGED BIOOXIDATION, (IN JAPANESE),
Yonetsuru Shuzo Co. Ltd, Yamagata (Japan).
M. Nagatani, H. Nakagawa, and Y. Nunokawa.
Hakko Kogaku, Society of Fermentation Technology, Osaka University, Japan. Vol. 56, No. 2, p 127-132, 1978. 5 fig, 1 tab, 2 ref.

Descriptors: *Oxidation, *Biological treatment, *Plastics, *Chemical oxygen demand, *Submergence, *Aeration, Porous media, Nutrient removal, Volumetric analysis, Respiration, Oxygen demand, Microorganisms, Waste water treatment, Municipal wastes.

An intermittent submerged biooxidation system utilizing microbial slime attached to palstic plates which are alternately submerged ans exposed to air was tested for use in small-scale waste water treatment plants. The plastic plates, with a total surface area of 0.5 sq m available for microbial slime, were mounted in two 5 liter vessels which were operated in 24 hr batch cycles. Waste water introduced into the first tank was drained to the second tank and then back to the first at 15 min intervals. The microorganisms thus received alternate supplies of nutrients and oxygen. The COD concentration of waste water initially containing less than 21 g/sq m/day was reduced by 90% with the biooxidation system. The oxygen uptake rate of the microbial slime was measured as 22.2 g/sq m/day by a membrane oxygen sensor after air within an empty vessel was circulated at 1.3 liter/min. The oxygen uptake rate of a slime-free wet surface using the same apparatus was measured as 7.4 g/sq m/day by rthe sulfide oxidation technique, verifying higher oxygen absorption rates due to the presence of microbial slime in the intermittent submerged biooxidation system. (Lisk-FIRL)
W78-08448

RESULTS OF INVESTIGATIONS OF OPERATION TECHNIQUES, OPERATIONAL SAFETY, TECHNOLOGY AND ECONOMICS OF THE BIOREACTOR FOR SEWAGE SLUDGE ROTTING (ERGEBNISSE DER UNTERSUCHUNGEN UEBER BETRIEBSTECHNIK, BETRIEBASSICHERHEIT, TECHNOLOGIE UND WIRTSCHAFTLICHKEIT AM BIOREAKTOR ZUR ABWASSERSCHLAMMVERROTTUNG),
Bayerisches Landesamt fuer Umweltschutz Munich (West Germany).
For primary bibliographic entry see Field 5E.
W78-08449

THE OPERATION OF THE ZIMPRO THERMAL CONDITIONING WITH AIR SLUDGE PLANT AT KWA DABEKA (CLERMONT) SEWAGE WORKS,
G. F. Antoni.
Water Pollution Control, Vol. 77, No. 1, p 75-78, 1978. 1 fig, 4 tab.

Descriptors: *Treatment plants, *Sludge treatment, *Dewatering, *Thermal radiation, *Cost analysis, Vacuum drying, Sludge disposal, Filtration, Biochemical oxygen demand, Chemical oxygen demand, Waste water treatment, Municipal wastes.

A cost and performance analysis was presented for the Zimpro thermal sludge conditioning system installed at the Kwa Kabeka sewage treatment plant in Natla, South Africa. The Kwa Kabeka facility, with a planned capacity of 18,200 cu m/day, produced raw sludge containing 3-6% solids; sludge liquors and vacuum filter filtrate were returned to the head of the works. The Zimpro system passes settled raw sludge through id-sintegrators the heat exchangers and a themal reactor. After decompression, sludge is pumped to a catalyst furnace; oxidized sludge is transported to a vacuum filter which separates the sludge cake from the supernatant liquor. The Zimpro system cost about 400,000 rands less than conventional sludge treatment processes and required less land. The filtration properties of the sludge were also improved by thermal oxidation. Capital costs for the sludge dewatering plant were 440,600 rands, 62,200 rands more than estimated. Annual operating costs of the Zimpro system without sludge dewatering and supernatant liqour treatment were 17,051 rands, at a unit cost of 3.79 rands/kiloliter raw sludge. Thermally oxidized sludge liquors contained an estimated 6,180 mg/liter BOD and 12,360 mg/liter COD at a pH of 4-9. Operational problems encountered during 1975, the first year of operation of the Zimpro system, included collapse of the gearbox in the oxidized sludge stirrer mechanism, grit abrasion of the piston seals and sleeves of the high-pressure pumps, and line blockage due to large amouts of rags and other materials in the influent to the raw sludge tanks. (Lisk-FIRL)
W78-08450

ABATEMENT OF ODOR IN SEWAGE WORKS--DETERMINED IN HEIDELBERG

(GERUCHSBEKAEMPFUNG IN KOMPOSTWERKEN AM BEISPIEL HEIDELBERG),
Technische Univ., Berlin (West Germany). Fachgebiet Abfallwirtschaft.
B. Jaeger, and J. Jager.
Muell and Abfall, Vol. 10, No. 2, p 48-54, 1978. 6 fig, 3 tab, 11 ref.

Descriptors: *Odor, *Air pollution, *Sludge treatment, *Biological treatment, *Municipal wastes, Filters, Filtration, Organic compounds, Costs, Sewage treatment, Waste water treatment.

The Heidelberg refuse and sewage composting plant generated malodorous emissions which were a nuisance to the residents of the community located 400 m from the plant. Feasibility and cost studies of various alternatives for odor abatement revealed the distinct advantages of odor control by means of compost bed filters with surface areas of 200 sq m. The compost filters proved to be efficient and reliable. The overall treatment efficiency relative to concentrations of organic carbon before and after filtration was 93%. Removal efficiencies for specific emission components were: 100% for ethanol, diacetyl, and acetone; 72% for limonene; and about 50% for other compounds. (Takacs-FIRL)
W78-08451

THE EURO-MATIC BIO-DRUM PROCESS,
European Plastic Machinery Mfg., Copenhagen (Denmark).
L. Holmberg.
Tribune du CEBEDEAU, Vol. 30, No. 409, p 437-441, December, 1977. 6 fig, 1 tab.

Descriptors: *Biological treatment, *Activated sludge, *Biological membranes, *Trickling filters, *Plastics, Construction materials, Rotational flow, Treatment plants, Sludge treatment, Biochemical oxygen demand, Separation techniques, Waste water treatment, Municipal wastes.

The design of the Euromatic Bio-Drum incorporates principleks of both the trickling filter and the rotating contact filter for biological waste water treatment. The Bio-Drum utilizes plastic balls held together in the shape of a drum by a metal net; the drum is free floating because of the low specific gravity of the plastic media. Containers built into the periphery of the drums lift waste water out of the aeration tank, as well as trap air which is taken down into the tank and bubbled through the drums. The drums can be adjusted to varying levels of waste water and speeds of rotation; the system provides 100% moistening of the biological filter media. BOD removal efficiencies by the microbial film supported on the plastic balls in the Bio-Drum have been about 85% and as high as 95% when sludge is returned to the system. Activated sludge flocs are easily separated from the water; 100% settling has been achieved within 30 min. The Bio-drum removes 3-4 kg BOD/kilowatt-hour, compared to 1 kg BOD/kilowatt-hour for conventional activated sludge systems. Two systems are in operation in Denmark; the Bio-Drum is also being tested for recirculating fish breeding pond water. (Lisk-FIRL)
W78-08452

HOLDENHURST: OXYGEN BOOST TO SEASIDE WORKS,
Wessex Water Authority, Bristol (England). Avon and Dorset Recovery Div.
J. T. Rees.
Surveyor, Vol. 151, No. 4471, p 17-20, February, 1978.

Descriptors: *Oxidation, *Activated sludge, *Dissolved oxygen, *Biochemical oxygen demand, *Nitrification, Ammonia, Suspended solids, Oxygen demand, Settling basins, Waste water treatment, Municipal wastes.

A Vitrox oxygen injection unit was installed in the Holdenhurst sewage treatment plant, under the jurisdiction of England's Wessex Water Authority, to improve nitrification in the effluent. The plant was upgraded from a capacity of 13.6 million liters/day to 27.2 million liters/day with provisions for an additional 6.0 million liters/day to accommodate higher sewage loads during the summer months. After the waste water was degritted and pulverized, it flowed through six settlement tanks to two activated sludge plants; a 12,000 cu m/day portion received further treatment by three nitrifying filters. The final effluent should have contained 15 mg/liter BOD, 20 mg/liter suspended solids, and 20 mg/liter ammonia-nitrogen. BOD levels were found to be higher than anticipated because of incomplete oxidation of nitrogenous material; dissolved oxygen levels were below the minimum 4% in the aeration channels. A fourth nitrifying filter as installed and the first aeration unit was limited to carbonaceous oxidation. The second aeration unit was upgraded with the Vitrox system injecting 4 tons oxygen/day. Mixed liquor suspended solids were increased to 3,000 mg/liter in the aeration units; final effluent was pumped into six storm tanks with a combined capacity of 6,820 cu m to eliminate the effects of denitrification. Three additional Vitrox units were subsequently installed to upgrade the first aeration unit. Odor problems arising from the plant were abated by Vitrox injection of 0.75 tons of oxygen/day into degritted influent. (Lisk-FIRL)
W78-08453

STUDY OF THE INFLUENCE OF ACTIVATORS ON THE PURIFICATION EFFICIENCY OF SEPTIC TANKS (ETUDE DE L'ACTION DES ACTIVATEURS SUR L'EFFICACITE D'EPURATION DES FOSSES SEPTIQUES),
SETRIC, Toulouse (France).
R. Chelle, and F. Bazerque.
Techniques et Sciences Municipales - l'Eau, Vol. 73, No. 1, p 43-47, January, 1978. 5 fig, 1 tab, 2 ref.

Descriptors: *Septic tanks, *Microorganisms, *Biodegradation, *Sewage bacteria, *Nutrient removal, Bacteria, Biological treatment, Ammonia, Municipal wastes, Waste water treatment.

Organic and inorganic additives were tested for their ability to improve septic tank sewage treatment. Biodegradable activators which can be assimilated by bacteria and stimulate microorganism growth were found to improve the performance of septic tanks, both at the initial startup phase and at restart after accidental poisoning of the septic tank microflora. The activators, containing concentrated bacteria and nutrients, shortened the length of time required to achieve a high degree of purification in terms of COD removal. Mineral additives increased the suspended solids content of the septic effluent without increasing the degradation of organic matter. Bacteria seeding was especially effective for temperatures below 15C where the growth rate of the bacteria in the additive far surpassed that of naturally occurring sewage bacteria. (Takacs-FIRL)
W78-08454

IS CHLORINE THE BEST DISINFECTANT.
For primary bibliographic entry see Field 5F.
W78-08455

CAN CALIFORNIA COPE WITH ITS MOUNTING SLUDGE VOLUMES,
California Office of Water Recycling, Sacramento.
For primary bibliographic entry see Field 5E.
W78-08456

THE OXFAM SANITATION UNIT,
Oxfam, Oxford (England).
J. Howard, and B. Lloyd.
Proceedings of the Royal Society of London Series B, Vol. 199, No. 1134, p 179-182, 1977. 1 fig.

Descriptors: *Treatment facilities, *Anaerobic conditions, *Percolation, *Filtration, *Salmonella, Hospitals, Coliforms, Aerobic treatment, Sewage bacteria, Septic tanks, Waste water treatment, Municipal wastes, *Oxfam sanitation unit.

The patented Oxfam sanitation unit is a three-stage plastic waste water treatment plant which does not require a power source and reduces pathogenic organisms. Each unit, servicing 500 people, contains: a latrine area, partially constructed from the unit's wooden shipping crate; nylon-reinforced butyl rubber tanks for sewage containment and anaerobic treatment; and an aerobic percolating filter composed of 50-75 mm locally obtained pieces of brick or stone. The filtrate from the process drains into a trench or drain. The Oxfam unit was tested with wastes from the Cholera Research Laboratories in Dacca, Bangladesh. Chlorea, coliform and salmonella populations were reduced to .01 of their original counts. Ascaris and Trichuris ova were undetected in 100 ml of effluent. The treatment unit, with an estimated life span of 5-10 yrs, costs about 5 pounds sterling per capita. (Lisk-FIRL)
W78-08457

S. HANTS' SEWAGE GIANT.
For primary bibliographic entry see Field 5E.
W78-08458

A CHLOROFORM PROBLEM AT GREAT WARFORD AND ITS SOLUTION,
Allott and Lomax, Manchester (England).
C. Lumb, D. Brown, and M. K. V. Bottomley.
Water Pollution Control, Vol. 76, No. 11, p 459-467, 1977. 3 fig, 6 ref.

Descriptors: *Organic compounds, *Aeration, *Sludge digestion, *Aerobic treatment, *Drying, Equipment, Chemical wastes, Waste dilution, Waste water treatment, Sludge treatment, Municipal wastes.

Air-stripping of sewage sludge was employed at the 2,950 cu m/day Great Warford municipal sewage treatment plant in England to remove chloroform originating from pharmaceutical plant wastes. Concentrations of chloroform averaged 2.7 mg/liter in wet sludge and 47 mg/kg in the dry sludge, arising from a discharge of 3 liters/day chloroform from the pharmaceutical laboratory. To improve sludge digestion, inhibited by the presence of chloroform, it was necessary to limit the concentration of chloroform in the dry sludge to 5-10 mg/kg. Laboratory experiments on air stripping of chloroform indicated that an aeration intensity of 20 cu m/sq m/hr at 9C for periods of 6.8-8.7 hr would reduce the wet sludge chloroform content of 0.2 mg/liter, yielding a dry sludge concentration of 5 mg/kg with a 4% dry solids content. The final sludge stripping system employed 15 coarse bubble air jet diffusers, with 600 jets mounted in the base of a 4.2 sq m tank operated on a batch basis. The stripped sludge was transported to a digester feed tank for chloroform monitoring before it was fed to the digester. Stripped sludges with chloroform concentrations in excess of 0.2 mg/liter, which would contribute to a dry sludge content of 7.5 mg/kg, were returned to the air stripping unit. (Lisk-FIRL)
W78-08459

FOR THE SAKE OF A FOOTPATH 240,000 (POUNDS STERLING) WAS LOST.
Water Services, Vol. 81, No. 975, p 295-298, May 1977.

Descriptors: *Treatment facilities, *Biological treatment, *Filtration, *Storm water, *Sludge treatment, Foundations, Piles(Foundations), Biochemical oxygen demand, Suspended solids, Waste water treatment, Municipal wastes.

Because of unstable ground conditions, the municipal waste water treatment facility in Saffron Walden, Essex, England, was constructed on piled foundations. The 5,160 cu m/day capacity plant required 670 piles at 29-30 m in length for support in the peat and alluvial soil; excavation was restricted to 4 m because of groundwater levels. The treatment system includes screening and degritting, primary settlement, biological filtration, secondary settlement, and effluent polishing with microstrainers. In the winter, BOD and suspended solids levels are reduced to 20 mg/liter and 30 mg/liter, respectively, and to 15 mg/liter and 20 mg/liter, respectively, during the summer when rivers have low flows. The sludge is thickened and stored for final treatment at a regional facility. Storm water is stored in tanks with a total capacity of 900 cu m and released for full treatment when flows decrease. During overflow conditions, the storm water flows over grassland for filtering and oxidation. Up to 100 mg/liter suspended solids are permitted in storm water discharged to the River Slade. THe sewage flows by gravity to the site of the old treatment works from which it is pumped to the new plant. (Lisk-FIRL)
W78-08460

SIERRAS BOAST MOST MODERN TREATMENT PLANT,
A. W. Allen.
Western Construction, Vol. 53, No. 4, p 22-24, April, 1978.

Descriptors: *Treatment facilities, *Design data, *Settling basins, *Chemical precipitation, *Polymers, Lime, Carbon dioxide, Oxidation, Sludge treatment, Dewatering, Equipment, Flocculation, Waste water treatment, Activated carbon, Adsorption, Filtration, Municipal wastes.

A $20 million tertiary treatment plant in California will treat 4.85 mgd of wastes from the Lake Tahoe Basin area, Truckee, and several other areas. The effluent receives conventional secondary treatment by primary and secondary settling with oxidation. Phosphorus and some suspended solids are then precipitated with lime, followed by polymer dosage in rapix-mix and flocculation tanks. The effluent is then injected with carbon dioxide gas in recarbonation basins for calcium removal and pH adjustment. The treated effluent is pumped to two ballast tanks with a total volume of 1.2 million gallons before the wastes are filtered, adsorbed on activated carbon towers, and stripped of ammonia on ion exchange beds and three ammonia removal and recovery modules for ammonium sulfate fertilizer production. The effluent is discharged into a series of subsurface ditches for percolation through the glacial soil into the Truckee River. Sludge is thickened, dewatered, conditioned with lime and polymers, filtered on a horizontal press operated by 3 variable speed pumps, and disposed of in a landfill. Carbon dioxide is generated on-site by compressed gas from the digester boilers and by carbon dioxide stripping during oxygenation of the wastes; supplementary liquid carbon dioxide is stored on-site. Oxygen is also generated on-side by Union Carbide's Pressure-Swing Adsorption process. The plant design includes enclosed piping and electrical corridors which provide passage from one building to another and a complete laboratory. (Lisk-FIRL)
W78-08461

ANIMAL DISEASE HAZARDS OF SLUDGE DISPOSAL TO LAND: OCCURRENCE OF PATHOGENIC ORGANISMS,
Northumbrian Water Authority, Gosforth (England).
For primary bibliographic entry see Field 5C.
W78-08463

AMMONIA VOLATILIZATION FROM SEWAGE SLUDGE APPLIED IN THE FIELD,
Guelph Univ., (Ontario). Dept. of Land Resources Science.
For primary bibliographic entry see Field 5E.
W78-08465

A UNIFIED THEORY OF FILAMENTOUS ACTIVATED SLUDGE BULKING,
California Univ., Berkeley. Div. of Hydraulic and Sanitary Engineering.
M. Sezgin, D. Jenkins, and D. S. Parker.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 362-381, February, 1978. 16 fig, 3 tab, 36 ref.

Descriptors: *Activated sludge, *Flocculation, *Microorganisms, *Bulk density, *Dissolved oxygen, Aeration, Chlorine, Toxins, Physical properties, Waste water treatment, Analytical techniques, Municipal wastes.

The formation of filamentous microorganisms is examined as a factor in bulking during the activated sludge process. The outgrowth of filamentous microorganisms from activated sludge floc is greater than zoogleal microorganism growth under particular conditions within the floc interior conducive to filament growth. Lower floc interior dissolved oxygen levels, from 1.3-1.8 mg/liter in an air system, are more conducive to filament growth than higher dissolved oxygen levels of 6.7-8.0 mg/liter. A minimum sludge floc interior dissolved oxygen level of 2.0 mg/kiter, maintained automatically, is considered optimum for sludge settleability. Filaments longer than 10,000,000 microns/ml can increase reflocculation time, 60-min compact volume, and the sludge volume index. A filament length of 10,000,000 microns/ml is considered the dividing point between a bulking and a non-bulking sludge. Activated sludge bulking was reportedly controlled by toxic chemicals, such as chlorine and hydrogen peroxide. Waste character and strength, reactor design, aeration system and temperature affect the critical dissolved oxygen concentration which limits sludge bulking. (Lisk-FIRL)
W78-08466

CRITICAL CONSIDERATIONS ON THE DETERMINATION OF EXTRACTABLE SUBSTANCES IN POLLUTED WATERS (CONSIDERAZIONI CRITICHE SULLA DETERMINAZIONE DI SOSTANZE ESTRAIBILI IN ACQUE INQUINATE),
Florence Univ. (Italy). Inst. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W78-08468

THE EFFECT OF QUICK FREEZING ON THE CONTENT OF ORGANIC WATER CAPACITY SUBSTANCES (DIE WIRKUNG DES TIEFGEFRIERENS AUF DEN GEHALT AN ORGANISCHEN WASSERINHALTSTOFFEN),
For primary bibliographic entry see Field 5A.
W78-08469

PROFILE-ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS IN SEWAGE SLUDGE BY GAS CHROMATOGRAPHY (GASCHROMATOGRAPHISCHE PROFILANALYSE DER POLYCYCLISCHEN AROMATISCHEN KOHLENWASSERSTOFFE IN KLARSCHLAMMPROBEN),
Biochemisches Inst. fuer Unweltearcinogene, Ahrensburg (West Germany).
For primary bibliographic entry see Field 5A.
W78-08470

PHOSPHATE FERTILIZING EFFECT OF SLUDGE FROM DOMESTIC SEWAGE PURIFICATION WITH PHOSPHATE PRECIPITATION (ZUR PHOSPHATDUENGEWIRKUNG VON SCHLAEMMEN AUS DER KOMMUNALEN ABWASSERREINIGUNG MIT PHOSPHATFAELLUNG),
Hoechst A.G., Huerth/Knapsack (West Germany).
For primary bibliographic entry see Field 5E.
W78-08471

PERSISTENCE OF ENTEROVIRUSES IN SEWAGE SLUDGE,
Ontario Ministry of Health, Toronto. Lab. Services Branch.
For primary bibliographic entry see Field 5A.
W78-08472

RELATION BETWEEN DEHYDRABILITY AND PROPERTIES OF SEWAGE SLUDGE (REPORT I) (GESUIODEI NO SHOSEIJO TO DASSEUISEI NI TSUITE),
For primary bibliographic entry see Field 5A.
W78-08473

THE DISTRIBUTION OF HEAVY METALS IN ANAEROBIC DIGESTION,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
T. D. Hayes.
Journal Water Pollution Control Federation, Vol 50, No 1, p 61-72, January, 1978. 15 fig, 5 tab, 21 ref.

Descriptors: *Heavy metals, *Anaerobic digestion, *Toxicity, *Sewage sludge, *Model studies, Biomass, nickel, Copper, Lead, Chromium, Zinc, Cadmium, Solubility, Distillation, Waste water treatment, Municipal wastes.

The distribution of heavy metals in anaerobic digesters was investigated using three bench-scale anaerobic digesters fed with sewage containing varying concentrations of heavy metals. Nitrate salts of chromium, copper, nickel, zinc, cadmium, and lead and dichromate were fed to the digesters in concentrations ranging from 5-15,000 mg/liter by step or pulse feed applications over a period of 10 days. Sludge samples taken during the digestion process were separated into soluble, precipitated, extracellular, and intracellular fractions for heavy metal analysis. Decreasing gas generation, methane concentrations, and organic acids accumulation were monitored as indicators of anaerobic digestion disruption by heavy metals. The toxicity impact of the heavy metals on anerobic digestion followed the relationships: nickel > copper > lead > chromium > zinc, with no toxic impact observed for the cadmium doses. Heavy metal concentrations in the digester were distributed between the in-soluble or precipitated fraction and the intracellular or biomass fraction, with little of the metals evident in the extracellular fraction. Levels of heavy metals which would produce inhibition and toxicity during anerobic digestion were calculated. (Lisk-FIRL)
W78-08474

MICROSCOPIC OBSERVATION OF ACTIVATED SLUDGE APPLIED TO THE MONITORING OF TREATMENT PLANTS (L'OBSERVATION MICROSCOPIQUES DES BOUES ACTIVEES APPLIQUE A LA SURVEILLANCE DES INSTALLATIONS D'EPURATION: TECHNIQUE D'ETUDE INTERPRETATION),
Montpellier-2 Univ. (France). Lab. de Genie Chimique, Traitement et Epuration des Eaux.
For primary bibliographic entry see Field 5A.
W78-08475

TEEPOL AND TRITON MEDIA FOR THE ENUMERATION OF ESCHERICHIA COLI BY MEMBRANE FILTRATION,
Dundee Univ. (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.

W78-08476

COMPARISON OF ADSORPTION ELUTION METHODS FOR CONCENTRATION AND DETECTION OF VIRUSES IN WATER,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5A.
W78-08477

DETERMINATION OF TOCL BY ENRICHMENT ON POWDERED ACTIVATED CARBON AND FLOCCULATION (UNTERSCHUNGEN ZUR BESTIMMUNG DE ORGANISCH GEBUNDENEN CHLORS MIT HILFE EINES NEUARTIGEN ANREICHERUNGSVERFAHREN),
For primary bibliographic entry see Field 5A.
W78-08478

STABILITY AND FLOCCULATION OF COLLOIDAL PARTICLES--PART 1,
J. Gregory.
Effluent and Water Treatment Journal, Vol. 17, No. 10, p 515, 517, 519-521, October, 1977. 5 fig, 15 ref.

Descriptors: *Colloids, *Flocculation, *Mathematical models, *Coagulation, Analytical techniques, Kinetics, Chemical precipitation, Solubility, Sedimentation rates, Shear, Waste water treatment.

Mathematical models were developed to describe the stability and flocculation kinetics of colloidal particles. Flocculation of colloidal particles occurs by either Brownian motion (perikinetic flocculation) or induced velocity gradients (orthokinetic flocculation). Both types of flocculation are rate dependent upon the collision rate which expresses the maximum flocculation rate. This rate can be described as a function of colloidal concentration, decreasing with time, and rate constant, indicating that perikinetic flocculation is a second-order process. Integration of the flocculation rate equation can provide particulate concentrations at a specific time. The rate of orthokinetic flocculation can be expressed as a function of shear rate, spherical particle diameter, and initial concentration of the particles. Perikinetic flocculation of spherical particles is described with an equation using Boltzmann's constant, absolute temperature, and water viscosity. A comparison of the orthokinetic and perikinetic rates indicates that orthokinetic flocculation is more significant for particles above 1 micron in diameter and for higher shear rates. Hydrophilic colloid flocculation occurs when water solubility is altered by temperature, or salt or ion additions. Hydrophobic colloids aggregate when the energy barrier formed by an excess electrical repulsion is reduced or removed. The zeta potential of the particle and solution can be measured by electrokinetic techniques. (Lisk-FIRL)
W78-08479

KINETIC AND EQUILIBRIUM ASPECTS OF FLOC COAGULATION,
Vanderbilt Univ., Nashville, TN. Dept. of Chemistry.
D. J. Wilson.
Separation and Science Technology, Vol. 13, No. 1, p 25-37, 1978. 2 fig, 4 tab, 13 ref.

Descriptors: *Kinetics, *Equilibrium, *Flocculation, *Colloids, *Mathematical models, Stability, Electrolytes, Coagulation, Ionization, Diffusion, Waste water treatment.

The kinetics of colloidal flocculation were studied under various conditions of surface potential, ionic strength, particle size, temperature, and particle concentration. Mathematical models to describe flocculation were developed by modification of the Gouy-Chapman model of the electric double layer. The potential agglomeration of particles is calculated according to the height of the barriers created by the potential energy generated from dispersion forces and electrical forces of the particles. Flocculati
W78-08480

STRATIFICATION IN LABORATORY SIMULATIONS OF SHALLOW STABILIZATION PONDS,
Indian Inst. of Tech., Kanpur, Dept. of Civil Engineering.
S. D. Bokil, and G. D. Agrawal.
Water Research, Vol. 11, No. 12, p 1025-1030, 1977. 5 fig, 3 tab, 14 ref.

Descriptors: *Laboratory tests, *Analytical techniques, *Settling basins, *Alkalinity, *Biochemical oxygen demand, Algae, Aerobic treatment, Anaerobic conditions, Waste water treatment, Municipal wastes.

Laboratory simulations were used to calculate the biochemical stratification occurring in shallow waste water stabilization ponds. Light intensity in the laboratory stabilization ponds, with depths of 53.5 and 35.5 cm, was maintained at a constant value of 60 cal/sq cm/day; two organic feed rates were employed. Biochemical stratification occurred in both laboratory ponds; stratification consisted of a small lower anaerobic bottom layer and an upper aerobic layer whose depth size remained constant under variations in hydraulic loading and pond depth. Low alkalinity and BOD levels were apparent in the upper stratum; high alkalinity and BOD were found in the bottom layer. The rate of oxygen decrease in the upper layer was a function of depth in the absence of agitation and averaged 0.09 mg/liter/cm. Algae concentrations increased functionally with decreasing detention time. Light attenuation at the depth where algal concentrations were insignificant was 96% of the surface light intensity. (Lisk-FIRL)
W78-08481

CONTROL TESTS AND KINETICS OF ACTIVATED SLUDGE PROCESS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical and Environmental Engineering.
L. K. Wang, C. P. C. Poon, and M. H. Wang.
Water, Air, and Soil Pollution, Vol. 8, No. 3, p 315-351, August, 1977. 16 fig, 1 tab, 31 ref.

Descriptors: *Activated sludge, *Kinetics, *Mathematical models, *Analytical techniques, *Oxygen demand, Biochemical oxygen demand, *Chemical oxygen demand, Aeration, Biodegradation, Nitrification, Denitrification, Sewage sludge, Waste water treatment, Municipal wastes.

Mathematical models described the kinetics of the activated sludge process in complete-mix reactors with and without sludge recycle and in plug-flow reactors with sludge recycle. The process parameters of biodegradability and sludge acclimation were analyzed as a function of oxygen uptake rate based on dissolved oxygen concentrations. Definitions and standard evaluations of solids, sludge settling, sludge blanket, sludge units and substrate utilization were presented. Equations were developed to describe the interrelationships between hydraulic retention time, volumetric loading, sludge production, sludge wasting, and recirculation ratio for the three types of activated sludge reactors. The ratio of BOD to COD could be replaced with equations for calculating the BOD:total organic carbon ratio; methods of establishing 5-day BOD, initial BOD of the influent, ultimate BOD, residual BOD and BOD at any given time period were presented. Mathematical models were also developed for calculating treatment efficiency, yield and endogenous respiration coefficients, growth rate, and sludge volume index. An energy-assimilation reaction model was designed to assess the nitrification and denitrification capacity of a system; an analytical procedure for calculating maximum nitrifying and denitrifying abilities was outlined. (Lisk-FIRL)
W78-08482

SIGNIFICANT CORRELATION EXISTS BETWEEN DESIGN TECHNIQUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
J. H. Sherrard.
Water and Wastes Engineering, Vol. 15, No. 1, p 50-52, January, 1978. 5 fig, 1 tab.

Descriptors: Analytical techniques, *Mathematical models, *Biochemical oxygen demand, *Nitrogen, *Design criteria, Activated sludge, Aeration, Suspended solids, Waste water treatment, Municipal wastes.

Correlations between rational and empirical design techniques of the activated sludge process are investigated with mathematical models. Rational techniques are based on microbial growth and degradation balanced with the utilization of materials to supply values for mean cell residence time, biological solids retention time, or sludge age. Empirical techniques utilize functions of hydraulic retention time, alone or in conjunction with oxygen uptake, BOD, and the food-to-microorganism ratio. Total Kjeldahl nitrogen (TKN) is a function of BOD, uptake rates of BOD or TKN, microorganism constant yield coefficient, influent flow rate, and influent and effluent BOD or TKN levels. Mean cell residence time is related to aeration basin volume, mixed liquor suspended solids, and flow rate; the food-to-microorganism ratio follows the ratio of flow rate and BOD or TKN concentrations to basin volume and mixed liquor suspended solids. When the mathematical models were applied to a 10 mgd treatment plant, BOD was metabolized at higher cell residence times with higher mixed liquor suspended solids. The food-to-microorganism ratio became smaller while nitrification occurred with increasing cell residence time and larger amounts of TKN. (Lisk-FIRL)
W78-08483

INAPPLICABILITY OF BATCH KINETIC DATA TO ANALYSIS OF SOIL TREATMENT SYSTEMS,
Kennedy Engineers, Inc., San Francisco, CA.
For primary bibliographic entry see Field 5E.
W78-08484

THE BEHAVIOR OF A POORLY DEGRADABLE MODEL SUBSTANCE DURING BIOLOGICAL PURIFICATION (VERHALTEN EINER SCHWER ABBAUBAREN MODELLSUBSTANZ BEI DER BIOLOGISCHEN REINIGUNG),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Wasserversorgung, Abwasserbeseitigung und Raumplanung.
I. Pedrag.
GWF-Wasser/Abwasser, Vol 119, No 3, p 127-134, 1978. 12 fig, 1 tab, 15 ref.

Descriptors: *Model studies, *Biological treatment, *Biodegradation, *Aeration, *Sludge treatment, Analytical techniques, Activated sludge, Organic wastes, Microorganisms, Degradation, Waste water treatment.

Pentaerythritol was used as a model substance to study the behavior of substances which are not generally amenable to biological waste water treatment. Persistent substances are broken down by slow growing microorganisms which may not have sufficient time to develop in conventional aeration basins. These substances can be more efficiently handled by increasing the age of the activated sludge. This can be achieved by subdividing the biological treatment into two stages. The first stage is operated under high sludge loading conditions. The easily degradable substances are

removed in this stage and some of the more persistent substances are converted by the microorganisms into more easily removed intermediates. The latter, along with the intact persistent substances, are removed in the second stage by microorganisms which have aged under low sludge loading conditions. The overall efficiency of the two-stage aeration system is equivalent to that of a conventional one-stage aeration system is equivalent to that of a conventional one-stage basin. The model studies with pentaerythritol demonstrate that hardly any degradation occurs during the first 2.5 days, after which pentaerythritol removal increases sharply until the 8th day. (Takacs-FIRL)
W78-08485

THE STABILITY OF SUSPENDED PARTICLES IN FLOCCULATION PROCESSES IN WATER AND WASTE WATER (DIE STABILITAET VON SUSPENDIERTEN FESTSTOFFEN BEI FLOKKUNGSPROZESSEN IN WASSER UND ABWASSER),
U. Neis.
Zeitschrift fuer Wasser- und Abwasserforschung, Vol 10, No 6, p 183-192, 1977. 11 fig, 3 tab, 26 ref.

Descriptors: *Flocculation, *Chemical precipitation, *Suspended solids, *Polyelectrolytes, *Aqueous solutions, Silica, Illite, Montmorillonite, Kaolinite, Clay minerals, Salts, Model studies, Waste water treatment, Municipal wastes.

The impact of flocculation and precipitation on the kinetic behavior of aqueous suspensions containing silica, aluminum oxide, kaolinite, illite, monmorillonite, and bacillus cereus was investigated with particle count techniques. Flocculation rates varied for the suspensions of silica, aluminum hydroxide, and clays when simple or hydrolized salts and polyelectrolytes were employed as aggregating agents. Aggregation rates increased while flocs remained intact when the mean velocity gradient was increased to 100/sec. Under optimal concentration ranges of 3.1 million to 2.1 billion particles/ml, variations in hydrodynamic parameters did not affect the destabilizing efficiency of the flocculants. When aluminum salt was used as a precipitant rather than a flocculant, the aggregation of silica in aqueous suspensions was more successful. (Lisk-FIRL)
W78-08486

UNDERFLOW RATE AND CONTROL OF AN ACTIVATED SLUDGE PROCESS,
Hoff-Weston Associates, Cleveland, OH.
M. W. Schaffner, and W. O. Pipes.
Journal Water Pollution Control Federation, Vol 50, No 1, p 20-30, January, 1978. 4 fig, 4 tab, 18 ref.

Descriptors: *Mathematical models, *Sludge treatment, *Settling velocity, *Suspended solids, *Model studies, Settling basins, Data collections, Analytical techniques, Waste water treatment, Municipal wastes.

The limitation of the underflow solids concentration by the area of the settling tank was quantified with mathematical models relating batch settling velocity to solids concentrations. A logarithmic formula, based on Dick and Young's theory of continuous sludge thickening, empirically related the initial settling velocity in batch settling tests, related the hypothetical settling velocity at an infinite solids concentration and the maximum batch solids flux to the initial solids concentration. When the equations were applied to data from batch settling tests conducted over a 1-mo period at a treatment plant, the empirical formula under estimated the underflow solids concentration while the reciprocal model over-estimated the concentration. The underflow suspended solids in the batch settling tests also exceeded the values calculated from the sludge volume index by six-fold. The solids loading on the settling tank was always greater than the solids flux. (Lisk-FIRL)
W78-08487

REMOVAL OF DICHLORAMINE AND AMMONIA BY GRANULAR CARBON,
Tennessee Valley Authority, Chattanooga.
B. R. Kim, V. L. Snoeyink, and R. A. Schmitz.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 122-133January, 1978. 10 fig, 2 tab, 17 ref.

Descriptors: *Activated carbon, *Chlorine, *Chlorides, *Mathematical models, *Ammonia, Model studies, Adsorption, Chemical reactions, Nitrogen, Chlorination, Kinetics, Waste water treatment, Municipal wastes.

Mathematical models were derived for the removal of dichloramine and ammonia on activated carbon batch and packed bed reactors. Temperature, concentration, and particle size were monitored in closed batch experiment; pore diffusion coefficients were calculated from this data. The coefficients were used to solve an algebraic expression, obtained from the removal rate of dichloramine from bulk fluid on carbon, as a function of the average mass of dichloramine reacted with time for a unit weight of carbon. The data obtained from the packed bed models was applicable in the design and prediction of performance of activated carbon beds. Units employing different carbon types than these experiments required additional batch tests to ensure the accuracy of the mathematical models. The packed beds did not achieve a steady state condition; reaction rates decreased as surface oxides accumulated on the packed bed media. (Lisk-FIRL)
W78-08488

THE INFLUENCE OF PH AND ORGANIC LOADING ON THE FILAMENTATOUS BULKING OF ACTIVATED SLUDGE,
Toyama Coll. of Tech. (Japan). Dept. of Sanitary Engineering.
M. Yasuda.
Transactions of the Japan Society of Civil Engineers, Vol. 8, p 131-132, 1976. 5 fig, 1 tab.

Descriptors: *Sphaerotilus, *Activated sludge, *Bulk density, *Organic loading, *Hydrogen ion concentration, Chemical oxygen demand, Suspended solids, Temperature, Model studies, Waste water treatment, Municipal wastes.

The growth of Sphaerotilus, an organism contributing to filamentatous sludge bulking, in activated sludge was measured with respect to variations in pH, COD, temperature,, and organic loading during laboratory experiments. The temperature of the 5 liter aeration tank and the 1.5 liter settling tank ranged from 18.5-29.4C with an organic loading of 0.24 g COD/g volatile suspended solids/day and a hydraulic loading of 0.57 g COD/liter/day. Sphaerotilus growth increased when the pH of the aeration tank effluent was raised above pH 6; the organic and hydraulic loading rates did not significantly affect Sphaerotilus growth. When pH was varied from 6-9 with an organic loading of 0.30 g COD/liter/day, Sphaerotilus growth was stimulated. Above this pH range Sphaerotilus growth was not apparent; loading rates did not affect growth in the high pH ranges. (Lisk-FIRL)
W78-08489

INFECTIOUS DISEASE HAZARDS OF LAND-SPREADING SEWAGE WASTES,
Agricultural Research Service, Beltsville, MD. Biological Waste Management and Soil Nitrogen Lab.; and Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5C.
W78-08490

PROBLEMS AND TECHNIQUES FOR THE AERATION SYSTEMS IN SEWAGE WORKS AND SURFACE WATERS--EXPERIENCE WITH INSTREAM AERATION AND OXYGEN MONITORING IN THE RIVER RUHR,
Ruhrverband, Essen (West Germany).
For primary bibliographic entry see Field 5G.
W78-08495

CHLORINATION: ASSESSING ITS IMPACT,
For primary bibliographic entry see Field 5C.
W78-08498

1984 IS APPROACHING--WHAT DOES IT MEAN TO THE WASTE-WATER SERVICE,
Thames Water Authority, London (England). Metropolitan Public Health Div.
A. M. Crossley.
Water Services, Vol. 81, No. 978, p 475-476, August, 1977.

Descriptors: *Computers, *Instrumentation, *Measurement, *Equipment, *Dissolved oxygen, Sludge digestion, Methane, Pumping plants, Flowmeters, Waste water treatment, Treatment facilities, Municipal wastes.

Future trends in municipal waste water treatment facilities are predicted. Treatment facilities will reportedly be automatically controlled and operated by a main computer. Log sheets and records will be maintained by the computer for read-out on a visual display unit or on tape. The computer will control plant maintenance schedules as well as security and personnel matters. Magnetic or ultrasonic flowmeters and level transmitters will monitor waste water and sludge flow. Floats and electrodes in pumping stations will be replaced by upstream level meters; pumping operations will be controlled by integrated solid state circuit chips. The computer will automatically regulate the dissolved oxygen secondary treatment process by evaluating data from electrodes. Digesters will be operated according to the quantity and rate of gas production, measured by the BTU or heat meter. Fuel to power the treatment facility, as well as excess fuel for local power stations, will be supplied in the form of methane from the digesters. (Lisk-FIRL)
W78-08499

CONDUCTING VALUE ENGINEERING STUDIES--THE EXPERIENCE OF FIVE CITIES,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, CA.
For primary bibliographic entry see Field 5G.
W78-08501

EFFECT OF GAMMA RAYS ON MICROORGANISMS AND CHEMICALS IN WATER, WASTEWATER, AND SLUDGE,
Florida Inst. of Tech., Melbourne. Univ. Center for Pollution Research.
D. D. Woodbridge, and P. C. Cooper.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 680, Price codes: A09 in paper copy, A01 in microfiche. Final Report to Army Facilities Engineering Support Agency, Report FESA-RT-2009, 1976. 175 p, 59 fig, 31 tab, 64 ref.

Descriptors: *Gamma rays, *Coliforms, *Chemical wastes, *Aeration, *Chlorination, Ozone, Oxygen, Bubble, Pathogenic bacteria, Sewage bacteria, Streptococcus, Irradiation, Disinfection, Waste water treatment, Trickling filters, Municipal wastes.

Gamma irradiation of secondary trickling filter effluent was evaluated in conjunction with air and oxygen bubbling, ozonation, and prechlorination for the treatment of bacteria and chemicals in waste water. Chemicals reduced by irradiation included: phenols, detergent surfactants, parathion,

and cyanide. Dissolved oxygen and free chlorine were removed; chloroform and carbon tetrachloride, byproducts of chlorination, were eliminated by irradiation and simultaneous oxygen bubbling. The destruction of coliforms by irradiation was enhanced in the presence of air or oxygen bubbling; chlorination before irradiation also had a synergistic effect. Irradiation was more effective in reducing coliforms in aqueous media than in sludge; undigested sludge was more treateble with gamma irradiation than digested sludge. Irradiation inactivation of the pathogenic bacteria, Streptococcus faecalis and Staphylococcus aureus, and the pathogenic amoeba, Naegleria gruberi, was tested. . Further research was recommended for pathogens and viruses. (Lisk-FIRL)
W78-08503

STUDIES ON THE TREATMENT OF NIGHT SOIL. VII. IDENTIFICATION OF BACTERIA ISOLATED FROM AEROBIC TREATMENT PLANT OF UNDILUTED NIGHT SOIL AND AMINO ACID UTILIZATION BY THESE BACTERIA (SHINYOSHORI NI KANSURU KENKYU (DAINANAHO)--MUKISHAKU SHINYO NO KOKUSEI SHORISHISETSU KARANO JOKASAIKIN NO BURNI RO SONO AMINO SAN BURKAINO),
Gifu Coll. of Pharmacy, (Japan). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 5A.
W78-08505

FINAL ENVIRONMENTAL IMPACT STATEMENT--CITY OF JACKSONVILLE, FLORIDA WASTEWATER MANAGEMENT FACILITIES, ARLINGTON-EAST SERVICE DISTRICT.
Environmental Protection Agency, Atlanta, GA. Region IV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 590, Price codes: A12 in paper copy, A01 in microfiche. Report EPA 904/9-76-021, August 1976. 245 p, 15 fig, 1 tab.

Descriptors: *Environmental effects, *Environmental engineering, *Treatment facilities, *Outfall sewers, *Incineration, Aquatic animals, Construction, Salt marshes, Conveyance structures, Waste water treatment, Municipal wastes.

The final Environmental Impact Statement on the specifications of the 10 mgd regional waste water treatment plant planned for Jacksonville, Florida, was presented by the U. S. Environmental Protection Agency as a preliminary to awarding grants for funding the project. In addition to the waste water treatment plant, the project included 13,900 ft of outfall line to the St. Johns River and a 38,000 ft force main for pumping sludge to an incinerator. The impact of construction activity on aquatic animals in two salt marsh ponds, on wildlife, and on the surrounding communities was reviewed. The effect of the discharge of 10 mgd of treated effluent on the St. Johns River and the community development associated with the expanding waste water treatment facilities were evaluated. The alternative sites for the treatment plant, outfall, and force main were considered on a cost-effective basis. The Environmetal Impact Statement is a continuation of a draft presented in 1976. (Lisk-FIRL)
W78-08506

DIRECT ENVIRONMENTAL FACTORS AT MUNICIPAL WASTEWATER TREATMENT WORKS--EVALUATION AND CONTROL OF SITE AESTHETICS, AIR POLLUTANTS, NOISE AND OTHER OPERATION AND CONSTRUCTION FACTORS,
For primary bibliographic entry see Field 5G.
W78-08507

PRELIMINARY LISTING OF MUNICIPAL WASTE WATER TREATMENT CAPACITIES.
Oklahoma Foundation for Research and Development Utilization, Inc., Edmond.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 430, Price codes: A09 in paper copy, A01 in microfiche. Report EDA-OER-76-038, September 1976. 187 p, 50 tab. Prepared for Economic Development Administration, Washington, D.C., Office of Economic Research.

Descriptors: *Treatment facilities, *Municipal wastes, *Data collections, Population, *Surveys, Costs, Statistics, Census, Cities, Waste treatment, Profiles, Waste water treatment, Sewage.

A preliminary listing of all municipal waste water treatment facilities servicing populations over 2,000 in the United States wes compiled. The updated listing was devised by the Oklahoma Foundation for Research Development Utilization, Inc. for the Economic Development Administration. The municipal treatment facilities, categorized by state and county, are evaluated for the population served, based on data from the 1970 census. Municipalities within counties located in Economic Development Districts are noted. Each plant is classified according to the daily treatment capacity, the average daily use, the average daily per capita use rate, and the percentage of treatment facility capacity utilized. Predicted parameters recorded in the preliminary listing include the population expansion permitted by the present facility's design capacity, the estimated cost of expanding the plant for a utilization rate of 70% with a 20% impact margin, the use of the system approaching capacity or beyond cpacity, and a reference number for each municipal facility. The second phase of this project, planned for 1977, will correct, update, and refine the data. (Lisk-FIRL)
W78-08508

THE EFFECT OF TEMPERATURE ON THE GROWTH OF ACINETOBACTER CALCOACETICUS,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Microbiology.
J. C. Du Preez, and D. F. Toerien.
Water SA, Vol. 4, No. 1, p 10-13, January, 1978. 5 fig, 2 tab, 10 ref.

Descriptors: *Sewage bacteria, *Cultures, *Lipids, *Activated sludge, *Growth rates, Thermodynamic behavior, Microbial degradation, Microorganisms, Biological treatment, Waste water treatment, Municipal wastes.

The activated sludge organism, Acinetobacter calcoaceticus, was cultered in an acetate medium and in Tryptone soy broth over a temperature range of 16-40C to evaluate the influence of temperature on microbial growth. The growth rate of Acinetobacter calcoaceticus in the acetate medium peaked within a temperature range of 30-36 C; growth declined steadily until 40.6 C when growth ceased. The maximum specific growth rate was 1.17/hr; the pH of the acetate media ranged from an initial 6.7 and 8.6 during growth. Optimum temperature for growth in the Tryptone soy broth was 29-33 C, with growth ceasing above 37 C; the maximum specific growth rate was 1.28/hr. Arrhenius curves were plotted for the relationship between growth rate and temperature in both media. Activation energies calculated from the curves for Acinetobacter calcoaceticus in the soy broth ranged from 9.51-22.87 kilocalories; activation energies for the acetate medium ranged from 10.36-17.49 kilocalories. Optimum temperature for an activated sludge process utilizing A. calcoaceticus bacteria for fatty acid removal was considered to be 29-35 C. (Lisk-FIRL)
W78-08509

ADSORPTION IN THE ACTIVATED SLUDGE PROCESS,
Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering.
G. A. Ekama, and G. V. R. Marais.
Water SA, Vol. 4, No. 1, p 39-48, January, 1978. 8 fig, 3 tab, 5 ref, 1 append.

Descriptors: *Activated sludge, *Nutrification, *Adsorption, *Analytical techniques, *Chemical oxygen demand, Oxygen demand, Oxygen requirements, Aerobic conditions, Laboratory tests, Waste water treatment, Municipal wastes.

The cause of sharp decreases in the oxygen consumption rate when waste water feed to an activated sludge reactor is stopped was investigated in laboratory tests. One unit was fed with COD-bearing influent containing low nitrogen levels during five test runs using a square wave system, equivalent to a 12 hr feeding period followed by a 12 hr period without feeding. The other unit was fed during three tests with influent at a constant COD concentration and low nitrogen levels at square wave additions of 24 mg NH4/hr. In the fourth test, the NH4 concentration was raised to 13.7 mg/hr. For the fifth test, the influent was spiked with an additional 20 mg NH4/hr. The units were monitored over a 10 hr period with sludge ages of 1.5 and 2.5 days. When the feeds were terminated, the unit fed on the square wave regimen exhibited an instantaneous steep reduction in oxygen consumption. The constant feed unit was unaffected. In the fifth test, both units displayed the same changes in oxygen consumption at feed termination. The oxygen consumption decline in the cyclically fed reactor was attributed to increased energy requirements for carbonaceous matter adsorption. An adsorption model incorporating the increased energy requirements was formulated in conjunction with Monod's nitrification equation and applied to the activated sludge model to improve process response predictions of oxygen consumption rate, effluent total Kjeldahl nitrogen, and nitrate concentrations. (Lisk-FIRL)
W78-08510

A RAPID CENTRIFUGE METHOD FOR DETERMINATION AND CONTROL OF SLUDGE CONCENTRATION IN ACTIVATED SLUDGE PLANTS,
National Inst. for Water Research, Pretoria (South Africa).
R. J. L. C. Drews.
Water SA, Vol. 4, No. 1, p 1-3, January, 1978. 2 fig, 1 tab, 3 ref.

Descriptors: *Centrifugation, *Activated sludge, *Analytical techniques, *Sludge treatment, *Bulk density, Physical properties, Gravimetric analysis, Volumetric analysis, Waste water treatment, Treatment facilities, Municipal wastes.

A centrifuge technique to measure mixed liquor suspended solids in activated sludge processes was developed as a more rapid alternative to the half-hour sludge settled volume test currently used by small treatment plants. Two graduated centrifuge tubes were filled with 15 ml of mixed liquor and centrifuged at 2,000 rpm for 2 min. Sludge levels were recorded immediately upon completion of centrifugation; values were multiplied by a centrifuge sludge volume factor calculated from the various solids retention times. A comparison of sludge concentration values obtained from 29 South African plant sludges by half-hour sludge settled volume tests and by the centrifuge method using 4,200 as the sludge volume verified that the centrifuge values were more reliable than the half-hour settling results and more easily obtained than gravimetric data. The half-hour test was still required to provide the sludge volume index for predicting sludge bulking potential. (Lisk-FIRL)
W78-08511

MASS TRANSFER AND REACTION RATE STUDIES OF OZONATED MUST WASTEWATERS IN THE PRESENCE OF SOUND WAVES,
Arizona Univ., Tucson. Dept. of Civil Engineering.
R. A. Sierka.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 026, Price codes: A07 in paper copy, A01 in microfiche. Technical Report UA-ENGR-1436, August 1976. 143 p, 31 fig, 7 tab, 14 ref, 5 append. Prepared for Army Medical Research and Development Command, Washington, D.C.

Descriptors: *Hospitals, *Ozone, *Reverse osmosis, *Disinfection, *Membrane processes, Organic wastes, Sodium compounds, Carbon, Chemical oxygen demand, Waste water treatment, Municipal wastes.

Ultrasonic waves were investigated for the treatment of synthetic, ozonated, and U.S. Army field hospital (MUST) wastes; reverse osmosis permeates; sodium acetate; urea; and Kodak X-ray developer and fixer. Ultrasonic treatment assisted in the decomposition of ozone, thus lowering the dissolved oxygen concentration. Mass transfer coefficients for ozone increased from 49.7 to 65.9/hr with ultrasound. While the organic stripping of MUST permeates was relatively unaffected by ultrasonic waves, ultrasound increased the rate and extent of ozone oxidation of the permeates in the higher and lower peak envelope power ranges. Total organic carbon and COD were reduced to 5 mg and 10 mg/liter, respectively, within two hrs at an ozonation rate of 236.4 mg/min with ultrasound. COD and total organic carbon level standards in permeates were achieved with a combination air stripper and ozone reactor which utilized 35% less ozone than a continuous ozonation system but required a longer reaction time. Ultrasonic treatment of sodium acetate improved its oxidation; urea, developer, and fixer solution oxidation was not significantly enhanced. The Kodak solutions could be oxidized before reverse osmosis treatment in the presence of sufficient ozone. (Lisk-FIRL)
W78-08512

THE HOUSTON SOLUTION: ADVANCED TREATMENT AND SLUDGE RECLAMATION.
Public Works, Vol. 109, No. 2, p 104, February, 1978.

Descriptors: *Activated sludge, *Nitrification, *Aeration, *Oxygen, *Sludge treatment, *Sludge digestion, Dewatering, Filtration, Biochemical oxygen demand, Treatment facilities, Fertilizers, Drying, Waste water treatment, Municipal wastes.

A two-stage activated sludge plant has been selected for treating waste water from a 53,500 acre section of Houston, Texas, containing one-third of the city's population and most of the business district. The first stage of the plant, following degritting and trash removal, reduces carbonaceous BOD by the activated sludge process. The second stage promotes nitrification with pure oxygen generated on-site in a cryogenic oxygen plant. The waste water then flows by gravity through rapid media filters followed by chlorination and discharge to the Buffalo Bayou and the Houston Ship Channel. The sewage sludge is thickened, aerobically digested, dewatered by vacuum filtration, and dried. An average of 112 tons/day of sludge is processed at the plant which has provisions for a peak capacity of 140 tons/day. The processed sludge is sold as commercial fertilizer. Sixty million dollars of the $220 million plant was allocated for the sludge processing plant. (Lisk-FIRL)
W78-08513

MARSH/POND SEWAGE TREATMENT PLANTS,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
M. M. Small.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-21237, Price codes: A02 in paper copy, A01 in microfiche. Report BNL-21237, March 1976. 15 p.

Descriptors: *Marshes, *Ponds, *Potable water, *Marsh plants, *Odor, Membranes, Plastics, Artificial recharge, Groundwater, Waste water treatment, Municipal wastes.

A marsh/pond sewage treatment system which purifies waste water to potable water standards at the Brookhaven National Laboratory in Upton, New York, is described. A prototype 10,000 gpd treatment system required 0.2 acres of marsh at a 1-ft depth followed by a 0.2 acre pond with a 5-ft depth. The system was completely underlined with a 20-mil polyvinyl chloride membrane to prevent groundwater infiltration of the waste water. A blend of sewage and septage is applied to the marsh at a rate of 50,000 gal/acre/day; a 20-acre site is required to treat 1 mgd. The marsh is planted with grasses, duckweeds, and cattails, although the continued growth of the cattails has been unsuccessful. The marsh/pond treatment system has been developed for populations up to 10,000, costing an estimated $0.60/gal/day for operation. (Lisk-FIRL)
W78-08514

FRESH WATER FROM SEWAGE ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
M. M. Small.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-21371, Price codes: A02 in paper copy, A01 in microfiche. Report BNL-21371, April 1967. 16 p, 10 ref.

Descriptors: *Marshes, *Ponds, *Grasslands, *Groundwater recharge, *Marsh plants, Seepage, Recharge ponds, Nutrient removal, Potable water, Waste water treatment, Sewage, Municipal wastes.

Sewage and cesspool contents were used to recharge groundwater in studies at the Brookhaven National Laboratory in Upton, New York. The waste water purification system was a sloping grass meadow draining into a planted marsh and eventually into a fish-stocked pond. The sewage was applied to the meadow where it permeated the soil and plant roots. The waste water passed through the marsh soils, plant stalks, and root before flowing into the pond. Overflow from the pond was usable as potable water. The same degree of purification could be attained by a marsh/pond system where meadowland is not available and there is a high population density. Both systems were completely lined so the waste water could not percolate into the groundwater before purification. The system produced no sludge or odor. The marsh/pond sewage treatment system costs an estimated $1,440,000, compared to $640,000,000 for a municipal sewage treatment plant. (Lisk-FIRL)
W78-08515

A MECHANISM FOR ASH ASSISTED SLUDGE DEWATERING,
Lehigh Univ., Bethlehem, PA. Center for Surface and Coatings Research.
F. J. Micale.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 070, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-76-297, December 1976. 51 p, 39 fig, 2 tab, 9 ref.

Descriptors: *Sludge treatment, *Activated sludge, *Flocculation, *Fly ash, *Settling velocity, Dewatering, Salts, Calcium compounds, Potassium compounds, Carbon, Silica, Polarity, Waste water treatment, Municipal wastes.

Fly ash and three types of ash from sludge incineration were evaluated as flocculants for improving activated sludge settleability. The ashes, with surface areas from 1.7-17 sq m/g, were washed to separate them into: a solid fraction containing two carbons, two silicas, and magnetite; and a liquid fraction of water soluble salts containing calcium fluoride, aluminum chloride, potassium phosphate, and anionic and cationic polymeric surfactants. Separate experiments were used to test the settling capabilities of the solids and the water soluble salts. Of the solids tested, the carbon black Elf-4 and the silica Quso H-40 were the most efficient flocculants because of their hydrophilic characteristics and high levels of polar groups. Flocculation of the alkaline activated sludge was enhanced by the polar surfaces which adsorbed the cationic and polar molecules and disrupted the sludge particle/liquid interfaces. In the water soluble salt tests, calcium fluoride and aluminum chloride promoted activated sludge settlement via preferential adsorption of the calcium and aluminum ions. Experiments using the unwashed ashes demonstrated that the ash with the most hydrophilic surface and the highest surface area had the greatest effect on activated sludge settleability. The reverse was true for this ash after washing. (Lisk-FIRL)
W78-08516

WASTEWATER RENOVATION BY A PROTOTYPE SLOW INFILTRATION LAND TREATMENT SYSTEM,
Cold Regions Research and Engineering Lab., Hanover, NH.
I. K. Iskandar, R. S. Sletten, D. C. Leggett, and T. F. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 744, Price codes: A04 in paper copy, A01 in microfiche. CRREL Report 76-19, June 1976. 51 p, 23 fig, 10 tab, 63 ref, 1 append.

Descriptors: *Percolation, *Return flow, *Nutrient removal, *Nitrogen, *Hydrologic properties, Phosphorus, Nitrates, Ammonia, Biochemical oxygen demand, Soil types, Coliforms, Carbon, Waste water treatment, Municipal wastes.

Six experimental sand loam and silt loam test cells at the United States Cold Regions Research and Engineering Laboratory in New Hampshire were spray irrigated with ozonated primary and secondary effluent for a one year period. The program's objective was to evaluate the effectiveness of waste water purification by slow land infiltration. Nitrogen, chloride, and suspended solids levels in the waste water varied with seasonal conditions; BOD, fecal coliforms, and organic carbon were reduced by secondary treatment with extended aeration. The application of 628-2055 kg/hectare total nitrogen, 85% of which was ammonia, to the soil cells over the one year period revealed that nitrogen was converted to nitrate-nitrogen in the top 45 cm of the soil. The concentration of nitrate in the soil percolates peaked at 125 mg/liter nitrate-nitrogen during the summer months and averaged 10 mg/liter during other periods. Ammonia-nitrogen leached through the soil cells only during winter months. A total nitrogen uptake of 26-54% by the forage grown on the soil cells was reported. The test cells removed 99% of the total phosphorus, averaging 7.0 and 7.1 mg/liter in the primary and secondary effluent, respectively. The test cells completely removed BOD, suspended solids, fecal coliform, and organic carbon. (Lisk-FIRL)
W78-08517

BACTERIAL AEROSOLS RESULTING FROM SPRAY IRRIGATION WITH WASTEWATER,
Army Medical Bioengineering Research and Development Laboratory, Fort Detrick, MD.
For primary bibliographic entry see Field 5A.
W78-08518

HANDBOOK OF WATER RESOURCES AND POLLUTION CONTROL.
Van Nostrand Reinhold Company, New York, 1976, 840 p. Edited by H. W. Gehm, J. I. Bregman and G. V. Beeland.

Descriptors: *Wastewater treatment, Water pollution control, *Water quality standards, *Water reuse, Municipal wastes, Industrial wastes, Water resources development, *Waste disposal, *Water distribution systems, *Water allocation(Applied), *Water treatment.

Advanced techniques for treatment of both municipal and industrial wastes, many of which are still in experimental stages, are presented. These techniques are also designed to increase available water supplies through the reuse of reclaimed wastewater. Advanced techniques of cost allocation among users of joint municipal/industrial waste treatment facilities are also discussed along with alternative methods of recovering costs. Joint treatment is frequently undertaken to obtain economies of scale, and federal law now requires industry to pay its full share of treatment in plants constructed with federal funding. The chapter on acceptable techniques for disposing of sludge resulting from waste treatment is of increasing importance as populations grow, treatment requirements become more stringent, and more solids are removed. As a guide to potential water demand, data are presented on actual water use by nearly 200 public water supplies in the U.S., information which is not tabulated in one source elsewhere. The treatment and distribution of potable water are covered in two chapters. The former presents the most modern practice in the preparation of potable water and provides a basis for meeting future requirements. The chapter on distribution will be especially useful to those responsible for extending water systems to serve burgeoning metropolitan areas. This is also true of the chapter 'Wastewater in the City,' which is concerned with projecting anticipated quantities of sewage, how to confine it, and how to remove it from its source. The potential for increasing the world's usable water supply through desalination of seawater is explored. This chapter discussed theoretical, practical, and economic considerations of the more promising processes of desalination. Innovative techniques for beneficial use of thermal discharges from power plants are described. These include increased-productivity greenhouses for vegetables as well as flowers, improved livestock production, and space heating. The book closes with a section-by-section analysis of the 1972 Amendments to the Federal Water Pollution Control Act which establish, for the foreseeabie future, the goals anticipated to be achieved in the nation's drive toward clean waterways.
W78-08543

EVALUATION OF TECHNIQUES FOR ALGAE REMOVAL FROM WASTEWATER STABILIZATION PONDS, REVIEW PAPER,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
E. J. Middlebrooks, D. B. Porcella, R. A. Gearheart, G. R. Marshall, and J. H. Reynolds.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 238, Price codes: A02 in paper copy, A01 in microfiche. Report No. PRJEW115-1, January, 1974. 20 p, 2 fig, 1 tab, 10 ref. OWRT A-015-UTAH(2), 14-31-0001-3845; and EPA 68-03-0281.

Descriptors: *Algae, *Algal control, Evaluation, Ponds, Waste water(Pollution), Waste water treatment, Waste storage, Stabilization, Centrifugation, Coagulation, Flocculation, Filtration, Soil filters, *Algal removal, Particulates, Microstraining, Containment.

Review and evaluation of techniques for algae removal from wastewater stabilization ponds are presented. Criteria for candidate processes for removal of particulate matter (e.g., microorganisms) include ease of operation, minimum maintenance and cost, dependability of operation, and efficiency of particulate removal, including preventing recycling biological oxygen demand and nutrients from decay of particulates. Processes reviewed are centrifugation, microstraining, coagulation-flocculation, containment, and soil filtration. The use of the soil mantle for polishing effluents is the most economically and technologically feasible method for algae removal, despite questions concerning environmental effects. Granular media filtration through soil mantles offers the advantages of automatic operation, clear effluent, low effluent biological oxygen demand, nutrient removal, and economy. (Wares-IPA)
W78-08544

PRESSURE FILTER FOR PURIFYING AQUEOUS INDUSTRIAL EFFLUENT-WITH A GRANULAR CHARGE AND PERFORATED PLATES, ONE OF WHICH MOVES UP AND DOWN,
A. M. Vyskrebets, E. I. Kozarskii, and B. V. Sudnik.
Soviet Patent SU 546-362. Issued March 17, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 4, p 7, March, 1978. 1 fig.

Descriptors: *Patents, *Oily water, *Suspended solids, *Granules, *Membranes, Permeability, Design criteria, Equipment, Pressure, Filters, Filtration, Separation techniques, Waste water treatment, Industrial wastes.

A patent has been issued for a pressure filter which removes suspended solids and oils from rolling mill and other industrial effluents. A cyclindrical tank, equipped with waste water intake and filtrate outlet pipes, is filled with a granular charge. A vertically mobile conical diaphragm in an open cyclone is attached to one of several perforated drainage distributors. When in operation, a rod and gear move the perforated drainage distributors. When in operation, a rod and gear move the perforated plate bearing the granular charge into the upper section of the tank. As the granular material is pressed against the drainage plate, the waste water is introduced into a cyclone chamber which has a conical bottom. The waste water is forced under pressure through the diaphragm, the granular charge, and the drainage plate located in the upper section. The granular charge is washed as the perforated plate moves down through the liquid towards the drainage plate. Purified water is withdrawn from the top section of the tank. (Lisk-FIRL)
W78-08585

ELIMINATING AND RECOVERING NICKEL FROM AQUEOUS EFFLUENT--BY BOILING WITH SODIUM HYPOPHOSPHITE AND CATALYST SUCH AS PALLADIUM CHLORIDE.
French Patent FR 2346-458. Issued December 2, 1977. Derwent French Patents Abstracts, Vol. A, No. 4, p 4, March, 1978.

Descriptors: *Metals, *Nickel, *Patents, *Sodium compounds, *Boiling, Catalysts, Chemical reactions, Chlorides, Alkaline earth metals, Waste water treatment, Industrial wastes.

A patent has been issued for a waste water treatment process to remove nickel from aqueous effluents. The nickel-bearing effluent is treated with sodium hypophosphite and intensely agitated. The solution is maintained at its boiling point and at pH 9-11. the boiling solution is further treated with 0.2 mg/liter of a catalyst selected from the alkaline earth metal oxides and the metal chlorides. The solution is boiled at 90-100 C in the presence of 0.2 mg/liter of palladium chloride, the preferred catalyst. Nickel is recovered from the treated aqueous solution in reusable form. (Lisk-FIRL)
W78-08587

METHOD AND APPARATUS FOR WASTE WATER TREATMENT,
G. Bernreiter, and L. Truxa.
U.S. Patent No. 4,064,047, 7 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 965, no 3, p 1050-1051, December 20, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water pollution control, Water purification, Absorption, *Ozone, Equipment.

This invention provides an improved apparatus for, and method of, treating waste water which facilitates more efficient ozone absorption by the waste water than has been previously achieved. Waste water treatment apparatus comprises a spray nozzle, a waste water inlet connected to the spray nozzle, means for supplying waste water under pressure to the waste water inlet, means for charging the waste water prior to the discharge of the waste water, an ozone inlet for supplying ozone under pressure, and a waste water outlet. To maintain the pressure within the ozone absorption chamber, a syphon arrangement may be provided for withdrawing the waste water and for maintaining a head of waste water within the ozone absorption chamber above the waste water outlet. The charging of the waste water prior to the discharge of the waste water into the interior of the ozone absorption chamber may be effected by providing two or more electrodes in a waste water supply duct extending to the waste water inlet, the electrodes being electrically connected, and means being provided for supplying a d.c. current to the electrodes. (Sinha-OEIS)
W78-08590

SANITARY WASTE TREATMENT PLANT.
Australian Patent 487,761. Issued November 3, 1977. The Australian Official Journal of Patients, Trade Marks, and Designs, Vol 47, No 41, p 3738, November, 1977.

Descriptors: *Biological treatment, *Patents, *Water conveyance, *Permselective membranes, *Filtration, Membranes, Separation techniques, Treatment facilities, Water purification, Waste water treatment, Design criteria, Municipal wastes.

A patent has been issued for a biological treatment system which incorporates sanitary waste delivery and water recovery. Sanitary waste is transported to the treatment facility by the delivery system. Water used by the delivery system for the transport of wastes to the biological treatment unit is supplied by the water recovery system. Th sanitary wastes are degraded in a biological treatment apparatus and treated effluent is transported to the water recovery system. The effluent is passed through a semi-permeable membrane for solids separation. A portion of the solids is returned to the biological treatment for further degradation. The liquid fraction and the remaining effluent concentrate are refiltered through the membrane for further clarification. The permeate is returned to the delivery system for the transport of sanitary wastes to the biological treatment plant. (Lisk-FIRL)
W78-08597

WATER PURIFICATION BY TREATING WITH ACTIVATED CARBON BEFORE BIOCHEMICAL TREATMENT,
Phillips Petroleum Co., Bartlesville, OK. (Assignee).
M. R. Cines, and B. B. Buchanan.
U.S. Patnet No. 4,066,538, 6 p, 1 fig, 5 tab, 5 ref:Official Gazette of the United States Patent Office, Vol 966, No 1, p 246, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Organic wastes, Chemical wastes, *Activated carbon, Microorganisms, Microbioal degradation.

Waste water having a high chemical oxygen demand caused primarily by soluble organic matter is treated with activated carbon and thereafter passed to a biochemical treating operation. The invention is of primary applicability in treating waste water from chemical plants and most particularly applicable to the purification of effluents from oxidative dehydrogenation processes. The activated carbon treatment is utilized first to obtain a greatly improved result. The activated carbon removes the heavier impurities (for which it is best suited) and the biochemical treatment removes the light impurities for which it is best suited. If biochemical treatment is used first the heavy impurities retard the activity of the bacteria, insufficient impurities are removed without excessive carbon consumption, and serious reduction in bacteria coagulation results. (Sinha-OEIS)
W78-08602

APPARATUS AND METHOD FOR CONTINUOUS FROTH FLOTATION,
Agency of Industrial Science and Technology, Tokyo (Japan). (Assignee).
S. Wada, Y. Matsunaga, and M. Noda.
U.S. Patent No. 4,066,540, 6 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 247, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, *Separation techniques, Foam separation, Heavy metals, Equipment, *Froth flotation.

An apparatus for continuous froth flotation is disclosed which comprises a vertically elongate column having a froth separator, a raw water inlet pipe, a treated water discharge pipe, a gas dispersing unit, and stepped shelves arranged inside the column adapted to provide thorough contact between the bubbles and the water subjected to treatment. (Sinha-OEIS)
W78-08603

PROCESS FOR TREATING WASTE WATER CONTAINING POLYVINYL ALCOHOL,
Sando Iron Works Co., Ltd. (Japan). (Assignee).
Y. Sando, H. Ishidoshiro, and E. Nakano.
U.S. Patent No. 4,066,541, 4 p, 1 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 247, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Organic wastes, *Water pollution treatment, Separation techniques, Chemical reactions, Recycling, *Polyvinyl alcohol, Boric acid.

To waste waters containing polyvinyl alcohol (P.V.A.), 0.1-0.2% of boric acid or borax and 0.3-0.6% of an inorganic salt such as sodium sulfate are added and the pH is adjusted to 8-10 with an oxide or hydroxide of an alkaline or alkali earth metal. This process is carried out at room temperature. When P.V.A. is the sole organic compound in the waste water, the mother liquor from which P.V.A. has been removed contains borate and inorganic salt and can be used for desizing of textiles. The recovered compound of V.V.A. wit boric acid can be used for a wide variety of applications such as processing of fiber and paper and for adhesives. (Sinha-OEIS)
W78-08604

METHOD OF PURIFICATION OF WASTE WATER BY TREATMENT WITH ZIRCONIUM SALT,
Shikoku Paper Mfg. Co., Ltd. (Japan). (Assignee).
B. Ayukawa.
U.S. Patent No. 4,066,542, 10 p, 6 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 248, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Separation techniques, Coagulation, Chemical precipitation, Color, Pulp and paper industry, *Zirconium salts(Treatmen).

In a method for purification of waste water zirconium salts are used to coagulate and precipitate suspended substances and colloidal dispersed particles as well as non-colloidal dissolved organic and inorganic substances in waste water. The object of the invention resides in complete removal of suspended substances and colloidal dispersed particles as well as complete or partial removal of non-colloidal dissolve low molecular organic substances in the waste water derived from chemical pulping and paper mills so that oxygen demand and color are minimized and transparency is maximized in one process. (Sinha-OEIS)
W78-08605

CONTINUOUS PROCESS FOR NON-CATALYTIC OXIDATION OF SULFITE-CONTAINING WATERS,
Texaco Inc., New York. (Assignee).
D. E. McCoy.
U.S. Patent No. 4,066,543, 3 p, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 248, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water quality control, *Oxidation, Sulfite liquors, Sulfates, Pulp wastes.

The invention relates generally to air and water pollution abatement and more particularly to a continuous, liquid phase, air oxidation process for converting sulfites and bisulfites present in waste water streams to non-polluting, non-oxygen demanding sulfates. The process is a non-catalytic oxidation effected at 25 to 50 pse, 175-250F using from 50 to 350 percent excess of oxygen when utilizing air or any suitable oxygen containing gas basis stoichiometric conversion of sulfite to sulfate. (Sinha-OEIS)
W78-08606

APPARATUS FOR SEWAGE TREATMENT WITH COUNTERCURRENT HEAT TRANSFER MEANS,
S. Beaumont.
U.S. Patent No. 4,066,550, 13 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 251, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, *Anaerobic bacteria, Thermophilic bacteria, Methane bacteria, *Anaerobic digestion, heat exchangers, Equipment.

An apparatus is disclosed for an anaerobic process in three stages having progressively higher temperatures up to 75C for digesting raw household sewage with methane-forming thermophilic bacteria, in which dolomite is added to control the pH of the system within the range 6.0-7.5. After a sterilization fourth stage at 82C or greater, the effluent is treated in a ground filter. Heat is countercurrently transferred from the sterilization stage effluent to the substrate of the digestion stages. The apparatus for carrying out this process has an underlying heat-exchange compartment and four concentric compartment, of wich the innermost is the sterilization stage compartment containing a heating means and the outermost compartment are flow chambers fo sequentially digesting the sewage in psychrophilic, mesophilic, and thermophilic stages, prior to sterilizing. The thermophilic stage contains a micron-size filter upon which a bacterial slime forms and which passes a sediment-free, treated effluent. Sterilized effluent from the fourth stage passes through the underlying heat-exchange compartment having the form of a truncated cone for heat exchange to the bottoms of the three concentric flow chambers. (Author)
W78-08609

PORTABLE WATER FILTRATION DEVICE,
Dynek Corp., Port Chester, NY. (Assignee).
For primary bibliographic entry see Field 5F.
W78-08610

WASTE DISPOSAL SYSTEM FOR CHEMICAL PLANTS,
Hitachi, Ltd., Tokyo (Japan).
T. Okada, N. Hosomi, and S. Kawamura.
Hitachi Review, Vol. 27, No. 1, p 27-32, January, 1978. 8 fig, 2 tab, 2 ref.

Descriptors: *Incineration, *Chemical wastes, *Sodium sulfate, *Chlorine, *Organic wastes, Quenching, Cooling, Venturi flumes, Linings, Corrosion control, Waste water treatment, Waste water disposal, Industrial wastes.

A high-temperature combustion technique has been developed by Hitachi, Ltd. of Tokyo, Japan, for the treatment of chlorinated organic wastes and sodium sulfate-bearing waste water. The process provides for the recovery of hydrochloric acid and disposal of caustic liquor. Free chlorine generation from chlorinated waste combustion has been reduced by directly spraying the combustion chamber, maintained at 1,250C, with water. A Venturi quencher which contans an inner porous carbon tube and an outer permeable carbon tube cools the exhaust gases from 1,000C to 90C. The quencher is followed by wet scrubbing without sodium hydroxide. The hydrochloric acid is recovered in a two-stage packed tower; chlorine and hydrogen chloride concentrations in the exhaust gas are reduced to 0.2-3.0 ppm. Caustic soda solutions from ethylene production are treated by high-temperature oxidation of sodium sulfide. Incineration at 900C also destroys grease and odor components in the spent liquor. The liquid is initially concentrated in a vaporizer before it is introduced into the incinerator through an atomizer. The sodium sulfate dissolved in the cooling water of the Venturi quencher, which reduces the flue gas temperature to 100C, can be discharged to a waste stream. The walls of the incinerator are covered with refractory material to prevent sodium sulfate corrosion. (Lisk-FIRL)
W78-08611

HYDROXYMETHANESULPHINATE SALTS AND RELATED DECOMPOSITON PRODUCTS IN WASTEWATER,
Florence Univ., (Italy). Inst. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W78-08612

INCINERATION OF ALKALINE WASTE LIQUORS,
Badische-Anilin und Soda-Febrik A.G., Ludwigshafen am. Rhein (West Germany).
For primary bibliographic entry see Field 5E.
W78-08613

DESIGN ALLOWS FOR DIVERSIFICATION,
Dewante and Stowell, Sacramento, CA.
F. J. Fahlen.
Water and Waste Engineering, Vol. 15, No. 4, p 30-32, April, 1978. 2 fig, 1 tab.

Descriptors: *Food processing industry, *Canneries, *Treatment facilities, *Seasonal, *Peaches, Stone fruits, Peak discharge, Biochemical oxygen demand, Activated sludge, Sludge digestion, Waste water treatment, Industrial wastes.

The $12.5 million waste water treatment plant in Yuba City, California, has a design capacity of 7 mgd for treating large quantities of influent with more than 46,000 lbs/day of BOD, originating from the seasonal processing of peaches and prunes. The treatment plant has handled BOD loads during the peak processing summer months that were as

much as 22% higher than the design capacity. Waste water flows by gravity to lift pumps which transport the influent through an aerated degritting chamber. Primary sedimentation is followed by biological membrane filtration and oxygenation. The oxygenated waste water receives secondary clarification and final chlorination before it is discharged into receiving waters or into percolation ponds during dry seasons. Waste activated sludge from primary solids digestion is thickened in dissolved air flotation tanks. The sludge receives secondary digestion and is dewatered by vacuum filtration before lan disposal. The plant was designed to reduce BOD concentrations by 97.5% with lower reductions experienced for COD and suspended solids. (Lisk-FIRL)
W78-08614

SOLVENT EXTRACTION STUDIES OF ZINC WITH ALAMINE 336 IN AQUEOUS CHLORIDE AND BROMIDE MEDIA,
Texas Southern Univ., Houston. Dept. of Chemistry.
C. W. McDonald, and N. Butt.
Separation Science and Technology, Vol. 13, No. 1, p 39-46, 1978. 8 tab, 8 ref.

Descriptors: *Zinc, *Metals, *Aqueous solutions, *Solvent extractions, *Chlorides, Bromides, Separation techniques, Solubility, Solvents, Waste water treatment, Industrial wastes.

The parameters influencing the removal of zinc from aqueous chloride and bromide solutions by Alamine 336 or impure tricaprylamine were investigated in laboratory experiments. Increasing the concentration of Alamine 336, in solution with xylene, to 0.10 M increased zinc removal to 99.25% in a 1.0 M HCL solution. When the concentration of Alamine 336 was held constant at 0.1 M, 99.8% of the zinc was extracted at an HCL concentrtion of 1.08 M. Zinc extraction efficiency increased to 99% removal when the pH was less than 1 and Alamine 336 was held constant at 0.1 M in a 0.4 M aqueous chloride solution. The stripping of znc from a 5% Alamine 336 solution was 99% or greater with 0.20 M NaOH, 0.5 M NH40H, and 0.02, 0.05, and 0.1 M EDTA. Similar experiments for removing zinc from hydrobromic acid solutions demonstrated that 0.10 M Alamine 336 reduced zinc by 99.2%; a 2.18 M HBr solution treated with 0.1 M Alamine 336 also reduced zinc by 99.2%. Zinc was more effeciently removed from acidic media at pH 0.23, 89.9% of the zinc was removed. The removal efficiencies of strippants in the HBr solution were similar to those obtained by chloride solution stripping. Zinc in a chloride solution was more readily removed at high aqueous to organic ratios than in the bromide system. (Lisk-FIRL)
W78-08615

TREATMENT OF WASTE OIL EMULSIONS BY ULTRAFILTRATION,
W. Priest.
Water and Waste Treatment, Vol. 21, No. 3, p 42-43, March, 1978.

Descriptors: *Filtration, *Oil wastes, *Emulsions, *Membranes, *Separation techniques, Semipermeable membranes, Emulsifiers, Membrane processes, Reverse osmosis, Chemical precipitation, Waste water treatment, Industrial wastes.

Ultrafiltration is described for the purification of waste oil emulsions from the refining industry. Chemical treatment with aluminum sulfate reduces the oil content to 100-150 ppm, a level requiring further processing that may not be able to break down some difficult or synthetic emulsions. Ultrafiltration requires 1-10 bars of pressure without the need for backwashing of the filter. Membrane materials that can be used for oil emulsion separation include cellulose acetate, vinyl, acrylonitrils, acrylamide polymers, and copolymers. Pretreatment to remove surface tramp oil and settled solids is required before ultrafiltration. The emulsion is continuously filtered through the paper tube-supported membrane at a rate of 20 liters/min at 8 bars pressure. The emulsion is concentrated to 50% oil and permeate passes through a second tank to overflow. The permeate is used as a flushing agent at the end of the ultrafiltration cycle. The emulsion is concentrated by 3-50%, representing a 94% volume reduction; the concentrate can be incinerated or skimmed for fuel oil. The final effluent has an oil content below 20 ppm and reduced COD levels. (Lisk-FIRL)
W78-08618

DETERMINATION OF BLACK LIQUOR SOLIDS CONTENT,
Combustion Engineering, Inc., Windsor, CT.
For primary bibliographic entry see Field 5A.
W78-08619

BIO-SOLIDS DEWATERING AND DISPOSAL AT A SULPHITE MILL,
Edde (Howard), Inc., Bellevue, WA.
H. Edde.
Pulp and Paper of Canada, Vol. 79, No. 3, p 65-68, March, 1978. 6 tab, 11 ref.

Descriptors: *Pulp and paper industry, *Sulfite liquors, *Sludge treatment, *Dewatering, *Incineration, Centrifugation, Solvent extractions, Biochemical oxygen demand, Chemical precipitation, Activated sludge, Aeration, Oxygenation, Pilot plants, Waste water treatment, Industrial wastes.

Dewatering methods were tested with biological sludges produced by three pilot plants treating wastes from the Alaska Lumber and Pulp Co., Inc., an acid sulfite pulp mill in Sitka, Alaska. Waste water BOD produced at a rate of 110,000 lbs/day, was reduced to 47,850 lbs/day by air activated sludge, oxygen activated sludge, or a rotating bio-disc. Chemical sludge treament with lime, lime plus ferric chloride, or polymer did not effectively increase the solids content. The three sludges could be dewatered to 3-4% solids by gravity thickening. Additional sludge dewatering techniques investigated included: vacuum belt, coil, and pressure filtration systems; centrifugation; and solvent extraction. While the oxygen activated sludge was most easily dewatered with centrifugation, this method produced a centrate with high suspended solids concentrations. Solvent extraction required temperature control and was untested in full-scale operations. The coil and pressure filtration system effectively dewatered primary and secondary sludge without chemical conditioning. The process finally selected for the pulp mill included an air activated sludge system with coil filtration and V-press dewatering. The activated sluge is mixed with an equal amount of primary sludge; the mixture is filtered and pressed with or without bark additions. The dewatered sludge is incinerated in an existing boiler. (Lisk-FIRL)
W78-08620

HIGH-EFFICIENCY BROWNSTOCK WASHER SYSTEMS--CONSIDERATIONS IN MEASURING LOSSES,
Chesapeake Corp. of Virginia, West Point.
W. D. South, and D. W. Gulley.
Tappi, Vol. 61, No. 5, p 61-63, May, 1978. 5 fig.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Fibers(Plant), *Sodium, *Biochemical oxygen demand, Color, Dissolved solids, Systems analysis, Evaluation, Measurement, Waste water treatment, Industrial wastes.

Sodium losses from brownstock washer systems used in pulp processing are compared in relationship to BOD, total dissolved solids, and color. The washable sodium loss is dependent upon the total sodium, determined by direct means such as flame spectrophotometry. The components of total sodium include: bound sodium, that which is adsorbed onto the fibers; wash water sodium, that remaining portion of the total sodium removable by washing of the brownstock. The rate of BOD and color removal in washing systems may be different from the removal rate of sodium. Data from a brownstock washer line indicates that sodium is removed at a higher rate than color or total dissolved solids during second stage washing. The efficiency of BOD removal in a brownstock washer system is also not dependent upon sodium removal because pulp mill condensates utilized as shower water may have high BOD concentrations, up to 50% of the total BOD. Shower water quality must be considered before sodium, total dissolved solids, color, and BOD removal efficiencies of a brownstock washer system are calculated. (Lisk-FIRL)
W78-08621

ACTIVATED CARBON ADSORPTION PROCESS FOR PURIFICATION OF TEXTILE WASTEWATER,
McGill Univ., Montreal (Quebec). Dept. of Chemical Engineering.
C. Roy, and B. Volesky.
Textile Chemist and Colorist, Vol. 10, No. 5, p 26-33, May, 1978. 7 fig, 1 tab, 61 ref.

Descriptors: *Textiles, *Activated carbon, *Adsorption, *Dyes, *Design criteria, Evaluation, Equipment, Biochemical oxygen demand, Chemical oxygen demand, Color, Waste water treatment, Industrial wastes.

The design parameters of activated carbon systems were evaluated for the treatment of textile industry wastes. The initial consideration in carbon adsorption design is the selection of either easily regenerated and carbon-efficient granular carbon or of cost-effective powdered carbon. Adsorber designs available include: fixed bed, in which the entire volume of spent carbon is replaced at one time; and moving bed, in which spent carbon is removed periodically from the bottom and replaced through the top. Options in adsorber system configuration include: single adsorbers; two or more in series or in parallel; or four or more in series or in parallel. A configuration incorporating two or more adsorbers is recommended for large flow rates. Carbon can be thermally regenerated in multiple hearth furnaces, rotary kilns, fluidized bed furnaces, and transport reactors. Chemical regeneration methods using acid or base extraction, chemical oxidation, solvent extraction, and wet oxidation are also available. The performance of various activated carbon treatment systems currently operating in textile plants is reviewed with respect to design, influent, and effluent characteristics. (Lisk-FIRL)
W78-08622

DEVELOPMENT OF WASTE WATER TREATMENT AT THE CLIMAX MINE,
Climax Molybdenum Co., Golden, CO.
R. D. Gott, and J. M. Laferty, Jr.
Industrial Water Engineering, Vol. 15, No. 2, p 6, 8-13, March, 1978. 6 fig, 12 tab.

Descriptors: *Acid mine water, *Mine drainage, *Molybdenum, *Heavy metals, *Anion exchange, Resins, Electrochemistry, Coagulation, Flotation, Nitrogen compounds, Copper, Zinc, Cadmium, Manganese, Iron, Solvent extractions, Sodium compounds, Waste water treatment, Industrial wastes.

A counter-current ion exchange column reduces molybdenum levels in outfall drainage waste water from Climax Molybdenum Co.'s mining operation in Golden, Colorado. Pilot plant studies on reducing heavy metals and cyanide in the mill effluent have been conducted since 1975 with a Chem-Seps

counter-current ion exchange unit. Targe concentrations of heavy metals in the effluent were 2.0 ppm Fe and Mo, 1.0 ppm Mn, < 1.0 ppm Cu, Zn, and Cd, and 0.025 ppm CN. The pilot plant, equipped with a weak-base amine type anion exchange resin, treated waste water bearing 2-20 mg/liter Mo at a downflow rate of 41 gpm/sq ft. Mo extractions by the resin were 98%; elution and regeneration of the resin were performed with NaOH and H2SO4. Further heavy metal polishing was achieved with a Swift Lectro Clear electrocoagulation-electroflotation system. NaOCl solutions were added to the system to reduce cyanide to within allowed discharge levels. High rate san filtration reduced heavy metal concentrations to within standards. The recovered Mo was processed with solvent extraction-crystallization for resale as sodium molybdate. Electro-flotation materials were stored with other tailings in an impoundment area. (Lisk-FIRL)
W78-08623

CU/U ORE-LEACHING ROUTE CUTS POLLUTION, TRIMS COSTS,
For primary bibliographic entry see Field 3D.
W78-08624

COPRECIPITATION OF ACID CHEESE WHEY AND TANNERY WASTE AND RECOVERY OF PROTEIN,
Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
R. E. Townsend.
Biotechnology and Bioengineering, Vol 20, No 4, p 589-599, 1978. 2 fig, 2 tab, 27 ref.

Descriptors: *Tannery wastes, *Dairy industry, *Chemical precipitation, *Proteins, *Amino acids, Acidity, Alkalinity, Heat treatment, Lime, Sulfides, Nutrients, Feeds, Waste water treatment, Industrial wastes.

Coprecipitation of acid cheese whey and dehairing lime-sulfide tannery effluents yields a precipitate which is high in essential amino acids and suitable as a feed supplement. The acid whey, with a pH of 4.39-4.61 and nitrogen concentrations of 1.2-1.4 mg/liter, is generally heated to render proteins insoluble. Several acid whey proteins are resistent to heat denaturation. The lime-sulfide dehairing waste water, at pH 12-13, contains dissolved hair protein, sulfur compounds, and high concentrations of dissolved and insoluble solids and BOD. At room temperature, the two-waste mixture, containing 20-40% tannery effluent, spontaneously produced centrifugeable precipitates with 17% of the total nitrogen and clear liquor. Heating of the supernatant for 15 min at 70C extracted an additional 20-25% of the total nitrogen; all soluble protein was removed from the supernatant by heating when tannery effluent content was 15-30%; lactose, nonprotein nitrogen, and excess sulfide remained in solution. Acid whey and tannery waste, mixed in a 4:1 ratio at pH 9.5 and 25C, produced spontaneous precipitates; the supernatant was steam heated to 80C for further protein removal. The heat-induced precipitate had higher amino acid concentrations than the spontaneous coprecipitates. The COD content of the supernatant was reduced by 16% after coprecipitation; total sulfur and total solids contents were 26 mg/ml and 8.5% by weight, respectively. (Lisk-FIRL)
W78-08626

THE PRINCIPLES AND METHODS OF CHROMIUM RECOVERY IN THE TANNERY,
Allied Chemical Corp., Morristown, NJ. Industrial Chemicals Div.
R. Smith.
The Leather Manufacturer, Vol 95, No 4, p 16-22, April 1978. 3 fig, 4 tab.

Descriptors: *Tannery wastes, *Chromium, *Recycling, *Chemical precipitation, *Ionization, Organic acids, Amino acids, Chelation, Incineration, Acidity, Alkalinity, Waste water treatment, Industrial wastes.

Techniques for improving chromium uptake, reusing spent chromium liquor, precipitating chromium as a hydroxide, and incinerating solid chromium are described for tannery effluents. Chromium exhaustion in the tanning bath can be improved by increasing the reactivity between the hide and the chromium sulfate. This can be accomplished by maximizing the ionization of the carboxyl groups of the amino acid side chains to form a polypeptide chain. A higher pH is required for ionization; chromium sulfate becomes insoluble above pH 5, the isoelectric point of collagen. Chelating agents, such as formic, acetic, or oxalic acid, can improve the solubility of chromium sulfate in the higher pH ranges. Conditioning of spent chrome tanning liquor for reuse requires acidification of the bath to remove hydroxyls for improved astringency. The spent liquor is sieved, cooled to 33C, and adjusted to pH is skimmed from the top; the solids removed from the bottom; and the conditioned liquor is ready for reuse. Chromium can be removed from the waste solution as a regenerable hydroxide by precipitation with alkali at pH 8-9. Magnesium oxide or polymers improve the floc characteristics of the chromium hydroxide; the hydroxide is regenerated in sulfuric acid. Alkaline oxidative incineration of chromium oxide produces soluble hexavalent chromium which is recoverable from other insoluble oxides. (Lisk-FIRL)
W78-08627

FILTER FOR REMOVING RESIDUES FROM DOMESTIC SEWAGE--COMPRISES MULTILAYER FILTER BEDS IN WHICH THE PARTICLES OF CHARGE DIMINISH.
Soviet Patent SU 552-096. Issued April 15, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 6, p 1, March, 1978. 1 fig.

Descriptors: *Filtration, *Domestic wastes, *Patents, *Absorption, *Critical flow, Particle size, Porous media, Suspended solids, Centrifugal pumps, Hydraulic design, Design criteria, Equipment, Construction materials, Pipes, Waste water treatment.

A multilayer, charged particle filtration system with a variable velocity gradient for removing suspended solids from domestic wastes has been patented. The system consists of a conical shaped body with internal horizontal gratings for supporting the charged filtration medium and an externally-mounted centrifugal pump at the base. Each layer of charged particles in the filter has the same hydraulic size. The particle size in each ascending filtration layer diminishes as the upward flow of liquid approaches the top of the unit. Waste water is introduced through a pipe at the base of the system by the centrifugal pump. The effluent passes upward through a distribution system into the layers of charged filter particles. The rate of filtration with respect to the hydraulic particle size within each layer is calculated as the critical flow rate multiplied by a coefficient in the range of 1.02-2.8. The flow rate of the waste water through the layers is adjusted so that the relative mobility of the charged particles is equivalent to the maximum absorption capacity of the particles in each layer; minimum relative mobility of the particles is maintained. The filter is regenerated when the layers contain the capacity load of residue from the waste water by pumping wash water upwards through the layers in the direction of waste water flow during filtration. (Lisk-FIRL)
W78-08657

DISEASE GERM TREATMENT FOR SEWAGE SLUDGE--BY PURE OXYGEN CONVERTED BY ELECTRON BEAM TO OZONE BUBBLING THROUGH SEWAGE LAYER.
German Patent DS 2546-756. Issued March 9, 1978. Derwent German Patents Abstracts, Vol. A, No. 11, p 3, April, 1978.

Descriptors: *Patents, *Ozone, *Oxygen, *Bubbles, *Turbulence, Equipment, Electronic equipment, Design data, Gases, Disinfection, Sewage, Sludge treatment, Waste water treatment, Municipal wastes.

A patent has issued to Werner and Pfleiderer for a continuous process to disinfect sewage sludge. A thin layer of sludge is transported on a conveyor channel which is equipped with a device to maintain an even sludge layer thickness. Oxygen-bearing gas is bubbled through the sludge layer via the nozzle base formed by the flat bottom of the sludge conveyor channel. The sludge layer, agitated by the gas, is subjected to an electron beam source which produces ozone. The gas is immediately drawn off and reapplied to the sludge on the conveyor via a suction nozzle connected to the nozzle base. (Lisk-FIRL)
W78-08739

LIQUID ACTIVATED SLUDGE TREATMENT--IN TANK WITH ELECTRODE SYSTEM PRODUCING GAS BUBBLES SAVES POWER BY SULPHURIC ACID ADDITION.
French Patent FR 2348-891. Issued December 23, 1977. Derwent French Patents Abstracts, Vol A, No 6, p 9, March 1978.

Descriptors: *Activated sludge, *Patents, *Sulfur compounds, *Flocculation, *Electrodes, Bubbles, Anodes, Cathodes, Acidity, Scum, Flotation, Sludge treatment, Waste water treatment, Municipal wastes.

An activated sludge treatment process which incorporates sulfuric acid conditioning flocculation, and electrode-generated bubbling has been patented. The activated sludge is first adjusted to pH 2.5 with additions of sulfuric acid; acidity is monitored with a pH meter. The sludge flows through a pipe into a treatment tank containing two cathodes, mounted above the bottom plates, and anodes, formed by parallel rods. These electrodes generate bubbles which float suspended solids in the form of scum to the surface of the tank. The sulfuric acid addition permits a higher sludge throughout, thereby reducing the electrical power costs of the treatment system. (Lisk-FIRL)
W78-08749

LAND APPLICATION OF SELECTED HOME WASTEWATER,
Metcalf and Eddy, Inc., Boston, MA.
For primary bibliographic entry see Field 5E.
W78-08759

LOW-PRESSURE SEWAGE SYSTEM FOR BUILDINGS--USES LARGE VENTILATED BACK-PRESSURE TANK, TO PREVENT FLOODING.
For primary bibliographic entry see Field 8C.
W78-08761

SEWAGE DISPOSAL SYSTEM.
Australian Patent 490,208. Issued February 16, 1978. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 48, No. 5, p 406, February, 1978.

Descriptors: *Separation techniques, *Patents, *Domestic wastes, *Sewerage, *Plumbing, Specific gravity, Settling basins, Monitoring, Water levels, Measurement, Sewage disposa, Sanitary engineering, Design criteria, Waste water disposal.

A sewage disposal system has been patented for water closets designed to incorporate a reuseable non-aqueous flush medium with a specific gravity lower than water. The medium bearing the wastes is flushed to a separating tank equipped with a sewage inlet at the top. In the separating tank, the flushing medium floats to the top because of its

lower specific gravity while the sewage settles to the bottom of the tank. Attached to the separating tank is a transfer apparatus for removing the settled sewage from the tank. A sewage level sensor is mounted in a branch conduit located outside the separating tank. When a specified sewage level is detected in the separating tank by the sensor, the sewage transport system is activated to remove the sewage. Minimum loss of the flushing medium is achieved with this process. (Lisk-FIRL)
W78-08763

PROCESS FOR THE DISPOSAL OF SEWAGE,
Monsanto Research Corps., St. Louis, MO. (Assignee).
R. E. Opferkuch, Jr., and G. M. Wong-Chong.
United States Patent 4,076,620. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol. 967, No. 4, p 1570, February, 1978. 1 fig.

Descriptors: *Carbon dioxide, *Lime, *Patents, *Settling basins, *Alkalinity, Separation techniques, Turbidity, Chemical oxygen demand, Waste water treatment, Design criteria, Municipal wastes.

A sewage treatment system employing lime and carbon dioxide additions has been patented. Trash and other objects in the sewage are removed by a degritter before lime is added at a 1:1 ratio with COD to the effluent. At least 500 ppm lime is added to the sewage to assist in carbonation and in separation of the solids from the liquid effluent. Lime coagulation is maintaned for 30 min or less to promote a Jackson Turbidity Unit of less than 50 in the separated sewage. The effluent is treated with carbon dioxide to adjust the pH to 10.6-11.2 and the solids are allowed to settle for 30 min. The solids are separated from the liquid fraction and concentrated for further dewatering. The concentrated solids and the settled solids are adjusted to pH 6-8 with carbon dioxide and discharged. (Lisk-FIRL)
W78-08764

BRIGHTON'S SEWAGE GOES TO SEA.
Surveyor, Vol. 150, No. 4456, p 8, November, 1977.

Descriptors: *Outfall sewers, *Outlets, *Excavation, *Waste water disposal, *Tunneling, Discharge lines, Tunnel construction, Construction, Pumping plants, Screens, Waste water treatment, Municipal wastes.

The 1,830 m long Portobello outfall has a design discharge capacity of 6,800 liters/sec for disposal of wastes from Brighton and Hove, England. The waste disposing tunnel, with an internal diameter of 2.13 m, discharges effluent to the English Channel through a diffuser located 14.4 m below the water surface. Waste water is transported from a pumping station to the outfall tunnel through a 3.4 m diameter shaft laid 44 m deep. The bolted segments of the shaft required peripheral ring grouting around the outside of the shaft to prepare the chalf cliff before installation. Influent reaching the pumping station is treated with coarse raked bar screens and fine mesh cup screens before discharge to the outfall. Screened solids and grit are passed through a pre-breaker, followed by dewatering to 50-55% moisture content in twin-screw presses. The outfall was assembled above water to eliminate the expense of compensating for high pressures at the 44 m water depth; air tools were required for excavating the chalk face of the cliff. The construction site was initially grouted until increasing deterioration was abated by lining the chalk with bolted cast iron rings. The outfall replaces a former structure that had a capacity of 680 liters/sec. (Lisk-FIRL)
W78-08765

COMBINATION TANKER FOR SEWER JETTING AND GULLY EMPTYING.
For primary bibliographic entry see Field 8C.
W78-08771

SEWAGE PLANT USES HOLE IN GROUND.
Engineering News-Record, Vol. 200, No. 1, p 12, January, 1978. 1 fig.

Descriptors: *Activated sludge, *Shafts(Excasvation), *Drilling, *Aeration, *Flotation, Sludge disposal, Construction equipment, Construction, Drilling equipment, Waste water treatment, Municipal wastes.

Eco-Research Ltd. of Canada has developed a deep shaft aeration and activated sludge treatment system for Virden, Manitoba, Canada. The $1.5 million municipal waste treatment plant with a design capacity of 600,000 gpd employs a 500-ft deep shaft with a 30-inch diameter. Waste water mixed with activated sludge is rapidly circulated within the shaft by compressed air. The aerated, biologicaly treated waste water is passed to a continuously operating flotation tank for gravity sedimentation of solids. A greater volume of waste water can be treated in less time because of rapid circulation and elimination of settling basin cleaning. The plant is constructed on a 10,000 sq ft site; the shaft was drilled with conventional well drilling equipment. The air compressor is driven by a 2-hp pump which constitutes the major energy demand of the plant. The design of the deep shaft evolved from experiments on the fermentation of methanol for single-cell protein generation with intense aeration. (Lisk-FIRL)
W78-08772

IMPORTED SEWAGE TREATMENT SYSTEM CLAIMED TO CUT COSTS, ENERGY USE.
Engineering News-Record, Vol. 200, No. 1, p 16, January, 1978.

Descriptors: *Activated sludge, *Aeration, *Treatment facilities, *Circulation, *Biological treatment, Biochemical oxygen demand, Capital costs, Aerated lagoons, Waste water treatment, Municipal wastes.

Designs for the municipal sewage treatment facility in Campbellsville, Kentucky, include installation of a 4.2 mgd Dutch Caroussel activated sludge system. The waste water is aerated and circulated through a baffled oval basin divided into channels with depths up to 15 ft. Aeration and circulation at 1 ft/sec or more are maintained by vertical aerators mounted at one end of the basin. Dilution of the raw sewage in a ratio of 50:1 with mixed liquor stabilizes the biological process under shock load conditions. Capital costs of the Kentucky plant are expected to be 50% lower than those for a conventional activated sludge system with a 20% operational energy savings. The imported Caroussel system converts nitrates into nitrogen gas and oxygen without additional treatment. A 500,000 gpd system that has been operational for one year in a leather tannery in New Hampshire has reduced BOD in the treated effluent to 3-7 ppm. (Lisk-FIRL)
W78-08773

SINGLE BASIN TREATS SEWAGE SIMPLY.
Engineering News-Record, Vol. 200, No. 15, p 89, April, 1978. 1 fig.

Descriptors: *Activated sludge, *Aeration, *Sludge digestion, *Treatment facilities, *Aerated lagoons, Sludge treatment, Nutrient removal, Nitrification, Biological treatment, Waste water treatment, Municipal wastes.

Mixing Equipment Company of Rochester, New York, has been distribution of a single basin waste water treatment plant with a capacity of 10 mgd. The process employs activated sludge to treat waste water with BOD and suspended solids concentrations up to 3,000 ppm and produces an effluent with less solids than other processes. The plant utilizes a common concrete wall between the aeration chamber and the clarifier at a cost savings. The system has either a surface or submerged aerator which returns settled sludge from the clarifier to the aeration basin. The system reportedly handles biological shock loads by mixing the loads with mixed liquor to prevent overload. Chemicals can be added directly to the basin to effect nitrification and phosphorus removal. The system is equipped with automatic sludge return; sludge produced has properties equivalent to those of aerobically digested sludge. (Lisk-FIRL)
W78-08775

INFRARED SLUDGE INCINERATORS OPERATIONAL IN TEXAS SEWAGE PLANT.
For primary bibliographic entry see Field 5E.
W78-08776

THAMES WA OUTLINES ITS COST STUDY ON SLUDGE.
Surveyor, Vol. 150, No. 4455, p 18, October, 1977. 1 tab.

Descriptors: *Sludge treatment, *Sludge disposal, *Incineration, *Drying, *Dewatering, Irrigation practices, Land reclamation, Landfills, Sludge digestion, Cost analysis, Waste water treatment, Municipal wastes.

Methods and costs of sludge treatment were analyzed by England's Thames Water Authority. Of the Water Authorities' 305,000 tons of dry solids (tds) produced from their annual 10 million tons sludge/yr, 154,000 tons are applied to agricultural land and 51,000 to land reclamation or fill. Sixty-nine percent of these solids are treated with heat digestion. The remaining sludge is reduced by mechanical dewatering, sludge thickening lagoons, or shipped to sea for disposal. The total cost, for a population of 500,000, of treating primary and secondary sludge by heat digestion is 14 pounds sterling/tds; by lime stabilization, 3-5 pounds/tds; by earth-banked dewatering lagoons, 6.7 pounds/tds; and by mechanical drying beds for digested sludge only, 52 pounds/tds. Vacuum filtration produces a sludge containing 18-20% dry solids at 10 pounds/tds. An 18-20% dry solids sludge costs 14 pounds/tds by centrifugal dewatering. Band or belt presses dewater sludges to 25-35% dry solids at an expense of 17 pounds/tds, while filter presses achieve a dry solids content of 35-40% at a cost of 19 pounds/tds. Incineration of sludge from populations of 100,000 and 500,000 costs 159 and 74 pounds sterling/tds, respectively. (Lisk-FIRL)
W78-08777

TARGET: TOXIN REMOVAL,
Ecodyne Corp., Union, NJ.
For primary bibliographic entry see Field 5G.
W78-08784

5E. Ultimate Disposal Of Wastes

VEGETATIVE STABILIZATION OF SPENT OIL SHALES: VEGETATION, MOISTURE, SALINITY, AND RUNOFF - 1973-1976,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-08268

SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE,
Alcorn State Univ., Lorman, MS.
For primary bibliographic entry see Field 5D.
W78-08302

AN ENVIRONMENTAL OVERVIEW OF GEOTHERMAL RESOURCES DEVELOPMENT,
Indiana Univ. at Bloomington. School of Law.
For primary bibliographic entry see Field 5G.
W78-08327

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES: PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS' MEETING--OCTOBER 1976, TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-08359

USING SAND FILL TO COVER DREDGE SPOILS CONTAINING MERCURY,
Kitakyushu Municipal Port and Harbor Bureau, Fukuoka (Japan).
For primary bibliographic entry see Field 5G.
W78-08367

DREDGED MATERIAL DENSIFICATION AND TREATMENT OF CONTAMINATED DREDGED MATERIAL,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
C. C. Calhoun, Jr.
In: Management of Bottom Sediments Containing Toxic Substances; Proceedings of the Second U.S.-Japan Experts' Meeting--October 1976, Tokyo, Japan. Report No. EPA-600/3-77-083, July 1977, p 253-265. 1 fig, 3 tab. 1BA608.

Descriptors: *Dredging, *Spoils, *Waste treatment, *Waste disposal, *Dewatering, Densification, Sediments, Slurries, Alabama, Army Corps of Engineers, Flocculation.

U.S. Army Corps of Engineers laboratory and field studies of dewatering dredging spoils and treating contaminated dredged material are reviewed. Fine-grained material dredged from harbors and waterways and placed into containment areas in slurry form retains high water content for years. Removal of the water would extend the service life of such areas at great savings. The purpose of densification (dewatering) is to gain additional disposal area volume, therefore, and not to stabilize the site. Field demonstrations are being carried out at the Upper Polecat Bay disposal area, Mobile, Alabama. Densification techniques under consideration include conventional gravity drainage, mechanical agitation, electro-osmosis, crust management, aeration, frost action, wicks, and vegetation. Other aspects are the applicability of conventional wastewater treatment methods to contaminated dredged material, the association of oil and grease contamination and confined disposal areas, the use of flocculants injecting oxygen and air into pipelines during open-water disposal to increase dissolved oxygen in the water column. (See also W78-08359) (Lynch-Wisconsin)
W78-08374

EFFECTS OF DREDGING ON AQUATIC ORGANISMS--WITH SPECIAL APPLICATION TO AREAS ADJACENT TO THE NORTHEASTERN PACIFIC OCEAN,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-08388

PUTTING WETLANDS TO WORK (CYPRESS DOMES AND PEATLANDS OFFER ECOLOGICALLY SOUND, ENERGY-CONSERVING WASTEWATER DISPOSAL).
National Science Foundation, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08406

A REVIEW OF THE HYDRAULICS OF GRAVITY DRAINAGE, WASTE AND VENT SYSTEMS,
Stevens Inst. of Tech., Hoboken, NJ. Davidson Lab.
For primary bibliographic entry see Field 8B.
W78-08431

PURIFICATION OF WASTE WATERS FOR SUBSOIL IRRIGATION (OCHISTKA STOCHNYKH VOD PRI PODPOCHVENNOM OROCHENII),
N. M. Shevtsov.
Gidrotekhnika i Melioratsiia, No 2, p 44-48, 1978. 1 fig, 2 tab, 6 ref.

Descriptors: *Return flow, *Artificial recharge, *Pipelines, *Irrigation practices, *Path of pollutants, Waste water disposal, Soil disposal fields, Nutrient removal, Waste water treatment, Foreign countries.

Treated waste water from a Russian village is used for subsurface irrigation of farmland by means of a gravitational distribution network of perforated irrigation pipes laid at a depth of 50-55 cm. After refuse, sand, and coarse suspended matter are separated mechanically, the sewage is settled for 2 hrs in two horizontal clarifiers. The treated sewage has a pH of 7.5-8.5, a dissolved solids content of 600-1,500 mg/liter, a suspended solids content of 200-300 mg/liter, a permanganate oxidizability of 274 mg/liter, and a bichromate oxidizability of 480 mg/liter. The waste water is then distributed through the irrigation network at a rate of 1-3 tons/ha/yr. Previous investigations have revealed that silting can reduce the free cross-section of the underground irrigation pipes by as much as 20-25% during the irrigation period. The organic matter is almost completely mineralized by the next irrigation period and the soluble components are washed out. This has resulted in a 4% net reduction in the free cross-section of the irrigation pipes over 8 yrs. These findings suggest that underground irrigation networks may have a lifespan as long as 50 yrs. (Takacs-FIRL)
W78-08432

SLUDGES AND SIDESTREAMS GO HAND-IN-HAND,
Camp Dresser and McKee Inc., Walnut Creek, CA.
For primary bibliographic entry see Field 5D.
W78-08439

HEAVY METALS IN WASTE WATERS FROM THE CITY OF ZURICH (SCHWERMETALLE IN DEN ABWAESSERN DER STADT ZUERICH),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewasserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5A.
W78-08443

AN OVERVIEW OF LAND TREATMENT FROM CASE STUDIES OF EXISTING SYSTEMS,
Cold Regions Research and Engineering, Lab., Hanover, NH.
A. Uiga, and R. Sletten.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 277-285, February, 1978. 3 fig, 3 tab, 16 ref.

Descriptors: *Irrigation practices, *Return flow, *Sewage disposal, *Crops, *Nutrient removal, Nitrates, Phosphorus, Irrigation effects, Precipitation(Atmospheric), Climatic zones, Waste water treatment, Municipal wastes.

Four land application systems of waste water disposal are discussed with respect to the varying climatic conditions the systems encounter. Untreated and undisinfected municipal wastes from Calumet, Michigan, averaging 1.2 mgd annually, are applied by rapid infiltration to percolation basins. Calumet's average annual temperature is 4.4 C with a total yearly precipitation of 5,380 mm. Primary, undisinfected effluent from Quincy, Washington, is applied at rates up to 15 cm/wk to four cropped fields and one fallow field by open ditch gravity distribution. The annual temperature in Quincy averages 9.4 C with an annual rainfall of 200 mm. Manteca, California, wastes receive secondary treatment without disinfection and are applied at a rate of 45.0 mm/wk by flooding to a 160-acre site covered with reyegrass. Temperatures in Manteca average 16.1 C with a yearly precipitation of 280 mm. At the fourth site in Livermore, California, treated effluent is applied from April to October to a municipal golf course, to land adjacent to the airport runways, and to crops. Applications of 13.0 mm to half of 100-acre golf course every other day, 610-910 mm/season to 45 acres of crops, and 13.0 mm/day for 2-4 wks to 55 acres of adjacent runway land are performed over the season. Temperatures in Livermore average 15 C with an annual rainfall of 380 mm. Land application of waste water in Calumet and Livermore efficiently removed all detectable phosphorus while levels remained high tin the soil waters at the Quincy and Manteca sites. Nitrate-nitrogen concentrations at the four sites were on the average below 10 mg/liter nitrate. Trace metal accumulations were low in all four sites due to the absence of industrial wastes. Cost data and specific site problems were also discussed. (Lisk-FIRL)
W78-08446

50 YEARS' EXPERIENCE OF SLUDGE DEWATERING.
Water Services, Vol. 81, No. 975, p 292-293, May, 1977.

Descriptors: *Sewage sludge, *Dewatering, *Sludge treatment, Equipment, *Filters, Drying, Separation techniques, Design data, Construction materials, Waste water treatment, Sludge disposal, Waste water treatment.

Sludge dewatering techniques developed over a 50-yr period by Edwards and Jones Ltd. of Stoke-on-Trent, England, are discussed. The plate filter press, developed 50 yrs ago, was completely mechanized in the 1960's and fitted with steel-reinforced molded rubber trays and push button operation. Polymer applications to sludge were investigated as an alternative to ferric sulfate, aluminum chlorohydrate, and lime conditioning. A patented in-line polymer dosing apparatus that did not require separate pumping equipment was designed by Edwards and Jones Ltd. Modification of the belt press, which produces a sludge cake with a high solids content, resulted in the development of the continuous filter press. This press provides the high pressure of the plate press within the design of the belt press and is suitable for liquid-solid separation of most wates. The continuous filter press is reportedly easily integrated into an on-line continuous sludge dewatering system. (Lisk-FIRL)
W78-08447

RESULTS OF INVESTIGATIONS OF OPERATION TECHNIQUES, OPERATIONAL SAFETY, TECHNOLOGY AND ECONOMICS OF THE BIOREACTOR FOR SEWAGE SLUDGE ROTTING (ERGEBNISSE DER UNTERSUCHUNGEN UEBER BETRIEBSTECHNIK, BETRIEBASSICHERHEIT, TECHNOLOGIE UND WIRTSCHAFTLICHKEIT AM BIOREAKTOR ZUR ABWASSERSCHLAMMVERROTTUNG),
Bayerisches Landesamt fuer Umweltschutz Munich (West Germany).
R. Woerle.
Muell und Abfall, Vol. 10, No. 1, p 12-19, 1978. 6 fig, 3 tab.

Descriptors: *Sludge treatment, *Fertilizers, *Sludge digestion, *Pulp wastes, *Sewage treat-

ment, Aeration, Operation and maintenance, Design data, Equipment, Municipal wastes, Biological treatment, Waste water treatment, Waste water disposal, Sludge disposal.

The performance of a pilot-scale aerated bioreactor to produce compost from sewage sludge and sawmill wastes was evaluated. Reactor performance was examined during three phases, including: charging of the reactor; operation with complete product return and continuing aeration; and steady-state operation with discharge, partial product return, and addition of fresh sewage sludge and sawdust. A carbon-to-nitrogen quotient of 31-33, the optimum level for the composting process, was maintained by adequate mixing of the sludge and sawdust. Temperature and carbon dioxide concentrations in different reactor zones correlated well with biological processes, indicating that these parameters could be used as control variables for oxygen input. Tests on the effects of raw and cured compost on the growth of cress revealed that curing for aproximately two months in the bioreactor would significantly enhance the fertilizer value and thereby improve plant growth. (Takacs-FIRL)
W78-08449

CAN CALIFORNIA COPE WITH ITS MOUNTING SLUDGE VOLUMES,
California Office of Water Recycling, Sacramento.
K. L. Wassermann.
Civil Engineering-ASCE, Vol. 48, No. 2, p 60-65, February, 1978. 2 fig.

Descriptors: *Sludge treatment, *Sludge disposal, *California, *Treatment facilities, *Irrigation practices, Outlets, Outfall sewers, Incineration, Dewatering, Drying, Waste water treatment, Municipal wastes.

Alternatives to ocean disposal of sewage sludge from the major metropolitan areas in California were investigated by the Los Angeles/Orange County Metropolitan Area project and the San Francisco Bay Regional Wastewater Solids Study. The Los Angeles Hyperion Treatment Plant discharges 1.2 mgd of sludge through a 7 mile long outfall to a submarine canyon. The 40 acres of land formerly employed by the Los Angeles County Sanitation District for winnows in the composting of sludge are required for plant expansions. The San Francisco Bay area disposes of 55% of its sludge in landfills, 30% in storage lagoons, 10% by incineration, and 5% as soil conditioner. Ocean disposal of sludge in California has been banned by 1980 and real estate costs are becoming prohibitive. An estimated 16,000 acres of farmland would be required for land application of all the sludge produced. Anaerobically digested sludge, dewatered to 20% solids content, can be composted and sold for domestic and commercial landscaping. Sludge must have a 25-40% solids content for efficient combustion; thermal processing can produce polychlorinated biphenyls and vaporized mercury as well as other air pollutants. Improved thermal processing techniques are under investigation. Pyrolysis of sludge generates gases which can be used as a fuel source in plant operations but pilot plant studies have indicated problems with the technique. (Lisk-FIRL)
W78-08456

S. HANTS' SEWAGE GIANT.
Surveyor, Vol. 151, No. 4473, p 8-9, March, 1978.

Descriptors: *Outfall sewers, *Treatment facilities, *Pumping plants, *Design data, *Sludge disposal, Waste water disposal, Storm water, Settling basins, Culverts, Concrete structures, Construction materials, Waste water treatment, Incineration, Dewatering, Municipal wastes, Regional development.

The regional sewage treatment facility and outfall planned for the communities of South Hampshire, England, are detailed. The sewer system will treat wastes from six districts and will have an ultimate capacity for servicing a population of 940,000. The first of four stages of construction includes: inlets and screw pumps, screens, coarse solids channels, six primary and storm water settling tanks, four parallel streams with diffused aeration, and four final settling tanks. Belt press dewatering of the sludge will be followed by fluidized bed incineration in a brick rather than asbestos building to reduce noise. The 5-km long outfall with a 3-m diameter will be constructed in a precast concrete culvert and will extend 1,000 m into the Lee-on-Solvent. The plant will have a capacity of 57 mgd with provisions for treating up to 5.5 times the dry weather flow with primary settling. Gravity sewers will transport sewage flows from the eastern and western sections of the region to a pumping station where they will be combined, lifted, and passed by gravity sewers to the treatment plant. The total cost of the completed project is estimated to be 95 million pounds sterling. (Lisk-FIRL)
W78-08458

PROTON BINDING IN FULVIC ACID EXTRACTED FROM SEWAGE SLUDGE-SOIL MIXTURE,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 5A.
W78-08462

ANIMAL DISEASE HAZARDS OF SLUDGE DISPOSAL TO LAND: OCCURRENCE OF PATHOGENIC ORGANISMS,
Northumbrian Water Authority, Gosforth (England).
For primary bibliographic entry see Field 5C.
W78-08463

SOIL PERCOLATION TESTS IN THE LAGOS AREA,
Lagos Univ. (Nigeria).
For primary bibliographic entry see Field 5B.
W78-08464

AMMONIA VOLATILIZATION FROM SEWAGE SLUDGE APPLIED IN THE FIELD,
Guelph Univ., (Ontario). Dept. of Land Resources Science.
E. G. Beauchamp, G. E. Kidd, and G. Thurtell.
Journal of Environmental Quality, Vol. 7, No. 1, p 141-146, January-March, 1978. 4 fig, 4 tab, 10 ref.

Descriptors: *Ammonia, *Nitrogen, *Volatility, *Sewage disposal, *Sludge digestion, Analytical techniques, Soil profiles, Air pollution, Waste water treatment, Waste water disposal, Municipal wastes.

The volatilization of ammonia-nitrogen from sewage sludge applied over a circular 0.405-hectare area was measured. The sewage sludge was applied at rates of 116,480 and 134,400 kg/hectare; ammonia flux was measured over periods of 5 and 7 days, respectively. Aerodynamic data was obtained at heights of 10, 50, 100, and 150 cm above the sewage application area. The sewage sludge applications monitored over the 5 day period contained 150 kg/hectare ammonia-nitrogen while the 7 day measurement period recorded volatilization of sewage sludge bearing 89 kg/hectare. Ammonia-nitrogen flux measurements were calculated according to the quantity of ammonia molecules carried through a vertical zone by horizontal air movement. Ammonia flux peaked daily around noon, decreasing exponentially with time. Ammonia volatilization was estimated during the 5 day measurement period at 60% or 90.9 kg of ammonia lost/hectare. In the 7 day experiment, 56% or 50.3 kg/hectare of the ammonia was volatilized. Air temperature within two or three days of application was found to affect the rate of ammonia flux. Actual ammonia-nitrogen levels in the sludge and soil layers varied significantly from predictions. (Lisk-FIRL)
W78-08465

PHOSPHATE FERTILIZING EFFECT OF SLUDGE FROM DOMESTIC SEWAGE PURIFICATION WITH PHOSPHATE PRECIPITATION (ZUR PHOSPHATDUENGEWIRKUNG VON SCHLAEMMEN AUS DER KOMMUNALEN ABWASSERREINIGUNG MIT PHOSPHATFAELLUNG),
Hoechst A.G., Huerth/Knapsack (West Germany).
D. Gleisberg, and N. Taubel.
Wasser und Boden, Vol. 30, No. 1, p 5-8, 1978. 3 fig, 6 tab, 8 ref.

Descriptors: *Phosphorus, *Chemical precipitation, *Fertilizers, *Soil amendments, *Nutrient removal, Soils, Plant growth, Phosphates, Ultimate disposal, Sludge disposal, Waste water treatment, Waste water disposal.

The phosphate fertilizer value of sludge from municipal waste water treatment plants using alum and iron sulfates for phosphate precipitation was measured in greenhouse and field studies with lettuce, spinach, and corn plants. The phosphate content of the sludge was 18.8-28.5%, compared to 9.4% for untreated sewage sludge and 28.5% for calcined phosphate. For sludge obtained after phosphate precipitation, 12.3-20.5% of the phosphate was soluble in citric acid, 12.5-26.7% in citrate, and 0.1-0.39% in water. There were no significant differences in terms of trace element content between untreated sludge and that obtained after phosphate precipitation. Greenhouse studies revealed the advantages in terms of fertilizer value of using sludge from phosphate precipitation instead of untreated sludge to amend lettuce and spinach crops grown in acidic and neutral soils. The effect of the sludge was comparable to that of calcined phosphate. Neither the phosphate precipitation sludge nor the calcined phosphate enhanced plant growth in a loamy sand at pH 3.8. Field tests with corn demonstrated that soil amendments with phosphate precipitation sludge would not significantly affect the trace element content of the corn-cobs. (Takacs-FIRL)
W78-08471

PERSISTENCE OF ENTEROVIRUSES IN SEWAGE SLUDGE,
Ontario Ministry of Health, Toronto. Lab. Services Branch.
For primary bibliographic entry see Field 5A.
W78-08472

INAPPLICABILITY OF BATCH KINETIC DATA TO ANALYSIS OF SOIL TREATMENT SYSTEMS,
Kennedy Engineers, Inc., San Francisco, CA.
R. M. Adams.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 386-389, February, 1978. 1 fig, 14 ref.

Descriptors: *Return flow, *Irrigation practices, *Kinetics, *Waste water disposal, *Soil types, Mathematical models, Analytical techniques, Biochemical oxygen demand, Waste water treatment, Municipal wastes.

Mathematical models were unsuccessful in describing the kinetics of biochemical removal of organic carbon by plug flow through soil columns. An equation for calculating hydraulic retention time of a constant-density liquid is integrated with the initial and final reactant concentration. To calculate the residence time in a differential plug flow reactor, the flow streamline length, the liquid fraction, and the water velocity are considered as a function of the soil and waste water COD, the streamline flow distance, and the rate of COD

removal. Activated sludge samples containing 330 mg/liter COD were filtered through packed soil columns; results were compared to batch anaerobic incubation data for COD reduction. The cell residence time equation was applicable only in designing plug flow systems where reaction rates were dependent upon concentrations and reactions involving only single chemical species. Batch incubation experiments provided unreliable COD reduction data in the soil columns because of spatial variations of the microorganism types in the soil. The batch data cannot, therefore, be utilized in soil treatment system designs. (Lisk-FIRL)
W78-08484

INFECTIOUS DISEASE HAZARDS OF LAND-SPREADING SEWAGE WASTES,
Agricultural Research Service, Beltsville, MD. Biological Waste Management and Soil Nitrogen Lab.; and Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5C.
W78-08490

RIVER WATER QUALITY IN ESSEX DURING AND AFTER THE 1976 DROUGHT,
Essex Water Co., (England).
For primary bibliographic entry see Field 5B.
W78-08491

THE MOVEMENT OF SEWAGE EFFLUENT THROUGH SOIL COLUMNS: THE MAJOR IONS (NA, CA, MG, CL, AND SO4),
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W78-08492

SPRAY IRRIGATION OF DOMESTIC SEWAGE IN THE BRAUNSCHWEIG SEWAGE ASSOCIATION - ENVIRONMENTAL POLLUTION OR SUCCESSFUL UTILIZATION OF SEWAGE. (DIE VERREGNUNG VON KOMMUNALEM ABWAESSERN IM ABWASSERVERBAND BRAUNSCHWEIG - UMWELTVERSCHMUTZUNG ODER SINNVOLLE ABWASSERVERWERTUNG),
Kiel Univ. (West Germany). Inst. fuer Wasserwirtschaft und Meliorationswesen.
For primary bibliographic entry see Field 5B.
W78-08493

NEW PROSPECTS FOR SEWAGE DISPOSAL IN U P,
Irrigation Commission, Lucknow (India).
A. C. Chaturvedi.
Journal of the Institution of Engineers (India), Vol. 58, Part EN 1, p 21-22, October, 1977.

Descriptors: *Water quality control, *Pollutant identification, *Pollution abatement, Surveys, *Lowflow augmentation, River basins, River basin development, Treatment facilities, Organic wastes, Protein, Carbohydrates, Eutrophication, Nutrients, Water utilization, Diseases, Waste water treatment, Municipal wastes, Sewage disposal.

Sources of water pollution in Uttar Pradesh, India, are identified and water quality controls are cited. The discharge of sewage effluents to rivers, ponds, and lakes has overburdened the natural self-purification process of receiving waters. Surveys have indicated that waste water treatment facilities should be expanded or replaced; further research on pollutant identification and water basin management is recommended. Identification of a water resource's use is required for the cost-effective evaluation of the need for treatment facilities, reservoirs, sewer systems, and control regulations. Trace quantities of pollutants have been identified as leading to hematopoitetic tissue. More strict control of halogenated methanes and chloroforms in receiving waters is needed; organic components in domestic wastes have been classified as carbohydrates, proteins, fatty acids, and soluble organic materials evident in trickling filter effluent. Effective water quality management includes establishing standardized rating scales, information resources, nutrient requirements of aquatic flora, and cost-effective alternatives of waste water treatment projects. (Lisk-FIRL)
W78-08500

A SHORT TERM STUDY ON THE POLLUTION OF TAPTI RIVER IN SURAT REGION,
S. V. Regional Coll. of Engineering and Technology, Surat (India).
For primary bibliographic entry see Field 5A.
W78-08504

FRESH WATER FROM SEWAGE ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 5D.
W78-08515

BACTERIAL AEROSOLS RESULTING FROM SPRAY IRRIGATION WITH WASTEWATER,
Army Medical Bioengineering Research and Development Laboratory, Fort Detrick, MD.
For primary bibliographic entry see Field 5A.
W78-08518

WASTEWATER DISPOSAL FROM TWO-DIMENSIONAL DIFFUSER,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
N. E. Kotsovinos.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Technical Notes, Vol 104, No HY4, p 559-561, April 1978. 1 fig, 3 ref.

Descriptors: *Waste water disposal, *Jets, *Mathematical models, *Hydraulic structures, Flow, Buoyancy, Model studies, Diffusion, Tracers, Spatial distribution, Mathematical studies, Analytical techniques, Analysis, Thermal pollution, Two-dimensional diffuser, Tracer concentration, Buoyant jets.

In the design of a multiport diffuser structure to dispose sewage of waste heat (thermal pollution) in the open sea, the engineer wants to calculate the time-average center line concentration of the pollutant (or heat) for various initial densimetric Froude numbers. The purpose of this note was to present an explicit equation that gives the center line dilution in a line vertical buoyant jet (physical model of the discharge effluent) for any initial Froude number. The experimental data for all buoyant jets (for any Froude number F in the range 1 less than F less than infinity, and for any nondimensionsl distance X/D greater than 10) followed a universal curve. Therefore, the note advocated a useful formula for the design engineer. (Humphreys-ISWS)
W78-08567

BILGE WATER DISPOSAL SYSTEM INCLUDING OIL RECOVERY MEANS,
National Marine Service, Inc., St. Louis, MO. (Assignee).
For primary bibliographic entry see Field 5G.
W78-08608

WASTE DISPOSAL SYSTEM FOR CHEMICAL PLANTS,
Hitachi, Ltd., Tokyo (Japan).
For primary bibliographic entry see Field 5D.
W78-08611

INCINERATION OF ALKALINE WASTE LIQUORS,
Badische-Anilin und Soda-Febrik A.G., Ludwigshafen am. Rhein (West Germany).
K. Schloemer.
International Chemical Engineering, Vol. 18, No. 2, p 204-208, April, 1978. 4 fig, 1 tab.

Descriptors: *Incineration, *Alkaline water, *Chemical wastes, *Alkalis(Bases), *Venturi flumes, Sodium, Design data, Construction materials, Linings, Corrosion control, Water vapor, Waste water treatment, Waste water disposal, Industrial wastes.

Incineration was considered for alkaline waste liquors that are nondegradable or contain elements toxic to microorganisms. Biological degradation, clarification, and waste sulfuric acid treatment were eliminated because of the high costs of installation and operation. High-temperature incineration of the alkaline waste waters at 1,000-1,100C without steam production was elected over low-temperature fluidized-bed incineration with steam production and high temperature combustion with steam production. A vertical, refractory-lined combustion chamber with temperatures of 1,000-1,600C in the upper selection was used. The soda produced during incineration was conveyed to an immersion bath were exhaust gas was cooled; molten soda was dissolved and removed; and dust in the exhaust gas was partially precipitated. Approximately 90-95% of the soda was removed in the immersion bath; the exhaust gas was cooled to 90C and the residual soda was reduced to 80 mg/cu m by a wet Venturi scrubber. The water-saturated exhaust gas was discharged at 80C through a 30 m high stack. (Lisk-FIRL)
W78-08613

OIL WELL OPERATION AND SALT-WATER INTRUSION: POLICY IMPLICATIONS,
Cities Service Oil Co., Charleston, WV.
For primary bibliographic entry see Field 5G.
W78-08617

BIO-SOLIDS DEWATERING AND DISPOSAL AT A SULPHITE MILL,
Edde (Howard), Inc., Bellevue, WA.
For primary bibliographic entry see Field 5D.
W78-08620

COPRECIPITATION OF ACID CHEESE WHEY AND TANNERY WASTE AND RECOVERY OF PROTEIN,
Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
For primary bibliographic entry see Field 5D.
W78-08626

THE PRINCIPLES AND METHODS OF CHROMIUM RECOVERY IN THE TANNERY,
Allied Chemical Corp., Morristown, NJ. Industrial Chemicals Div.
For primary bibliographic entry see Field 5D.
W78-08627

CONSIDERATIONS RELATING TO TOXIC SUBSTANCES IN THE APPLICATION OF MUNICIPAL SLUDGE TO CROPLAND AND PASTURELAND (A BACKGROUND SUMMARY),
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
For primary bibliographic entry see Field 5B.
W78-08651

DISPERSION STUDY OF BURIED ELEMENTAL MERCURY,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
E. G. Orebaugh, and W. H. Hale, Jr.

Available from the National Technical Information Service, Springfield, VA 22161 as DP-1401, Price codes: A03 in paper copy, A01 in microfiche. Report DP-1401, UC-41, July 1976, 44 p, 7 fig, 1 tab, 21 ref.

Descriptors: *Mercury, *Metals, Soil analysis, Soil chemistry, *Soil contamination, *Soil environment, Chemical analysis, Translocation, Public health, *Water supply, Model studies, Waste disposal, Waste dumps, Environmental effects, Path of pollutants, *Mercury transport, *Mercury flux, Buried mercury, Four Mile Creek.

Waste elemental mercury disposed of by burial in trenches has been found to have no probable environmental effects. (This method of disposal has been discontinued). Transport modes by which buried mercury would be expected to reach man in the environment were modeled mathematically using experimentally determined and estimated parameters. Calculations established that elemental mercury is the stable chemical form in the soil matrix. Consequently, only diffusion of mercury vapor to the atmosphere and transport of mercury in soil water to the water table merited consideration. Aqueous transport occurs by both dissolution of mercury in water (maximum = 57 ppb) and suspension of mercury on oxide colloids of iron and silicon in soil water (maximum = 6 ppm). This study indicated that colloidal suspension is the dominant mode for transport of mercury from the burial site. By this means, a mercury flux of about 200 mg/hr from about 10 tons of buried mercury may enter the water table and travel horizontally, eventually exiting as surface water. As a worst case, this flux could contribute approximately 0.2 ppb to nearby Four Mile Creek, which is near the range of natural mercury levels in fresh water streams and lakes. (EIS-Katz)
W78-08655

MIGRATION OF EXPLOSIVES AND CHLORINATED PESTICIDES IN A SIMULATED SANITARY LANDFILL,
Construction Engineering Research Lab. (Army). Champaign, IL.
For primary bibliographic entry see Field 5B.
W78-08656

UTILIZATION OF SWINE MANURE IN A POLYCULTURE OF ASIAN AND NORTH AMERICAN FISHES,
Illinois Natural History Survey, Kinmundy.
For primary bibliographic entry see Field 5C.
W78-08694

IRRIGATION WASTEWATER DISPOSAL WELL STUDIES-SNAKE PLAIN AQUIFER,
Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 5B.
W78-08724

LAND APPLICATION OF SELECTED HOME WASTEWATER,
Metcalf and Eddy, Inc., Boston, MA.
B. P. Popkin.
American Society of Agricultural Engineers, ASAE Technical Paper No. 78-2062, 1978 20 p, 11 tab, 1 fig, 32 ref.

Descriptors: *Supplemental irrigation, *Waste water disposal, *Water conservation, *Sewage treatment, Cost analysis, Water reuse, Water costs, Drainage, Southwest U.S., Consumptive use, Water quality, Irrigation water, Gray water, Agricultural engineering.

Application of selected home wastewater (gray water) is reviewed for domestic irrigation of lawns and gardens in the arid Southwest. Conditions may be considered favorable where there are high sewage-treatment and drinking-water costs, as well as accessibility to loamy, well-drained, cropped soils. Quality and quantity of gray water are suitable for such irrigation purposes if climate, soil conditions, plant needs, and engineering problems are taken into account. Costs are compared for most gray water and laundry-effluent reuse for 4 cases: a 100-unit trailer park, a 50-unit apartment complex, a double family home of 6, a single family home of 3. The economics of wastewater reuse is favorable under the limited conditions of large-scale units and high water and sewer user fees, conditions which do exist in the Southwest U.S. (Popkin-Arizona)
W78-08759

BRIGHTON'S SEWAGE GOES TO SEA.
For primary bibliographic entry see Field 5D.
W78-08765

INFRARED SLUDGE INCINERATORS OPERATIONAL IN TEXAS SEWAGE PLANT.
Water and Wastes Engineering, Vol. 15, No. 2, p 23, February, 1978. 1 fig.

Descriptors: *Incineration, *Infrared radiation, *Sludge disposal, *Construction materials, *Conveyance structures, Dewatering, Operation and maintenance, Drying, Ultimate disposal, Waste water treatment, Sludge treatment, Municipal wastes.

A patented infrared sludge incineration process, designed by Shirco, Inc. of Dallas, Texas, has been installed in the Richardson, Texas, sewage treatment plant. Sewage sludge is transported on woven wire belts through two horizontal, insulated incinerators, each 8.5 by 72 ft. The sludge, which is fed into the unit through a feed hopper, is pressed to 1-inch thickness by an internal roller before it is passed into the incinerators. Within the chambers, infrared heating elements incinerate the sludge at a rate of 2,400 lbs/hr. Gas is heated over the ash produced as it passes counter-current to the incoming sludge. The ash is removed for further handling. The modular incineration system has a 1-1/2 hr start up or shut down time. (Lisk-FIRL)
W78-08776

THAMES WA OUTLINES ITS COST STUDY ON SLUDGE.
For primary bibliographic entry see Field 5D.
W78-08777

5F. Water Treatment and Quality Alteration

ARIZONA'S WHITE RIVER - A WORKING WATERCOURSE,
Arizona State Historical Society, Tucson.
L. Davisson.
The Journal of Arizona History, Vol 19, No 1, p 55-72, Spring, 1978. 42 ref.

Descriptors: *Arizona, History, River basin development, Irrigation practices, *Indian reservations, Water supply, Water utilization, Dams, Water pumping, Water rights, Recreation, *Water resources development, Crop production, Livestock, Bridge construction, Arid lands, *Water conservation, Land management.

Research summarizes historic and present day use of the White River Valley, located in central Arizona. Today the White Mountain Apaches utilize the river's water supply to irrigate crops of corn, fruit, alfalfa and vegetables and to provide water for livestock. Since 1954 the White Mountain Recreation Enterprise has constructed a series of lakes on the Indian reservation which have become popular camping and fishing spots. Federal fish hatcheries have been developed jointly by the White Mountain Tribe and the U.S. Bureau of Sports Fisheries and Wildlife. A large portion of the tribal income is derived from annual sale of fishing, hunting and camping permits to visitors. Carful water conservation and protection of natural resources in this arid environment are responsible for the successful White Mountain Apache enterprises. (Jewkes-Arizona)
W78-08372

THE COST OF WATER SUPPLY AND WATER UTILITY MANAGEMENT (VOLUMES I AND II),
Municipal Environmental Research Lab., Cincinnati, OH. Water Supply Research Div.
For primary bibliographic entry see Field 5G.
W78-08390

HUMAN PATHOGENS AS POTENTIAL HEALTH HAZARDS IN THE REUSE OF WATER,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Virology and Immunology.
E. Lund.
Ambio, Vol. 7, No. 2, p 56-61, 1978. 4 tab, 7 ref.

Descriptors: *Pathogenic bacteria, *Disinfection, *Mycobacterium, *Protozoa, *Viruses, Diseases, Potable water, Chlorination, Trickling filters, Biological treatment, Lime, Waste water treatment, Municipal wastes.

Methods of removing pathogenic bacteria, viruses, protozoa, and helminths from waste water are reviewed. Salmonella and E. coli are reduced by 50% with primary and mechanical treatment. Parasitic ova and amoebic cysts are removed only through sedimentation in primary or secondary clarifiers. Trickling filter systems, depending on climatic conditions and facility design, can reduce E. coli, salmonella, and sometimes viruses from 10,000,000-1,000,000 bacteria/100 ml to 10,000-100,000/100 ml; Clostridium perifringens are relatively unaffected. A pH of 10.5-11.0, induced by chemical treatment with lime, disinfects treated water but does not reduce mycobacteria or vibrio cholera. Chlorination of sewage effluent effectively kills bacteria, salmonella, Clostridium perfringens, and mycobacteria with adequate contact time but does not destroy enteric viruses and parasitic eggs. Bacteria and viruses in drinking water are effectively removed by chlorination. Pasteurization or irradiation may reduce the concentrated microorganisms contained in primary and digested sludges. (Lisk-FIRL)
W78-08435

IS CHLORINE THE BEST DISINFECTANT.
The American City and Country, Vol. 93, No. 3, p 82-83, March, 1978. 1 fig.

Descriptors: *Chlorination, *Disinfection, *Ozone, *Ultraviolet radiation, *Bromine, Halogens, Toxicity, Viruses, Bactericides, Viricides, Iodine, Sulfur compounds, Chlorine, Waste water treatment, Municipal wastes.

Dechlorination ozonation, chlorine dioxide, ultraviolet light, bromine chloride, and iodine are investigated as alternative disinfectants to chlorine which has been found toxic to some aquatic organisms, to form carcinogenic halogenated organic compounds, and to pose a potential health hazard in transport and in storage. Dechlorination with sulfur dioxide can reduce the pH and dissolved oxygen content of the effluent, which then requires further treatment before discharge. Ozonation is a more costly procedure than chlorination but it is not toxic to aquatic organisms, assists in increasing the dissolved oxygen content, and provides adequate disinfection. Contractors under investigation for ozonation include baffled diffusers, positive-pressure injection systems, turbine contactors, bubble diffusers, and multi-stage mixing pumps. Chlorine dioxide disinfection requires on-site generation equipment. While

chlorine dioxide does not form halogenated compounds, does not react with ammonia in the waste water, and disinfects efficiently and selectively at high pH levels, it is more toxic than chlorine. Ultraviolet light disinfection is efficient at high doses, produces no toxins, and can disinfect turbid or colored water. Bromine chloride, which forms bactericidal and viricidal bromines when reacted with ammonia, produces some monohalogenated compounds which are more degradable than chlorinated compounds. Bromine chloride disinfection also has the advantage of rapidly killing poliovirus. Iodine disinfection, currently under investigation, is considered prohibitively expensive. (Lisk-FIRL)
W78-08455

THE OXFAM SANITATION UNIT,
Oxfam, Oxford (England).
For primary bibliographic entry see Field 5D.
W78-08457

A CHLOROFORM PROBLEM AT GREAT WARFORD AND ITS SOLUTION,
Allott and Lomax, Manchester (England).
For primary bibliographic entry see Field 5D.
W78-08459

TEEPOL AND TRITON MEDIA FOR THE ENUMERATION OF ESCHERICHIA COLI BY MEMBRANE FILTRATION,
Dundee Univ. (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-08476

COMPARISON OF ADSORPTION ELUTION METHODS FOR CONCENTRATION AND DETECTION OF VIRUSES IN WATER,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5A.
W78-08477

DETERMINATION OF TOCL BY ENRICHMENT ON POWDERED ACTIVATED CARBON AND FLOCCULATION (UNTERSCHUNGEN ZUR BESTIMMUNG DE ORGANISCH GEBUNDENEN CHLORS MIT HILFE EINES NEUARTIGEN ANREICHERUNGSVERFAHREN),
For primary bibliographic entry see Field 5A.
W78-08478

CHLORINATION: ASSESSING ITS IMPACT,
For primary bibliographic entry see Field 5C.
W78-08498

EFFECT OF GAMMA RAYS ON MICROORGANISMS AND CHEMICALS IN WATER, WASTEWATER, AND SLUDGE,
Florida Inst. of Tech., Melbourne. Univ. Center for Pollution Research.
For primary bibliographic entry see Field 5D.
W78-08503

MASS TRANSFER AND REACTION RATE STUDIES OF OZONATED MUST WASTEWATERS IN THE PRESENCE OF SOUND WAVES,
Arizona Univ., Tucson. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-08512

PROCESS FOR CHELATING AND INHIBITING SCALE IN AQUEOUS SYSTEMS,
Petrolite Corp., St. Louis, MO. (Assignee).
P. M. Quinlan.
U.S. Patent No. 4,064,044, 10 p, 3 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 965, no 3, p 1049, December 20, 1977.

Descriptors: *Patents, *Scaling, *Descaling, *Water softening, Industrial water, *Chelation, *Water treatment, Chemical reactions, Organic compounds.

A process for inhibiting scale such as calcium, barium and magnesium carbonate, sulfate, silicate, etc. is described which comprises employing threshold amounts of methylene phosphonates of polyalkylenepolyamines polymerized with epoxyhalides or dihalides. These products are the reaction products of (1) polyalkylene polyamines and related compounds with (2) polyfunctional compounds, preferably bifunctional, capable of yielding upon reaction (3) a polymer having controlled crosslinking so that the polymer is soluble and/or dispersable in an aqueous system, and then reacting this polymer with a phosphomethylolating agent to yield (4) methylene phosphonates of polymerized polyalkylenepolyamines. (Sinha-OEIS)
W78-08589

WATER CLEANER,
For primary bibliographic entry see Field 5G.
W78-08592

ALGAE GROWTH CONTROL,
Algard Pty. Ltd., Balwyn (Australia). (Assignee).
For primary bibliographic entry see Field 5G.
W78-08594

METHOD AND APPARATUS FOR ELECTRO SHOCK DEGERMINATION OF WATER,
Multorgan S. A., Magliaso (Switzerland). (Assignee).
UW. Stark.
U.S. Patent No. 4,066,544, 6 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 248, January 3, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Disinfection, Bacteria, Oxidation, Equipment, *Electrolysis, Magnetic fields, *Degermination.

A primary object of this invention is to provide a new and improved method of, and apparatus for, killing the bacteria or germs in water by electroshock. In the proposed method the water is exposed to an air-air ion mixture and at the region where there is effective mixture there is produced a magnetic field which penetrates the water. The apparatus comprises an ion generator, the outlet of which is connected with a section of a conduit conducting the water or a vessel containing such water and formed of an electrically insulating material. At the outlet region for the ions there are provided means for generating the magnetic field. (Sinha-OEIS)
W78-08607

PORTABLE WATER FILTRATION DEVICE,
Dynek Corp., Port Chester, NY. (Assignee).
E. Stern.
U.S. Patent No. 4,066,551, 8 p, 11 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 251, January 3, 1978.

Descriptors: *Patents, *Water treatment, *Water quality control, *Water purification, *Filtration, Chlorinization, Equipment, Sterization, Portable.

The portable water filtration device may be made in various ways. In one way, the reservoir is formed in a seal-tight housing and the water is pumped by means of an air pump through a filter located within the reservoir and then passed through a spout. In another way, use is made of a blender with the water being forced by an impeller from with a lower compartment of the blender jar into a filter and then out a spout on the filter. Other pump means may also be used to pump the water through a filter and out an outlet from a closed reservoir. Sterilizing means may also be provided in the various ways to sterilze the water prior to filtration. Also, the water being treated may be recycled to increase the time of treatment. (SInha-OEIS)
W78-08610

EFFECTS OF MANGANESE AND THEIR MODIFICATION BY HEXAMETAPHOSPHATE,
Environmental Protection Agency, Cincinatti, OH.
For primary bibliographic entry see Field 5C.
W78-08640

5G. Water Quality Control

PROTECTION OF FISHING WATERS.
For primary bibliographic entry see Field 6E.
W78-08203

SOIL EROSION AND SEDIMENTATION CONTROL ACT OF 1972.
For primary bibliographic entry see Field 6E.
W78-08204

HAMPSON V. SUPERIOR COURT FOR COUNTY OF INYO.
For primary bibliographic entry see Field 6E.
W78-08212

CHESAPEAKE BAY AND TRIBUTARIES.
For primary bibliographic entry see Field 6E.
W78-08215

WATER POLLUTION CONTROL AND ABATEMENT.
For primary bibliographic entry see Field 6E.
W78-08216

CHEMICAL CONTROL OF BRUSH AND ENVIRONMENTAL SAFETY OF ROADSIDE VEGETATION MANAGEMENT CHEMICALS,
Purdue Univ., Lafayette, IN. Dept. of Biological Sciences.
D. J. Morre.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 848, Price codes: A07 in paper copy, A01 in microfiche. Report No. FHWA-IN-76-32, December 1, 1976. 134 p, 29 fig, 22 tab, 71 ref. C-36-48F, HRP - 1(14) Part II.

Descriptors: *Brush control, *Weed control, *2, 4-D, *Herbicides, *2,4,5-T, *Vegetation effects, Environmental effects, Aquatic life, Algae, Fish, Environmental effects, *Roadside vegetation management, Roadside maintenance, Vegetation control, *Krenite, 2,4,-DP, Dicamba, Picloram, Banvel, Tordon, 2,4,5-TP, Silvex, Roadside mowing.

A research project to identify and test a suitable herbicide treatment program (for use on the Interstate System in combination with reduced mowing practices) that would provide a practical alternative to 2,4,5-T and at the same time control broad leaf weeds is presented; one such treatment in the form of a specific recommendation is provided. The herbicide 2,4,5-T, alone or in combination with 2,4-D (brush killer) either as an ester formulation or as an amine salt, applied either as a dormant treatment in winter or to foliage in summer or early fall, is the most effective chemical treatment for control of roadside bursh. Regulatory rulings prohibit the use of 2,4,5-T on home grounds, recreational areas, and in or near water

areas. Discontinuance of the use of 2,4,5-T in roadside applications on the basis of environmental safety should be seriously questioned. Three herbicides were tested: (1) picloram (Tordon), (2) 2,4-D, and (3) dicamba (Banvel). A mixture of equal parts of an amine salt formulation of 2,4-D + 2,4,5-TP (Silvex) + dicamba (Banvel) is recommended for inclusion in the Fall-Spring spraying rotation to be applied by off-road equipment to unmowed portions of the Interstate System. This same mixture or 'Krenite' brush control agent is recommended as a foliar application for control of brush along county roads and other situations where hydraulic spary applications directly to stems and foliage are indicated. Environmental safety of these herbicides was also investigated and is reported. Potential hazards wer minimal if the sprays were used as recommended. Control of herbicide drift is an important aspect of any chemical control of brush. (Seip-IPA)
W78-08224

WATER CONSERVATION AND POLLUTION CONTROL IN COAL CONVERSION PROCESSES,
Water Purification Associates, Cambridge, MA.
D. J. Goldstein, and D. Yung.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 568, Price codes: A21 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-065, June, 1977. 467 p, 96 fig, 154 tab, 280 ref, append. 68-03-2207.

Descriptors: *Electric power, *Electric power production, *Water pollution, *Coal, *Waste water treatment, *Water conservation, *Water demand, *Coal conversion, Coal gasification, Coal preparation, Hygas process, Synthane process, Solvent refined coal, Lurgi process, Western coal.

Results of a study to develop strategies and recommend measures to minimize water pollution and consumption by coal conversion complexes in the Western states are reported. Part I - 'Water Quantities' - gives brief descriptions and process water requirements for nine conversion processes. Detailed designs and analyses are given for Hygas, Synthane, and Solvent Refined Coal (SRC) processes, and for Lurgi combined-cycle power generation. At three proposed sites (in North Dakota, New Mexico, and Wyoming), complete water requirements and effluents, including all mining and related off-site uses, are given for the power, Hygas, and SRC plants. The Synthane process is analyzed only at the Wyoming site. Part 2 - 'Water Treatment' - gives analyses of influent and effluent waters, with examples for study. For the three plants at the North Dakota site, source water of good quality is assumed to be cheap and available. For three plants in New Mexico, souce water will be available but is brackish. All the plants at the Wyoming site receive sewage from a satellite town; additional fresh water is available but is assumed to be expensive. The plants, being net consumers of water, are designed for no discharge of water. For each process at each site (10 cases) an integrated water treatment plant block flow diagram is given with approximate costs and energy requirements. (Seip-IPA)
W78-08228

BROMINE CHLORIDE - AN ALTERNATIVE TO CHLORINE FOR FOULING CONTROL IN CONDENSER COOLING SYSTEMS,
Martin Marietta Corp., Baltimore, MD. Environmental Technology Center.
L. H. Bongers, T. P. O'Conner, and D. T. Burton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 968, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-053, May, 1977. 160 p, 12 fig, 26 tab, 71 ref, 6 append. 68-02-2158.

Descriptors: *Bromine, *Bromides, *Chlorine, Electric powerplants, *Thermal powerplants, Fouling, Condensers, *Cooling water, Degradation, Environmental effects, Water pollution effects, Water pollution control, Performance, Estuaries, Pollutant identification, Bromine chloride, *Fouling control, Condenser cooling systems, Estuarine water, Dissipation, Decay rate, Bromine chloride residues, Chlorine residues, Bromamines.

Results of a comparison of bromine chloride (BrCl) and chlorine (Cl) for fouling control in condenser cooling systems are presented; their decay rate in estuarine cooling water and their fouling control effectiveness are evaluated. The program was conducted at an 1100-MWe, fossil-fueled, two-unit generating facility using estuarine water for one-through cooling. The halogens were applied continuously at doses of 0.5 ppm or less. Fouling control was evaluated by observing the accumulation of fouling on glass panels exposed to treated and untreated cooling water, and on condenser performance data. Decay characteristics of the halogens were evaluated by measuring residual oxidant concentrations using an amperometric back-titration method sensitive to 5 ppb. Fouling control resulted from the presence of bromamines expected from the rapid reaction of free hypobromous acid with the ambient levels of ammonia present. Dosing requirements depended primarily on intake cooling water temperature. Using BrCl decay and fouling response to treatment data, a control model was formulated which predicted minimum BrCl dose necessary to attain adequate fouling control. BrCl was effective when dosed continuously at 0.5 ppm and less. Oxidant residuals resulting from BrCl treatment dissipate more rapidly in the estuarine water than the chlorine-induced oxidants. Advantages and disadvantages of continuous and intermittent fouling control strategies are discussed on the basis of biological and environmental considerations. (Seip-IPA)
W78-08247

TRANSURANICS IN NATURAL ENVIRONMENTS.
Energy Research and Development Administration, Las Vegas.
For primary bibliographic entry see Field 5B.
W78-08248

SITE SELECTION AND DESIGN FOR MINIMIZING POLLUTION FROM UNDERGROUND COAL MINING OPERATIONS,
Alabama Univ., University.
R. Q. Shotts, E. Sterett, and T. A. Simpson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 180, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/7-78-006, January, 1978. 98 p, 40 fig, 16 tab, 33 ref. 68-03-2015.

Descriptors: *Mine drainage, *Coal mines, *environmental effects, *Pollutant identification, *Water quality, *Acid mine water, *Mine water, Underground, *Mining engineering, *Heavy metals, Engineering geology, Soil mechanics, Alabama, Sites, Coal mine development, Underground coal mining, Coal mine site selection, Sulfide oxidation, Cedar Creek(AL).

Discussed are mine site selection, Manner of mine development, method of extraction of coal, and the proper closure of underground coal mines to ensure the minimum pollution of the mine area both during the life of the mine and after abandonment. The study area was the North River Mine in west-central Alabama. Pre-mining environment was assessed by sampling Cedar Creek and other streams. Analyses of samples of groundwater into the mine, of the water pumped from the mine pump, and of water from Cedar Creek below the mine, made possible the assessment of water quality. Principal factors associated with mining which affected downstream water quality were sulfide oxidation and acid formation in the mine, the quality of the groundwater seeping into the mine, the limestone used for rock dusting, and the quality of the resettled but not treated mine and washing plant water. Pollution downstream from the mine was slight, even when untreated mine effluent flowed directly into the creek. Quantities of heavy metal ions contained in the mine influent and effluent were small. If openings are sealed after closure, environmental integrity for the area should exist indefinetely. Deep mines in Alabama's synclinal coalfields, if entered some distance from the outcrop, or mined down-dip if started on the outcrop, should produce little surface pollution. Sealing of all openings should ensure minimum pollution far beyond the life of the mines. (Seip - IPA)
W78-08261

FIELD AND LABORATORY METHODS APPLICABLE TO OVERBURDENS AND MINESOILS,
West Virginia Univ., Morgantown. Coll. of Agriculture and Forestry.
For primary bibliographic entry see Field 5A.
W78-08264

VEGETATIVE STABILIZATION OF SPENT OIL SHALES: VEGETATION, MOISTURE, SALINITY, AND RUNOFF - 1973-1976,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
H. P. Harbert, III, and W. A. Berg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 308, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/7-78-021, February, 1978. 169 p, 24 fig, 18 tab, 11 ref, 2 append. R-803059.

Descriptors: *Oil shales, *Waste disposal, *Ultimate disposal, *Vegetation establishment, *Plant growth, *Saline soils, *Salt balances, *Salinity, Runoff, Moisture content, Irrigation, Leaching, *Spent oil shales, TOSCO oil shale, Salt transport, Resalination.

To investigate surface stability of and salt movement in spent shales and spent shales covered with soil after vegetation has been established by intensive treatment and then left under natural precipitation conditions, field studies were initiated in 1973 on two types of spent oil shale - coarse-textured (USBM) and fine-textured (TOSCO). Plots were established at low and high-elevation study sites in northwestern Colorado. A good cover of native species was established on all plots by leaching, N and P fertilization, seeding, mulching, and irrigation. The plots have not been irrigated since establishment and now support an adequate cover of vegetation dominated by perennial grasses, with the exception of the low-elevation TOSCO plots which are dominated by a mixture of annuals and perennial grasses. Higher levels of Mo were found in plants grown in the spent shales than in plants grown in soil. Water applied during leaching and establishment was being used by plants during the third growing season; thus, only one year's information for growth under seasonal precipitation is represented. Resalinization occurred following leaching of the TOSCO spent shale; salt moved up into 15 cm of soil cover over leached TOSCO spent shale. USBM spent shale was resalinized at the high-elevation site following inadequate leaching but was not at the low-elevation site. The 30 cm of soil cover over the unleached spent shale was not salinized at either study site. Greatest runoff was from the TOSCO spent shale. Sediment yields were very low reflecting the use of mulch and establishment of adequate plant cover. (Seip-IPA)
W78-08268

MODELING EFFECTS OF AQUATIC PLANTS IN RIVERS.
Ministry of Works and Development, Hamilton (New Zealand).
For primary bibliographic entry see Field 5C.
W78-08300

PROJECTIONS OF PHOSPHORUS LEVELS IN WHITE LAKE,
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5C.
W78-08304

WATER QUALITY MANAGEMENT IN THE HSINTIEN RIVER IN TAIWAN,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
B. N. Lohani, and N. C. Thanh.
Water Resources Bulletin, Vol. 14, No. 3, p 689-695, June 1978. 3 fig, 2 tab, 2 ref.

Descriptors: *Water quality control, *Hsintien River(Taiwan), *Chance-constrained programming, *Cost minimization, Programs, Decision making, Cost effectiveness, Probability, Drainage basins, Dissolved oxygen, Biochemical oxygen demand, Optimization, Stochastic processes, Reach(Streams), Treatment facilities, Treatment costs, Computer programs, Mathematical models, Systems analysis.

The Hsintien Drainage Basin is located in northern Taiwan. The river is a major source of water supply and is carefully managed to maintain a desired water quality. Chance-constrained programming was used to derive a cost effective water quality control program. The water quality objective was to maintan a desired dissolved oxygen limit, and this was accomplished by determining the degree of treatment required at each wastewater source so as to minimize the total operating cost. The stochastic programming model accounted for the probabilistic nature of the streamflows in the river, providing an economic tradeoff between water quality and reliability. (Graf-Cornell)
W78-08309

EVALUATION AND IMPROVEMENT OF QUALITY CHARACTERISTICS OF URBAN STORMWATER,
New South Wales Univ., Kensington. (Austrialia). School of Civil Engineering.
I. Cordery.
Report No. 147, Water Research Laboratory, The University of New South Wales, Manly Vale, N.S.W., Australia, October 1976. 12 fig, 9 tab, 44 p, 28 ref.

Descriptors: *Stormwater, *Urban runoff, *Water pollution, *Evaluation, *Water quality control, Floods, Settling, Treatment, Sewage, Sewers, Effluents, Pollutants, Discharge(Water), Surface runoff, *Australia.

Stormwater samples collected from three urban catchments in Sydney, Australia show that in separately sewered areas the surface runoff has a greater concentration and carries a greater total load of pollutants than effluent from secondary sewage treatment plants. Pollution and nutrient indicators are highly concentrated in the 'first flush' at the start of urban storm runoff, but these concentrations fall rapidly to quite low levels during the passage of each flood. An important exception to this trend is phosphate. The phosphate concentration remains approximately constant during each flood. Whenever the discharge increases sharply the concentrations of suspended solids and phosphate increase slightly. However, the concentrations of BOD and ammonia do not usually increase after the first flush unless a later increase in discharge is extremely rapid. Faecal coliform concentrations in flood flows are usually between one and two orders of magnitude less than for raw sewage. Some of the stormwater samples were subjected to simple settling in the laboratory for durations of up to one hour. For a typical urban catchment, these laboratory tests show that on an annual basis, short duration settling of stormwater could remove amounts of pollutants comparable to the amounts which could be removed by tertiary treatment of secondary sewage effluent from the same catchment. The costs of settling storm runoff would probably be far less than tertiary treatment of secondary sewage effluent. (Graf-Cornell)
W78-08310

A REVIEW OF LOCAL AGENCIES IMPACTING REGIONAL WATER QUALITY MANAGEMENT.
Miami Valley Regional Planning Commission, Dayton, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 375, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-208-MVRPC-M4, March, 1976. 113 p.

Descriptors: *Local governments, *Ohio, *Water resources, *Water quality control, Water quality, Waste treatment, Waste water treatment, Flood control, Water supply, Land use, Storm water, Solid wastes, Storm water runoff, Water management(Applied), Transportation, Planning, Federal Water Pollution Control Act.

The manner, scope and overall impact of twenty local governmental units' water quality management plans are reviewed in this report. The report will be used in the development and implementation of an areawide waste treatment management plan by the Miami Valley (Ohio) Regional Planning Commission. The plan will be designed to meet water quality goals of the Federal Water Pollution Control Act Amendments of 1972. Local governmental plans in the areas of wastewater management, water supply, land use, solid waste, storm water, flood control, transportation, and general water quality policies and programs are reviewed. The report revealed that the townships studied had minimal involvement in the functional areas of waste treatment, water supply, solid waste disposal and flood control. They were most involved in land use and storm water control. The larger municipalities and cities studied had programs based on statutes in basically all areas of local water quality management. County governmental plans were the most extensive, with programs in the areas of wastewater management, water supply and storm water management being broadcast in scope. However, county land use control measures were noticeably underdeveloped. (Easterbrook-Florida)
W78-08315

EVALUATION OF THE COLORADO WATER SUPPLY PROGRAM.
Environmental Protection Agency, Denver, CO. Water Supply Section.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 149, Price codes: A08 in paper copy, A01 in microfiche. November, 1974. 157 p.

Descriptors: *Colorado, *Water supply, *Water quality control, *Regulation, Water policy, Administrative agencies, State governments, Evaluation, Quality control, Surveys, Federal government, Public health, Permits, Law enforcement, Water quality standards, Legislation, Water supply development.

The study evaluated an estimated 704 community water supply programs serving 90% of Colorado's population and smaller public or individual systems serving recreational areas and the remainder of the population. The Colorado Department of Health requested the Environmental Protection Agency (EPA) to make the study to evaluate and determine the effectiveness of Colorado's water supply system. The EPA reviewed the records of the Colorado Department of Health for 394 community water supplies under surveillance in January of 1973 to form the basis of the survey. The bacteriological and chemical properties of the water were judged as well as the legislative and administrative regulation of the water supply program. Recommendations included increasing surveillance of public water supplies, improvement of fluoridation efforts, enforcement of regulations, legislating permit requirements for new systems, use of data processing equipment, and more governmental cooperation. Increases in funding, personnel, and office locations were also recommended to implement the goal of assuring each Colorado resident and visitor an adequate and safe supply of drinking water. (Molloy-Florida)
W78-08316

ACCOMPLISHMENT PLAN. REGION VIII. JORDAN RIVER BASIN--SALT LAKE CITY AREA.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 265, Price codes: A03 in paper copy, A01 in microfiche. March, 1972. 44 p.

Descriptors: *Water quality control, *Utah, *River basins, *Comprehensive planning, Administrative agencies, Planning, Regional development, Waste water treatment, Pollutants, Coliform, Oxygenation, Water quality standards, Waste treatment, Waste disposal, Water pollution control, Oxygen demand, Recreation, Fishing, *Jordan River Basin(Utah).

The Environmental Protection Agency (EPA) prepared this plan for review by local government entities to promote a comprehensive, integrated effort in addressing the environmental problems of the Salt Lake City Area. The plan was also designed to inform the public about the EPA's role and efforts toward abatement of pollution. The area was selected as one of the highest priority areas for abatement and control. Significant pollution problems result from municipal and industrial sewage discharges, and natural air pollution. Broad objectives leading toward improvement of water quality include· improvement of Utah Lake to support perpetration of fish and recreational activities, maintenance of sufficiently low coliform concentrations to permit body contact recreation, and improvement of the Jordan River to support fish and recreation by reducing oxygen demand and coliform concentrations. The EPA seeks a 'C' classification for the Jordan River, protecting the water quality against controllable pollution. This classification would permit protection of aesthetics, propagation and perpetration of fish, recreation, and is required for state participation in higher percentage construction grant funding. (Molloy-Florida)
W78-08317

SUMMARY OF A WATER QUALITY SURVEY, GREELEY, COLORADO, NOVEMBER 16-19, 1971.
Environmental Protection Agency, Denver, CO. Technical Support Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 259, Price codes: A03 in paper copy, A01 in microfiche. Report SA/TSB-1, July 1971. 30 p.

Descriptors: *Rivers, *Colorado, *Effluents, *Waste water treatment, Surveys, Industrial plants, Sugar crops, Water quality control, Water quality, Waste facilities, Water pollution, Water pollution sources, River regulation, Waste assimilitive capacity, Water quality standards.

This survey was conducted on the Cache La Poudre River and on selected waste discharges in the Greeley area in November of 1971. The purpose of the survey was to assess the effect of Great Western's sugar factory on the river and to determine the characteristic of the waste discharged from this plant. The results indicated that the Greeley wastewater treatment facility was overloaded and that the sugar refinery was discharging high strength waste with minimal

treatment. Despite the adverse effects of both of these facilities on the river, existing waste quality standards were not violated. Bacterial contamination was found upstream of the two facilities. Recommendations included expansion or renovation of the wastewater treatment facility to reduce loading, provision of treatment facilities at the sugar refinery to produce an effluent suitable for discharge, and further investigation to determine the source of the upstream bacterial pollution. The study included the entire Greeley area because of the proximity of the waste facilities and other possible discharge sources.
W78-08318

EVALUATION OF EFFLUENT REGULATIONS OF THE STATE OF ILLINOIS.
Illinois Inst. for Environmental Quality, Chicago.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 101, Price codes: A04 in paper copy, A01 in microfiche. Report IIEQ 76/21, June 1976. 51 p.

Descriptors: *Illinois, *Water quality standards, *Effluents, *Regulation, Water pollution, State governments, Water quality control, Governmental interrelationships, Standards, Legislation, Planning, Federal Water Pollution Control Act, Administrative agencies, Permits, Monitoring, Control.

This report, prepared by the Illinois Effluent Standards Advisory Group (IESAG), presents the results of its evaluation of the effluent standards of Rules 406 and 408, Part IV, Chapter 3 of the Illinois Pollution Control Board Rules and Regulations, as applied to industrial discharges. The report contains the results of that evaluation, and IESAG recommendations pertaining to effluent standards. In its considerations, IESAG took into account the capabilities and economics of available pollution abatement technology, the standards of other states, as well as the effluent limitation guidelines issued by the EPA. The recommendations pertain to monitoring requirements, acceptable effluent variability, compatibility of federal and state criteria, procedures for permitted exceptions to the standards, and application of the ammonia-nitrogen and pH standards. IESAG found that some effluent standards should be retained at their present value and that other values should be modified. IESAG also recommended that certain parameters be added as contaminants to be regulated under rule 408, and that some pollutants be deleted from the regulated list. The report was prepared for the Illinois Institute for Environmental Quality. (Molloy-Florida)
W78-08319

MANPOWER PLANNING CRITERIA MANUAL FOR STATE WATER POLLUTION CONTROL AGENCIES.
Abt Associates, Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 711, Price codes: A04 in paper copy, A01 in microfiche. 1973. 71 p.

Descriptors: *Planning, *Legislation, *State governments, *Monitoring, *Research and development, Manpower, Environment, Organizations, Data collections, Waste water, Personnel management, Water quality, Oil pollution, Forecasting, Administrative agencies, Water pollution control, Local governments.

The Manpower Development Staff, Office of Water Program Operations, Environmental Protection Agency (E.P.A.) is responsible for forecasting the number and types of personnel needed by various levels of governments, private industry, and other organizations which have a role in implementing environmental legislation. To assist in this determination process the EPA is presently working with and assisting state and local governments in establishing their own in-house manpower planning capabilities by developing a systematic approach to manpower planning. One aspect of this is the development of manpower planning criteria. The criteria presented in this report consist of selected program definitions, associated occupation descriptions, and staffing guides for estimating state water pollution control agency manpower and training requirements. The programs defined herein include monitoring and data support; research and surveillance of water quality; oil and hazardous substances; and municipal waste water systems. (Hammersley-Florida)
W78-08320

HOW THE DRINKING WATER ACT AFFECTS INDUSTRIAL PLANTS,
Allied Chemical Corp., Morristown, NJ. Specialty Chemical Div.
E. Shields.
Pollution Engineering, Vol 8, No 8, p 35, August, 1976.

Descriptors: *Turbidity, Water analysis, Analytical techniques, *Potable water, Coliforms, Nitrates, Bacteria, Membrane processes, Surface waters, Wastes, Chemical analysis, Sanitary engineering, Regulation, Monitoring, Construction, Water treatment, Administrative agencies.

The National Interim Primary Drinking Water Regulations which were promulgated in December, 1975 become effective on June twenty-fourth 1977. The regulations apply to those who own, operate on control a private portable water system that provides on treats its own water and has at least fifteen service connection or regularly serves at least twenty five individuals daily at least sixty days out of the year. The article lists nine important provisions of the regulations that apply to these 'noncommunity public water systems'. These regulations include: approval by the state or Environmental Protection Agency for new systems or increasing the capacity of existing systems; effective dates of monitoring and those factors to be monitored; reports that must be submitted; and records that must be kept. It is advisable for those affected to check their system's water for those contaminants which will require monitoring. Failure to prepare ahead of time may mean taking the conective measures under the regulatory agency pressure and publicity which form an important part of the regulations' enforcement provisions. (Beamer-Florida)
W78-08322

SUSPENDED SOLIDS LIMITATIONS FOR WASTEWATER TREATMENT PONDS.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol 42, No 195, p 54664-54666, October 7, 1977.

Descriptors: *Administrative agencies, *Administrative decisions, *Ponds, *Suspended solids, *Waste water treatment, Algae, Biochemical oxygen demand, Decision-making, Design flow, Economic justification, Effluents, Environment, Environmental control, Environmental effects, Environmental sanitation, Federal government, Federal Water Pollution Control Act, Industrial wastes, Liquid wastes, Pollutants, Regulation, Waste water(Pollution), Waste water disposal, Water law.

The Environmental Protection Agency (EPA) amended the Secondary Treatment Information regulation to allow less stringent suspended solids limitations for wastewater treatment ponds. Promulgation of the amendment is based on the fact that properly operated treatment ponds are a form of secondary treatment which may be incapable of meeting the limitations contained in the regulation without supplemental treatment processes for removal of such suspended solids as algae. In light of comments received prior to the adoption of the amendment, the EPA changed the proposed rule to allow for adjustment of suspended solids limitations for wastewater treatment ponds with a maximum facility design capacity of two million gallons per day or less. The EPA concluded, in answer to objections received, that the amendment was justified for historical, technical, and economic reasons, and that it would ultimately prove beneficial, particularly to smaller communities. Other problems discussed by the EPA involved the rule's applicability to private and federally-owned sewage treatment plants; its relationship to industrial effluent limitations; biochemical oxygen demand limitations for ponds; use of suspended solids as a regulatory parameter for wastewater treatment ponds; and, availability of suspended solids monitoring data. (White-Florida)
W78-08325

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM, GENERAL PERMIT PROGRAM (PROPOSED RULES).
Environmental Protection Agency, Washington, DC.
Federal Register, Vol 42, No 24, p 6846-47, February 4, 1977.

Descriptors: *Water pollution control, *Federal Water Pollution Control Act, *Administrative agencies, *Agricultural runoff, *Storm runoff, Sewers, Surface runoff, Water pollution, Water pollution sources, Storm water, Water permits, Water quality, Pollutants, Irrigation, Navigable water, Animal populations, Permits, Agriculture, Storm drains, Federal government.

Pursuant to a court order, the Environmental Protection Agency establishes additional regulations for the issuance of National Pollutant Discharge Elimination System (NPDES) permits. These regulations extend the permit system to include all point sources in the concentrated animal feeding operation, separated storm sewer, agricultural, and silvicultural categories. The program will be implemented in two phases: (1) permit-issuing agencies are required to designate general permit programs areas (GPPAs) that correspond to existing institutional and geographical boundaries, and (2) within one year after the GPPAs are designated, general permits will be issued in each GPPA to cover owners and operators of point sources. An owner or operator may exclude himself from the general permit process. However, any such excluded owners or operators would then be subject to the conventional NPDES permit program. The general permits will be issued in each GPPA to cover owners and operators not receiving individual permits in the separate storm sewer and agriculture categories. General permits may be issued for a maximum five year period and may be terminated in instances where an approved plan is not followed or a point source is found to be a significant pollution source. (Quarles-Florida)
W78-08326

AN ENVIRONMENTAL OVERVIEW OF GEOTHERMAL RESOURCES DEVELOPMENT,
Indiana Univ. at Bloomington. School of Law.
A. D. Tarlock, and R. L. Waller.
Land and Water Law Review, Vol. 13, No. 1, p 289-324, 1977.

Descriptors: *Water pollution control, *Brine disposal, *Geothermal studies, *Energy, *Thermal pollution, Seismic properties, Surface waters, Groundwater, Seepage, Aquifer management, Craters, Geysers, Environmental effects, Permits, Federal Water Pollution Control Act, Water cooling, Thermal power, Resources development, Effluents, Water pollution.

This article discusses both the advantages and disadvantages of the development and use of geothermal resources as a potential future energy source. One of four areas of potential adverse environ-

mental impact discussed is water pollution. Blow outs, cratering and mud ejection could cause local property damage and pollution of surface and groundwaters could occur because of brine disposal, seepage or spillage. Additional water pollution problems encountered during power generation may arise in connection with the disposal of cooling waters and other wastes from liquid-dominated systems. The reinjection of saline brine into an area's water reservoir presents the serious problem of potential aquifer pollution, a potential subsidence problem, as well as the remote possibility that the reinjection will trigger seismic activity in the area. Adequate liability assessment provisions appear to currently exist under various state and federal water pollution control laws, particularly the Federal Water Pollution Control Act Amendments of 1972. Pollutant discharge would also be subject to permitting under the National Pollution Elimination Discharge System. Both point source effluent limits and thermal pollution effluent standards would control the Environmental Protection Agency or appropriate state agency permitting procedure. (Easterbrook-Florida)
W78-08327

RECENT DEVELOPMENTS IN THE REGULATION OF OCS OIL AND GAS ACTIVITY,
Liskow and Lewis, New Orleans, LA.
J. B. St. John, Jr.
In: Proceedings of the Twenty-eighth Annual Institute on Oil and Gas Law and Taxation, Southwestern Legal Foundation, February 9-11, 1977, Dallas, Texas, Matthew Bender, New York, New York, 1977. p 217-44.

Descriptors: *Coasts, *Coastal structures, *Continental shelf, *Oil, Shore protection, Federal jurisdiction, Legislation, Mining, Offshore platforms, Drilling, Fuels, Oil industry, Gases, Exploration, Drilling equipment, Natural resources, Water law, Legal aspects.

Because the United States' production of oil and gas in the 1970s was lagging far behind consumption, the federal government undertook a program to develop the outer continental shelf through offshore lease sales. A number of coastal states concerned with the offshore impacts of offshore oil and gas exploration and development have challenged these sales in the courts. Congress attempted to meet the complaints of the coastal states by passing the Coastal Zone Management Act of 1972, and by amending it in 1976. The amendments create a comprehensive frame work in which coastal states can work with the federal government to provide a national basis for the siting of coastal energy facilities, the development of these sites, and for exploratory drilling operations. Proposed amendments to the Outer Continental Shelf Lands Act of 1953, if passed, would also provide for more environmental protection, allow the states to participate more directly in the decision making process, and subject Outer Continental Shelf oil and gas leasing to public scrutiny. Predictably these amendments will substantially slow the pace of outer continental shelf development. (Curtis-Florida)
W78-08328

THE ROAD TO EROSION--A CAUTIONARY TALE,
California Univ., Berkeley. Dept. of Conservation and Resource Studies.
For primary bibliographic entry see Field 4D.
W78-08332

THE INDIANA EXPERIMENT,
T. Wyman.
Environment, Vol. 19, No. 5, p 2-4 (June-July, 1977).

Descriptors: *Indiana, *Phosphats, *Phosphorus, *Algae, *Water pollution, Legislation, Detergents, Lakes, Soaps, Sewage, Environmental effects, Limnology, Surface waters, Nutrients, Water quality, New York, Sewage effluents, Agricultural runoff, Water quality control.

A second attempt to repeal Indiana's phosphate-detergent ban has failed, but opposition to the ban continues to be strong. The 1972 ban was intended to reduce the amount of phosphorus reaching lakes and rivers in sewage flow and thereby retard excessive growth of algae. Controversy over the effectiveness of such a ban continues to rage. The most powerful opponent to the ban continues to be the Soap and Detergent Association. Studies have indicated that since the ban, algae pollution has dropped, but studies remian inconclusive as to the cause of reduction. Legislation regulating phosphates has been extemely slow, with New York being the only other state wtih a phosphate law in effect. The article traces the beginnings of the Indiana ban up to the current attempts to repeat it. Statistical proof of t he ban's effectiveness is difficult to document. Opponents of the ban claim that non-phosphorus detergents are ineffective and more costly. The author calls for survey programs to resolve the questions remaning as to the effects of phosphate bans. (Quarles-Florida)
W78-08335

ZERO DISCHARGE INTO WATERS BY 1985, NO WAY,
M. Zeldin.
Audubon, Vol. 77, No. 4, p 97-100, July, 1975.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, *Water pollution control, *Administrative agencies, *Federal government, Discharge(Water), Waste water(Pollution), Regulation, State governments, Permits, Administration, Supervisory control(Power), Legislation, Water quality control, Waste Disposal, Water law.

The Federal Water Pollution Control Act goals of water clean enough to swim in by July 1, 1983, and no discharge of pollutants into the nation's waters by 1985, will not be attained because requirements of the act have not been enforced by the Environmental Protection Agency (EPA) due to understaffing and ineptness. States and industries are unhappy with the law; criticism includes poor EPA implementation, setting nationwide rather than plant-by-plant effluent limitations, and the impractically of the zero discharge goal. Also criticized is the lack of funds promised by Congress ro help communities build sewage treatment facilities, to help state and local water pollution control agencies, and to staff EPA. The author suggests that the reason for some of criticism is that states and industries find it hard to accept the authority the 1972 act conferred upon the EPA. Previously, the federal government had little authority in water pollution control, whereas the act established a national regulatory program with abatement requirements, strengthened enforcement procedures, and provided heavy penalties for violators. The ultimate success of the act seems to depend upon Congressional appropriations and amendments. (Rule-FLorida)
W78-08336

AN OFFER TOO GOOD TO REFUSE,
Department of the Interior, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-08348

THE FEDERAL RECLAMATION PROGRAM.
Reclamation Era, Vol 59, No 3, p 14-18, Summer 1973.

Descriptors: *Reclamation, *Impaired water use, *Water reuse, *Irrigation programs, *Reclaimed water, Land reclamation, Federal Reclamation Law, Recirculated water, Waste water(Pollution), Water treatment, Flood control, Recreation, Hydroelectric power, Irrigation practice, Irrigated land, Water distribution(Applied), Governments, Reservoirs, Planning, Water sources.

Since its development in 1902 the Federal Reclamation Program has guided construction of reservoirs, dams and hydroelectric power plants. Originally designed to help settle western states by providing irrigation water, the program is intended to recover 90% of capital costs, and uses an extensive cost-benefit economic analysis for each proposed project. Since its conception, program emphasis has shifted from agricultural projects to multipurpose projects. Today, the basic types of output from reclamation projects include municipal and industrial water, hydroelectric power, recreational facilities (including fish and wildlife), agricultural water, and flood control. Crop and livestock production have increased due to a water supply assured by reclamation. In addition, the low cost hydroelectric power reclamation provides has facilitated industrial development in the Northwest. Reclamation projects also provide recreational opportunities such as camping, as well as supplying increasing amounts of water for urban and industrial use. Future concerns require adapting the program to changing national objectives and needs, including analyses of environmental impacts while recognizing the continuing need for federal involvement in water resource development. (Mulligan-Florida)
W78-08350

IMPORTANCE OF ANALYSES FOR YOUR NPDES PERMIT,
Abbott Labs., North Chicago, IL. Corporate Environmental Services.
M. R. Stumph.
Pollution Engineering, Vol 7, No 6, p 42-44, June, 1975.

Descriptors: *Waste water(Pollution), *Effluents, *Assay, *Water analysis, *Analytical techniques, Industrial wastes, Wastes, Water pollution, Chemical analysis, Colorimetry, Biochemical oxygen demand, Acidity spectroscopy, Management, Permits, Data collections, Sampling, Reliability, Water treatment, Waste water.

To meet the requirements of the National Pollution Discharge Elimination System permit program, industrial and municipal water permit holders must regularly sample, analyze and report effluent quality. For valid interpretation, the sample to be analyzed must be representative, uncontaminated, and of adequate size. In addition the sample must be properly and completely indentified. Preservation methods should be utilized if there is a time lapse between collection and analyze. Proper containers and stoppers must also be employed. To insure validity, the Environmental Protection Agency will send, without charge, samples to work as independent check. Other means of rececking accuracy include both internal rechecking and the use of outside laboratories. A program to insure the reliability of the data is essential because of the importance of laboratory analyze and the resultant actions which it produces. Financial decisions on process changes, plant modifications or even the construction of a new facility may be based on results of the laboratory analyze. Industry must also realize that the procedures used and the reported values may be challenged in court. This article recommends that an established routine control program be applied to every analytical test to insure the reliability of the final results. (Beamer-Florida)
W78-08352

WATER POLLUTION REMEDIES--USE OF PUBLIC NUISANCE THEORY IN SUIT BY FEDERAL AND STATE GOVERNMENTS,
P. E. Murray, Jr.
Boston College Industrial and Commercial Law Review, Vol 15, No 4, p 795-813 (April 1974). 97 ref.

Descriptors: *Judicial decisions, *Lake Michigan, *Water pollution control, *Common law, *Rivers and Harbors Act, Navigable waters, Legal

aspects, Law enforcement, Water law, Federal jurisdiction, State jurisdiction, Public rights, Governmental interrelations, Federal government, Illinois, Water quality, Industrial wastes, Interstate rivers, State governments, *Standing(Legal), *Interstate bodies of water, *Federal Water Pollution Control Act(FWPCA) Amendments of 1972, *Nuisance(Legal aspects), Injunctive relief.

This case note examines the decision in United States v. United States Steel Corporation, and its impact on future water pollution litigation. The United States and the State of Illinois sought an injunction to prevent defendant from discharging its industrial waste into Lake Michigan on the basis of three theories: federal common law power to abate public nuisances in navigable or interstate waters; violation of the Rivers and Harbors Act of 1899; Illinois common law power to abate public nuisances. The court found that both the U.S. and Illinois had a cause of action and standing to sue in federal court under the federal common law of nuisance to abate pollution of navigable interstate waters. Plaintiffs' third theory was dismissed as merely cumulative, but the court also upheld the United States' right to sue under the 1899 Act. No prior case had acknowledged a valid federal common law action to enjoin pollution by a private as opposed to governmental corporation. Diversity was not needed for a state to invoke federal jurisdiction since actions based on federal common law nuisance are federal questions; standing of the U.S. arose from the necessity for uniform decisions and a proprietary interest in navigable waters. Allowance of federal invocation of federal common law is, however, inconsistent with the clear legislative intent to encourage states to bear the primary responsibility for pollution abatement. (Moorhouse-Florida)
W78-08353

THE POTENTIAL EFFECTS OF CLEARING AND SNAGGING ON STREAM ECOSYSTEMS,
Kansas State Univ., Manhattan. Div. of Biology.
For primary bibliographic entry see Field 5C.
W78-08358

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES: PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS' MEETING--OCTOBER 1976, TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 684, Price codes: A14 in paper copy, A01 in microfiche. Report EPA-600/3-77-083, July 1977. 294 p, 2 append. 1BA608.

Descriptors: *Dredging, *Bottom sediments, *Spoils, *Waste disposal, *Waste treatment, *Water pollution control, *Ultimate disposal, *Eutrophication, Japan, Pollutants, Toxins, Mercury, Polychlorinated biphenyls, Heavy metals, Nutrients, Sediments, Land reclamation, Soil stabilization, Industrial wastes, Bioaccumulation, Sludge disposal, Minamata Bay(Japan).

The Second U.S.-Japan Experts' Meeting on the Management of Bottom Sediments Containing Toxic Substances was held in October 1976 in Tokyo, Japan. Ten Japanese papers focus on dredging of contaminated bottom sediments in Japanese waterways for water pollution control, and subsequent spoils treatment and disposal problems. Papers deal with an overview of the dredging program in Japan, pollution control measures in Tokyo Bay, dredging and sludge disposal in the Seto Inland Sea, the methylmercury accumulation mechanism in the red sea bream, determining trace methylmercury in seawater, evaluation of possible secondary pollution from heavy metals and PCBs during spoils disposal, behavior of mercury compounds in Minamata Bay sediments, a mechanical method of stabilizing spoils in a landfill for covering with sand, evaluation of chemical soil-stabilization agents, and disposal of spoils effluent without use of flocculants and with reduced turbidity. Six United States papers include a survey of sources of toxic sediments dumped into the oceans and EPA control measures, use of hydraulic dredging for lake restoration, effects of dumping dredging spoils into Puget sound, spoils disposal effects in San Francisco Bay, dewatering and treatment of dredging spoils, and benthic macrofauna as indicators of the effects of spoils disposal. (Lynch-Wisconsin)
W78-08359

REDUCING WATER QUALITY DEGRADATION THROUGH MINIMIZED LEACHING MANAGEMENT,
Agricultural Research Service, Riverside, CA. Salinity Lab.
J. D. Rhoades, and D. L. Suarez.
Agricultural Water Management, Vol 1, No 2, p 127-142, September, 1977, U.S. Salinity Laboratory Publication 621. 10 tab, 15 ref.

Descriptors: *Water quality control, Water conservation, Water management(Applied), Water resources development, Saline water, Impaired water quality, *Leaching, Irrigation practices, Water pollution sources, Soil-water-plant relationships, Surface-groundwater relationships, Crop production.

The United States endorses a policy of improving water quality and conserving natural resources through minimized leaching programs to reduce salinity pollution for irrigated agriculture. Report summarizes significant leaching conditions by which minimized leaching can improve water quality. Report indicates reduced leaching was beneficial under the following conditions: (1) desalination processes are practical and drainage waters are not returned to receiving waters; (2) saline groundwater concentrations in excess of those recharging drainage waters are displaced by the surface water, (3) waters with low salinity content, are used to irrigate soils containing gypsum or gypsum substrata; and (4) groundwater is under-saturated with CaCO3 (unlikely with arid lands). Report concludes by stating that effective leaching is limited by individual crop tolerance to increased salinity in the lower root zone. (Jewkes-Arizona)
W78-08366

USING SAND FILL TO COVER DREDGE SPOILS CONTAINING MERCURY,
Kitakyushu Municipal Port and Harbor Bureau, Fukuoka (Japan).
S. Fujino.
In: Management of Bottom Sediments Containing Toxic Substances; Proceedings of the Second U.S.-Japan Experts' Meeting--October 1976, Tokyo, Japan. Report No. EPA-600/3-77-083, July 1977, p 144-154. 9 fig, 2 tab, 2 ref. 1BA608.

Descriptors: *Mercury, *Dredging, *Spoils, *Landfills, *Waste disposal, *Dokai Bay(Japan), *Ultimate disposal, Sands, Japan, Kitakyushu(Japan), Mud, Bottom sediments, Sediments, Bays, Pollutants, Water pollution control, Soil stabilization, Methodology.

Highly contaminated dredge spoils from Dokai Bay, Kitakyushu, Japan, was safely disposed of by means of impoundment in a diked basin overlain with bamboo and plastic mesh and covered with sand, Subsequent sampling of the sand layer and adjacent groundwater showed no secondary pollution. The 350,000 cu m of bottom sediments dredged from the bay contained an average of 50 mg/kg mercury, and considerable amounts of lead, chrome, cyanide, and arsenic. The spoil area, covering 52,600 sq m, was prepared by enclosing a basin of the bay with a double sheet-piled wall which was lined with plastic sheets to prevent polluted water from seeping out. The spoil formed a very soft soil seven m thick and 2.5 m above the datum level. To eliminate offensive odors and prevent dried surface soil from being carried away by the wind, a layer of sand was used. Due to softness of the spoil and danger of eruption an undercovering was needed to stabilize the muddy sediment. Four methods were rejected as ineffective or too expensive. The method selected consisted of laying a raft of bamboo poles 70 cm apart arranged at right angles over the spoil, placing polypropylene ropes between the poles, and covering the raft with sheets of polypropylene cloth. Clean sea sand was spread over this network to a depth of 1.3 m. (See also W78-08359) (Lynch-Wisconsin)
W78-08367

DREDGED MATERIAL DENSIFICATION AND TREATMENT OF CONTAMINATED DREDGED MATERIAL,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W78-08374

COMPARISON OF THE PHOTOSYNTHETIC CHARACTERISTICS OF THREE SUBMERSED AQUATIC PLANTS,
Florida Univ., Gainesville. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W78-08376

MINNESOTA WATER QUALITY: A REPORT TO THE CONGRESS OF THE UNITED STATES BY THE STATE OF MINNESOTA PURSUANT TO SECTION 305(B) OF THE FEDERAL WATER POLLUTION CONTROL ACT,
Minnesota Pollution Control Agency, Roseville.
J. C. Winslow, D. J. Trippler, L. R. Peissig, J. G. Schilling, and J. Nutter.
June 1977. 45 p, 4 fig, 5 tab.

Descriptors: *Minnesota, *Water quality, *Water pollution control, *Rivers, *Lake Superior, Economics, Nonpoint pollution, Lake restoration, Eutrophication, Mississippi River, Asbestos, Ammonia, Biochemical oxygen demand, River basins, Coliforms, Turbidity, Pollutants, Water quality standards, Fishing, Swimming, Dissolved oxygen.

The water quality of 26 Minnesota rivers, grouped into 11 basins, plus Lake Superior, were assessed for the water year 1976 using chemical and physical data from 75 state monitoring stations. Comparison of existing water quality with the national 1983 goal of 'fishable' and 'swimmable' water indicates most rivers currently conform with the goal, equated with class 2B of Minnesota water quality standards. However, 23% of the monitoring stations fail to meet one or both of the two aspects of the goal, including the Mississippi River below Minneapolis-St. Paul, the Zumbro River below Rochester, the Cedar River below Austin, Buffalo Creek below Glencoe, Center Creek below Fairmont, and the headwater tributaries of the Missouri and Des Moines Rivers. It is estimated that, due to inadequate funding, by 1983 11% of the waterways assessed will still not be in compliance. Of these, the headwater tributaries of the Missouri and Des Moines rivers have acute nonpoint source pollution problems due to agriculture and natural conditions, and the metropolitan segment of the Mississippi River is contaminated by combined sewer overflows, urban runoff, and pathogens from municipal treatment plants. An investment of $320 million would reduce agricultural nonpoint pollution about 45%. Costs of lakeshore erosion control are estimated at $400 million. (Lynch-Wisconsin)
W78-08387

THE COST OF WATER SUPPLY AND WATER UTILITY MANAGEMENT (VOLUMES I AND II),
Municipal Environmental Research Lab., Cincinnati, OH. Water Supply Research Div.
R. M. Clark, and J. I. Gillean.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 639, Price codes: A09 in paper copy, A14 in microfiche; and PB-276 640, Price codes: A01 in paper copy, A01 in microfiche. Reports EPA-600/5-77-015a and b, November 1977. 170 fig, 192 tab, 1 append. 1CC614, SOS 1. 68-03-2071.

Descriptors: *Water management(Applied), *Water supply, *Utilities, *Safe Drinking Water Act, *Potable water, *Mathematical models, Cincinnati(OH), Kansas City(MO), Fairfax County(VA), Dallas(TX), Elizabeth(NJ), San Diego(CA), New Haven(CN), Phoenix(AZ), Kenton County(KY), Orlando(FL), Pueblo(CO), Seattle(WA), Model studies, Economics, Decision-making, Cost analysis, Water purification, Forecasting.

Ten years of system and cost data for 12 water utilities selected to represent each of the ten EPA regions indicate an increasing demand for revenue-producing water, increasing labor wage rates, and increases in other operating and capital costs associated with water supply. However, the man hours required to supply one million gallons of water has decreased, and if unit costs are adjusted to the Consumer Price Index, costs have actually declined. The study (1974-76) was carried out in response to provisions of the Safe Drinking Water Act of 1974. The utilities studied were those of Cincinnati, OH; Kansas City, MO; Dallas, TX; Fairfax County, VA; Elizabeth, NJ; San Diego, CA; New Haven, CN; Phoenix, AZ; Kenton County, KY; Orlando, FL; Pueblo, CO; and Seattle, WA. Volume I provides summary information and a detailed aggregate analysis of the first five utilities listed; factors affecting the cost of water supply are examined, and the impact of the Safe Drinking Water Act is projected to 1980. Volume II contains basic data for each of the 12 utilities. Services of each utility are listed in five functional areas: (1) support services, (2) acquisition, (3) treatment or purification, (4) distribution, and (5) power and purification. Costs are categorized as operating or capital. Mathematical models relate labor cost, productivity, and production to annual operating costs. (Lynch-Wisconsin)
W78-08390

A DECADE OF NONDEGRADATION POLICY IN CONGRESS AND THE COURTS: THE ERRATIC PURSUIT OF CLEAR AIR AND CLEAN WATER,
Iowa Univ., Iowa City. Coll. of Law.
N. W. Hines.
Iowa Law Review, Vol 62, No 3, p 643-701, February 1977.

Descriptors: *Nondegradation policy, *Judicial decisions, *Legislation, *Legal aspects, *Water pollution control, *Air pollution, Industrial wastes, Watersheds(Basins), Economics, Cost-benefit analysis, Governments, Environmental Protection Agency, Sierra Club v Ruckelhaus, Sierra Club v EPA, History, Political aspects, Social values, Environmental effects, Water pollution effects, Commonwealth Edison v EPA.

A comprehensive discussion of the federal commitment since 1965 to a policy of nondegradation of air and water in the U.S. concludes that it is a fundamental concept which must be embraced and implemented in a national pollution control program. The policy, difficult to accomplish politically in a federal system, requires that no significant deterioration be allowed in existing high quality air and water unless necessary to meet compelling social or economic needs. Congressional failure to expressly enact the policy and the absence of an explicit legal basis have impaired the policy's effectiveness, and immediate congressional intervention is essential. Theoretical, political, and economic aspects of the policy are reviewed, including a discussion of benefit-cost analysis. The paper traces the history of water and air pollution legislation in the U.S., including the Water Quality Act of 1965, the Federal Clean Air Act (amended as the Air Quality Act of 1967), the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), and proposed 1976 air quality regulations. Three major judicial decisions are analyzed, Sierra Club v. Ruckelshaus (1972) and Sierra Club v. EPA (1976),. which concerned EPA's interpretation of air and water pollution policy, and Commonwealth Edison v. EPA, which challenged the agency's power to adopt water quality regulations. Congressional review of nondegradation and state actions are discussed. (Lynch-Wisconsin)
W78-08393

AN EXAMINATION OF PROBLEMS AND POTENTIALS FOR FUTURE LARGE-SCALE INTENSIVE SEAWEED CULTURE SYSTEMS,
Massachusetts Univ., Wareham. Aquacultural Engineering Lab.
For primary bibliographic entry see Field 6C.
W78-08396

CONCLUSIONS DRAWN FROM THE REVIEW OF ENVIRONMENTAL POLICIES OF JAPAN.
Organization for Economic Co-operation and Development, Paris (France).
Publication No 38062, August 1977. 6 p.

Descriptors: *Japan, *Environmental control, *Pollution abatement, *Air pollution, *Governments, Organization for Economic Cooperation and Development, Economic development, Standards, Compensation, Economics, Pollutants, Pollution taxes(Charges), Water pollution control, Public health, Monitoring, Policies.

A review of Japan's environmental policies by the Environment Committee of the Organization for Economic Cooperation and Development (OECD), conducted in July 1977, concludes that, while forceful measures have been taken in that country without complete scientific data and often with little information on economic costs and consequences, benefits have outweighed adverse effects. Japanese policy gives highest priority to pollution control, especially air pollution and control of such toxicants as mercury, cadmium, and PCBs. Water pollution receives less attention. Environmental policy has focused on health objectives rather than on the broader area of quality of life. Business has responded to the stringent standards with acceptance and development of strikingly successful new technology measures to meet them. In most cases Japanese policy has conformed to OECD decisions and recommendations. Local governments have played a crucial role in setting emission standards. Sophisticated and costly monitoring networks have been developed in all major areas. The compensation system, both judicial and administrative, has been rigid, but has met immediate, urgent needs. The main deterrent to pollution remains, however, emission standards. Macroeconomic consequences of the rigorous policies do not appear serious. An important policy allows individual plants to allocate permissible emission levels among individual sections within the facility, resulting in increased efficiency. (Lynch-Wisconsin)
W78-08397

PUTTING WETLANDS TO WORK (CYPRESS DOMES AND PEATLANDS OFFER ECOLOGICALLY SOUND, ENERGY-CONSERVING WASTEWATER DISPOSAL).
National Science Foundation, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 453, Price codes: A02 in paper copy, A01 in microfiche. MOSAIC, Vol 8, No 3, p 25-29, May-June, 1977. 3 fig. Also as Report NSF/RA-770224.

Descriptors: *Wetlands, *Waste assimilative capacity, Wastewater, *Waste disposal, *Sewage effluents, Wastes, Sewage, Water pollution, Water treatment, Sewage treatment, Nutrients, Water quality, Water supply, Florida, Michigan, *Duckweed, *Peatlands, *Cypress Domes.

Two research projects, conducted in Florida and in Michigan, designed to ascertain the capability of wetlands to absorb partially treated wastewater from municipal facilities are reported. These studies suggest that wetlands are ecological systems that not only can absorb treated effluents while treating them in a natural rather than energy-consuming, artificial way, but can benefit from the fertilization secondarily treated effluents are able to provide. The research suggests that as long as the effort is based on understanding of the wetlands environments, it represents a way that civilized man can return to a symbiotic relationship with an important part of his natural environment. There is substantial opportunity for small communities to take advantage of the results of these experiments. (Maroncelli-Mass)
W78-08406

GROWTH OF WATER HYACINTHS IN TREATED SEWAGE EFFLUENT,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
J. W. Wooten, and J. D. Dodd.
Economic Botany, Vol. 30, No. 1, p 29-27, January-March, 1976. 3 tab, 23 ref.

Descriptors: *Water hyacinths, *Nutrient removal, *Primary productivity, *Waste water treatment, Phosphorus, Nitrogen, Biological treatment, Sewage treatment, Value.

Two thousand of water hyacinth, Eichornia crassipes Solms., were introduced on 11 April 1971 into a series of five ponds, each 5000 sq. ft. in area and 2.6 ft. deep. Treated wastewater effluent from the Ames, Iowa, sewage treatment plant filled the ponds and was added to pond 1 at a rate of 127 gallons/minute. These plants increased to more than 500,000 in number, and all five ponds were covered completely by 26 July. On that date the extrapolated estimate of total weight was 287 U.S. tons/acre (645 metric tons/hectare). The estimated oven dry weight was 13.2 U.S. tons/acre (29.7 metric tons/hectare). Ammonia and nitrate disappeared rapidly from the pond water, and phosphate concentrations were lowered appreciably. Evapotranspiration and seepage accounted for water losses of more than 0.5 in/day. The potential economics values of this plant and its possible use in tertiary treatment to reduce N and P components of wastewaters are discussed briefly. (Stihler-Mass)
W78-08410

ORGANOCHLORINE PESTICIDE AND POLYCHLORINATED BIPHENYL RESIDUES IN SELECTED FAUNA FROM A NEW JERSEY SALT MARSH---1967 VS. 1973,
Iowa Cooperative Wildlife Research Unit, Ames.
E. E. Klaas, and A. A. Belisle.
Pesticides Monitoring Journal, Vol. 10, No. 4, p 149-158, March, 1977. 1 fig, 8 tab, 27 ref.

Descriptors: *Salt marshes, *Pesticides, *Pesticide residues, *Bioindicators, *DDT, Dieldrin, Hazards, Public health, Rails, Aquatic animals, Mollusks, Fish, Estuaries, Coastal marshes, Wetlands, New Jersey, *Polychlorinated biphenyls.

More than a half million pounds of DDT were applied to control mosquitoes in salt marsh estuaries of Cape May County from 1946 to 1966. The use of DDT was discontinued in the county after 1966.

Clapper rails, fish, and invertebrates were collected from six locations in 1967. Sampling was repeated at the same localities in 1973. Residue levels of organochlorine pesticides and polychlorinated biphenyls (PCB's) detected in these samples are reported and findings of 1967 and 1973 are compared. In 1967, mean concentrations of DDT and metabolites ranged from 0.63 to 9.05 ppm in aquatic fauna, but by 1973 mean residue levels had decreased 84 to 99 percent among nine species. DDE was still present at reduced levels in nearly all samples in 1973, but other DDT isomers had mostly disappeared. Dieldrin was detected only in clapper rails, and residue levels decreased during the period. Mean concentrations of PCB's increased in the clapper rail, remained the same in the fiddler crab and mud snail, and decreased in the sheepshead minnow, mummichog, striped killifish, and salt marsh snail. Small amounts of mirex, toxaphene, cis-chlordane (and/or trans-nonachlor), oxychlordane, and HCB were detected in a few specimens. (Maroncelli-Mass)
W78-08411

STREAM CHANNELIZATION IMPACTS ON SONGBIRDS AND SMALL MAMMALS IN VERMONT,
Massachusetts Univ., Amherst. Ddpt. of Forestry and Wildlife Management.
E. E. Possardt, and W. E. Dodge.
Wildlife Society Bulletin, Vol. 6, No. 1, p 18-24, Spring, 1978. 3 fig, 2 tab, 13 ref.

Descriptors: *Channeling, Effects, *Song birds, Wetlands, *Vermont, Dredging, Birds, Mammals, Wildlife, *Small mammals, *White River(Vermont), Warblers, Species diversity, Streamside vegetation, *Channelization, Channel improvement.

Stream channelization effects were documented in the White River watershed during the first and second years after channelization. Birds were mist-netted during four sampling periods. Percentages of birds collected from channelized areas were 33%, 27%, 38%, and 46% for fall 1974, spring 1975, early summer 1975 and later summer 1975, respectively. Species diversity was significantly less in channelized areas for fall 1974 and early summer 1975; highly significantly less for spring 1975; no significant difference existed for later summer 1975. Swallows and spotted sandpipers (Actitis macularia) were more abundant in channelized areas; thrushes, vireos, and particularly warblers were more abundant in non-channelized areas. Small mammals were live-trapped during three sampling periods. Percentages of mammals collected from channelized areas were 28%, 39% and 39% for fall 1974, early summer 1975, and later summer 1975, respectively. Shrews and jumping mice were most adversely affected; the white-footed mouse (Peromyscus leucopus), the most abundant small mammal collected, recovered rapidly in channelized areas. Impact on small mammals and songbird populations was most dramatic where streamside vegetation had been extensively destroyed. (Stihler-Mass)
W78-08412

ESTIMATED VALUES FOR SELECTED WATER HYACINTH BYPRODUCTS,
Georgia Univ., Athens. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W78-08415

PURIFICATION OF WASTE WATERS FOR SUBSOIL IRRIGATION (OCHISTKA STOCHNYKH VOD PRI PODPOCHVENNOM OROCHENII),
For primary bibliographic entry see Field 5E.
W78-08432

CLEVELAND PUSHES TO MEET STRICT EFFLUENT LIMITATIONS,
Cleveland Regional Sewer District, OH.
A. T. Ungar, and D. Patrick.
Water and Wastes Engineering, Vol. 15, No. 2, p 57-60, February, 1978.

Descriptors: *Treatment facilities, *Sludge treatment, *Sludge disposal, *Transfer, *Sludge digestion, Chemical precipitation, Vacuum drying, Dewatering, Lime, Polymers, Centrifugation, Incineration, Waste water treatment, Municipal wastes.

Four sewage treatment facilities, with a combined capacity of 251.6 mgd, treat the municipal wastes, storm water, and sludge in the Cleveland, Ohio, area. The largest treatment plant, based on the activated sludge method, receives wastes which average 125 mg/liter BOD and 135 mg/liter suspended solids. Sludge produced by the plant is pumped 13.2 miles through a 12-inch cast iron force main to the next largest treatment facility for final treatment at a rate of 1,200-1,400 gpm. Sludges from both plants currently undergo primary settlement, anaerobic digestion, and vacuum filtration. The incinerators, which normally dispose of the sludge, are being modified to incinerate up to 400 tons sludge/day. Further treatment in addition to current practices includes cyclone degritting, gravity thickening, centrifugation, and sludge conditioning with ferric chloride ans lime or polymers. The 35 mgd treatment plant employs 64 Imhoff primary treatment tanks, primary digestion, and vacuum filtration. A physical-chemical treatment plant with a 50 mgd dry weather flow ans a 100 mgd wet weather capacity, is planned. The smallest 1.6 mgd treatment plant will be operated until interceptor lines are constructed to transport wastes from the area to the second largest facility. (Lisk-FIRL)
W78-08440

ABATEMENT OF ODOR IN SEWAGE WORKS--DETERMINED IN HEIDELBERG (GERUCHSBEKAEMPFUNG IN KOMPOSTWERKEN AM BEISPIEL HEIDELBERG),
Technische Univ., Berlin (West Germany). Fachgebiet Abfallwirtschaft.
For primary bibliographic entry see Field 5D.
W78-08451

RIVER WATER QUALITY IN ESSEX DURING AND AFTER THE 1976 DROUGHT,
Essex Water Co., (England).
For primary bibliographic entry see Field 5B.
W78-08491

SPRAY IRRIGATION OF DOMESTIC SEWAGE IN THE BRAUNSCHWEIG SEWAGE ASSOCIATION - ENVIRONMENTAL POLLUTION OR SUCCESSFUL UTILIZATION OF SEWAGE. (DIE VERREGNUNG VON KOMMUNALEM ABWAESSERN IM ABWASSERVERBAND BRAUNSCHWEIG - UMWELTVERSCHMUTZUNG ODER SINNVOLLE ABWASSERVERWERTUNG),
Kiel Univ. (West Germany). Inst. fuer Wasserwirtschaft und Meliorationswesen.
For primary bibliographic entry see Field 5B.
W78-08493

THE APPLICATION OF A TIME-SERIES-ANALYSIS IN WATER QUALITY MANAGEMENT (ANWENDUNG EINER ZEITREIHENANALYSE IN DER WASSERGUETEWIRTSCHAFT),
Abteilung Siedlungswasserwirtschaft, Brunswick (West Germany) Inst. fuer Stadtbauwesen.
R. Stegmann, H. Ehrig, and P. Liem.
Wasser und Boden, Vol. 30, No. 3, p 50-54, 1978. 8 fig, 8 ref.

Descriptors: *Analytical techniques, *Time series analysis, *Fourier analysis, *Water supply development, *Water quality control, Rivers, Water management(Applied), Path of pollutants, Water quality, Baseline studies, Waste water disposal, Mathematical studies, Model studies, Environmental effects, Sewage disposal, Planning.

Spectral and Fourier analysis constitute important tools for the description of time series in water quality management. A calculated time series function can be extrapolated to predict changes in water quality. The difference between measured water quality indicators, such as oxygen content and chloride levels, and the extrapolated values can be used to quantify the environmental impact of external factors, such as the construction of a sewage treatment plant or the addition of a new industrial source of pollution. The procedure is used in an example involving water quality data for the Oker River and its tributaries, collected for the years 1965-1973 by the Institute for Urban Studies of the Technical University in Braunschweig, West Germany. Equations expressing the trend and periodicity functions are derived; time series analysis is used to predict the Oker River quality on the basis of trends in dissolved oxygen and chlorine levels. (Kroha-FIRL)
W78-08494

PROBLEMS AND TECHNIQUES FOR THE AERATION SYSTEMS IN SEWAGE WORKS AND SURFACE WATERS--EXPERIENCE WITH INSTREAM AERATION AND OXYGEN MONITORING IN THE RIVER RUHR,
Ruhrverband, Essen (West Germany).
D. Albrecht.
Tribune du CEBEDEAU, Vol. 30, No. 409, p 449-456, December, 1977. 13 fig, 7 ref.

Descriptors: *Dissolved oxygen, *Aeration, *Rivers, *Chlorophyta, *Oxygen sag, Fishkill, Eutrophication, Nutrients, Low-flow augmentation, Low-flow, Reservoir storage, Waste water disposal, Oxygen demand, Water quality control, Municipal wastes.

Instream aeration of the Ruhr River in West Germany has been conducted since 1965 to compensate for oxygen deficiencies during summer months due to the decomposition of dead algae. The Ruhr, with average flows of 75 cu m/sec, sustains low flows of 3-5 cu m/sec over an average of 120 days annually. The water flow is augmented by reservoir water during these periods. The Ruhr also receives treated waste water which comprises up to 36% of the total flow during low flow conditions. Four impounding lakes, providing further treatment of municipal effluent and storm water overflows, reduce effluent BOD from 5.5 to 4.8 mg/liter. Chlorophyll-a algal blooms during summer months depress dissolved oxygen levels to as low as 2 mg/liter; high chlorophyll-a concentrations have resulted in oxygen supersaturation followed by dissolved oxygen depression, a situation leading to fishkill. During 1971-1975, five oxygen monitors were installed along the Ruhr above an instream aeration system which includes: a 47 kg O2/hr floating aerator, a 178 kg O2/hr aerator, two weirs, and a bypass stream. The instream aeration system is activated when the oxygen monitors detect dissolved oxygen concentrations below 4 mg/liter in the upstream waters. Compressed air was found to be more economical than pure oxygen aeration. (Lisk-FIRL)
W78-08495

RESULTS OF POLLUTION CONTROL OF THE RHINE WATER IN RHINELAND-PALATINATE (ERFOLGE BEI DER REINHALTUNG DES RHEINS IN RHEINLAND-PFLAZ),
Landesamt fuer Gewasserkunde, Mainz (West Germany).
E. Hantge.
Wasserwirtschaft, Vol. 67, No. 11, p 348-352, 1977. 7 fig, 1 tab.

Descriptors: *Water quality control, *Pollutants, *Pollution abatement, *Biochemical oxygen demand, *Chromium, Ammonia, Human population, Hydrologic data, Organic wastes, Waste water treatment, Municipal wastes.

Pollution parameters in the Rhineland-Palatinate area of the Rhine River were measured by the West German Hydrologic State Office. The pollution load on the Rhine has been reduced by 90% since 1974, representing a population equivalent to 1.16 million. Water quality parameters measured during the study included BOD, dissolved oxygen, ammonia, chromium, and saprobidity. The pollution load on the Rhine, reduced by 650,000 population equivalents in 1976, was higher in that year than in the previous year due to a 56% increases in runoff. The pollution load was lower within the first 4 mos of 1977 than during 1975 and 1976. The study verified that the water quality of the Rhine since has improved significantly as a result of pollutant load reductions. (Lisk-FIRL)
W78-08496

LEGISLATION NEEDED TO PROMOTE CONSERVATION AND RECYCLING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
D. G. Wilson.
Compost Science, Vol. 18, No. 4, p 13-15, July-August, 1977.

Descriptors: *Legislation, *Pollution taxes(Charges), *Pollution abatement, *Treatment facilities, *Water utilization, Natural resources, Air pollution, Tariff, Waste water treatment, Municipal wastes.

Legislation for regulating environmental pollution proposes that polluters be charged for sewage treatment and those who are affected by the pollution be compensated. An increase in sewer charges is recommended so that adequate waste water treatment can be accomplished. Suggested charges are based on the amount of waste water produced by an individual rather than evenly distributed charges. While sewer charges are usually based on water intake, individuals using water for non-polluting practices, such as irrigation, should be credited rather than taxed for this water usage. Individual waste production charges would encourage the use of water-saving and non-polluting devices, such as composting toilets. Where adequate sewage treatment is unfeasible, it is recommended that waste water charges continue to be collected and utilized in a compensatory fashion. This would include improvement of water supply and recreational facilities for communities located downstream from a pollution source. Long-term effects of pollution may be compensated for by creating national parks or wildlife centers. Other areas affected by pollution that are considered by the proposed legislation include natural resources, air pollution, and water supplies. (Lisk-FIRL)
W78-08497

1984 IS APPROACHING--WHAT DOES IT MEAN TO THE WASTE-WATER SERVICE,
Thames Water Authority, London (England). Metropolitan Public Health Div.
For primary bibliographic entry see Field 5D.
W78-08499

NEW PROSPECTS FOR SEWAGE DISPOSAL IN U P,
Irrigation Commission, Lucknow (India).
For primary bibliographic entry see Field 5E.
W78-08500

CONDUCTING VALUE ENGINEERING STUDIES--THE EXPERIENCE OF FIVE CITIES,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, CA.
G. Culp.
Water and Sewage Works, Vol. 125, No. 2, p 56-60, February, 1978. 6 tab, 1 ref.

Descriptors: *Cost analysis, *Appraisals, *Engineers estimates, *Evaluation, *Value engineering, Treatment facilities, Construction costs, Economic efficiency, Costs, Waste water treatment, Municipal wastes.

Value engineering reports, required by the EPA for all waste water treatment projects costing more than $10,000, and the subsequent cost reductions of constructing municipal waste treatment plants were reviewed for five cities in which value engineering was employed. The value engineering report on the upgrading of a 3 mgd trickling filter plant indicated a cost savings of $3,843,570, of which $920,000 was implemented. An evaluation of a 70-80% completed 24 mgd activated sludge plant indicated a cost savings of $547,467, of which $274,770 was realized. The third plant, upgraded from 1.6-3.8 mgd capacity, saved $1,404,872 with value engineering. Upgrading of a 115 mgd treatment plant to 200 mgd with nutrient removal operations cost $5,700,000 less than estimated. The fifth project in which two plants with a total capacity of 250 mgd were upgraded to provide nitrification and improved effluent quality, was evaluated as costing $43,600,000 less than estimated; $9,318,000 was saved in construction costs when value engineering was implemented. The value engineering fees ranged from 0.2-0.8% of the total construction costs for each of the five projets. (Lisk-FIRL)
W78-08501

THE PROVISION OF TECHNICAL INFORMATION IN A REGIONAL WATER AUTHORITY,
Severn-Trent Water Authority, Birmingham (England).
M. G. Mathews, and D. W. Hilder.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 1, p 7-18, January, 1978. 1 fig, 5 tab.

Descriptors: *Regional development, *Water pollution control, *River basin commissions, *Analytical techniques, *Data collections, Sampling, Treatment facilities, Water supply, Watershed management, Comprehensive planning, Waste water treatment, Municipal wastes.

Guidelines for water quality data collections and analyses are described for regional planning and records maintained by water authorities. The guidelines are categorized as: water resources, land drainage, reclamation and trade effluent control, water supply, sewerage, general engineering, planning and design, water quality management, recreation, fisheries, and medical. Continuous monitoring of water in water supply sources, waste water treatment plants, and rivers is recommended; samples are referenced according to site, date, time, and type of analyses to be performed. Background information suggested for sewage works includes: flows, discharges, pumping information, economic history, physical statistics, and a complete record of sewers. Further information required for treatment plants involves: the chemical, biological, and bacteriological data; and trade effluent details, such as the strength and volume of the waste, as well as charges and rebates. Computers are forwarded for collating, analyzing, and storing the regional water authority data. (Lisk-FIRL)
W78-08502

DIRECT ENVIRONMENTAL FACTORS AT MUNICIPAL WASTEWATER TREATMENT WORKS--EVALUATION AND CONTROL OF SITE AESTHETICS, AIR POLLUTANTS, NOISE AND OTHER OPERATION AND CONSTRUCTION FACTORS,
R. E. Leffel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 456, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-430/9-76-003, January 1976. 111 p, 20 fig, 14 tab, 104 ref, 1 append.

Descriptors: *Legislation, *Regulation, *Treatment facilities, *Design criteria, *Environmental control, Air pollution, Wildlife habitats, Wetlands, Waste water treatment, Municipal wastes, Water pollution control.

Methodologies of municipal waste water treatment plant design evaluation and planning in compliance with the Federal Water Pollution Control Act Amendment of 1972 (P.L. 92-500) were developed to assist treatment plant designers in achieving cost-effective and environmentally sound projects. Planning and design controls are reviewed for treatment plants, pumping stations, separation structures, interceptors, force mains, collection systems, and outfall sewers. Criteria for controlling noise and air pollution, and providing aesthetic lighting, architecture, site design, and landscaping are presented. Environmental impacts considered in project planning include wildlife, shorelines, wetlands, flood plains, drainage, and construction and operation effects. A compilation and review of reference legislation affecting waste water treatment plants is included in the guidelines. (Lisk-FIRL)
W78-08507

FRESH WATER FROM SEWAGE ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 5D.
W78-08515

HANDBOOK OF WATER RESOURCES AND POLLUTION CONTROL.
For primary bibliographic entry see Field 5D.
W78-08543

EVALUATION OF TECHNIQUES FOR ALGAE REMOVAL FROM WASTEWATER STABILIZATION PONDS, REVIEW PAPER,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5D.
W78-08544

EROSIONAL REMOVAL OF FALLOUT PLUTONIUM FROM A LARGE MIDWESTERN WATERSHED,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 4D.
W78-08549

SEASONAL RUNOFF LOSSES OF NITROGEN AND PHOSPHORUS FROM MISSOURI VALLEY LOESS WATERSHEDS,
Agricultural Research Station, Lafayette, IN.
For primary bibliographic entry see Field 5B.
W78-08550

NITRATE, CHLORIDE AND DISSOLVED SOLIDS, OGALLALA AQUIFER, WEST TEXAS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 5B.
W78-08555

PREVENTION OF NITRATE LEAKAGE FROM THE HULA BASIN, ISRAEL: A CASE STUDY IN WATERSHED MANAGEMENT,
Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Agricultural Engineering.

Y. Avnimelech, S. Dasberg, A. Harpaz, and I. Levin.
Soil Science, Vol. 125, No. 4, p 233-239, April 1978. 4 fig, 2 tab, 17 ref.

Descriptors: *Watershed management, *Nitrates, *Leakage, Leaching, Nitrification, Subsidence, Drainage effects, Water table, Sprinkler irrigation, Basins, Organic soils, Crops, Oxygenation, Drainage systems, Water quality, *Lake Kinneret(Sea of Galilee), *Israel, *Hula Basin(Israel).

Drainage of the Hula basin led to the exposure of about 2,000 ha of organic soils. Corollary to a high subsidence rate, extensive nitrification and leaching of nitrates became evident, endangering the quality of the water in Lake Kinneret (Sea of Galilee). The problem is being solved by (1) improving the drainage system and reducing water flow through the basin; (2) maintaining a relatively high water table during the summer, thus minimizing the depth of the oxidized layer; (3) inducing denitrification through the use of sprinkler irrigation; and (4) selecting crops that reduce the accumulation of nitrates in the soil. (Visocky-ISWS)
W78-08564

HIGH FREEBOARD BARRIER CONSTRUCTION FOR WATER CARRIED POLLUTANTS,
P. Preus.
U.S. Patent No. 4,062,191, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 965, No. 2, p 449, December 13, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water pollution control, *Water quality control, Barriers, Floating, Containment, Oil booms.

Floating barriers, known generally as oil booms, have been found to have great utility in containing and controlling oil slicks and other water carried pollutants on and in bodies of water. The barriers usually include floatation elements having a depending liquid impervious skirt which, when deployed around or in a controlling position relative to the pollutant, provide means to contain or prevent the pollutant from spreading or moving into uncontaminated areas. This invention is composed of a series of boom sections which are connectable in end to end relationship with each of the boom sections containing a floatation material which comprises an oleophilic-hydrophobic-lighter than water composition which will selectively absorb and/or adsorb hydrocarbons or other pollutants or the floatation means may comprise air inflatable chambers. Flexible draft members and associated connectors are employed to support an upstanding fabric or plastic or fabric and plastic web which increases the freeboard or the boom. (Sinha-OEIS)
W78-08583

WATER CLEANER,
A. S. Calvano.
U.S. Patent No. 4,064,049, 5 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 965, no 3, p 1052, December 20, 1977.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, Water purification, Filtering, Filters, Equipment, Screens.

A water cleaner has a hollow casing containing a water inlet and a water outlet. An elongated tubing is secured to the interior of the casing and contains an inlet and an outlet. The tubing inlet is coupled to the water inlet and the tubing outlet is coupled to the water outlet. A screen surrounds the exterior of the tubing and is secured to it. A filter element surrounds the screen for removing impurities from water passing from the casing inlet to the casing outlet. (Sinha-OEIS)
W78-08592

ALGAE GROWTH CONTROL,
Algard Pty. Ltd., Balwyn (Australia). (Assignee).
R. A. Rigby.
U.S. Patent No. 4,065,386, 4 p, fig, 2 ref; Official Gazette of the United States Patent Office, Vol 965, No 4, p 1487, December 27, 1977.

Descriptors: *Patents, *Water treatment, *Water pollution control, *Water quality control, Industrial water, Algae, Algae control, Magnetic studies, Magnetic fields.

The presence and rapid multiplication of algae organisms in water systems, particularly where water recirculation is involved constitutes a serious economic problem requiring constant attention in industrial systems, and a substantial nuisance in public and private swimming pools. It has been found that the effect of a magnetic field on the water is such as to almost completely render the water unsuitable for the propagation and growth of algae. The device of this invention comprises a duct member incorporated in the water supply duct. Magnetic means placed within the duct creates a magnetic field transverse to the lengthwise direction of the duct. It is equally possible to incorporate permanent or electromagnets about the periphery of the duct and this is particularly desirable where separation of the magnetic material from the water is required. (Sinha - OEIS)
W78-08594

SLIME CONTROL METHOD,
Kurita Water Industries Ltd., Osaka (Japan). (Assignee).
T. Tsuneki, N. Takahashi, and H. Tashiro.
U.S. Patent No. 4,065,387, 4 p, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 965, No 4, p 1487, December 27, 1977.

Descriptors: *Patents, *Water treatment, *Industrial water, Cooling water, Slime, Microorganisms, Water quality control, Bromine, Oxidation.

In industrial water systems such as cooling water systems, paper mill water systems, and the like, there takes place the formation of slime caused by the deposition of microorganisms, inorganic substances and organic substances. On the surface of microorganisms or a floc consisting of an aggregation of microorganisms, there is a sticky substance as an extracellular matrix which is apt to adhere to the surface of solids, and this is the cause of slime formation. The slime control agent of this invention eliminates the adhesiveness of microorganisms by changing the nature of the sticky substances of the extracellular matrix through oxidation with the bromite. This is quite different from the effects of chelating agents or cationic surface active agents. Bromite substances used in this invention demonstrate a high efficiency in controlling the formation of slime when employed in a low range of concentration. In the case of such a low concentration, the bromite substance cannot manifest the effect of killing microorganisms, and accordingly the slime control effect of the bromite is not attributable to a biocidal action. (Sinha - OEIS)
W78-08595

APPARATUS FOR DETECTING PROPORTION OF OIL IN OIL/WATER MIXTURES,
Marine Construction and Design Co., Seattle, WA. (Assignee).
J. L. McGrew.
U.S. Patent No. 4,065,389, 5 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 965, No 4, p 1488, December 27, 1977.

Descriptors: *Pollutant identification, *Patents, *Oil pollution, *Oily water, *Water pollution control, *Water quality control, Industrial wastes, Separation techniques, Monitoring, Equipment, Sensing.

In many cases where surface runoff water or in dustrial process waste or recycling water ma become contaminated with oil, continuous or in termittent samplings of water may be adequat without the necessity of passing all of the wate through a separator to assure removal of exces oil. This invention is useful in detecting o responding to an excessive proportion of oil i samplings of water. However it is equally effectiv in conjunction with the continuous or intermitter operation of an oil/waterseparator routinel processing all of the discharging or recycling wate in a purification system. By pumping the accumu lating oil from an oil ourput sump in the apparatu at a predetermined pumping rate, and by detectin level of oil rising in the sump above the range wit the oil pump operating, the system is made respor sive to the proportion of oil in the mixture above certain percentage. Any one or more of variou responsive functions may then be initiated such a sounding an alarm, terminating an industri process, momentarily interrupting operation of th oil/water separator,, etc. (Sinha - OEIS)
W78-08596

BARRIER CONSTRUCTION FOR WATER CAR RIED POLLUTANTS,
P. Preus.
U.S. Patent No. 4,065,923, 7 p, 3 fig, 4 ref; Offici Gazette of the United States Patent Office, V 966, No 1, p 46, January 3, 1978.

Descriptors: *Patents, *Oil pollution, *Water po lution control, *Water quality control, *Barriers Floating, Absorption, Oil booms, Containment.

A barrier for water carried pollutants comprises series of end to end connectable boom section containing a floatable material which may con prise an oleophilic-hydrophobic-lighter than wate composition which will selectively absor hydrocarbons; fluid impervious connectors for th ends of the boom sections and flexible draft mem bers and associated connectors for maintaining th integrity of the boom if it becomes necessary t replace one or more of the boom sections. (Sinha OEIS)
W78-08598

BILGE WATER DISPOSAL SYSTEM INCLUD ING OIL RECOVERY MEANS,
National Marine Service, Inc., St. Louis, MO (Assignee).
C. H. Walters, H. J. Barmeier, Jr., and G. E. Sullivan.
U.S. Patent No. 4,066,545, 13 p, 4 fig, 16 ref; Off cial Gazette of the United States Patent Offic Vol 966, No 1, p 248, January 3, 1978.

Descriptors: *Patents, *Oil pollution, *Oily wate *Water pollution control, *Water quality contro Separation techniques, Evaporation, Equipmen Bilge water, Flash evaporation.

An environmentally protective bilge wate disposal system utilizes an inverted dome gravit tion oil separator unit in combination with an e gine exhaust flash water vaporizer to remove an recover oil contamination from the bilge wate prior to its disposal by flash evaporation in the e haust stack. The system is capable of operatin continuously under regulation by an electrical co trol arrangement that ensure safety of the engin and shutting down of the system if certain ke components do not function in a proper manne The system includes a pump, an oil separator, co trol valves and sensors for various operatin parameters and mechanical functions of th system, such parameters and functions includin bilge fluid level, water pump function, water flo valve function, engine fuel pressure, engine thro tle air pressure, engine exhaust stack temperature separator function, separator dome position, an oil storage level. Processed bilge water from whic oil contaminant has been removed may b discharged directly overboard the vessel

desired. Recovered oil is stored in a suitable oil storage tank aboard the vessel. (Sinha-OEIS)
W78-08608

OIL WELL OPERATION AND SALT-WATER INTRUSION: POLICY IMPLICATIONS,
Cities Service Oil Co., Charleston, WV.
V. Meier.
Industrial Wastes, Vol. 24, No. 2, p 42-45, March-April, 1978.

Descriptors: *Oil wells, *Oil industry, *Oil wastes, *Saline water, *Injection wells, Tenches, Ditches, Brine disposal, Natural gas, Well casings, Storage tanks, Oil water, Groundwater, Drilling, Drilling fluids, Waste water disposal, Industrial wastes.

Regulations and methods to prevent oil, salt water, and waste water intrusion into groundwater during the drilling of oil wells are reviewed. Waste water from oil drilling is generally contained in earthern pits which may be lined with a gel and polymer, plastic, or steel. The volume of waste water is evaporated, pumped into a well annulus, injected into salt water disposa wells, buried in trenches, or applied to land. Defoamed water is settled in a series of pits before it is discharged into streams. Casings for wells are drilled 30-100 ft below the fresh water horizon and lined with cement that can be returned to the surface. Intermixing of oil, gas, fresh, or salt water strata above the source of oil is prevented by cementing and casing. Fuel tanks are contained by dikes; waste oil is collcted in ditches and dikes. Tank overflow and backwash are channeled to plastic-lined pits for evaporation or injection well disposal. Compressor stations or cooling towers treat the gas produced during drilling before it is pumped into pipelines. Oil and grease in cooling streams are skimmed to 10 ppm before discharge; water discharged from drilling operations has an oil content not greater than 50 ppm. (Lisk-FIRL)
W78-08617

DETERMINATION OF POLYTHIONATES AND THIOSULPHATE IN MINING EFFLUENTS AND MILL CIRCUIT SOLUTIONS,
Canada Centre for Mineral and Energy Technology, Ottawa (Ontario).
For primary bibliographic entry see Field 5A.
W78-08625

IMPACT OF NEARSTREAM VEGETATION AND STREAM MORPHOLOGTY ON WATER QUALITY AND STREAM BIOTA,
Illinois Univ. at Urbana-Champaign. Dept. of Ecology, Ethology and Evolution.
J. R. Karr, and I. J. Schlosser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 652, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-097, August 1977. 90 p, 12 tab, 30 fig, 140 ref.

Descriptors: *Streams, Stream flow, *Stream erosion, *Stream fisheries, *Stream improvement, *Stream stabilization, Sediments, Vegetation, Vegetation, Vegetation effects, Vegetation regrowth, Watershed(Basins), Water pollution, Water quality, Benthos, Freshwater fish, Nutrients, Water temperature, Near stream vegetation, Stream morphology, Stream biota, Reviews.

As man modifies watersheds by removal of natural vegetation and stream channelization, disequilibria in both the terrestrial and aquatic environments result. These disequilibria are the major problem in controlling sediments and nutrients from non-point sources and improving the quality of the stream biota. In this report we review the literature dealing with (1) the possible use of near stream vegetation to reduce the transport of sediment and nutrients from the terrestrial to the aquatic environment and decrease stream temperature fluctuations, (2) the effect of stream morphology on sediment transport, and (3) how near stream vegetation and stream morphology affect the biota of streams. The results of this review suggest proper management of near-stream vegetation and channel morphology can lead to significant improvements in both the water and biological quality of many streams. However, critical research outlined in this report is still necessary if we are to properly use this management alternative to attain the objectives of the Federal Water Pollution Control Act of 1972 (Public Law 92-500). (EIS-Katz)
W78-08634

ENVIRONMENTAL REQUIREMENTS AND POLLUTIN TOLERANCE OF COMMON FRESHWATER CHIRONOMIDAE,
Florida Agricultural and Mechanical Univ., Tallahassee. Lab. of Aquatic Entomology.
For primary bibliographic entry see Field 5C.
W78-08636

CONTROLLED-ENVIRONMENT BIVALVE MOLLUSCAN MARICULTURE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-08644

REARING PACIFIC SALMON IN SALTWATER PONDS FERTILIZED WITH DOMESTIC WASTEWATER,
Humboldt State Univ., Arcata, CA.
For primary bibliographic entry see Field 5C.
W78-08645

POTENTIAL EFFECTS ON AQUATIC RESOURCES OF PROCESSING AND/OR CONVERSION OF IOWA COAL,
Iowa Cooperative Fishery Research Unit, Ames.
For primary bibliographic entry see Field 5C.
W78-08648

ECOSYSTEM PROCESSES AND ORGANIC CONTAMINANTS: RESEARCH NEEDS AND AN INTERDISCIPLINARY PERSPECTIVE,
Institute of Ecology, Washington, DC.
J. M. Neuhold, and L. F. Ruggerio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 129, Price codes: A04 in paper copy, A01 in microfiche. Report NSF/RA-770008, 1977. 44 p, 126 ref.

Descriptors: *Research priorities, *Pollution, *Water pollution effects, Path of pollutants, Methodology, On-site investigations, Toxicity, *Organic wastes, *Ecosystems, Ecotypes, *Planning, Stress, Organic compounds, Organic matter, Organic wastes.

A group of 52 toxicologists and ecologists discuss the problem of organic pollution. Vital and vulnerable ecosystem processes are discussed using the hypotheses that ecosystems include structural and functional elements vital to the function of the ecosystem and vulnerable to the effects of contaminants introduced into that ecosystem. The ability of ecosystem to withstand contamination stress is considered under the major topics: mechanisms of stress, ecosystem sensitivity, and ability to withstand stress. The chemical-ecosystem interface is considered from the specific vantage of chemical dynamics. Long-term effects of organic pollutants on ecosystem are discussed on the premise that metabolism, structure, and behavior are three unifying concepts common to all levels of organization from the cell to an ecosystem. (EIS-Katz)
W78-08649

DEVELOPMENT OF A KIT FOR DETECTION OF HAZARDOUS MATERIAL SPILLS INTO WATERWAYS,
Edgewood Arsenal, Aberdeen Proving Ground, MD.
For primary bibliographic entry see Field 5A.
W78-08658

THE IMPORTANCE OF PREDATION BY CRABS AND FISHES ON BENTHIC INFAUNA IN CHESAPEAKE BAY,
Virginia Inst. of Marine Sciences Gloucester Point.
For primary bibliographic entry see Field 2L.
W78-08692

EVALUATION OF BIOLOGICAL CONTROL OF NUISANCE AQUATIC VEGETATION BY GRASS CARP,
Iowa Conservation Commission, Chariton. Research Station.
L. Mitzner.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p 135-145, 1978, 5 fig, 6 tab, 6 ref.

Descriptors: *Biocontrol, *Carp, *Vegetation, Control, *Vegetation effects, *Plant growth, Plant populations, *Nitrites, *Nitrates, *Biochemical oxygen demand, *Phosphates, *Primary productivity, Fish behavior, Sport fishing, *Growth rates, Animal growth, Biomass, Ecosystems, Biological communities, *Iowa, Ctenopharyngodon, *Grass carp, Red Haw Lake(Iowa).

Grass carp introductions at Red Haw Lake, Iowa resulted in a decrease of aquatic macrophytes from 2,438 g/m2 in 1973 to 211 g/m2 in 1976, with species of Potamogeton, Elodea, Ceratophyllum, and Najas all controlled effectively by grass carp. During 1974-1976 mean nitrites, nitrates, biological oxygen demand, and turbidity showed significant decreases, while alkalinity increased significantly from a mean of 115 mg/liter in 1974 to 132 mg/liter in 1976. Mean concentrations of organic and inorganic phosphates gradually increased during the investigation, but were not statistically different. Average primary production was nearly identical in 1974-1975 at about 2 g carbon/m2/day, but decreased significantly to 1.35 g carbon/m2/day in 1976. Grass carp consumed all major plant groups at the lake with greatest selection for Najas and Potamogeton. Reduction in vegetation biomass by 91% in four years increased the opportunity for anglers to fish from shore. During the investigation popularity of shoreline fishing increased by 241% with catch success remaining greater than 0.70 fish per hour. (EIS-Deal)
W78-08693

FREQUENT IRRIGATION MORE EFFICIENT,
Agricultural Research Service, Peoria, IL.
For primary bibliographic entry see Field 3F.
W78-08716

THE CONTROL OF NITRATE AS A WATER POLLUTANT,
Texas Agricultural Experiment Station, College Station.
A. R. Swoboda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 893, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/2-77-158, August, 1977. 141 p, 16 fig, 55 tab, 14 ref, 3 append.

Descriptors: *Nitrates, *Leaching, Soils, Crop production, *Fertilizers, Fertilization, Nutrients, Lysimeters, *Water pollution control, Nitrification inhibitors, *N-Serve.

This study was based on the premise that the most logical approach to reducing nitrate leaching in soils was to limit the amount of nitrate in the soil solution at any one time. Methods of limiting the

concentration of nitrate in the soil solution while maintaining an adequate supply of available nitrogen for plant growth are reported. Timing of nitrogen application was found to be a very effective meas of reducing nitrate leaching. When nitrogen was applied in the fall as much as 3-fold more nitrate was found to have leached below 60 cm in the soil by June as compared to applications made in March. A nitrification inhibitor, N-Serve, was found to be very effective in reducing the amount of nitrate leached. Slow release sulfur coated ureas and treatment of nitrogen fertlizers with N-Serve were found to be effective means of reducing leaching losses of nitrate whe fertilizers were applied in the fall or winter. (Skogerboe-Colorado State)
W78-08723

STOCHASTIC PREDICTION OF SEDIMENT YIELDS FROM STRIP MINE SPOILS OF THE ARID SOUTHWEST,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2J.
W78-08729

SOIL EROSION AND SEDIMENT CONTROL ON THE RECLAIMED COAL MINE LANDS OF THE SEMI-ARID SOUTHWEST,
Arizona Univ., Tucson. School of Renewable Resources.
For primary bibliographic entry see Field 4D.
W78-08730

POLLUTANT CONTRIBUTIONS FROM IRRIGATION SURFACE RETURN FLOWS,
Max C. Fleischmann College of Agriculture, Reno, NV.
For primary bibliographic entry see Field 5B.
W78-08743

RECLAMATION OF COAL-MINED LAND IN THE SOUTHWEST,
Rocky Mountain Experiment Station, Denver, CO.
For primary bibliographic entry see Field 4C.
W78-08750

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NONPOINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
J. C. Wade, and E. O. Heady.
Agriculture and Environment, Vol 3, No 4, p 307-323, October, 1977. 3 tab, 6 fig, 12 ref.

Descriptors: *Sediment control, *River basins, *Model studies, *Alternative costs, *Crop production, Water pollution, Pollutant identification, Water pollution sources, Farm management, Alternate planning, Nonpoint pollution, Cost-benefit ratio, Evaluation.

Concepts involved in developing an evaluation procedure for sediment as a nonpoint pollutant are reviewed. A model of the agricultural production economy, which links crop production to sediment loads and environmental quality, is discussed, using five hypothetical sediment-control alternatives for 18 U.S. river basins, including 5 arid areas: The Rio Grande, the Upper Colorado, the Lower Colorado, the Great Basin, and California. Insight into changes in farm production technologies, incomes, pollution levels, and consumer and producer costs is given by the model. In terms of alternatives, the Minimum Sediment Alternative has an unfavorable benefit-cost ratio, and would require interregional changes in technology and production patterns. The T-Limit Alternative increases production costs and has adminstrative difficulties. The PA-Limit and River Basin Limit Alternatives do not provide a large change in national sediment load over the Unrestricted Alternative. No alternative examined indicates a best sediment control policy. (Popkin-Arizona)
W78-08758

DETERIORATING SEWER LINE RE-LINED IN ARIZONA.
For primary bibliographic entry see Field 8G.
W78-08766

INTERCEPTOR NORTH COMPLETED AHEAD OF SCHEDULE.
For primary bibliographic entry see Field 8F.
W78-08770

TARGET: TOXIN REMOVAL,
Ecodyne Corp., Union, NJ.
A. V. Metzner.
Environmental Science and Technology, Vol. 12, No. 5, May 1978, p 530-533, 4 fig, 2 ref.

Descriptors: *Water pollution control, *Waste water treatment, Ion exchange, Membrane processes, Adsorption, *Toxins, Oxidation, Incineration.

Industry's water clean-up efforts which have focused on reducing suspended solids and BOD content to secondary and tertiary treatment levels, and also on the options available as solutions to the toxin-removal problem. Sources of toxins and problems associated with removal of relatively low levels of these is discussed. Major processes available for treating larger volumes of toxins are identified as being ion exchange, membrane processes, carbon adsorption, and polymeric adsorption. Other methods which are less economical and not so universally applied (ozonation, chemical oxidation, thermal destruction or incineration) are discussed to some extent. (Chilton-ORNL)
W78-08784

PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON SOIL EROSION AND SEDIMENTATION BY WATER.
American Society of Agricultural Engineers, St. Joseph, MI.
For primary bibliographic entry see Field 4D.
W78-08787

CURRENT SOIL EROSION AND SEDIMENT CONTROL TECHNOLOGY FOR RURAL AND URBAN LANDS,
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 4D.
W78-08789

SEDIMENTATION AND EROSION CONTROL IMPLICATIONS FOR WATER QUALITY MANAGEMENT,
Environmental Research Lab., Athens, GA. Technology Development and Applications Branch.
For primary bibliographic entry see Field 4D.
W78-08794

EROSION AND SEDIMENT CONTROL FOR COAL SURFACE MINE AREAS,
Washington Irrigation and Development Co., Centralia.
For primary bibliographic entry see Field 4D.
W78-08799

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

COMPREHENSIVE FLOOD PLAIN STUDIES USING SPATIAL DATA MANAGEMENT TECHNIQUES,
Hydrologic Engineering Center, Davis, CA.
For primary bibliographic entry see Field 6F.
W78-08307

THE USE OF GEOMETRIC PROGRAMMING IN THE DESIGN OF AN ALGERIAN WATER CONVEYANCE SYSTEM,
Becht Corp., San Francisco, CA.
For primary bibliographic entry see Field 4A.
W78-08308

WATER QUALITY MANAGEMENT IN THE HSINTIEN RIVER IN TAIWAN,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W78-08309

UNTESTED IDEAS ON A WATERING DEVICE FOR ARID CLIMATES,
F. Hopman.
Southwest Bulletin, New Mexico Solar Energy Association, Vol. 3, No. 5, p 15, May, 1978. 2 fig.

Descriptors: *Arid climates, Dry farming, Water storage, *Water vapor, *Root systems, Soil moisture, Condensation, *Water supply, *Capillary action, Environmental engineering.

The Ajo Lily of the Sonoran Desert conducts heat from its roots to its leaves, where the heat is radiated off at night. As the temperature of the surrounding soil remains warmer than the plant, the plant roots are able to condense water vapor from the surrounding soil. A moisture-condensing device for arid lands farming is proposed, based on the Ajo Lily's water gathering techniques. Two line drawings illustrating the suggested moisture collecting device, include these features: (1) white radiator-reflector in the shape of a Y designed to shade plants with a trough to attract and retain dew and/or rain under favorable conditions; (2) a stem, planned so that moisture drains a distance of eight feet into the soil, making moisture accessible to plants with capillary roots. Stem also conducts heat into the trough where it is radiated off. Suggested construction materials for the 'Y' include: (1) junk car metal, painted white; (2) high density concrete, painted white; and (3) high-density ceramic. (Jewkes-Arizona)
W78-08363

THE SANIBEL REPORT: FORMULATION OF A COMPREHENSIVE PLAN BASED ON NATURAL SYSTEMS,
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 6B.
W78-08398

ENERGETICS: SYSTEMS ANALYSIS WITH APPLICATION TO WATER RESOURCE PLANNING AND DECISION MAKING,
C. D. Meyers.
IWR Contract Report 77-6, Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, December 1977. 42 p, 27 ref.

Descriptors: *Energetics, *Water resource development, *Environmental assessment, *Planning, *Decision making, Systems analysis, Mathematical models, Simulation analysis, Computers, Energy Cost-benefit analysis, Investmen

ratio, Net energy, Energy yield ratio, Energy units, Energy quality, Quantification, Natural values.

Energetics is evaluated as a possible analytical tool for use in water resources planning and decision making. Basic scientific concepts which comprise the comprehensive subject of energetics are explained through the use of easily understandable correlaries. Examined are the potential which these concepts have in water resources work as well as the limitations which curtail their present useability and acceptance. It is concluded that energetics has promise as an analytical tool for assessing environmental quality in general and water resources in specific. So far, no other proposed analytic technique has the promise energetics has for total environmental assessment which includes quantification of values of natural systems. However, energetics is a data-limited tool, its major drawback. (Bell-Cornell)
W78-08423

ANALYSIS OF EXPENDITURES FOR OUTDOOR RECREATION AT THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM,
Oklahoma Agricultural Experiment Station, Stillwater.
For primary bibliographic entry see Field 6B.
W78-08424

AGRICULTURAL WATER DEMANDS: PRELIMINARY RESULTS OF SILISTRA CASE STUDY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6D.
W78-08428

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 6B.
W78-08429

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT - REVIEW OF RECENT DEVELOPMENTS IN THE U.S.A.,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
W. T. O'Brien.
Research Project No 72/47, Technical Paper No 29, Australian Water Resources Council, Department of National Resources, Australian Government Publishing Service, Canberra, 1977. 84 p, 8 tab, 5 ref, 3 append.

Descriptors: *Multiobjective, *Planning, *Water resources development, *United States, *Standards, Water management(Applied), Water policy, Land resources, Environmental control, Constrained maximization approach, Benefit maximization, Cost sharing.

A review is presented of recent developments in the application of the U.S. Principles and Standards for planning water and related land resources. This report follows an earlier paper (O'Brien at al, 1977) which examined the Principles and Standards for its suitability as a possible starting point in the development of a set of planning guidelines relevant to Australian conditions. Discussed are several studies on planning policy, undertaken by the U.S. Water Resources Council, which have investigated various policy options for the objectives, discount rate, and cost sharing arrangements used in the Principles and Standards. Discussed are a multi-objective approach, integrated objective approach, and constrained economic maximization approach. Outlined are studies made on the integration of Environmental Impact Statement requirements of the National Environmental Policy Act of 1969 into the planning requirements of the Principles and Standards. Finally, this report reviews the development and application of procedures to implement the Principles and Standards by the U.S. Army Corps of Engineers. Outlined are major policy issues arising from these studies, and the implications for Australia are summarized. (Bell-Cornell)
W78-08430

DIRECT ENVIRONMENTAL FACTORS AT MUNICIPAL WASTEWATER TREATMENT WORKS--EVALUATION AND CONTROL OF SITE AESTHETICS, AIR POLLUTANTS, NOISE AND OTHER OPERATION AND CONSTRUCTION FACTORS,
For primary bibliographic entry see Field 5G.
W78-08507

A UTILITY CRITERION FOR REAL-TIME RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 4A.
W78-08732

6B. Evaluation Process

THE PREOPERATIONAL EFFECTS OF A WATER-RESOURCES PROJECT ON PROPERTY PRICES,
Ottawa Univ. (Ontario). Geography and Regional Planning.
P. F. Ricci, R. E. Laessig, and E. R. Glaser.
Water Resources Bulletin, Vol. 14, No. 3, p 524-531, June 1978. 3 fig, 12 ref.

Descriptors: *Water resources, *Projects, Effects, Properties, *Prices, *Time series analysis, Economic analysis, Consumer surplus, Park-lake systems, State parks, Recreation, Land market, Statistical methods, *Property values, *Pennsylvania, *Philadelphia(Penn).

Using time series analysis, residential properties nearby a park-lake system, Nockamixon State Park at the fringe of the Philadelphia Metropolitan Area, have been studied to detect possible changes in the land market during the period between announcement and completion of the impounding reservoir, 1962 to 1973. The analysis identifies a period of increases in the values of properties which is concomitant with the announcement of the park-lake. This is followed by a second period characterized by lower prices, which ends in 1970, as construction activities take place. During construction, from 1970 to 1973, property values have been found to increase rapidly. (Graf-Cornell)
W78-08305

FLORIDA KEYS COASTAL ZONE MANAGEMENT STUDY.
Florida Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council.
June 1974, 18 p.

Descriptors: *Florida, *Resources development, *Land management, *Coasts, Water law, Water, Resources, Zoning, Land use, Land resources, Environmental control, Coral, Septic tanks, Liquid wastes, Urban runoff, Dredging, Vegetation, Economic prediction, Environmental effect, Planning.

Florida statutes charge the Coastal Coordinating Council with development of a comprehensive plan for development, protection and zoning of the coastal zone. In response to this mandate, the National Coastal Zone Management Act of 1972, and a request from the governor, this study was conducted. This publication summarizes the Florida Keys Coastal Zone Management Study. The study condenses major findings and recommendations and contains an overview of the basic biophysical, socio-economic, environmental quality, planning and management factors involved in the management of public resources in the Florida Keys. The study includes recommendations as to biophysical and environmental quality. These relate to: (1) coral reefs; (2) liquid waste management; (3) solid waste disposal; (4) urban runoff; (5) dredge and fill activities; and, (6) destruction of natural vegetation. Among the socio-economic conditions examined are: (1) land use analysis; (2) public support services; (3) land ownership; (4) Monroe County economy; (5) population growth trends; and (6) attitude and information study. An introduction contains the essence of policy planning, prerequisites for a Keys policy plan, and a map of the study area. (Quarles-Florida)
W78-08331

MINNESOTA WATER QUALITY: A REPORT TO THE CONGRESS OF THE UNITED STATES BY THE STATE OF MINNESOTA PURSUANT TO SECTION 305(B) OF THE FEDERAL WATER POLLUTION CONTROL ACT,
Minnesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5G.
W78-08387

A DECADE OF NONDEGRADATION POLICY IN CONGRESS AND THE COURTS: THE ERRATIC PURSUIT OF CLEAR AIR AND CLEAN WATER,
Iowa Univ., Iowa City. Coll. of Law.
For primary bibliographic entry see Field 5G.
W78-08393

AN EXAMINATION OF PROBLEMS AND POTENTIALS FOR FUTURE LARGE-SCALE INTENSIVE SEAWEED CULTURE SYSTEMS,
Massachusetts Univ., Wareham. Aquacultural Engineering Lab.
For primary bibliographic entry see Field 6C.
W78-08396

THE SANIBEL REPORT: FORMULATION OF A COMPREHENSIVE PLAN BASED ON NATURAL SYSTEMS,
Conservation Foundation, Washington, DC.
J. Clark.
The Conservation Foundation, Washington, D.C., 1976. 305 p.

Descriptors: *Planning, *Florida, *Land use, *Land management, Long-term planning, Biological communities, Ecosystems, Wetlands, Construction, Land development, Natural resources, *Sanibel Island(Florida).

Carrying capacity for the natural systems of Sanibel Island, Florida, were determined and used in formulating a comprehensive land-use plan that controlled growth and preserved environmental values. Part I of the report presents a brief history of the island, from settlement to incorporation. Part II presents the natural systems study with an analysis of the island's ecosystem, identification of the major ecological zones (water, interior wetlands, mangrove swamps, uplands, beachfront), diagnosis of the condition of these zones, and management suggestions. Part III consists of two chapters: the first reports on the planning process of the Sanibel Plan; the second presents an abridged version of the final plan. Appendixes cover the hydrology, vegetation, beach geology, wildlife ecology, estuarine ecology, and natural systems of the island. (Steiner-Mass)
W78-08398

ENERGETICS: SYSTEMS ANALYSIS WITH APPLICATION TO WATER RESOURCES PLANNING AND DECISION MAKING,
For primary bibliographic entry see Field 6A.

W78-08423

ANALYSIS OF EXPENDITURES FOR OUTDOOR RECREATION AT THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM,
Oklahoma Agricultural Experiment Station, Stillwater.
D. D. Badger, D. F. Schreiner, and R. W. Presley.
IWR Contract Report 77-4, Army Engineer Institute for Water Resources, Fort Belvoir, Va., December 1977. 145 p, 4 fig, 66 tab, 5 append.

Descriptors: *River systems, *Recreation, *McClellan-Kerr River Project, *Economic effects, *Assessment, Management, Environmental effects, Data collections, Expenditures, Investment, Water policy, Recreational use, Socio-economic aspects, Methodology, Input-output analysis, Regional analysis, Mathematical models, Dams, Reservoirs, Navigation, Systems analysis.

Data are presented on expenditures for water-related outdoor recreation by users of the McClellan-Kerr Arkansas River Navigation system. The system includes several multiple-purpose lakes and a navigation channel. Current recreational use is over 27 million visits per year, and expenditures average about $10 per visitor day, wit visitors originating primarily from Arkansas and Oklahoma. Assessment of the economic impacts of the expenditure data gathered herein are made by the Institute for Water Resources, utilizing a four-region, interregional input-output model. Water recreation and related land based recreation have increased significantly in economic importance in recent years. A major management problem is the increasing imbalance in the overuse-underuse syndrome long prevalent at lakes in the southwestern United States. The socio-economic and expenditure data on recreationists and seasonal and permanent homeowners around the lakes, locks, and dams were obtained by personal interview. (Bell-Cornell)
W78-08424

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM; HYDROELECTRIC POWER GENERATION.
Institute for Water Resources (Army), Fort Belvoir, VA.
For primary bibliographic entry see Field 8C.
W78-08425

POPULATION CHANGE, MIGRATION AND DISPLACEMENT ALONG THE MCCLELLAN-KERR RIVER NAVIGATION SYSTEM,
Missouri Univ.-Columbia. Dept. of Sociology.
R. R. Campbell, G. J. Stangler, G. H. Dailey, Jr., and R. L. McNamara.
IWR Contract Report 77-5, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Va., December 1977. 116 p, 7 fig, 6 tab, 36 ref, 3 append.

Descriptors: *River systems, *McClellan-Kerr Waterway, *Demographic impact, *Economic effects, *Migration, Benefits, Reservoir construction, Property acquisition, Displacement, Population change, Arkansas, Oklahoma, Methodology.

An investigation was made of demographic impact resulting from the McClellan-Kerr River Project, a major Corps of Engineer system of multi-purpose lakes and navigation channels. The major conclusion drawn is that the waterways are a major factor in the large net migration rate into the area; distinguishing characteristics between migrants and residents are noted. The project has provided a potential mechanism for economic development and improved amenities for residential and industrial location; the composition of the population is changing in favor of higher educational, occupational, and income levels as migrants move to the area. The project thus far has been a complete success in many aspects; but care must be taken to consider the costs associated with unused potential and misdirected efforts. (Bell-Cornell)
W78-08426

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
W. T. O'Brien, A. A. Thornley, and A. S. Atkins.
Research Project No 72/47, Technical Paper No 27, Department of National Resources, Australian Water Resources Council, Australian Government Publishing Service, Canberra, 1977. 156 p, 13 fig, 30 tab, 3 map, 46 ref, 2 append.

Descriptors: *Multiobjective, *Planning, *Water resources development, *Standards, Water management(Applied), Land resources, Projects, Cost-benefit analysis, Evaluation, Economics, Effects, Environmental effects, Measurement, Cost allocation, Cost sharing, Mathematical models, Systems analysis, Irrigation, Salinity, *Australia.

The basic concepts and theory of multi-objective planning are outlined, showing that the evaluation component of this planning process has been developed as an extension of benefit-cost analysis to provide better assessments of non-monetary as well as monetary project effects. The historical development of multi-objective planning of water resources in the United States is reviewed; in response to changing community values, there has been a marked shift in water planning from almost sole emphasis on national economic efficiency to the multi-objective approach used in the present Principles and Standards for Planning Water and Related Land Resources (1973). The Principles and Standards are reviewed for their suitability as a possible starting point in the development of a set of guidelines for water resources planning in Australia. Planning objectives, evaluation of economic, environmental and social effects, public participation, cost allocation and cost sharing procedures are considered and possible modifications more appropriate to Australian conditions are presented. The relationship between multiobjective planning and the preparation of environmental impact statements is discussed. Summarized is a case study involving the multiobjective assessment of alternative means to reduce waterlogging and salinity in the Nagiloc-Colignan irrigation area of Australia. Case study conclusions include: multiobjective planning provided a comprehensive and systematic framework for insuring the formulation of a wide range of alternative plans to meet problems and needs of water management in the study area. (Bell-Cornell)
W78-08429

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT - REVIEW OF RECENT DEVELOPMENTS IN THE U.S.A.,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 6A.
W78-08430

THE PROVISION OF TECHNICAL INFORMATION IN A REGIONAL WATER AUTHORITY,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 5G.
W78-08502

PHASE II, ARIZONA STATE WATER PLAN: ALTERNATIVE FUTURES,
Arizona Water Commission, Phoenix.
C. L. Linser.
February 1977. 145 p, 45 fig, 28 tab, 60 ref.

Descriptors: *Arizona, *Water resources development, *Competing uses, *Alternative planning, *Water conservation, Economic impact, *Groundwater mining, Land use, *Water management(Applied), Mineral industry, Withdrawal, Evaluation, Electric power, Bibliographies, Energy transfer, Surface-groundwater relationships, Water requirements, Water rights, Irrigated land, Wildlife, Industrial water, Water quality, Urban hydrology.

This second report, in a series of three, presents alternative plans for the development of water resources in the State of Arizona for the next 50 years. Significant factors are suggested as having particular impact upon current and future water supplies and water uses for each Arizona county. Potential problems discussed include: (1) increased urban water use, (2) possible expanded water use in the copper industry, (3) possible expanded water use for electrical power, and (4) probable increase in agricultural water use for irrigation. Alternative water use plans are presented, emphasizing the consequences of continued unlimited expansion of groundwater mining of Arizona's diminishing water resources. Planning suggests that only strict water conservation measures can prevent the continuation of the current groundwater overdraft. County water resources and land use are illustrated by numerous figures and tables. (See also W77-04782) (Jewkes-Arizona)
W78-08725

ARIZONA WATER POLICY: CHANGING DECISION AGENDAS AND POLITICAL STYLES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6E.
W78-08727

AN ECONOMIC ANALYSIS OF THE CENTRAL ARIZONA PROJECT,
Arizona Univ., Tucson. Dept. of Economics.
J. L. Barr, and D. E. Pingry.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetins of the American Water Resouces Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 15-27, 6 tab.

Descriptors: *Economics, Annual benefits, *Capital, Costs, *Cost analysis, *Electric power costs, Debt, Financing, Return(Monetary), Water requirements, Project planning, *Simulation, *Cost repayment, *Arizona, *Central Arizona Project.

An economic evaluation of the Central Arizona Project was conducted with a goal of developing a simulation model of CAP costs, water operations and capital repayment alternatives. This model was compared to the actual cost experience of the Metropolitan Water District of Southern California for a realistic assessment. In addition, an effort was made to consider some of the indirect impacts of the CAP, and the overall economic outlook was summarized. In devising the simulation model CAP capital costs, CAP power supply and CAP water supply factors were considered along with user charges, management alternatives, and operations, maintenance and repair costs. (Payton-Arizona)
W78-08728

PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON SOIL EROSION AND SEDIMENTATION BY WATER.
American Society of Agricultural Engineers, St Joseph, MI.
For primary bibliographic entry see Field 4D.
W78-08787

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE PREOPERATIONAL EFFECTS OF A WATER-RESOURCES PROJECT ON PROPERTY PRICES,
Ottawa Univ. (Ontario). Geography and Regional Planning.
For primary bibliographic entry see Field 6B.
W78-08305

WATER PRICE RESPONSIVENESS OF COMMERCIAL ESTABLISHMENTS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
G. D. Lynne, W. G. Luppold, and C. Kiker.
Water Resources Bulletin, Vol. 14, No. 3, p 719-729, June 1978. 1 tab, 13 ref.

Descriptors: *Water policy, *Pricing, *Water demand, *Commerical firms, *Statistical model, *Miami(Fla), Regression analysis, Price elasticities, Production function, Costs, Estimating, Department stores, Restaurants, Hotels, Motels, Grocery stores, Linear model, Constraints, Equations, Systems analysis.

Pricing policy in water allocation has become of more concern as some areas find water is indeed a scarce resourse. Demand estimates, where the quantity purchased-value in use relationships are of concern, have been made in other studies for residential, industrial, and agricultural uses in many areas of the country. The price-quantity relations for water use in commercial firms are estimated and discussed for several different types of stores. A derived demand model is used to estimate commercial demand in the Miami, Florida area. The price elasticity is found to be generally low (inelastic) for all groups studied, except for the department stores; this group is found to have an elastic demand for water at all prices above $0.93 per thousand gallons purchased per month, where the mean price for this part of the sample was $1.24. The major implication of the study is that commercial establishments may be responsive to price changes over the long run; also, different establishments will respond differently to price changes. (Graf-Cornell)
W78-08306

THE COST OF WATER SUPPLY AND WATER UTILITY MANAGEMENT (VOLUMES I AND II),
Municipal Environmental Research Lab., Cincinnati, OH. Water Supply Research Div.
For primary bibliographic entry see Field 5G.
W78-08390

AN EXAMINATION OF PROBLEMS AND POTENTIALS FOR FUTURE LARGE-SCALE INTENSIVE SEAWEED CULTURE SYSTEMS,
Massachusetts Univ., Wareham. Aquacultural Engineering Lab.
J. E. Huguenin.
Aquaculture, Vol 9, No 4, p 313-342, December 1976. 6 fig, 5 tab, 62 ref. Massachusetts Institute of Technology, Sea Grant Program 04-5-158-1.

Descriptors: *Aquiculture, *Seaweed, *Algae, *Hydroponics, *Rhodophyta, Economics, Cost analysis, Nutrient removal, Tertiary treatment, Raceways, Beneficial use, Gracilaria foliifera, Eucheuma, Hypnea musciformis, Neoagardhiella baileyi, Rhodymenia palmata, Carrageenans, Harvesting of algae, Nutrients.

The commercial feasibility of large-scale seaweed culturing is evaluated based on its marketable potential and engineering characteristics, and the design and operational requirements of a useable culturing system are explored. The two basic approaches to large-scale culturing are: (1) use of estuaries, bays, or ponds for growing the seaweed on nets and ropes (particularly in Japan and the southwest Pacific); and (2) unattached mass culturing of seaweeds in man-made raceways (the primary method in the United States). Of the second type, the most promising configuration consists of raceways with either a V-shaped cross-section or a perpendicular wall with a sloping bottom, both with water circulated by oilless compressed air. A 10-m wide V-shaped raceway terminating in short perpendicular walls is examined in this study. It has 20-degree sloping bottom sections and a cross-sectional area of 10.9 sq m. The raceway surface is epoxy-coated asphalt, and air is delivered at 1 standard cu ft/min of air per foot of raceway. To produce 1000 metric tons/yr dried seaweed, about 10,000 m of raceways would be required; the raceways could be divided into two sets of twenty 250-m long raceways. Species with the most potential are red algae (Rhodophyta), such as Neoagardhiella baileyi, Gracilaria foliifera, Hypnea musciformis, Eucheuma sp, and Rhodymenia palmata. Problems and costs are discussed. (Lynch-Wisconsin)
W78-08396

ESTIMATED VALUES FOR SELECTED WATER HYACINTH BYPRODUCTS,
Georgia Univ., Athens. Dept. of Agricultural Economics.
M. J. Mara.
Economic Botany, Vol. 30, No. 4, p 383-387, October-December, 1976. 2 fig, 16 ref.

Descriptors: *Water hyacinth, *Market value, *Byproducts, Evaluation, Aquatic weeds, Soil amendments, Compost, Cattle feed.

Attempts were made to measure the demand for selected water hyacinth byproducts--compost, soil amendment, and feed ingredient in beef cattle diets. An upper limit on the value of water hyacinths, when used in a compost blend, was determined to be $6.42/wet ton. Only a very limited quantity could be used in this manner. It is doubtful that the value as a soil amendment would cover the cost of transporting and spreading the hyacinths. There has been increased potential demand for water hyacinths as a feed ingredient due to increased prices in other feed ingredients, but the quantity demanded is not very significant. These results suggest that by-products from water hyacinths have little value and offer little help in defraying harvesting costs. (Stihler-Mass)
W78-08415

6D. Water Demand

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley.
For primary bibliographic entry see Field 4A.
W78-08244

DETERMINING THE USEFULNESS OF REMOTE SENSING FOR ESTIMATING AGRICULTURAL WATER DEMAND IN CALIFORNIA,
California Univ.-Berkeley. Remote Sensing Research Program.
For primary bibliographic entry see Field 3F.
W78-08256

WATER PRICE RESPONSIVENESS OF COMMERCIAL ESTABLISHMENTS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 6C.
W78-08306

AGRICULTURAL WATER DEMANDS: PRELIMINARY RESULTS OF SILISTRA CASE STUDY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
I. V. Gouevsky, and D. R. Maidment.
Research Memorandum RM-77-44, International Institute for Applied Systems Analysis, Laxenburg, Austria, September 1977. 91 p, 14 fig, 25 tab, 4 ref, 5 append.

Descriptors: *Water demand, *Irrigation, *Linear programming, *Benefit maximization, *Economic efficiency, Optimization, Water supply, Crop yield, Agriculture, Mathematical models, Equations, Systems analysis.

Preliminary results of the Silistra Water for Irrigation Model (SWIM) for determining agricultural water demands in the Silistra region of Bulgaria are presented. For various areas of irrigated and nonirrigated land, and various volumes of water supply, SWIM uses linear programming to select the optimal combination of crop areas and production inputs so as to maximize annual net benefits from crop production in excess of target production quantities of each crop. Both normal and dry weather conditions are examined. The region's import-export balance is investigated for areas of irrigated land between 10,000 and 50,000 hectares, and it is shown that total costs of crop production are minimized at the point when the region is self-sufficient in crop production. By means of demand curves, it is demonstrated that the marginal values of land and water for irrigation are greater than their unit costs of development so that it is optimal to develop irrigation to the maximum area considered by the model. (Bell-Cornell)
W78-08428

6E. Water Law and Institutions

GRACI V. UNITED STATES (LIABILITY OF UNITED STATES FOR FLOOD DAMAGE).
435 F. Supp., p. 189-196 (E.D. La. 1977).

Descriptors: *Louisiana, *United States, *Floods, *Mississippi River, *Negligence, *Flood damage, *Storms, Navigation, Gulf of Mexico, Marshes, Levees, Bayous, Tributaries, Navigable waters, Flood control, Storm surge, Water levels, Canals, Hurricanes, Flood-water.

Plaintiff land owners brought suit against the United States seeking to recover for damages arising from flooding. Plaintiffs contended that defendent was negligent in designing, constructing, and operating the Mississippi River Gulf Outlet which resulted in the flooding of plaintiffs' land during a hurricane. The residential area in which plaintiffs' lands are located was, at the time of the storm, enclosed by a levee. Surrounding the area on its various sides are the Mississippi River, a canal, a lake, an intercoastal waterway, marshland, and the Mississippi River Gulf Outlet. When Hurricane Betsy struck the Louisiana coastline, the levee protecting the plaintiffs' property eventually collapsed as a result of the massive flooding caused by the hurricane. The United States District Court, Eastern District Louisiana, held that the defendant was not liable for the flooding damage of plaintiffs' lands. The court found that the Mississippi River Gulf Outlet was built and maintained as an aid to navigation, not to facilitate flood control. Plaintiffs failed to show any causal connection between the Outlet and any damages sustained by them. (Quarles-Florida)
W78-08201

STATE OWNERSHIP OF LAKE AND RIVER BEDS; TAKING OF SAND AND GRAVEL.
S.D. Comp. Laws Ann. secs 5-2-4 thru 5-2-8 (1974).

Descriptors: *South Dakota, *Lake beds, *Mining, *River beds, *State jurisdiction, Beds,

Gravels, Legislation, Minera industry, Navigation, Navigable rivers, Quarries, Riparian rights, Sands, Streambeds, Administrative agencies, Contracts, Channels, Penalties(Legal).

The bed and channel of any lake or river in South Dakota or bordering on South Dakota to the middle of the main channel as well as all islands and sand bars lying in any lakes or river shall be considered the property of the state unless the state or the United States has conveyed an adverse legal or equitable interest. This provision shall not affect or impair the rights of riparian owners. It shall be unlawful for any person to take from, within, or beneath the bed of any navigable river or lake or any other material except by authorization of the commissioner of the board of school and public lands. Such person shall first enter into a contract with the commissioner upon such terms and conditions as the board may determine. No contract shall be made giving any person any exclusive privilege. Provisions are set forth regarding rules and conditions governing contracts, proceeds of the contracts, and penalties for unlawful taking of materials from lake or river beds. (Jordan-Florida)
W78-08202

PROTECTION OF FISHING WATERS.
S.D. Comp. Laws Ann. secs 41-13-1 thru 41-13-5 (1967).

Descriptors: *South Dakota, *Chemicals, *Fish conservation, *Wastes, Chemical wastes, Fish, Fish management, Fishing, Herbicides, Law enforcement, Legislation, Regulation, Sawdust, Sediments, Water policy, Water quality, Wildlife conservation, Aquatic environment, Pollutants.

It shall be unlawful for any person to empty or allow to be placed, any sawdust, manure, refuse matter, sedimentary materials, or chemicals of any kind into the waters of South Dakota containing game fish, or to deposit same within such distance that it may be carried into such waters by natural causes. It shall be also unlawful to place chemicals into the public waters of South Dakota containing game fish for the purpose of controlling plants, unless explicit authorization to do so is obtained from the game, fish and parks commission. Furthermore, it shall be unlawful for any person to transplant any fish or fish eggs into any of the public waters of this state without the permission of the commission. Finally, it shall be unlawful for any person to empty the contents of any receptacle containing bail into any of the public waters of South Dakota. However, the commission may remove and dispose of rough fish and bullheads by the use of seines, nets, chemicals or by any other means of devices when in its' discretion the same is necessary or advisable. (Jordan-Florida)
W78-08203

SOIL EROSION AND SEDIMENTATION CONTROL ACT OF 1972.
Mich. Comp. Laws Ann. secs 282.101 thru 282.117 (1967), as amended, (Supp. 1977).

Descriptors: *Michigan, *Legislation, *Soil erosion, *Land use, *Sedimentation, Erosion, Degradation(Stream), Soil conservation, Surface runoff, Soil management, Land management, Stream erosion, Land development, Land resources, State governments, Local governments, Governmental interrelations, Administrative agencies, Regulation.

Michigan's department of agriculture shall submit to the water resources commission of the department of natural resources a statewide program to control soil erosion and sedimentation. Land uses which may be governed, shall be identified and recommendation, guidelines, and specifications shall be included. Rules for the control program, including review and approval of site plans, land use plans, and permits for erosion and sedimentation control, shall of promulgated by the commission. Counties are responsible for the enforcement of the rules, except in municipalities with conforming ordinances. Municipalities may enact soil erosion and sedimentation control ordinances more restrictive than this act; but ordinances not complying with minimum requirements shall have no effect. The commission shall be notified of all violations of this act. Bonds may be required as a condition for issuance of permits. State, local, or county agencies may be authorized by the commission to approve soil erosion and sedimentation control procedures. All preliminary plats submitted after June 30, 1974 must contain a statement of compliance with this act. In addition, all final plats shall include evidence of that permit from the appropriate enforcing agency has been obtained and that the requirements of the act will be followed. (Malefatto-Florida)
W78-08204

WATERWAYS AND MILLDAMS.
Ky. Rev. Stat. Ann. sec 182.170 (Supp. 1976).

Descriptors: *Kentucky, *Damsites, *Condemnation, *Eminent domain, *Canals, Dams, Construction, Legislation, Local governments, Mills, Milldams, State governments, Structures, Riparian rights, Public benefits, Public access, Watercourses(Legal), Land use.

In order to build a mill or factory useful to the public in Kentucky, any person owning land on a watercourse may acquire by condemnation sufficient land to build a dam in or across the watercourse. Land may also be acquired to raise an established dam or to cut or enlarge a canal above or below the proposed structure site. Condemnation proceedings shall be brought in the county in which the largest part of the land to be condemned is located, and shall include all the land to be condemned, whether the land is completely within that county or not. (Easterbrook-Florida)
W78-08205

WILD RIVERS SYSTEMS.
Ky. Rev. Stat. Ann. secs 146.210 thru 146.360 (Supp 1976).

Descriptors: *Kentucky, *Wild River Act, *River systems, *Land use, *Wild rivers, *Natural resources, Streamflow, State governments, River flow, Dredging, Agriculture, Strip mines, Roads, Water management(Applied), Recreation, Preservation, Legislation, Streams, Conservation, Environment, Rivers, Penalties(Legal).

In order to preserve certain streams and watercourses in their natural state, the Kentucky legislature has established a wild rivers system. The act establishes a wild river system. The act establishes a wild river system by designating certain streams for immediate inclusion in the system and prescribing the procedures for administration of the system. The system is to be administered by the department for natural resources and environmental protection. The secretary of the department is authorized to establish such reasonable regulations as are necessary to preserve the streams in their primitive state. Primary emphasis shall be given to protecting esthetic, scenic, historic, archaeologic, and scientific features of the area. The secretary shall publicize and hold public hearings on all management plans developed. The act also authorizes the secretary to acquire whatever land tiles as are necessary to protect streams within the system. Land uses that are allowed within the boundaries of a protected area must apply to the secretary before engaging in selected land uses. Procedures are established for the processing of applications and penalties for noncompliance are also provided. (Quarles-Florida)
W78-08206

WATER RIGHTS.
Mont. Const. art. IX sec 3 (1972).

Descriptors: *Water rights, *Montana, *Appropriation, *Beneficial use, *Administration, Legal aspects, Meteoric water, Canals, Ditches, Controlled drainage, Flumes, Aqueducts, Reservoirs, Surface waters, Flood discharge, Groundwater, Right-of-way, Water storage, Water control, Legislation.

All existing water rights are recognized and confirmed if they serve a useful or beneficial purpose. The use of all water, whether appropriated now or in the future for any beneficial use, the right of way across the lands of others needed in connection with any beneficial use and the reservoirs necessary for collecting and storing water shall be held to be a public use. All waters of the state, including surface, underground, flood and atmospheric waters, belong to the state and may be appropriated for such beneficial uses as are provided by law. The legislature shall provide for the administration, control and regulation of water rights. The legislature shall also establish a central system of record keeping in addition to the present system of local records. (Beamer-Florida)
W78-08207

FLOODWAY MANAGEMENT AND REGULATION.
Mont. Rev. Code secs 89-3501 thru 89-3515 (Supp. 1975).

Descriptors: *Flood plains, *Floodways, *Flood protection, *Water management(Applied), *Montana, Flood control, Flood data, Flood forecasting, Flood frequency, Flood plain zoning, Routing, Drainage, Flood routing, Legislation, Land management, Regulation, Management, Permits, Penalties(Legal).

The Montana legislature passed the Floodway Management and Regulation Act in order to prevent and alleviate flooding threats to life and health and to reduce private and public economic losses. The specific purpose of this Act is to guide development of floodway areas. The Department of Natural Resources and Conservation is authorized to initiate a comprehensive program for the delineation of designated floodplains and designated floodways for every watercourse and drainway in the state. After a thorough study and a public hearing, land-use regulations shall be established within designated political subdivisions. Each subdivision has six months after transmittal of floodplain information to adopt land-use regulations which meet or exceed the minimum standards established. It is unlawful for a person to establish an artifical obstruction or nonconforming use within a designated floodplain or floodway without a permit. Specific open space uses are excepted, including agricultural and industrial uses. The types of uses a permit will be issued for are specifically enumerated herein, along with application procedures. The Department is authorized to enter lands for inspection and reserves the right to judicial remedy for violations. (Thomas-Florida)
W78-08208

BRUSCO TOWBOAT CO. V. STRAUB (LEASING PROGRAM FOR STATE OWNED SUBMERGED AND SUBMERSIBLE LANDS EXAMINED).
567 P2d 1037-52 (Ore. Ct. App. 1977).

Descriptors: *Oregon, *Navigable waters, *Riparian rights, *Leases, Aquatic life, Marinas, Docks, Submergence, Buoys, Administrative decisions, Riparian waters, Riparian land, Access routes, Adjacent land owners, Beneficial use, Boundaries(Property), Public access, Public benefits, Public rights.

A program of the Oregon State Land Board requiring users to enter into leases for the use of submerged and submersible lands underlying navigable waterways is challenged in this consolidation

of three cases. The plaintiffs seek a declaratory judgment that the program is invalid in that it denies equal protection of the laws, violates the commerce and supremacy clauses to the Oregon and United States constitutions, and results in takings without just compensation. The program requires anyone engaged in permanent or long-term use of state-owned submersible lands, which effectively preclude any other use of and enjoyment of such land and the overlying water, to obtain a lease and pay rent to the state. Exempted from the lease program are uses which are essentially navigational or in aid of navigation. Construction of permanent facilities subject to the lease program requires a permit from the Corps of Engineers. The court held that the lease program is constitutional, compatible with the commerce and supremacy clauses, and not violative of equal protection. The court also allowed riparian owners who had constructed navigational structures prior to the program's effective date a reasonable period of rent free use of their structure. (Spector-Florida)
W78-08209

TALBOT'S INC. V. CESSNUN ENTERPRISES, INC. (GRANTING OF EASEMENT OF REASONABLE NECESSITY NOT SUPPORTED BY EVIDENCE).
566 P2d 1320-24 (Alas. 1977).

Descriptors: *Easements, *Navigable waters, *Adjacent land owners, *Alaska, Land use, Submergence, Cities, Acess routes, Legal review, Boundaries(Property), Claims(Contracts), Legislation, Judicial decisions, Tidal marshes, Prescriptive rights, Water law.

The Alaska Tidelands Statute gives municipalities the power to adjudicate easements by reasonable necessity upon application for a conveyance. Plaintiff property owner brought suit to establish such an easement over an adjacent land owners' tidelands parcel. The trial judge granted a permanent injunction against any interference with Plaintiffs' alleged easement rights. The defendants appealed from this injunction. The Supreme Court of Alaska struck down the trial court's order and clarified the interpretation of the Tideland's statute. The court held that before an easement can be found to be reasonably necessary there must be no other reasonable mode of enjoying the dominant tenement. The fact that the available mode of access was less convenient or was not the mode of access commonly used did not render it unreasonable. While strict or absolute necessity is not required, more than mere convenience must be demonstrated before a tidelands occupant is entitled to an easement under the Tidelands statute. The Supreme Court reversed the trial judge's finding that the alleged easement was reasonably necessary for use and enjoyment of the plaintiffs' property. (Spector-Florida)
W78-08210

SOUTH DAKOTA-MINNESOTA BOUNDARY WATERS.
Minn. Stat. sec 114.13 (1976).

Descriptors: *Minnesota, *South Dakota, *Interagency cooperation, *Interstate compacts, *Water levels, Administrative agencies, Interstate, Natural resources, Political aspects, Surveys, Water law, Water level fluctuation, Water policy, Water resources, Interstate rivers, Boundaries(Property), Legislation.

The Minnesota commissioner of natural resources shall cooperate with the director of the game and fish commission of South Dakota with regard to the South Dakota-Minnesota boundary water. The commissioner shall have the power and authority: to determine the most beneficial levels of artificially controlled boundary waters; to prescribe and promulgate rules to regulate investigations, surveys, and hearings; and to hold hearings and take evidence. Hearings shall be held at such time and place as may be designated by the commissioner. If the commissioner and the director fail to agree on matters which affect the interests of both state, an engineer knowledgeable on the issues will be chosen by the governors of both states as an arbitrator. Any party aggrieved by any order of the commissioner establishing or regulating water levels may appeal to the district court or the circuit court of any county in either state in which the subject matter of the order is located, or to the district court of the county in either state where the capital thereof is located. Appeals may be taken from the judgments of the district court to the supreme court of the respective state. (Jordan-Florida)
W78-08211

HAMPSON V. SUPERIOR COURT FOR COUNTY OF INYO.
139 Cal. Rptr., 722-31 (App. 1977).

Descriptors: *Administrative agencies, *Septic tanks, *Waste water(Pollution), *Remedies, California, Environment, Land use, Discharge(Water), Law enforcement, Public health, Sewage, State governments, Wastes, Water policy, Water pollution, Water quality control, Water law, Administrative decisions, Jurisdiction, Legislation.

The petitioner regional water quality control board sought to have the respondent Superior Court restrained from setting aside a decision of the board. The board's decision denied the plaintiff landowner's request for an exemption from a waste discharge prohibition adopted by the board. The board argued that the landowners had failed to exhaust administrative remedies and therfore the Superior Court did not have jurisdiction. The landowners contend that an agreement between themselves and the board's executive officer was a final administrative decision; that the officer acted in bad faith in presenting the agreement to the board for approval; and that this agreement acted as an estoppel against the board. The Court of Appeal issued a writ of prohibition restraining the Superior Court from overruling the board. The Court found that, although an executive office may be authorized to make an initial determination, ultimately the board is responsible for granting exemptions. Furthermore, estoppel could not be invoked against a governmental agency where it would operate to defeat the agency's purpose. Since the regional board's decision could have been appealed to the State board, the court held that the landowner's had not exhausted their administrative remedies. (Jordan-Florida)
W78-08212

SALT LAKE CITY CORP. V. UTAH WOOL PULLING CO. (VALUE OF WATER RIGHTS AS PART OF COMPENSATION TO BE PAID THROUGH CONDEMNATION PROCEEDINGS).
566 P.2d 1240-45 (Utah 1977).

Descriptors: *Condemnation, *Condemnation value, *Utah, *Eminent domain, *Market value, Aquifers, Compensation, Damages, Comparative costs, City planning, Claims(Contracts), Industrial water, Land appraisals, Legal review, Public rights, Replacement costs, Water rights, Judicial decisions, Value.

Condemnation proceedings initiated by the plaintiff city resulted in a pretrial settlement in which the value of the defendant's land, buildings and water diversion facilities used to remove underground water was ascertained. The defendant company then claimed additional compensation for the value of its water rights and sought to prove value by showing how the water rights were used, the cost of replacement of the water and by offering evidence of market value. The plaintiff city claimed the water rights had no or nominal value. This argument was based on the assertion that the value of the water rights was included in the payment for diversionary facilities. The Utah Supreme Court upheld a jury verdict for the defendant company in the amount of $50,000, stating the company was entitled to have its water rights valued in relation to the appurtendant property. The court also upheld the admission of evidence as to value to which the company put its water rights. Lastly, the court approved of the trial judge's admission of evidence of comparable sales outside the defendant's aquifer to measure value and to his giving of jury instructions on 'specialty property'. (Spector-Florida)
W78-08213

ENVIRONMENTAL AND ESTUARINE STUDIES.
Md. Code Ann. secs 3-401 thru 3-403 (1974), as amended, (Supp. 1976).

Descriptors: *Maryland, *Education, *Research facilities, *State governments, Legislation, Colleges, Training, Universitives, Chesapeake Bay, Ecology, Environment, Estuarine environment, Environmental effects, Environmental control, Research and development, Planning, Projects, Testing, Conservation, Natural resources.

The University of Maryland's Center for Environmental and Estuarine Studies is designated to encompass the functions of the National Resources Institute. The Center is under the control of Maryland's Board of Regents. Its purpose is to conduct a research and education predictive ecology program geared to the improvement and preservation of Maryland's physical environment. Functions shall include: (1) liaison with the state to identify environmental problems, particularly those affecting Chesapeake Bay; (2) inventory appropriate professional individuals, public and private organizations, facilities, and programs dealing with the environment; (3) prepare reports concerning topical environmental problems; (4) assist the development and coordination of environmental studies programs at public and private educational and research institute; (5) perform other acts of public service relating to the environment, and (6) apply the university's resources where needed by state agencies in environmental matters. The Center may collect animal, plant, or other sample, and use any collection device, necessary for its programs. (Malefatto-Florida)
W78-08214

CHESAPEAKE BAY AND TRIBUTARIES.
Md. Code Ann. sections 8-1601 through 8-1605 (1974), as amended (Supp. 1976).

Descriptors: *Maryland, *Legislation, *Chesapeake Bay, *Dredging, Conservation, Penalties(Legal), State governments, Harbors, Spoil banks, Tidal waters, Bottom sediments, Water pollution control, Channel improvement, Recreation, Fish conservation, Water law, Legal aspects.

The Chesapeake Bay and its tributaries, which are assets of the state, are threatened by the dumping of dredge spoil in Baltimore Harbor. This dumping pollutes the bottomland of the bay and its tributaries, is harmful to fish and other marine life, and affects recreational use to the recreational and social detriment of the people. Baltimore Harbor includes the tidal portions of the Patapsco River, and spoil is defined as earth, rock, waste, or anything else dredged from Baltimore Harbor. Dumping or scattering of spoil from Baltimore Harbor is prohibited in any portion of the water or bottomland of Chesapeake Bay or the tidewater portions of any of its tributaries outside of Baltimore Harbor. The attorney general or certain state's attorneys are empowered to seek an injunction against any person violating or threatening to violate this section, and may also seek criminal penalties against alleged violators. A violation is designated a misdemeanor calling for a maximum fine of $5000 or imprisonment of up to one year or both, for each violation. (Molloy-Florida)

W78-08215

WATER POLLUTION CONTROL AND ABATEMENT.
Md. Code Ann. sections 8-1401 through 8-1417 (1974) as amended (Suppl 1976).

Descriptors: *Maryland, *Legislation, *Water pollution control, *Planning, Pollutants, State governments, Legal review permits, Disposal, Government interrelations, Oil pollution, Storage tanks, Water supply development, Interstate compacts, Disasters, Penalties(Legal), Cost allocations, Pollution abatement.

The Department of Health and Mental Hygiene and Natural Resources are required to submit a joint annual report to the governor and assembly summarizing the state's water pollution control program. Included in the report are water supply plans, interstate compacts, studies developed under this subtitle, federal plans and other state studies. All oil terminal facilities must be licensed, with a fee based on the size of the storage facility. An oil disaster fund is created to plan for disasters and maintain equipment. Department orders are subject to direct judicial review. Any party discharging pollutants into the waters of the state must obtain an administrative permit after hearings and reports. In cooperation with appropriate agencies, the Department shall monitor the dumping of dredged spoil in the waters of the state. The Department shall also identify and establish criteria for the disposal of hazardous substances. A permit is required to operate a hazardous disposal facility, with fee based on the dangers and costs of the disposal process. Violation of these provisions is a criminal misdemeanor, and the violator may be enjoined. Oil discharge from a vessel may result in denial of port clearance, and penalties constitute a lien on the vessel. (Molloy-Florida)
W78-08216

FLOOD HAZARD MANAGEMENT ACT OF 1976.
Md. Code Ann. sections 8-9A01 through 8-9A11 (1974) as amended (Supp. 1976).

Descriptors: *Maryland, *Legislation, *Flood control, *Mapping, Watershed management, Local governments, Floodproofing, Flood plain, Zoning, Regulation, State governments, Maps, Hazards, Permits, Planning, Water management(Applied), Public health.

Flooding causes damage, public costs, and the need for statewide management of waters. The Department of Natural Resources shall prepare maps showing flood hazard areas, relying on historical information and other available data. The Department shall hold hearings in each county with a flood hazard area before adopting flood hazard maps. Every county shall then develop use rules for each flood hazard area. These rules shall take into account availability of alternate locations, permanency of the proposed use, effects on the adjacent area, tidal or nontidal character, and efficient agricultural production. Applicants for use must show provisions for adequate drainage, adequacy of water and sewer facilities, ability of structures to withstand a 100 year flood, and that the use will not worsen local flooding. The Department shall assume overall management by dividing the state into watersheds for flood control planning. Implementation of watershed plans is the responsibility of the counties, in consultation with the Department. Management techniques may include: (1) flood control dams; (2) levees and dikes; (3) floodways; (4) retention structures; (5) flood warning systems; (6) public acquisition; (7) floodproofing; and (8) drain and stream maintenance. Each county may implement civil penalties to insure compliance with the provisions of this statute. (Molloy-Florida)
W78-08217

FLOOD CONTROL AND WATER SUPPLY POWERS AND FUNCTIONS.
Md. Code Ann. sec 8-905 (1974), as amended, (Supp. 1976).

Descriptors: *Maryland, *Flood control, *Flood data, *Storm water, *Drainage water, Surface runoff, Flooding, Floodwater, Surface waters, Hazards, Surface drainage, Storm runoff, Watersheds, Structures, Legislation, Drainage effects, State governments, Water management(Applied), Feasibility, Downstream.

The Maryland Department of Natural Resources shall conduct a study of all state planned or financed construction projects to determine if the project will create a surface water runoff which may cause or add to on-site or downstream flooding hazards. Considered in the study will be natural conditions, existing storm drainage, future development in the watershed and flood control structures. If such an additional flood hazard will be created by the project studied, the Department of Natural Resources shall require storm water management or retention measures to be included in the project. (Easterbrook-Florida)
W78-08218

HOEKSTRA V. KANKAKEE (DIMINISHMENT OF PROPERTY VALUES BY COUNTY HIGHWAY IMPROVEMENTS).
365 N.E. 2d 553-556 (Ill. App. Ct. 1977).

Descriptors: *Illinois, *Eminent domain, *Flood damage, *Road construction, Culverts, Economics, Farms, Highways, Local governments, Floods, Overflow, Property values, Right-of-way, Road design, Water law, Damages, Judicial decisions, Leases, Drainages.

Plaintiffs filed suit against defendant County to recover damages for the loss of a corn crop due to flooding which allegedly resulted from an improperly constructed highway culvert. Plaintiffs alleged that the culvert was constructed in a manner which prevented the water from draining naturally. Plaintiffs also alleged that the actions of the county constituted a taking of property rights for public use without just compensation. The trial court dismissed the complaint on the bases of defendant's governmental immunity. The appellate court affirmed the dismissal, but held that since the culvert was constructed before the plaintiffs leased the property, they were deemed to have known how the culvert would affect the premises and to have assumed the risk of flooding. The court held that although a county is liable for damages to private property caused by a public improvement, any resulting action for damages must be brought by the owner of the property at the time the improvement is constructed. Subsequent leases take the property as it existed at the time of the leasing, because the value of the land was already diminished and the risk of flooding was reflected in the low rent. (Jordan-Florida)
W78-08219

COUNTY OF INYO V. CITY OF LOS ANGELES (GROUNDWATER MANAGEMENT BASED ON HYDROLOGIC CYCLE AND PROJECTED LONG-TERM USE).
132 Cal. Rptr. 167-74 (Cal. App. 1976).

Descriptors: *Hydrologic cycle, *California, *Pumping, *Groundwater basins, Water utilization, Water consumption, Groundwater, Subsurface waters, Judicial decisions, Hydrologic data, Water resources, Water policy, Water allocation(Policy), Water management(Applied), Precipitable water, Environmental effects.

The defendant city sought to increase its extraction of subsurface water from the Owens Valley Basin. Holding that the proposed increase was a 'project' within the meaning of the California Environmental Quality Act (CEQA), the defendant was ordered to prepare an environmental impact report and to complete the CEQA requirements. Pending ultimate resolutions of the suit, it became necessary to establish an interim rate of groundwater extraction. Because this computation required an evidential inquiry, the matter was referred to a lower court. The lower court acting on formulas devised by appellate court twice fixed a pumping rate. This action is an appeal taken by the plaintiff county to the second interim rate. The appellate court, in vacating the lower court's finding, sought to formulate an equitably convenued pumping rate as well as delineate an appropriate time span to which the rate should be applied. Based on the defendant's long-range projected pumping rate and evidence of available precipitation, the court set an interim limit of 149.56 cfs. In fixing a time span the court looked to nature's cycle and shifted the beginning of the hydrological year to April 1. (Petruff-Florida)
W78-08220

PACK V. CORPS OF ENGINEERS UNITED STATES ARMY (CORPS RIGHT TO DREDGE AND FILL).
428 F. Supp. 460-68 (M.D. Fla. 1977).

Descriptors: *Florida, *Shrimp, *Beach erosion, *Dredging, Commmercial shellfishing, Aquatic environment, Shore protection, Rivers and Harbors Act, Legislation, Environmental effects, Shores, Aquatic animals, Economic impact, Landfills, Erosion control, Marine animals, Conservation.

Plaintiff commercial shrimpers brought an action to enjoin the defendant United States Army Corps of Engineers from performing proposed dredge and fill activities designed to prevent the erosion of certain Florida beaches. The project was authorized by Congress under section 301 of the Rivers and Harbors Act. The defendant moved the proposed borrow site in response to plaintiff's request that fill not be taken from prime shrimping areas but communications broke down when plaintiffs also complained of the manner in which fill was to be placed on the beaches. Plaintiffs contended that the Environmental Impact Statement for the project was deficient because it failed to consider possible adverse environmental effects on shrimp and other marine life in the affected area. Plaintiffs also alleged that the EIS failed to give adequate consideration to alternatives. The District Court, applying the reasonableness standard of review, held that the EIS compiled with the requirements of the National Environmental Policy Act by adequately setting forth the problems and the effects of the proposed activity on the marine environment. The court denied the preliminary injunction, holding that plaintiffs had standing but failed to show irreparable harm. (Beamer-Florida)
W78-08221

CALIFORNIA DROUGHT OF 1976 AND 1977: EXTENT, DAMAGE, AND GOVERNMENTAL RESPONSE.
Comptroller General of the United States, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 574, Price codes: A06 in paper copy, A01 in microfiche. October 19, 1977. 92 p, 14 fig, 2 append.

Descriptors: *Droughts, *California, *Environmental effects, *Agriculture, *Water conservation, *Legislation, *Water supply, Planning, Hydroelectric power, Power, *Water planning, Governmental response.

Data on the extent and impact of and governmental response to the California drought of 1976 and 1977 are presented. In 1977, California agriculture (especially livestock) was expected to lose $2.4 billion in gross farm income and related industries. Losses in 1976 were estimated at $500 million, but losses to urban and industrial areas were con-

sidered minimal. During 1977, farmers switched to crops requiring less water, pumped groundwater extensively, and took advantage of rising crop prices. The impact on employment, recreation, and electric power generation generally was not large. Hydroelectric power, which normally furnished about 28% of State needs, was cut back by about one-third as a result of low reservoir levels; power-generating alternatives are assessed. Specific state, federal, and local government actions included (1) legislation to help improve water supply systems, purchase and transport water, provide immediate drought relief, and promote water conservation, (2) funding for drought-related emergencies, (3) establishment of a task force to deal with the immediate and long-range implications and to coordinate state, federal, local, and private relief efforts, (4) local and regional emphasis on water conservation, including mandatory and voluntary water conservation measures and (5) reduction by about 60-75% of the amount of water delivered for agriculture by the two major water projects (which provide about 25% of State needs). Water planning and development techniques are described. (Seip-IPA)
W78-08225

STATE WATER CONSERVATION PROJECTS.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 546, Price codes: A05 in paper copy, A01 in microfiche. Report, March, 1977. 187 p, 24 fig, 8 tab, 1 append.

Descriptors: *Montana, *Water conservation, *Projects, *Research and development, *Economics, Inspection evaluation.

The current physical and financial condition of the 41 water conservation projects intitiated by the Montana Water Resources Board (MWRB) and the nature of the involvement of Department of Natural Resources and Conservation in their operation are described. Also reported are: the annual inspection program conducted by the Department, major problems encountered on the projects, information to be included in project critiques, and implementation progress. (Twenty-two of the 41 project reports are presented.) The appendix includes a master list of projects, water rights summary, and a selected bibliography. (Seip-IPA)
W78-08235

THE USE OF GEOMETRIC PROGRAMMING IN THE DESIGN OF AN ALGERIAN WATER CONVEYANCE SYSTEM,
Becht Corp., San Francisco, CA.
For primary bibliographic entry see Field 4A.
W78-08308

A REVIEW OF LOCAL AGENCIES IMPACTING REGIONAL WATER QUALITY MANAGEMENT.
Miami Valley Regional Planning Commission, Dayton, OH.
For primary bibliographic entry see Field 5G.
W78-08315

EVALUATION OF THE COLORADO WATER SUPPLY PROGRAM.
Environmental Protection Agency, Denver, CO. Water Supply Section.
For primary bibliographic entry see Field 5G.
W78-08316

ACCOMPLISHMENT PLAN. REGION VIII. JORDAN RIVER BASIN--SALT LAKE CITY AREA.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W78-08317

EVALUATION OF EFFLUENT REGULATIONS OF THE STATE OF ILLINOIS.
Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5G.
W78-08319

MANPOWER PLANNING CRITERIA MANUAL FOR STATE WATER POLLUTION CONTROL AGENCIES.
Abt Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-08320

ASSESSING IMPACTS OF NEW OCEAN LAW,
Washington Univ., Seattle.
E. Wenk, Jr.
Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, Report WHOI-76-104, November, 1976. 32 p.

Descriptors: *Law of the sea, *Oceans, *International law, *Political constraints, *United Nations, Legal aspects, Technology, Political aspects, Environmental control, Natural resources, Water law, International waters, Treaties, Management, Governments, Waste disposal, Jurisdiction, Boundaries(Surfaces), Population, Food abundance, Energy, Minerals.

Use of the sea for transportation, food, energy, minerals, waste disposal, and recreation is growing so dramatically that the United Nations' Conferences on the Law of the Sea (LOS) have attempted over the past three years to focus on worldwide cooperation to ensure that the deep seas and ocean bottoms will regain the legacy of all human beings. However, initial dedication to global unity has died and nationalism has become paramount as developing nations act out their feelings over historic deprivation. This article's author is fearful that the LOS will fail in its goal of structuring the future of international ocean affairs. Recommendations to effectuate rational management of the oceans include: (1) heroic acts of leadership; (2) anticipating rather than reaccting to crises; (3) use of anticipatory technological assessments; and (4) looking toward a process which is less a game of political power and more one of healthy steering of a 'sociopolitico-technological engine'. Finally, a moratorium on unilateral initiatives will allow planning tools such as technology assessment to be used to identify alternative courses of action and shown United Nations members what the expected results of each course would be. This will hopefully instigate a renewed spirit of cooperation. (Spector-Florida)
W78-08321

HOW THE DRINKING WATER ACT AFFECTS INDUSTRIAL PLANTS,
Allied Chemical Corp., Morristown, NJ. Specialty Chemical Div.
For primary bibliographic entry see Field 5G.
W78-08322

SUBMARINE AREAS AROUND GREAT BRITAIN,
Durham Univ. (England). School of Law.
F. E. Dowrick.
Public Law, p 10-28, Spring 1977.

Descriptors: *Ownership of beds, *Boundaries(Property), *Public rights, *Public lands, *International law, High water mark, Seashores, Intertidal areas, Coasts, Regions, Tidal streams, Tidal marshes, Continental shelf, Estuaries, Bays, Law of the sea, Water law, Exploration.

As the feasibility of extracting wealth from the sea-bed and sea-water becomes economically practical, the question of ownership of areas adjacent to coastlines will arise. This article describes a land survey, confined to Great Britain, which extends seaward from the mean high water mark. The survey works outward starting with the foreshow of the coast and tidal rivers, taking account of the beds of tidal rivers, estuaries and bays, the sea bed under territorial waters, the continental shelf and then out to and including the projected exclusive economic zone. This article defines the legal limis of each of the above areas and then considers the question of who, under English and Scots law is invested with title and what is the degree of ownership. Each section of the article deals with a specific area and culminates in an estimate of the area in terms of square statutory miles. By defining Great Britain as including the land under its internal and territorial waters the proportion of publicly owned land rises drastically. The author suggests that statutes will soon be needed to reconcile the emerging and existing interests in the sub-marine parts of the public domain. (Curran-Florida)
W78-08323

INTERNATIONAL UNITISATION OF AN OFFSHORE GAS FIELD,
Leicester Univ. (England). School of Law.
J. C. Woodliffe.
International and Comparative Law Quarterly, Vol 26, No 2, p 338-53, April 1977.

Descriptors: *International law, *Treaties, *Continental shelf, *Natural gas, Legal aspects, Law of the sea, Foreign waters, International waters, International commissions, Foreign countries, Europe, Oceans, Water law, Natural resources, Water resources, Water resources development, Jurisdiction, Political aspects, Governments.

In 1972 it was discovered that the Frigg gas field in the North Sea extended from the British sector into the Norwegian sector. The discovery activated a treaty procedure agreed upon earlier by the two nations. As a result of negotiations, the first international treaty governing a shared offshore gas field is currently in use. Though the field will be exploited as a single unit, the Frigg Agreement does not apportion the gas on an equal basis. Instead, the reserves will be apportioned by determining the amount of gas in the British and Norwegian sectors of the continental shelf. Provisions regarding exploitation of the gas field include regulations governing the licensees of the two nations. Since the government of Norway has decided to sell its gas to Britain, two undersea pipelines, one British and one Norwegian, will carry gas to Scotland. The Norwegian pipeline will be under concurrent jurisdiction of the two nations. Other treaty provisions include the number of installations, settlement of disputes, emergency action, prevention of pollution, and protection of workers. The Frigg Agreement will probably be a model for future treaties involving offshore resources development between two or more nations. (Malefatto-Florida)
W78-08324

SUSPENDED SOLIDS LIMITATIONS FOR WASTEWATER TREATMENT PONDS.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08325

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM, GENERAL PERMIT PROGRAM (PROPOSED RULES).
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08326

AN ENVIRONMENTAL OVERVIEW OF GEOTHERMAL RESOURCES DEVELOPMENT,
Indiana Univ. at Bloomington. School of Law.
For primary bibliographic entry see Field 5G.

W78-08327

RECENT DEVELOPMENTS IN THE REGULATION OF OCS OIL AND GAS ACTIVITY,
Liskow and Lewis, New Orleans, LA.
For primary bibliographic entry see Field 5G.
W78-08328

LAW OF THE SEA: CONFERENCE AND PROBLEMS OF IMPLEMENTATION.
Proceedings, Law of the Sea Institute Tenth Annual Conference, June 22-25, 1976, University of Rhode Island, Kingston, Rhode Island. 415 p, 5 fig, 19 tab.

Descriptors: *Law of the sea, *International waters, *Environmental control, *International law, *Negotiations, Coasts, International commissions, United Nations, Oceanography, Management, Mining, Boundary disputes, North America, Water law, Legal aspects, Oceans, Economics.

Included in this record of the proceedings of the Tenth Annual Conference of the Law of Sea Institute are commentaries, discussions, and speeches by participants of the conference. These commentaries, discussions, and speeches are categorized into four major areas. Articles relative to the topic of international aspects of economic zone management living resources concern the fisheries policy of the European community, national and international aspects of coastal zone management, vessel traffic management, and the extent to which marine transportation within the zone will be effected by enforcement of proposed pollution controls. Part II deals with modes of establishing exclusive economic zones. This section contains chapters on unilateralism, delimitation, boundaries of the zone, and methods for dispute settlement. Part III includes discussions of environmental provisions in the revised single negotiating text. Implementation of the scientific provisions of the text as well as the present status of the marine science negotiations are also discussed. The topic 'exploitation of the deep seabed' contains commentaries on the environmental consequences of deep-sea mining, U. S. policies and the ocean mining industry, and an evaluation of the seabed revised single text. (Howard-Florida)
W78-08329

PREEMPTION AND THE ROLE OF STATE LEGISLATION IN THE COASTAL ZONE,
McCutchen, Black, Verleger and Shea, Los Angeles, CA.
R. K. Wrede.
Natural Resources Lawyer, Vol. 10, No. 2, p 237-48 (1977).

Descriptors: *Coasts, *Federal-state water rights conflicts, *Supervisory control(Power), *Land management, Shores, Federal jurisdiction, State jurisdiction, Legal aspects, Federal government, Water law, Water rights, Legislation, Management, Regulation, Coastal structures.

According to the doctrine of federal preemption, in any case where there is a discernible conflict between federal law and state action, federal law prevails. Congress may implicitly or explicitly reserve to the states any or all the powers which may be affected by a particular piece of federal legislation. The issue of coastal zone management involves such a saving clause. This presents the question of how much leeway Congress has left the states in the management of their coastal zones by virtue of this clause. It does not appear that the Coastal Zone Management Act has done much to alter the balance of power between state and federal government with regard to coastal zone management. It is not clear exercise of federal preemption, yet it does cede ultimate power to the states. Rather, the Act is intended primarily to provide federal supervision and encouragement. Thus, it seems that the states retain broad discretion to exercise their resource management rights, subject to federal power to intervene in federal or constitutional policy matters. (Rule-Florida)
W78-08330

FLORIDA KEYS COASTAL ZONE MANAGEMENT STUDY.
Florida Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council.
For primary bibliographic entry see Field 6B.
W78-08331

COASTAL ZONE MANAGEMENT,
E. Mullin.
Environment, Vol. 19, No. 8, p 2-3 (November, 1977).

Descriptors: *Coastal engineering, *Coastal plains, *Land management, *Coasts, Legislation, Grants, Water utilization, Erosion, State governments, Atlantic Coastal Plain, Pacific Coast Region, Gulf Coastal Plain, Great Lakes Region, Loca governments, Land use, Zoning, Beach erosion, Beaches, Public access.

Under the Federal Coastal Zone Management Act of 1972, federal aid is provided to coastal states and territories to develop programs to protect the nation's coastal resources. To qualify under the act, a state management plan must: (1) idenify its coastal boundaries; (2) define permissible land and water uses in the coastal zone; (3) designate areas of particular concern; (4) establish adequate legal authorities to ensure effective implementation; (5) establish guidelines for priority uses in different areas; (6) idenify the responsibilities of local, regional, state, and interstate agencies in the complementation of the program; and (7) provide for beach access and erosion and and energy facility siting. To date, only a few areas have received approval for program implementation. The article examines several weaknesses in many state programs. For example, vagueness of policy often prevents strong program implementation. In addition, many states rely on existing use patterns rather than natural resource characteristics to identify permissible uses. Finally, many states lack sufficient legal authorities for implementation, and some rely on local controls. (Quarles-Florida)
W78-08333

THE WINTERS DOCTRINE AS FEDERAL COMMON LAW,
Martineau and Maak, Salt Lake City, UT.
R. J. Grow, and M. N. Stewart.
NAtural Resources Lawyer, Vol. 10, No. 3, p 457-97, 1977.

Descriptors: *Federal-state water rights conflicts, *Reservation doctrine, *Water rights, *Water allocation(Policy), *Common law, Water law, Public lands, Jurisdiction, Water utilization, State governments, Supervisory control(Power), Legislation, Prior appropriation, Legal aspects, Withdrawn lands, Regulation, Federal government, *Winter Doctrine.

Early federal legislation affecting water rights allocated the ownership of water rights as well as the authority to control such rights between the states and the fedral government. However, there are alternative constructions of these acts which spark debate on the proper balance of federal and state ownership. These alternate constructions affect the viability of the Winters doctrine. The doctrine states that where the federal sovereign has expressly withdrawn or reserved lands from the public domain for purposes requireing the use of water, sufficient water is implied reserved to guarantee the present and future fulfillment of those purposes. The federal reserved water rights are junior to those vesting under state law prior to certain of the federal reservation, and senior to all non-federal rights vesting afterwards. Although the Winters doctrine has never been treated by federal courts as federal common law, analysis of the docrine as federal common law will lead to better evaluation of the substantive worth of the doctrine and more accurate prediction of its future development. (Rule-Florida)
W78-08334

THE INDIANA EXPERIMENT,
For primary bibliographic entry see Field 5G.
W78-08335

ZERO DISCHARGE INTO WATERS BY 1985, NO WAY,
For primary bibliographic entry see Field 5G.
W78-08336

COASTAL ZONE LAW AND POLICY,
Washington Univ., Seattle. School of Law.
R. W. Johnson, and R. J. Goldsmith.
1977. 502 p.

Descriptors: *Coastal plains, *Common law, *Legislation, *State governments, *Federal Water Pollution Control Act, Boundaries(Property), Water management(Applied), Coasts, Ecosystems, Fisheries, Management, Jurisdiction, Control systems, Federal government, Interfaces, Treaties, Land use, Eminent domain, Regulation, International law.

This casebook of leading federal and state cases, statutes, and regulations regarding coastal zone management is designed for use in law school courses and may be helpful to lawyers and officials working in the area. Excerpted articles in initial chapters provide an overview of politics of the ocean, the National Coastal Zone Management Act of 1972, natural resources in the zone, and man's activities there. Problems of jurisdiction, ownership and control are examined through case law and articles on land use planning, eminent domain, and the taking issue. Potential jurisdictional conflicts are discussed with regard to international treaties, federal-state relationships, and fisheries. One chapter is entirely devoted to federal controls affecting the zone. This chapter places particular emphasis on the Federal Water Pollution Control Acts and Amendments. State common law development of private rights as well as the public trust doctrine, navigational servitude, express and implied dedication and other public rights, is outlined. The concluding chapter surveys state coastal zone management programs, discussing the programs of California, Delaware, Oregon, Florida, Massachusetts and Washington in detail. (Howard-Florida)
W78-08338

SOUTH DAKOTA'S RESPONSE TO THE 'WATER CRISIS': AN ANALYSIS OF ALTERNATIVES,
R. E. Hayes.
South Dakota Law Review, Vol. 22, No. 2, p 272-96 (Spring 1977).

Descriptors: *South Dakota, *Water rights, *Legislation, *Riparian rights, *Prior appropriation, *Appropriation, Semi-arid climates, Water management(Applied), Reasonable use, Beneficial use, Eminent domain, Irrigation, Groundwater resources, Judicial decisions, Surface waters, Flow, Usufructuary right, Compensation.

The dual system of water rights previously operational in South Dakota, the inherent conflicts between the riparian and appropriative systems, and recent legislative and court attempts purporting to resolve those conflicts are discussed. The riparian system, which vested in every proprietor on the bank of a stream, the right to use water for all reasonable purposes is shown to be problematic because of the state's semi-arid climate. The ap-

propriative systems, permitting water to be diverted from a stream, thus promoting the most efficient use of scarce water resources, is depicted as more desirable. The state attempted to resolve these conflicts in 1955 by effectively declaring all water in the state to be the property of the people. By basing its action on the state's police powers instead of eminent domain, the legislature effectively took or significantly restricted recognized quasi-property rights without compensation. This legislation has since been upheld by state courts as a reasonable exercise of police power. However, the police power justification of this legislation is viewed as potentially dangerous and disruptive should it be expanded from the limited area of water rights to other forms of privte property. (Easterbrook-Florida)
W78-08339

RIPARIAN RIGHTS: THE LAW RETURNS TO ITS FORMER COURSE,
P. D. Cordes, Jr.
Loyola Law Review, Vol. 23, No. 2, p 563-70, Spring, 1977.

Descriptors: *Riparian rights, *Riparian land, *Navigable waters, *Constitutional law, *Boundaries(Property), Legal aspects, State governments, Beds, Beds under water, Grants, Common law, Decision making, Judicial decisions, Boundary disputes, Federal jurisdiction, Federal-state water rights conflicts, Federal government, Riparian waters, State jurisdiction.

The United States Supreme Court has often been asked to decide whether federal or state law is applicable when a navigable waterway alters the contour of a prestatehood federal land grant. This article outlines the common law of riparian rights under such circumstances and traces the Court's recent decisions. Prior to formation of the Union, territories and navigable waters were under 'state' sovereignty. After formation of the Union, but prior to a particular state's statehood, such territories and waters were under federal sovereignty. Upon statehood, ownership of the beds of navigable waterways became vested in the states. Consequently, when a navigable waterway changes its course, the sovereign powers of the state mandates that state law determine the rights of the riparian land owners, including those whose title originated by federal grant. Although Supreme Court decisions have strayed from the principle of state law determination, recently the Court has returned to that theory. The Court has reaffirmed that property ownership is governed by state law rather than general federal law. The author submits that the ability of a state to choose its system of determining riparian borders achieves proper equality among the states. (Spector-Florida)
W78-08340

FREEDOM OF NAVIGATION: THE EMERGING INTERNATIONAL REGIME,
Santa Clara Univ., CA. School of Law.
D. Shelton, and G. Rose.
Santa Clara Law Review, Vol. 17, No. 3, p 523-58, Summer 1977.

Descriptors: *Law of the Sea, *United Nations, *International waters, *International law, *Jurisdiction, Navigation, Resources, Exploitation, Continental shelf, Fishing, Conservation, Competition, Boundary disputes, Coasts, International commissions, Water law, Oceans, Regime, Legal aspects.

The third United Nations Law of the Sea Conference has been working since 1973 to resolve conflicts between maritime states seeking unhampered navigation and access to resources and coastal states seeking exclusive control of adjacent seas. As competition for ocean space and resources intensifies, new legal concepts must be developed to help balance these competing interests. This article examines Part II of the Revised Single Negotiating Text (RSNT) which contains basic compromises between the competing interests of maritime and coastal states. Also examined are the jurisdictional zones the RSNT creates, the rights and duties incident to those zones, the history of the Law of the Sea Conference, and the basic purpose and structure of the RSNT. In addition, the allocation of these rights and duties is examined to determine their impact on existing navigational rights. While Part II of the RSNT may shift the balance in favor of the interests of the coastal states, it contains the basic ingredients necessary to assure navigational freedom as required by maritime states. (Spector-Florida)
W78-08341

WETLANDS CONTROVERSY: A COASTAL CONCERN WASHES INLAND,
K. R. Martin.
Notre Dame Lawyer, Vol. 52, No. 5, p 1015-34, June 1977.

Descriptors: *Wetlands, *Regulation, *Inland waterways, *Natural resources, Control, Boundaries(Property), Compensation, Supervisory control(Power), Future planning(Projected), Legislation, State governments, Judicial decisions, Constitutional law, Jurisdiction, Public rights, Water management(Applied), Economic efficiency, Marshes, Eminent domain, High water mark.

Legislative recognition of the importance of coastal wetlands and the developing judicial concern that such recognition may affect constitutional safeguards against government appropriation of private property are discussed in this article. These legislative and judicial developments may provide sufficient indicia of the probable success interior states will have in formulating wetlands regulatory statutes. The enactment of effective legislation for the inland states involves questions concerning who should control the interior wetlands and how this control can be economically and constitutionally manifested. The author advocates state control over wetlands through legislation seeking to establish uniform criteria for state wide application. In discussing the scope and legal sufficiency of a statutory definition which would accurately describe and inventory the wetlands, approaches adopted by different states and the problems these inventory methods pose are analyzed. Included is an examination of the criteria considered in determining the mean high water line. Also discussed is the lawful extent of the police power in regulations adopted by the state to control use of the wetlands. The problem of enacting legislation which will withstand constitutional attack is also considered in this article. (Howard-Florida)
W78-08342

LEGISLATIVE AND JUDICIAL ATTENTION TO STREAM MODIFICATION: CHANNELIZATION, ITS EFFECTS AND ALTERNATIVES,
Syracuse Univ., NY. School of Law.
M. Migliore.
Cumberland Law Review, Vol. 8, No. 1, p 21-75, (Spring, 1977).

Descriptors: *Flood control, *Governments, *Planning, *Stream improvement, Channel improvement, Channel morphology, Erosion control, Flood protection, Hydraulic structures, Legal aspects, Legislation, Meanders, Regulation, River training, Social aspects, Streambeds, Stream stabilization, Water law.

Channelization is the straightening, deepening, widening, clearing, or lining of an existing stream or the dredging of a new channel to which a stream is diverted. The primary purpose of channelization projects is flood control. The modern flood control techniques as utilized by the Army Corps of Engineers, Soil Conservation Service and private drainage districts have a drastic effect on the environment and have recently become the focus of considerable concern. The National Environment Protection Acts requirements have brought channelization to the attention of the courts. But, a reading of judicial opinions commenting on the inadequacies of the environmental impact statements submitted by participating agencies reads like a litany of administrative incompetence, myopic anti-environmental bias and lack of candor. A full disclosure statement required by NEPA must contain a full and objective discussion of the alternatives to any proposed channelization project. The alternatives to channelization are: (1) structural alternatives such as levees, floodways and reservoirs, (2) strict building and housing codes, (3) flood plain zoning, (4) flood proofing structures, and (5) flood risk insurance. (Jordan-Florida)
W78-08343

PROBLEMS OF LEGAL SECURITY OF THE WORLD HARD MINERALS INDUSTRY IN THE INTERNATIONAL OCEAN,
Deepsea Ventures, Inc., Miami, FL.
R. J. Greenwald.
Natural Resources Lawyer, Vol. 4, No. 3, p 639-45, (1971).

Descriptors: *Mineral industry, *Continental margins, *International law, *United Nations, *Jurisdiction, Oceans, Reasonable use, Negotiations, Investment, Claim(Contracts), Political aspects, Legislation, Public lands, Exploration, Dredging, Regime, Exploitation, Management, United Nations, Legal aspects, Technology, Mineralogy, Mining.

As populations and expectations grow, the world hard minerals industry endeavors to provide the world with enough useable minerals to supply developed countries while helping developing countries meet their goals of accelerating progress. The industry must increase supply as well as decrease the costs of minerals. Its efforts are hampered by the interplay of political pressures, inadequacy of existing international legal theory and practice, and the introduction of revolutionary legal theory by Third World nations. Specifically cited in this article are United Nations actions which have promoted effective restraint or prohibition of ocean mining by nations capable of exploiting the mineral resources beyond their continental margins and the lack of Administration efforts to implement President Nixon's call for an interim regime to encourage exploration and exploitation. Ocean miners need to be secure in their rights to exclusive use and title to goods recovered. The author suggests as an interim plan a system of national licensing of mine sites under which exclusive rights to sites would be enforced beyond the continental margins against other nationals of the licensing nation only. Under this system, duties could be established which would take into account the reasonable interests of all nations. (Spector-Florida)
W78-08344

THE FUTURE OF OUR CONTINENTAL SHELF AND THE SEABEDS,
Senate, Washington, DC.
T. Stevens.
Natural Resources Lawyer, Vol 4, No 3, p 646-53, 1971.

Descriptors: *Continental Shelf, *Continental margins, *United States, *Natural resources, *International law, Constitutional law, International waters, Jurisdiction, Offshore platforms, Investment, Treaties, Leases, Navigation, Fishing, Research and development, Exploration, Exploitation, Technology, Administration.

For the past two years, a Senate subcommittee has been studying the question of sovereignty and control over the continental shelf and seabeds. This subcommittee differed with the Administration's

suggestion that the United States renounce its sovereign rights to the continental margin in return for limited rights in a trustee-ship zone. It also rejected the suggestion that leases to areas of the continental shelf beyond the 200-meter isobath be issued by an international regime. The article not only summarizes the subcommittee's objections to the Administration's proposal but also emphasizes its support of the well established freedom of the seas doctrine. This doctrine guarantees international freedom of navigation, overflight, fishing, and cable and pipeline placement. It also implies freedom to research and explit high seas resources although this freedom has been tempered to declare that all coastal nations own the mineral estate of their continental margins. Claiming that the sovereign right of each coastal nation to exploit the natural resources of its continental shelf is not dependent on the acquiescence of any other nation, the sub-committee seeks affirmance of and adherence to existing international law rather than support of the Administration's policy favoring trusteeship. (Spector-Florida)
W78-08345

RIGHTS OF COASTAL NATIONS TO CONTINENTAL MARGINS,
Ad Hoc Committee on Mineral Resources Beneath the Sea, Washington, D.C.
L. W. Finlay.
Natural Resources Lawyer, Vol 4, No 3, p. 668-75, 1971.

Descriptors: *Treaties, *International law, *Regime, *United Nations, *United States, Exploration, Exploitation, Jurisdiction, International waters, Leases, Legal aspects, Continental margins, Continental shelf, Pollutants, Coasts, Oceans, Investment, Islands, Military aspects, Beds under water.

Pursuant to a 1970 Presidential statement expressing a desire to provide for exploration and exploitation in progressively deeper waters of the sea, the United States presented a draft treaty on trusteeship of the international seabed area to the United Nations. Its provisions give coastal nations substantial but limited rights as trustees for the international community with respect to that portion of their continental margins beyond a depth of 200 meters. This article examines that draft and suggests revisions. The author contends that land-locked and shelf-locked nations would benefit too greatly at the expense of coastal nations, and the proposed mass of detailed controls by the international regime would deter rather than promote exploration and exploitation. Also criticized are provisions which: (1) grant all residual powers to the international regime; (2) provide for suspension of a nation's trustee rights as a penalty for nonconformance; (3) strip signatories of the right to prevent erection of man-made islands on their continental margins; and (4) prohibit all military uses of the seabed beyond the 200-meter isobath. It is suggested that the drafters take a fresh look at the President's objectives and redraft the treaty in a manner which will eliminate the problems forecast in this article. (Spector-Florida)
W78-08346

UNITED NATIONS WATER CONFERENCE ADOPTS PLAN OF ACTION IN ARGENTINA.
U.N. Chronicle, Vol 14, No 4, p 35-39, April 1977.

Descriptors: *United Nations, *Foreign waters, *Foreign countries, *Federal jurisdiction, Water law, Public rights, Public health, Irrigation programs, Irrigation efficiency, Irrigation, Industrial water, Public benefits, Industrial wastes, Floods, Flood forecasting, Flood data, Flood control, Fish farming, Erosion control, Economics, Potable water.

Ensuring adequate water supplies for the earth's expanding population and its growing economic activities is a crucial world. The United Nations Water Conference has adopted a special action plan on community water supply and waste disposal. This plan calls for commitments from national governments to provide all people with water of safe quality and adequate quantity as well as basic sanitary facilities by 1990. In addition, action plan dealing with agricultural water use was adopted. Under this plan agricultural land will be protected from flooding and waterlogging. Through supervision and control of water distribution and use, irrigation and rainfed agricultural will be improved and extended. The Conference has recommended that countries provide economic incentives for recycling industrial waste water. Also recommended are national regulations prohibiting the discharge of untreated wastes from ships. Other recommendations involve flood forecasting and warning systems. Special attention is given to international and regional cooperation, particularly where countries share a common water supply. In these instances, the Conference recommends the establishment of joint committees to manage such areas. (Wright-Florida)
W78-08347

AN OFFER TOO GOOD TO REFUSE,
Department of the Interior, Washington, DC.
N. P. Reed.
Parks and Recreation, Vol 12, No 2, 15a-17a, February 1977.

Descriptors: *Water quality standards, *Conservation, *Recreation, *Land use, *Federal Water Pollution Control Act, Landfills, Zoning, Management, Reclamation, Environmental effects, Planning, Discharge(Water), Permits, Sewage treatment, Fish, National parks, Recreation, Dredging, Wildlife.

The Federal Water Pollution Control Act Amendments of 1972 require that we act as custodians of our nation's waters, restoring them to their intended role in nature after we have used them for man's benefit. They set standards for clean water; require permits for discharge from point sources, subject dredge and fill operation to review and permitting; call for regional, state, and local planning systems to achieve water quality standards; and provide federal funding for the construction of sewage treatment plants. This article illuminates the benefits that can be obtained from imaginative implementation of the amendments. It also discusses how the amendments can be used to further the objectives of the Bureau of Outdoor Recreation, the Fish and Wildlife Service and the National Park Service. Examples are given of how each department can use specific provisions to protect natural resources, encourage recreation programs, and benefit fish and wildlife. A close examination of programs being pursued by these three departments under the act show that progress has been made; but that work still needs to be done so that the unlimited benefits that can be provided under the amendments are achieved. (Spector-Florida)
W78-08348

AN OPEN TAP FOR TAYLOR SLOUGH,
National Park Service, Washington, DC. Resource Management Div.
L. P. Purkerson, and D. Morrow.
Parks and Recreation, Vol 12, No 2, p. 31a-34a, February 1977.

Descriptors: *Florida, *National parks, *Federal Water Pollution Control Act, *Swamp, *Water conservation, Aquatic environment, Aquatic habitat, Economics, Federal government, Fishing, Legislation, Local government, Marshes, Public lands, Recreation, Shallow water, State governments, Water quality.

The Everglades National Park does not contain all of the famous 'river of grass' known as the Everglades. Large as it is, the park does not include the northern and eastern reaches of the swamp, although it remains dependent upon the continued flow of water from those areas. Currently, the park's most critical concern is over an area known as Taylor Slough, approximately ninety square miles of which lie outside of the park. The immediate economic interests of private corporations seem to favor responding to increased pressure for agricultural, industrial and residential development in the region. Section 208 of the FWPCA which establishes state responsibility for water management planning to achieve comprehensive state plans controlling future use and development of waters within the state is a key provision which has been selected for special demonstration projects. Although the proposed 208 demonstration project for the park is only beginning to take shape in raw outlines, the future of both the plan and the park looks bright. (Jordan-Florida)
W78-08349

THE FEDERAL RECLAMATION PROGRAM.
For primary bibliographic entry see Field 5G.
W78-08350

THE STORY OF A DAM,
W. Wieking.
Western Water, p 3-8, November-December 1977.

Descriptors: *Dam construction, *Dam design, *Dam failure, *Earthquake engineering, *Seismic design, Disaster, Construction, Dams, Dam sites, Floods, Flood damage, Arch dams, Concrete dams, California, Earthquakes, Engineering geology, Seismic studies, Water storage, Political aspects, Governmental interrelations, Federal government, State governments, Flood control, Central Valley Project.

Construction on the Auburn Dam in California's Central Valley was scheduled to begin late in 1965. However, the U.S. Bureau of Reclamation Project has not yet gotten past the excavation stage. In the meantime, the project's estimated cost has increased from $427,000,000 to $1.1 billion. Concern over what effects an earthquake would have on the dam has been the project's main obstacle. Three state review boards are currently studying the safety question. Their findings will be fowarded to the Department of Interior, the President, and Congress for a final decision on the dam. Opponents of the dam cite a report which claims that a major earthquake would crack the dam and cause disastrous floods in the region, which includes Sacramento. Proponents maintain that the dam could withstand any earthquake likely to occur. They say the dam would in fact provide flood control for the area. Proponents of the project also point out that it would provide hydroelectric power, additional water for agriculture, and the recreational value of the reservoir. In reply, opponents state that the natural recreational value of the American River Canyon would be destroyed by the dam. (Malefatto-Florida)
W78-08351

IMPORTANCE OF ANALYSES FOR YOUR NPDES PERMIT,
Abbott Labs., North Chicago, IL. Corporate Environmental Services.
For primary bibliographic entry see Field 5G.
W78-08352

WATER POLLUTION REMEDIES--USE OF PUBLIC NUISANCE THEORY IN SUIT BY FEDERAL AND STATE GOVERNMENTS,
For primary bibliographic entry see Field 5G.
W78-08353

A LEGISLATIVE-POLITICAL HISTORY OF THE COASTAL ZONE MANAGEMENT ACT OF 1972,
Wisconsin Univ.-Madison. School of Law.
Z. L. Zile.

Coastal Zone Management Journal, Vol 1, No 3, p 235-274 (1974). 152 ref.

Descriptors: *Coasts, *Management, *Planning, *Legislation, *Comprehensive planning, Future planning(Projected), Long-term planning, Decision making, Estimated benefits, Estimated costs, Governments, Federal government, Administrative agencies, Social aspects, Coastal engineering, Land development, Land management, Regulation, Legal aspects, Water law, Zoning, Oceans, Estuaries, *Coastal Zone Management Act of 1972, *Estuary Protection Act, *Marine Resources and Engineering Development Act of 1966, Coastal waters, Coastal zone management, Congressional hearings.

The Coastal Zone Management Act (CZMA) of 1972 was signed late in an election year with presidential misgivings. It was fiscally starved thereafter. It is poorly drafted, deficient in substantive standards, vague on policy, and uncertain regarding agency responsibility. The Act developed in four distinct phases, each emphasizing a different concern of coastal management. The earliest expressed public interest had a recreational bias. This was brought about by the advent of more leisure time, and the need for more parks. Along with the desire to save our shorelines for recreational purposes, came the desire to protect critically endangered coastal habitats. Known as the estuary protection phase, this era was characterized by extensive debate and numerous hearings conducted in both houses of Congress; it eventually resulted in the Estuary Protection Act. The next phase concerned coastal planning. Interest for this phase developed in response to the Water Resources Planning Act. The same concern for coastal management was echoed in the Marine Resources and Engineering Development Act of 1966. Almost simultaneously with the ocean management phase emerged the land use policy phase. This was spawned by the growing concern at all levels of government for comprehensive master plans for future development. The Coastal Zone Management Act of 1972 reflects each of these antecedent phases, and it fails in its attempt to weave them into a consistent whole. (Moorhouse-Florida)
W78-08355

PRELIMINARY LEGAL CONSIDERATIONS IN DEVELOPING ARTIFICIAL REEFS,
Texas A and M Univ., College Station. Dept. of Management.
J. L. Seymour.
Coastal Zone Management Journal, Vol 2, No 2, p 149-169 (1975). 3 fig, 80 ref.

Descriptors: *Reefs, *Project planning, *International law, *Fish management, Federal Water Pollution Control Act, Law of the sea, Navigable waters, Continental shelf, Legal aspects, Governmental interrelations, Jurisdiction, Regulations, Supervisory control(Power), Federal government, Environmental effects, United Nations, Coastal structures, Fishing, Administrative agencies, *Coastal Zone Management Act(CZMA), *Coastal waters, *Coastal zone management, National Environmental Policy Act(NEPA), Territorial sea(Jurisdiction), Administrative regulations, Artificial reefs.

Artificial reefs appear to be a desirable means of optimizing our returns from the sea. These reefs, which can be constructed from a number of materials, pose numerous legal questions which need to be resolved. Of primary importance are issues surrounding the location, construction, operation, and management of the artificial reefs. Both state and federal regulatory policies will have a direct impact on these issues. On a general level, the Coastal Zone Management Act (CZMA) will insure that priorities balancing public interests allowing for both development and protection, preservation and restoration are considered. Specific protection of marine environment and fishery resources will be assured by the application of such laws as the National Environmental Policy Act (NEPA), the Fish and Wildlife Coordination Act, the Marine Protection, Research and Sanctuaries Act, the Continental Shelf Act, and the Federal Water Pollution Control Act (FWPCA). Jurisdictional aspects of control relating to ownership of artificial reefs is affected not only by state and federal territorial policies, but also by the lack of international agreement on the law of the sea. Efforts are now under way in the United Nations to resolve this problem. (Petruff-Florida)
W78-08357

A DECADE OF NONDEGRADATION POLICY IN CONGRESS AND THE COURTS: THE ERRATIC PURSUIT OF CLEAR AIR AND CLEAN WATER,
Iowa Univ., Iowa City. Coll. of Law.
For primary bibliographic entry see Field 5G.
W78-08393

CONCLUSIONS DRAWN FROM THE REVIEW OF ENVIRONMENTAL POLICIES OF JAPAN.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-08397

U. S. ARMY CORPS OF ENGINEERS PERMIT PROGRAM, A GUIDE FOR APPLICANTS,
Office of the Chief of Engineers (Army), Washington, D.C.
Report EP 1145-2-1. November, 1977. 20 p.

Descriptors: *Rivers and Harbors Act, *Permits, *Administrative agencies, Legislation, Wetlands, Rivers, Navigation, Regulation, Legal aspects, Corps of Engineers.

This pamphlet is designed to assist a person applying for a Corps of Engineers permit. Permits are required for authorizing structures and work in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. The pamphlet is not intended to be a complete description of all aspects of the permit program, but will provide basic, general information of a non-technical nature. Full explanation of the program may be found in the regulations, 33 Code of Federal Regulations, Parts 320 through 329. (Steiner-Mass)
W78-08405

LEGISLATION NEEDED TO PROMOTE CONSERVATION AND RECYCLING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W78-08497

POLITICAL EFFICIENCY AND POLITICAL EFFECTIVENESS IN WATER-RELATED POLICY AREAS: A REPORT OF RESEARCH RESULTS ON THREE STATE AGENCIES IN OREGON,
Oregon State Univ., Corvallis. Dept. of Political Science.
W. B. Shepard, and D. J. Doubleday.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 060, Price codes: A07 in paper copy, A01 in microfiche. Water Resources Research Institute, Oregon State University, Completion Report No. WRRI-55, November 1977. 132 p, 29 tab, 2 append. OWRT A-030-ORE(1).

Descriptors: *Political aspects, State agencies, *Institutional cooperation, *Water policy, *Local governments, *State governments, *Oregon, Legal aspects, *Institutional constraints.

Major objectives were to study: (1) the nature and salience of local concerns with respect to the structure and substance of state policies affecting the use of water resources; (2) the various state policies and procedures which will likely elicit voluntary local compliance or substattial and potentially effective resistance at the local level; and (3) those aspects of water policy which may be successfully established in a uniform manner for large areas of the state and those portions of state water policy for which considerable flexibility would appear requisite given varying desired and consumptive preferences among localities. Specific conclusions are presented under the following sections: Local concerns about state water-related policies and agencies; Uniformity and flexibility in state water-related policy; and Factors facilitating and inhibiting local compliance.
W78-08519

WINTER'S DOCTRINE: A REVIEW,
Nevada Univ., Reno. Dept. of Civil Engineering.
J. W. Bird.
ASCE Journal of the Irrigation and Drainage Division, Vol. 103, No. IR4, p 395-400, December, 1977. 9 ref, 1 append.

Descriptors: *Appropriation, Beneficial use, Federal government, State government, *Water law, *Water rights, *Winter's Doctrine, *Reviews, *Indian reservations, Indian water rights.

The western states are areas of short water supply. In general, they apply the water law doctrine of appropriation that relates a water right to the time or date that the right started. The Federal government has applied for water rights at a much later time, but with an early appropriation date. This would give the Federal agencies priority over the existing water users, many of which have been beneficially using the water for years. Since the Federal agencies apparently have decided, through the courts, their ability to act unilaterally in this matter, it is apparent that guidance from the Congress is sorely needed in this matter. Otherwise the state's water laws shall be greatly weakened, along with state water planning and policy. (Skogerboe-Colorado State)
W78-08718

DRAINAGE LAW ASSISTS LAND DRAINAGE,
Guelph Univ. (Ontario). Dept. of Engineering.
R. W. Irwin, and J. R. Johnston.
American Society of Agricultural Engineers, Saint Joseph, Michigan, Paper Number 77-2560, (1977). 12 p, 59 fig.

Descriptors: *Drainage, Drainage systems, Drains, Drainage practices, *Water law, *Drainage laws, Legal aspects, *Canada(Ontario).

Drainage law in Ontario is integrated to provide systems of procedures, financing and inspections to ensure that agricultural drainage proceeds in a deliberate and fair way. The law covers the construction of outlet drains, on-farm tile drains and the regulation of the drainage construction industry. (Skogerboe-Colorado State)
W78-08722

PHASE II, ARIZONA STATE WATER PLAN: ALTERNATIVE FUTURES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W78-08725

A WATER SUPPLY DATA BASE,
Arizona Univ., Tucson. Management Information Systems.
For primary bibliographic entry see Field 7C.
W78-08726

ARIZONA WATER POLICY: CHANGING DECISION AGENDAS AND POLITICAL STYLES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
H. J. Cortner, and M. P. Berry.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 7, Proceedings, Meetins of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 7-14. 35 ref.

Descriptors: *Political aspects, Constraints, *Institutional constraints, Administration, Area development, Jurisdiction, *Water resouces development, Governmental interrelations, Local governments, Institutions, *Public utilities, *Water control, Water utilization, *Arizona, *Water policy.

It is argued that Arizona has traditionally and persistently pursued a style of politics in which state government is a reactor rather than an initiator, and that its role has been subordinate to the federal government and local and private water users. The lack of adequate water policies has led to an inability to respond to new conditions and demands, such as conflicts among traditional water users, Indian claims, rising water costs, energy developments and environmental concerns. Past themes of administrative fragmentation and lack of concern over water and water planning have been responsible for these deficiencies. There is some evidence that the customary decision-making process is changing and the state is establishing its own water planning capability. (Payton-Arizona)
W78-08727

ALTERNATIVE ENERGY SOURCES IN THE USSR,
Royal Swedish Academy of Science (Stockholm).
For primary bibliographic entry see Field 3F.
W78-08736

POLITICAL, SOCIAL, AND ECONOMIC ASPECTS OF SOIL EROSION AND SEDIMENTATION CONTROL PROGRAMS,
Ohio State Univ., Columbus. Dept. of Agronomy.
F. E. Heft.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 23-30.

Descriptors: *Economics, Erosion, Sediments, *Soil erosion, *Political aspects, *Social aspects, Social values, *Erosion control, Sediment control.

The politics and economics of soil erosion and sedimentation controls on private land through management practices have the potential of a significant economic impact on the owner should such controls be unreasonable. The lack of these control practices generates significant economic impacts upon the off-site systems and enterprises requiring sediment-free water and minimum depth drainage outlets and navigable channels. Significant in addressing economic aspects is the basic capability of an industry or system to add their control costs into their product price to the consumer. The agricultural community is uniquely void of this capability and must be given consideration for economic compensation for those control practices required which are not cost beneficial. In Ohio, at the request of the legislative branch, a brief economic evaluation was made of proposed soil erosion and sedimentation control legislation. (See also W78-08787) (Skogerboe-Colorado State)
W78-08790

6F. Nonstructural Alternatives

COMPREHENSIVE FLOOD PLAIN STUDIES USING SPATIAL DATA MANAGEMENT TECHNIQUES,
Hydrologic Engineering Center, Davis, CA.
D. W. Davis.
Water Resources Bulletin, Vol. 14, No. 3, p 587-604, June 1978. 4 fig, 5 tab, 8 ref.

Descriptors: *Floodplains, *Planning, *Assessment, *Management, *Methodology, *Computer models, Flood damage, Environmental effects, Urban hydrology, *Spatial analysis, *Data management, Computer programs, Land use, Watersheds(Basins), Systems analysis.

A pilot study undertaken to develop and test analytical methodologies for application in comprehensive flood plain information studies is described. The methodology permits and encourages comprehensive, systematic, practical assessments of present and alternative future basin-wide development patterns as reflected by alternative land use patterns and physical works in terms of flood hazard, economic damage potential and selected environmental consequences. The analysis methodologies are centered around integrated use of computerized spatial, gridded geographic and resouce data files. A family of special purpose utility computer programs access the data file and extract appropriate variables and interpret and format the data into specific analytical parameters that are subsequently formatted for input to traditional modeling computer programs. An example application to Trail Creek in Clarke County, Georgia is described. (Graf-Cornell)
W78-08307

6G. Ecologic Impact Of Water Development

OSO CREEK FLOOD CONTROL PROJECT AREA, NUECES COUNTY, TEXAS: A REPORT ON THE ARCHAEOLOGICAL AND HISTORICAL RESOURCES,
Texas Univ. at Austin, TX.
For primary bibliographic entry see Field 4A.
W78-08229

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACTS FROM OIL SHALE DEVELOPMENTS,
TRW, Inc., Redondo Beach, CA. Environmental Engineering, Div.
For primary bibliographic entry see Field 5C.
W78-08246

TRANSURANICS IN NATURAL ENVIRONMENTS.
Energy Research and Development Administration, Las Vegas.
For primary bibliographic entry see Field 5B.
W78-08248

HYDROLOGIC AND ECOLOGIC INVENTORIES OF THE COASTAL WATERS OF WEST HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2L.
W78-08311

PHYTOPLANKTON OF THE LOWER COLORADO RIVER, GRAND CANYON REGION,
Arizona State Univ., Tempe.
W. M. Crayton, and M. R. Sommerfeld.
Journal of the Arizona - Nevada Academy of Science, Vol 13, No 1, p 19-24, February, 1978. 1 fig, 2 tab, 24 ref.

Descriptors: *Phytoplankton, *Diatoms, Plankton, Water sampling, On-site data collections, Hydrologic data, *Colorado River, Aquatic microorganisms, *Arizona.

The purpose of this investigation was to determine the phytoplankton species composition, population size, and distribution within a study area of the Colorado River, extending from Lees Ferry to Diamond Creek. Sampling for phytoplankton, at 33 sites 1975-76, revealed a total of 63 genera and 127 species, including 73 diatoms. Dominant species were Diatom vulgare Bory, Rhoicosphinia curvata (Kutz.) Grun and Cocconeis pediculus Ejr. A detailed list of the phytoplankton species and their relative abundance was included in the report. This section of the Colorado was found to have a small, evenly distributed phytoplankton population, dominated by tychoplankters. The presence of the tychoplanktonic forms probably resulted from widely fluctuating river levels, high current velocity, and turbulence. Few euplanktonic species were found in the river. Low water temperature, high turpidity, and limited age of the water appear to preclude the development of a larger euplanktonic population. (Jewkes-Arizona)
W78-08354

LIMNOLOGICAL CHARACTERISTICS AND FISHERY POTENTIAL OF MAN-MADE DESERT PONDS,
Arizona Cooperative Fishery Research Unit, Tucson.
For primary bibliographic entry see Field 2H.
W78-08356

A LOG OF THE VERDE THE 'TAMING' OF AN ARIZONA RIVER,
Northern Arizona Univ., Flagstaff. Center for Intergrated Studies.
For primary bibliographic entry see Field 5C.
W78-08373

WHO KILLED THE GILA,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5C.
W78-08375

CONCLUSIONS DRAWN FROM THE REVIEW OF ENVIRONMENTAL POLICIES OF JAPAN.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-08397

LAGOON OF ISLANDS, TASMANIA--DEATH KNELL FOR A UNIQUE ECOSYSTEM,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
P. A. Tyler.
Biological Conservation, Vol. 9, No. 1, p 1-11, January, 1976. 9 fig, 5 ref.

Descriptors: *Islands, Sedges, Reeds, Water level, *Ecosystems, Dams, Wetlands, Water storage, Lake basins, *Lagoon of Islands(Tasmania), *Island formation, Floating mat, Callistemon viridiflorus, Australia.

Lagoon of Islands is a partly filled-in lake basin covered by a floating mat of rhizomatous Chorisandra cymbaria and Baumea rubiginosa (Cyperaceae) on which islands are formed by a graphic process. Tussocks of Carex appressa are colonized first by herbaceous then by woody plants, forming a growing island. The accumulating weight of an island leads to its own destruction by sinking and waterlogging. This unique aquatic site is seriously threatened by the use of the basin as a minor water storage site. (Stihler-Mass)
W78-08417

POPULATION CHANGE, MIGRATION AND DISPLACEMENT ALONG THE MCCLELLAN-KERR RIVER NAVIGATION SYSTEM,
Missouri Univ.-Columbia. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W78-08426

FINAL ENVIRONMENTAL IMPACT STATEMENT--CITY OF JACKSONVILLE, FLORIDA WASTEWATER MANAGEMENT FACILITIES, ARLINGTON-EAST SERVICE DISTRICT.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5D.
W78-08506

DIRECT ENVIRONMENTAL FACTORS AT MUNICIPAL WASTEWATER TREATMENT WORKS--EVALUATION AND CONTROL OF SITE AESTHETICS, AIR POLLUTANTS, NOISE AND OTHER OPERATION AND CONSTRUCTION FACTORS,
For primary bibliographic entry see Field 5G.
W78-08507

PROGRAM REVIEW PROCEEDINGS OF: ENVIRONMENTAL EFFECTS OF ENERGY RELATED ACTIVITIES ON MARINE/ESTUARINE ECOSYSTEMS.
Environmental Protection Agency, Washington, D.C. Office of Energy, Minerals, and Industry; and Environmental Protection Agency, Washington, D.C. Office of Research Development.
For primary bibliographic entry see Field 5C.
W78-08520

ECOLOGICAL CHARACTERIZATION: AN AID TO DECISION MAKING,
Fish and Wildlife Service, Bay Saint Louis, MS. Office of Biological Services.
For primary bibliographic entry see Field 5C.
W78-08525

AN ECOLOGICAL CHARACTERIZATION OF THE CHENIER PLAIN OF SOUTHWESTERN LOUISIANA AND SOUTHEASTERN TEXAS: OBJECTIVES AND METHODOLOGIES,
Energy Resources Co., Inc., Cambridge, MA.
For primary bibliographic entry see Field 2L.
W78-08526

THE CONSTRUCTION OF A CONCEPTUAL MODEL OF THE CHENIER PLAIN COASTAL ECOSYSTEM IN TEXAS AND LOUISIANA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources; Florida Univ., Gainesville. Center for Wetlands; and Energy Resources Co., Cambridge, MA.
For primary bibliographic entry see Field 2L.
W78-08527

FATE AND EFFECTS OF CONTAMINANTS MARINE ECOSYSTEMS AND ORGANISMS,
National Oceanographic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 5C.
W78-08528

LABORATORY AND FIELD STUDIES ON THE LONG-TERM EFFECTS OF PETROLEUM HYDROCARBONS ON BENTHIC MARINE INVERTEBRATES,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
For primary bibliographic entry see Field 5C.
W78-08529

ENVIRONMENTAL ASSESSMENT OF NORTHERN PUGET SOUND AND THE STRAIT OF JUAN DE FUCA,
National Oceanographic and Atmospheric Administration, Seattle, WA.
For primary bibliographic entry see Field 5C.
W78-08530

ENVIRONMENTAL ASSESSMENT OF AN OFFSHORE OIL FIELD: A PROGRESS REPORT,
National Marine Fisheries Service, Galveston, TX. Southeast Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-08531

A STANDARD PROGRAM FOR ENVIRONMENTAL IMPACT ASSESSMENT: PHASE I--ICHTHYOPLANKTON SAMPLING,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
M. A. M. Hyman, E. Lorda, and S. B. Saila.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 153-159.

Descriptors: *Plankton, *Water pollution effects, *Sampling, *Model studies, Baseline studies, Environmental effects, *Outer Continental Shelf, Environmental assessment, Ichthyoplankton, Narragansett Bay.

The complexity of estuarine ecosystems and the growing need for proper management decisions and regulations have placed a high priority on large-scale integrated models. However the practical effectiveness of predictions from such a model is limited. It is suggested that a successful environment impact assessment program is predicated on a sequence of carefully planned experiments designed to answer specific questions, rather than on a general measurement system. This carefully planned standard program can then be used for establishing suitable guidelines for more routine types of assessment. To assign sources of variability in ichthyoplankton surveys more accurately, an intensive sampling scheme was proposed for a single site. The purpose of this study was to work toward producing a standard program for ichthyoplankton sampling. If variability is assigned to various effects, as opposed to being confined into an overall error term, data will be of an overall higher consistency and, thus, generally more useful. Specifically, once this variability is better understood, any modeling effort should prove more productive. (See also W78-08520) (Sinha - OEIS)
W78-08532

EFFECTS OF CHEMICAL USE IN OFFSHORE WELL-DRILLING OPERATIONS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-08533

THE CHEMISTRY AND ECOLOGICAL EFFECTS OF CHLORINATION OF SEAWATER: A SUMMARY OF EPA RESEARCH PROJECTS,
Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station; Miami Univ., FL. Div. of Chemical Oceanography.
For primary bibliographic entry see Field 5C.
W78-08534

POWER PLANT COOLING WATER CHLORINATION IN NORTHERN CALIFORNIA,
California Univ., Berkeley. Coll. of Engineering; and California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5B.
W78-08535

ENVIRONMENTAL REQUIREMENTS AND POLLUTIN TOLERANCE OF COMMON FRESHWATER CHIRONOMIDAE,
Florida Agricultural and Mechanical Univ., Tallahassee. Lab. of Aquatic Entomology.
For primary bibliographic entry see Field 5C.
W78-08636

ECOSYSTEM PROCESSES AND ORGANIC CONTAMINANTS: RESEARCH NEEDS AND AN INTERDISCIPLINARY PERSPECTIVE,
Institute of Ecology, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08649

THE EFFECTS OF PRECIPITATION ON AQUATIC AND TERRESTRIAL ECOSYSTEMS: A PROPOSED PRECIPITATION CHEMISTRY NETWORK, DEPT. OF ENVIRONMENTAL SCIENCES.
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5C.
W78-08762

7. RESOURCES DATA

7A. Network Design

SHIPBOARD ENVIRONMENTAL DATA ACQUISITION SYSTEM,
National Weather Service, Silver Spring, MD.
For primary bibliographic entry see Field 5A.
W78-08541

THE HARMONIZATION OF THE MONITORING OF THE QUALITY OF INLAND FRESH WATER,
Department of the Environment, London (England).
For primary bibliographic entry see Field 5A.
W78-08548

7B. Data Acquisition

DEVELOPMENT OF A SYSTEM FOR CONDUCTING INTERLABORATORY TESTS FOR WATER QUALITY AND EFFLUENT MEASUREMENTS,
FMC Corp., San Jose, CA. Advanced Products Div.
For primary bibliographic entry see Field 5A.
W78-08227

APPLICATION OF REMOTE SENSING TO THE CHESAPEAKE BAY REGION: VOLUME 1 - EXECUTIVE SUMMARY.
National Aeronautics and Space Administration, Greenbelt, MD. Goodard Space Flight Center.
For primary bibliographic entry see Field 5A.
W78-08232

EFFLUENT MONITORING PROCEDURES: BASIC LABORATORY SKILLS - STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, MD.
For primary bibliographic entry see Field 5A.
W78-08233

REMOTE SENSING OF EFFECTS OF LAND USE PRACTICES ON WATER QUALITY,
Kentucky Univ., Lexington. Dept. Forestry.
For primary bibliographic entry see Field 5B.
W78-08237

SNOWMAPPING IN SOUTHERN NORWAY BY USE OF LANDSAT IMAGERY,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 2C.

W78-08238

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 5B.
W78-08239

THERMAL REMOTE SENSING CALIBRATION TECHNIQUES,
Calspan Corp., Buffalo, NY.
J. R. Schott.
Available from the Nationala Technical Information Service, Springfield, VA 22161 as PB-269 471, Price codes: A06 in paper copy, A01 in microfiche. Report No. NYSERDA-75-22, Calspan NA-6019-M-1, March 15, 1977. 97 p, 28 fig, 7 tab, 28 ref, 7 append.

Descriptors: *Water temperature, *Remote sensing, *Aerial sensing, Aircraft, *Mapping, *Data collections, Data transmission, Data processing, Analytical techniques, Statistics, Radiometric image calibration, *Radiometry, Surface radiometric temperatures, Thermal mapping, Thermal plumes, Thermal scanning.

A technique for measuring water surface temperatures from airborne platforms was developed and is demonstrated. A number of techniques were tested and evaluated to determine their suitability and the precision with which surface water temperatures could be measured from the air. Approaches considered were wholly airborne requiring no ground truth and thus represent a major difference from current approaches which require ground data if true surface temperatures are to be calibrated. Data derived from boat measurements were compared. The mean of the absolute value of the differences between the two data sets is 0.70F, with a standard deviation of 0.59F (63 points considered), which compares quite favorably to a standard deviation of about 0.5F for successive measurements of the thermal data collected by the boat. Results indicate that wholly airborne monitoring and mapping of thermal plumes using the approaches described is an operational procedure with accuracies comparable to surface measurements. The improved mapping and quality control procedures developed, when combined with the advances in the theoretical approach to the radiometric physics, enable rapid collection, analysis and product generation. This greatly facilitates quantitative analysis in a rapid and cost effective manner. Sufficient detail is given to serve as a guide for using the approaches discussed for collection, calibration or mapping of power plant thermal discharges. (Seip-IPA)
W78-08241

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley.
For primary bibliographic entry see Field 4A.
W78-08244

DETERMINING THE USEFULNESS OF REMOTE SENSING FOR ESTIMATING AGRICULTURAL WATER DEMAND IN CALIFORNIA,
California Univ.-Berkeley. Remote Sensing Research Program.
For primary bibliographic entry see Field 3F.
W78-08256

MONITORING WATER QUALITY BY REMOTE SENSING,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5A.
W78-08257

EVALUATION OF THE TECHNICON BLOCK DIGESTOR SYSTEM FOR TOTAL KJELDAHL NITROGEN AND TOTAL PHOSPHORUS,
Environmental Monitoring and Support Lab., Cincinnati, OH. Physical and Chemical Methods Branch.
For primary bibliographic entry see Field 5A.
W78-08260

MEASUREMENTS OF THE ENERGY FLUXES INVOLVED IN THE ENERGY BUDGET OF A SNOW COVER,
Atmospheric Environment Service, Downsview (Ontario).
For primary bibliographic entry see Field 2C.
W78-08272

TIME-SYNCHRONISED STAGE RECORDERS FOR THE MONITORING OF INCREMENTAL DISCHARGE INPUTS IN SMALL STREAMS,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W78-08284

DILUTION GAUGING ON THE RECESSION LIMB: 2. THE INTEGRATION METHOD,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2E.
W78-08289

CHANNEL EROSION IN SOUTHWESTERN LOUISIANA CANAL,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-08298

THE USE OF AERIAL COLOR INFRARED PHOTOGRAPHY IN MAPPING THE VEGETATION OF A FRESHWATER MARSH,
American Univ., Washington, DC. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-08421

TESTSETS FOR THE QUANTITATIVE ANALYSIS OF AQUEOUS SOLUTIONS WITH PERMANENT INDICATION (TESTSETS FUR DIE QUANTITATIVE ANALYSE WAESSRIGER LOESUNGEN MIT BLEIBENDER ANZEIGE),
For primary bibliographic entry see Field 5A.
W78-08467

THE EFFECT OF QUICK FREEZING ON THE CONTENT OF ORGANIC WATER CAPACITY SUBSTANCES (DIE WIRKUNG DES TIEFGEFRIERENS AUF DEN GEHALT AN ORGANISCHEN WASSERINHALTSTOFFEN),
For primary bibliographic entry see Field 5A.
W78-08469

1984 IS APPROACHING--WHAT DOES IT MEAN TO THE WASTE-WATER SERVICE,
Thames Water Authority, London (England). Metropolitan Public Health Div.
For primary bibliographic entry see Field 5D.
W78-08499

STANDARDIZATION AND INTERCALIBRATION TECHNIQUES FOR MARINE MONITORING,
National Ocean Survey, Rockville, MD. Test and Evaluation Lab.
For primary bibliographic entry see Field 5A.
W78-08538

THE UNDERWAY WATER SAMPLING SYSTEM,
National Ocean Survey, Rockville, MD. Engineering Development Lab.
For primary bibliographic entry see Field 5A.
W78-08540

CALIBRATION STABILITY AND RESPONSE TIME FOR SALINITY SENSORS,
Agricultural Research Service, Riverside, CA. Salinity Lab.
For primary bibliographic entry see Field 2G.
W78-08559

A SOIL COLUMN TENSION LYSIMETER THAT MINIMIZES EXPERIMENTAL EDGE EFFECTS,
Dartmouth Coll., Hanover, NH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2G.
W78-08565

A DEVICE TO EXCLUDE DUST FROM RAIN-WATER SAMPLES,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
For primary bibliographic entry see Field 2B.
W78-08578

WATER WELL MONITOR,
For primary bibliographic entry see Field 4B.
W78-08593

BACK FLUSHING FILTER FOR SEWAGE ANALYSER--WITH SEMICIRCULAR DEFLECTOR IN CENTRAL SECTION FLANKED BY SINTER FILTER DISCS.
Netherlands Patent NL 7707-801. Issued January 17, 1978. Derwent Netherlands Patents Report, Vol. A, No. 5, p 7, March, 1978.

Descriptors: *Filters, *Instrumentation, *Filtration, *Patents, *Monitoring, *Design criteria, Construction materials, Equipment, Sewage treatment, Waste water treatment, Municipal wastes.

A back-flushing filter system employing sintered filter discs to clear sewage upstream of a water quality meter in a waste water flow has been patented. The system contains sintered filter discs on either side of a central section; the discs are positioned beneath covers to clarified water outlets. The central section is equipped with a peripheral inlet for introducing raw waste water. The influent strikes a semicircular, perforated deflector plate located in the central section. The filter discs are backwashed by blocking one of the clarified water outlets with compressed air. As the other filter disc becomes operational, the filter cake formed on the first filter disc is washed away by a back flow of clarified water. The system reduces the need for frequent replacement of the filters and extends the filters' functional life span. (Lisk-FIRL)
W78-08691

VALIDATION OF USE OF DYE-DILUTION METHOD FOR FLOW MEASUREMENT IN LARGE OPEN AND CLOSED CHANNEL FLOWS,
Peerless Pump, Montebello, CA.
For primary bibliographic entry see Field 8B.
W78-08701

THE DESIGN OF OPEN CHANNEL ACOUSTIC FLOWMETERS FOR SPECIFIED ACCURACY: SOURCES OF ERROR AND CALIBRATION TEST RESULTS,
Ocean Research Equipment, Inc., Falmouth, MA. Accusonic Div.
For primary bibliographic entry see Field 8B.

W78-08702

NUMERICAL MODELING OF TWO-DIMENSIONAL FLUMES,
National Bureau of Standards, Washington, DC. Mechanics Div.
For primary bibliographic entry see Field 8B.
W78-08703

INSTRUMENT ERRORS IN OPEN CHANNEL FLOW MEASUREMENT SYSTEMS,
Instrumentation Specialties Co., Lincoln, NE.
For primary bibliographic entry see Field 8B.
W78-08704

COMPENSATING FOR CONSTRUCTION ERRORS IN CRITICAL-FLOW FLUMES AND BROAD-CRESTED WEIRS,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 8B.
W78-08705

ERRORS IN FLOW MEASUREMENT AND THEIR IMPORTANCE IN INFILTRATION/INFLOW ANALYSIS,
Environmental Quality Systems, Inc., Rockville, MD.
For primary bibliographic entry see Field 8B.
W78-08706

A NEW DIELECTRIC SOIL MOISTURE METER FOR FIELD MEASUREMENT OF SOIL MOISTURE,
Technical Univ. of Prague (Czechoslovakia). Dept. of Irrigation and Drainage.
For primary bibliographic entry see Field 2G.
W78-08707

7C. Evaluation, Processing and Publication

REMOTE SENSING INPUTS TO LANDSCAPE MODELS WHICH PREDICT FUTURE SPATIAL LAND USE PATTERNS FOR HYDROLOGIC MODELS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 4A.
W78-08236

SNOWMAPPING IN SOUTHERN NORWAY BY USE OF LANDSAT IMAGERY,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 2C.
W78-08238

A USER'S GUIDE FOR REDEQL-EPA: A COMPUTER PROGRAM FOR CHEMICAL EQUILIBRIA IN AQUEOUS SYSTEMS,
Corvallis Environmental Research Lab., OR. Marine and Freshwater Ecology Branch.
For primary bibliographic entry see Field 5A.
W78-08262

A MATHEMATICAL MODEL OF STRATIFIED GROUNDWATER FLOW,
Egyptian Desert Inst., Cairo. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08291

SENSIBILITY OF PARAMETERS OF THE SSARR MODEL (SENSIBILITE DES PARAMETRES DU MODELE SSARR),
Hydro-Quebec, Montreal. Service Hydraulique.
For primary bibliographic entry see Field 2A.
W78-08293

FORMAT FOR ACQUIRING RAPID DATA ANALYSIS CAPABILITIES OF STORED DATA: MANIPULATION OF NATIONAL EUTROPHICATION SURVEY WATER QUALITY DATA,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Operations Div.
For primary bibliographic entry see Field 5A.
W78-08377

HYDROGEOLOGY OF THE MEDICINE HAT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W78-08580

A COMPUTER PROGRAM FOR THE ANALYSIS OF MACROINVERTEBRATE DATA FROM WATER QUALITY SURVEYS,
Army Armament Research and Development Command, Aberdeen Proving Ground, MD. Chemical Systems Lab.
For primary bibliographic entry see Field 5A.
W78-08646

RECOMMENDATIONS OF THE EPA/NBS WORKSHOP ON THE NATIONAL ENVIRONMENTAL SPECIMEN BANK,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08652

A WATER SUPPLY DATA BASE,
Arizona Univ., Tucson. Management Information Systems.
J. F. Nunamaker, D. E. Pingry, and R. Riley.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977. Las Vegas, Nevada, p. 1-6. 1 tab, 3 fig.

Descriptors: Basic data collections, Information exchange, *Networks, Data collections, *Design, *System analysis, Operations research, Water data, Model studies, Regional analysis, Arizona, Colorado, Utah, New Mexico, Nevada, Wyoming, *Colorado River Basin, *Water supply, Southwest US.

A water supply data base was developed for the Colorado River Basin states as a guide to existing natural, technical, economic and legal water data agencies in Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming. This data was developed in order to determine whether water of acceptable quality and quantity could be delivered to specific locations at reasonable costs. Water data structure, data base design and data base implementation were discussed, with an emphasis on the Colorado River Basin Area. The thrust of the article deals with basic water supply data base construction rather than specific information. (Payton-Arizona)
W78-08726

8. ENGINEERING WORKS

8B. Hydraulics

HYDRAULIC DESIGN FOR COMBINED SEWER DIVERSION,
Worcester Polytechnic Inst., MA. Alden Research Lab.
B. J. Pennino, and R. A. Perkins.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13729, p 595-606, May 1978. 8 fig, 3 ref, 1 append.

Descriptors: *Combined sewers, *Diversion structures, *Water pollution control, *Model studies, Hydraulic models, Flow, Water levels, Sewers, Cities, Urban runoff, Head loss, Gates, Hydraulic structures, Water pollution, Hydraulics, *Richmond(Va), Retention basins, Flow distribution.

The City of Richmond is building two diversion structures that will join two existing sewers to a retention basin where combined sewage and storm runoff will be stored for later treatment. This scheme will minimize the discharge of combined sewage to the James River. Levels in the sewers and diversion structures vary with flow, river level, and interaction between the connected diversion structures. In order to accurately predict and minimize levels in the sewers upstream of the diversion structures, a 1:18 hydraulic model was tested. The model showed that levels could be reduced in both the 'flow to the river' mode and 'diversion' mode by streamlining various elements of the diversion structures. A flow distribution device reduced unacceptably high velocities at the trash screens. (Sims-ISWS)
W78-08269

RESPONSE OF OPEN-BOTTOM FLOATING PLATFORMS TO WIND,
Columbia Univ., New York. Dept. of Civil Engineering.
M. Shinozuka, S. S. Fang, K. Kitutake, and G. Matsui.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY5, Proceedings Paper 13730, p 607-622, May 1978. 11 fig, 26 ref, 2 append. NSF ENG75-13761.

Descriptors: *Offshore platforms, *Winds, *Floating, *Model studies, Mathematical models, Floats, Wind pressure, Effects, Hydrodynamics, Monte Carlo processes, Frequency, Hydraulics, Structures, Floating bodies, Mooring, Time dependence.

The motion response of a moored open-bottom floating platform was examined by a time-domain simulation technique, derived by the impulse response method that takes into consideration the frequency dependency of the fluid reactive force terms i.e., added mass and damping force coefficients. The sway and roll responses of the moored platform to random wind loading were evaluated by solving the equations of motion using a simulated random wind loading history. The hydrodynamic coefficients of the open-bottom platform, with pressurized subdivided air chambers having a free air-water interface, were evaluated by modified Frank's close-fit method. Numerical examples of the motion response of the floating platform were presented. The results were used to study the effect of the variation of mooring system elasticity on platform response. (Sims-ISWS)
W78-08270

BASIN DYNAMICS, CHANNEL PROCESSES, AND PLACER FORMATION: A MODEL STUDY,
Victoria Univ., Wellington (New Zealand).
For primary bibliographic entry see Field 2J.
W78-08273

EXPERIMENTS ON SURFACE BUOYANT JET,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 5B.
W78-08280

MODEL FOR SHORE-ATTACHED THERMAL PLUMES IN RIVERS,
NALCO Environmental Sciences, Northbrook, IL.
For primary bibliographic entry see Field 5B.
W78-08281

SYSTEM OF SLIGHTLY IMMERSED GATES,
Technion - Israel Inst. of Tech., Haifa. Hydrodynamics and Hydraulic Engineering Lab.
For primary bibliographic entry see Field 8C.
W78-08295

CHANNEL EROSION IN SOUTHWESTERN LOUISIANA CANAL,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-08298

A REVIEW OF THE HYDRAULICS OF GRAVITY DRAINAGE, WASTE AND VENT SYSTEMS,
Stevens Inst. of Tech., Hoboken, NJ. Davidson Lab.
T. P. Konen.
Plumbing Engineer, Vol 6, No 2, p 11-15, March-April, 1978. 4 fig, 3 tab, 5 ref.

Descriptors: *Hydraulic jump, *Hydraulic properties, *Pipes, *Hydraulic conduits, *Domestic wastes, Plumbing, Sewerage, Hydraulic systems, Velocity, Flow characteristics, Waste water disposal, Municipal wastes.

The hydraulic characteristics of drainage, waste, and vent systems in domestic sewerage are described. Water closets operate with an average daily water consumption of 100 gal, reaching a peak flow of 30 gpm; lavoratories achieve a peak flow of 10 gpm over a discharge period of 12 seconds; and bathtubs rapidly reach a peak discharge of 12 gpm. Water flowing through a horizontal pipe, with constantly varying velocity and depth of flow, occupies half the pipe's capacity. Vertical drains or stacks maintain a rapid annular flow within a short distance from discharge. When the flow in a vertical pipe is transferred into a horizontal pipe, the decrease in velocity from 15 ft/sec to 2 ft/sec causes a hydraulic jump or an increase in depth of flow in the horizontal pipe. Relief vents and vent stacks alleviate the pressure at the base of the vertical stack. A comparison of surge durations in conventional and water saving toilets, as calculated by the ratio of volume and peak flow, indicates that a one-second difference in duration results in a 2% velocity difference between the systems. Velocity of discharge from a water closet is considered in calculating the depth of flow and velocity in primary and secondary branch pipes. (Lisk-FIRL)
W78-08431

RAINFALL ANALYSIS FOR THE DESIGN OF STORM SEWERS IN BOMBAY,
Associated Industrial Consultants, Bombay (India).
For primary bibliographic entry see Field 2B.
W78-08433

GROUND WATER MANUAL, A GUIDE FOR THE INVESTIGATION, DEVELOPMENT, AND MANAGEMENT OF GROUND-WATER RESOURCES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 2F.
W78-08542

A NEW APPROACH TO FULLY GRAPHICAL (DIMENSIONAL) SOLUTION OF THE COLEBROOK-WHITE FUNCTION,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
D. I. H. Barr.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 1, p 19-30, January 1978. 3 fig, 1 tab, 14 ref, 2 append.

Descriptors: *Pipe flow, *Graphical analysis, *Analytical techniques, Graphical methods, Curves, Mathematical studies, Dimensional analysis, Flow resistance, Discharge(Water), Analysis, Charts, *Colebrook-White function.

The basis of Ackers' system of dimensional design charts was outlined, and an alternative approach to fully dimensinal working of the standard pipe flow problems was given. The difficuly which has been overcome is the incorporation of the high resolution solution routes, which become available when the modified friction factor is adopted as solution group, within a dimensional rather than a non-dimensional graphical system. This then allows a number of potential developments. In particular, there was given a single page composite diagram, for practical use, wherein the degree of resolution is similar to that attained in the aforementioned charts, these being considered to have set a satisfactory standard for practical purposes. Other possible developments and applications included non-circular conduits and open channels. (Humphreys-ISWS)
W78-08552

RESULTS OF PUMPING TESTS IN CRYSTALLINE-ROCK AQUIFERS,
Geraghty and Miller, Inc., Tampa, FL.
For primary bibliographic entry see Field 4B.
W78-08556

DYNAMIC RESPONSES OF FLOATING STRUCTURES,
Exxon Production Research Co., Houston, TX.
J. C. Chao.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13769, p 105-118, May 1978. 20 fig, 1 tab, 9 ref.

Descriptors: *Structural analysis, *Offshore platforms, *Floating, Ocean waves, Waves(Water), Model studies, Hydraulics, Structures, Engineering structures, *Dynamic response, Spectral analysis, Wave energy, Floating bodies.

Theoretical and experimental studies were conducted to investigate wave loadings on, and structural responses of, floating platforms. Strip theory was applied to calculate wave forces on the structure. The wave forces, the interaction between waves and the structure, and the resulting inertia forces then were applied to the structure, as external forces, to calculate member stresses. The structure was treated as a space frame for stress calculations. Typical characteristics of dynamic stresses resulting from wave loading were considered. A wave tank model test program was conducted to collect strain data. The model test program, measurements, and correlation of measured data with theoretical calculations were considered. Satisfactory agreement was found between theoretical stress calculation and measured data. (Lee-ISWS)
W78-08560

DIFFRACTION OF WAVES BY A WEDGE,
Case Western Reserve Univ., Cleveland, OH. Dept. of Earth Sciences.
W. Lick.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13715, p 119-133, May 1978. 6 fig, 13 ref, 2 append.

Descriptors: *Waves(Water), *Refraction(Waterwaves), *Model studies, Mathematical models, ocean waves, Coasts, Beaches, Breakwaters, Mathematics, Equations, Oceanography, *Diffraction(Water waves), Reflection, Wedges, Wave propagation.

The problem of wave propagation past a vertical wedge has been examined with the intent of generalizing previous solutions and finding useful asymptotic results. Reflection, diffraction, and the subsequent refraction of the incident, reflected, and diffracted waves were included in the analysis, and convenient asymptotic solutions were obtained. Significant effects due to reflection and diffraction were demonstrated and shown to be strongly dependent on wedge angle. The solutions obtained can be readily incorporated into present computer refraction programs so as to describe the propagation of waves past a wedge more generally than is presently possible. The geometrical theory of diffraction used here also can be applied to bodies of any shape so as to describe combined diffraction-refraction effects. (Sims-ISWS)
W78-08561

RUNUP OF IRREGULAR WAVES ON PLANE SMOOTH SLOPE,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
J. W. Kamphuis, and N. Mohamed.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13716, p 135-146, May 1978. 8 fig, 4 tab, 15 ref, 2 append.

Descriptors: *Waves(Water), *Breakwaters, *Oceans, Model studies, Mathematical models, Laboratory tests, Flumes, Hydraulic models, Data processing, Analytical techniques, Oceanography, *Wave runup, Irregular waves, Wave spectra, Wave reflection, Wave period, Wave height, Breaking(Water waves), Spectral analysis.

Runup of irregular waves on smooth slopes of 1:3, 1:2, 1:1.5 and 1:1 was investigated. The waves were generated by superposition of component waves and simulated the spectra defined by Bretschneider and Scott. A few narrow frequency band spectra also were generated. Since the waves were nonbreaking for the most part, the reflection process affected the results and thus was investigated in detail. Subsequently runup distributions were related to wave height distributions, with special emphasis on average runup and 2% runup. A number of secondary observations with respect to superelevation of mean water level, spectrum bandwidth, runup period, and position of the leading edge of the runup also were made. (Sims-ISWS)
W78-08562

WASTEWATER DISPOSAL FROM TWO-DIMENSIONAL DIFFUSER,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
For primary bibliographic entry see Field 5E.
W78-08567

RIVER TRANSPORT MODELING FOR UNSTEADY FLOWS,
Sutron Corp., Arlington, VA.
For primary bibliographic entry see Field 2E.
W78-08569

UNDERGROUND DRAINAGE PIPE,
For primary bibliographic entry see Field 4A.
W78-08600

VALIDATION OF USE OF DYE-DILUTION METHOD FOR FLOW MEASUREMENT IN LARGE OPEN AND CLOSED CHANNEL FLOWS,
Peerless Pump, Montebello, CA.
W. H. Morgan, D. Kempf, and R. E. Phillips.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurement in Open Channels and Closed Conduits, Gaithersburg, Maryland, p. 361-394, February 23-25, 1977. 12 fig, 4 tab, 13 ref, 1 append.

Descriptors: *Flow measurement, Water measurement, *Open channel flow, *Pipe flow, Pipelines, Tracers, Flumes, Calibrations, Instrumentation, *Dye dispersion.

The use of water soluble tracers for determining flow rates of rivers and streams has been practiced for several decades, both in the United States and abroad. During the last 15 years the economical availability of water soluble dyes, coupled with the considerable technical improvement in fluorometry equipment, has made feasible the use of dye-dilution methods for in situ calibration of flumes and other flow measurement devices. (Skogerboe-Colorado State)
W78-08701

THE DESIGN OF OPEN CHANNEL ACOUSTIC FLOWMETERS FOR SPECIFIED ACCURACY: SOURCES OF ERROR AND CALIBRATION TEST RESULTS,
Ocean Research Equipment, Inc., Falmouth, MA. Accusonic Div.
F. C. Lowell, Jr.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurements in Open Channels and Closed Conduits, Gaithersburg, Maryland, p. 243-266, February 23-25, 1977. 16 fig, 6 ref.

Descriptors: *Flow measurement, Water measurement, Velocity, Flow rate, *Open channel flow, *Flow meters(Acoustic), *Calibration, Instrumentation, *Design flow.

The design of open channel acoustic flowmeters is more difficult than the design of pipeline flowmeters because of errors introduced by the free surface, as well as because the open channel environment is usually more susceptible to attenuation and multipath conditions which can inject large errors unless special signal recognition and filtering techniques are employed. The sources of error in open channel acoustic flowmeters are tabulated and discussed. (Skogerboe-Colorado State)
W78-08702

NUMERICAL MODELING OF TWO-DIMENSIONAL FLUMES,
National Bureau of Standards, Washington, DC. Mechanics Div.
R. W. Davis.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurement in Open Channels and Closed Conduits, Gaithersburg, Maryland, p. 219-242, February 23-25, 1977. 12 fig, 2 tab, 10 ref.

Descriptors: Water measurement, *Flow measurement, *Flumes, *Open channel flow, Hydraulics, *Model studies, Weirs.

Flumes are commonly used devices for the measurement of open-channel flow rates. Their range of operation has been limited, however, because, outside of experimentally calibrating each configuration used, one has had to resort to one-dimensional theory for flow rate determination. This theory is restricted to fairly low values of upstream-head to crest-length ratio, as well as to almost level flumes with a reasonably uniform incoming velocity profile and nonconverging sidewalls. The present study is concerned with extending the operational range of a particular type of flume (the two-dimensional version of the Palmer-Bowlus flume) into areas where one-dimensional theory loses its validity. The determination of the head-discharge relationship for this flume is done numerically by use of the SOLA finite difference routine for two-dimensional free-surface flows. Effects of changes in flume geometry, channel slope, and upstream velocity profile are investigated. The numerical results are verified experimentally. (Skogerboe-Colorado State)
W78-08703

INSTRUMENT ERRORS IN OPEN CHANNEL FLOW MEASUREMENT SYSTEMS,
Instrumentation Specialties Co., Lincoln, NE.
D. M. Grant.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurement in Open Channels and Closed Conduits, Gaithersburg, Maryland, p 91-103, February 23-25, 1977. 9 ref.

Descriptors: *Flow measurement, Open channels, *Open channel flow, *Instrument errors, *Instrumentation, Flow meters.

Certain aspects of open channel flow measurement systems are briefly discussed, including primary and secondary measuring devices. The two functions of a secondary measuring device (open channel flow meter) are discussed: level measurement and level-to-flow rate conversion. Some of the common methodologies used to accomplish each of the two functions of a secondary device are described, and the possible sources and magnitudes of errors associated with each of these methodologies are analyzed. Level measurement methods discussed are: float, electxrical, ultrasonic, bubbler, and dipping probe. Level-to-flow rate conversion methods discussed are: mechanical cam, electronic analog function generator, electronic memory device, and opto-electronic function generator. In the interest of promoting a uniformity of specifications, a standard general format for open channel flow meters is proposed. (Skogerboe-Colorado State)
W78-08704

COMPENSATING FOR CONSTRUCTION ERRORS IN CRITICAL-FLOW FLUMES AND BROAD-CRESTED WEIRS,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
J. A. Replogle.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurement in Open Channels and Closed Conduits, Gaithersburg, Maryland, p 201-218, February 23-25, 1977. 5 fig, 1 tab, 8 ref.

Descriptors: *Flow measurement, *Flumes, *Weirs, *Open channel flow, Water measurement, Instrumentation, Errors.

Critical-flow flumes and braod-crested weirs can now be routinely and accurately calibrated (plus or minus 2%) by computer techiques over a wide range of flow rates and flume cross sections, including trapezoidal and complex shapes. This ability permits detailed compensation for errors introduced by construction anomalies. Procedures were developed and used on a series of primary devices in irrigation canals, including trapezoidal flumes and broad-crested weirs, which identified construction errors and accurately related a readout mechanism to the primary device, as constructed, so that the original intended accuracy could be restored. (Skogerboe-Colorado State)
W78-08705

ERRORS IN FLOW MEASUREMENT AND THEIR IMPORTANCE IN INFILTRATION/INFLOW ANALYSIS,
Environmental Quality Systems, Inc., Rockville, MD.
D. L. Guthrie, D. R. Washington, and C. Vincenty.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurement in Open Channels and Closed Conduits, Gaithersburg, Maryland, p. 173-200, February 23-25, 1977. 7 fig, 2 tab, 10 ref.

Descriptors: *Flow measurement, *Infiltration, *Weirs, *Flumes, Water measurement, Seepage, Errors, *Parshall flume, *Scow, *Instrumentation.

Several common flow-measurement devices including the weir, Parshall flume, and scow were used in field studies of infiltration/inflow in Puerto Rico. Mathematical determinations of infiltration/inflow were made by calculating the hydraulic gradient, the height of water in the sewer, and the velocity head loss. Both of these instrumental and physical-mathematical methods for flow determination are reviewed, stressing the advantages and disadvantages of each, their sources of error, and methods used to resolve that error, wherever possible. (Skogerboe-Colorado State)
W78-08706

DESIGN OF DRIP IRRIGATION LINES WITH VARYING PIPE SIZES,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
I. P. Wu, and H. M. Gitlin.
ASCE Journal of the Irrigation and Drainage Division, Vol. 103, No. IR4, p 499-503, December, 1977. 2 fig, 5 ref, 1 append.

Descriptors: *Irrigation design, Irrigation efficiency, Hydraulics, Irrigation methods, Hydraulic design, *Design, Irrigation engineering, Pipes, *Pipe sizes.

Most drip irrigation laterals and submains are designed for a single pipe size. The energy gradient line for a lateral with a single size has been derived and presented by an exponential curve that is used as basis for designing laterals or submains of drip irrigation systems on level fields or on slopes. However, under certain field conditions, the length of laterals and submains may be relatively long and have nonuniform slopes. The lateral and submain design may use a series of different pipe sizes. A design technique is presented. The purpose of this paper is to show that by designing laterals or submains with different pipe sizes (different diameters) the energy gradient line will be close to the slope of the lateral or submain; therefore, the pressure variation will be reduced. (Skogerboe-Colorado State)
W78-08719

LOW-PRESSURE SEWAGE SYSTEM FOR BUILDINGS--USES LARGE VENTILATED BACK-PRESSURE TANK, TO PREVENT FLOODING.
For primary bibliographic entry see Field 8C.
W78-08761

8C. Hydraulic Machinery

SYSTEM OF SLIGHTLY IMMERSED GATES,
Technion - Israel Inst. of Tech., Haifa. Hydrodynamics and Hydraulic Engineering Lab.
J. Mevorach, and K. Zanker.
Journal of Hydraulic Research, Vol 16, No 1, p 45-54, 1978. 5 fig, 10 ref.

Descriptors: *Gates, *Submergence, *Hydraulics, *Laboratory tests, Methodology, Control structures, Theoretical analysis, Energy loss, Froude number, *Self-regulating system, Contraction coefficient, Multi-gate systems.

A simple method was developed for solution of multi-gate systems often used in hydraulic engineering. While the problem cannot be analyzed rigorously, the solution was based on a simplified theoretical approach of divided flow and experimental evidence obtained from laboratory study. In order to dispense with laborious iterative computations, a working diagram was developed which enables speedy and simple solution of engineering problems. A few numerical examples were worked out and checked in the model, with remarkably good agreement. Related engineering aspects associated with multi-gate systems were reviewed, briefly, particularly the spacing of gates, which is of major improtance as far as hydraulic efficiency and prevention of wave amplification are concerned. (Singh-ISWS)
W78-08295

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM; HYDROELECTRIC POWER GENERATION.
Institute for Water Resources (Army), Fort Belvoir, VA.
IWR Research Report 77-R4, December 1977. 110 p, 11 fig, 13 tab, 2 plates.

Descriptors: *McClellan-Kerr River Project, *River systems, *Hydroelectric power, *Marketing, *Cost allocation, *Powerplants, Investment, Navigation, Financing, Costs, Benefits, Federal government, Dams, Effects, Fuels, Reservoirs, Operations, Projects, Estimating.

An analysis of the hydroelectric generating facilities in the McClellan-Kerr River Project is presented. Installed capacity of the federal installations total 639 megawatts. Economic and financial questions of production and marketing are examined--the power is sold by a federal agency, the Southwestern Power Administration (SPA). Due to the rising cost of other fuels, the power benefits are expected to rise from a project justification estimate of $14 million. However, benefits are not as high as possible, due primarily to poor marketing practices by the SPA. There are also several problems in the cost allocation formula used to rate the on-going return on investment to the Federal Government for each dam taken individually. A supplemental report is appended which presents the results of the method now used by the Southwestern Division to keep running accounts for each power project, to check its financial progress toward meeting the requirement of Section 5 of the Flood Control Act of 1944 that costs allocated to power be recovered in a reasonable period of time; considered also are other accounting procedures. (Bell-Cornell)
W78-08425

EXPERIMENTAL STUDY OF DISCHARGE SIPHONS OF PUMPS IN THE PROJECT OF THE URBAN SEWER SYSTEM OF MONTREAL (ETUDE EXPERIMENTALE DES SIPHONS DE DECHARGE DES POMPES DANS LE CADRE DU PROJET D'ASSAINISSEMENT DE LA COMMUNAUTE URBAINE DE MONTREAL),
Service d'Assainissement des Eaux, Montreal (Quebec).
C. Mitci.
Tribune du CEBEDEAU, Vol 31, No 410, p 41-52, January, 1978. 13 fig, 5 tab, 6 ref.

Descriptors: *Pumping plants, *Siphons, *Sewerage, *Hydraulic structures, *Costs, Conveyance structures, Pipes, Flow rates, Design criteria, Equipment, Pumping, Municipal wastes, Waste water treatment.

Experiments were used to test two different discharge siphon designs for a pumping system planned to deliver municipal wastes and surface runoff from two interceptors in the Montreal sewer system to a sewage treatment plant. Parameters used to compare design performance included: charge loss, flow conditions in the siphon, and flow conditions in the sewer (water level, sediment transport, and pressure). Hydraulic characteristics and costs for operating pumping stations were also compared. Tests had disclosed that the presence of a stationary air pocket in the siphon of a variable speed pump necessitated the use of a vacuum pump not required under constant speed operation. For both constant and variable speed pumping, the siphon required a vent and a valve to prevent intake of air during priming; addition of a certain volume of air was necessary to unprime the siphon when pumping stopped. (Korha-FIRL)
W78-08434

MAINTAINING DIGESTER BALANCE MAKES FOR ENERGY CONSERVATION.
For primary bibliographic entry see Field 5D.
W78-08437

PERFORMANCE OF CIRCULAR FINAL CLARIFIERS AT AN ACTIVATED SLUDGE PLANT,
Metropolitan Sanitary District of Greater Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-08438

LOW-PRESSURE SEWAGE SYSTEM FOR BUILDINGS--USES LARGE VENTILATED BACK-PRESSURE TANK, TO PREVENT FLOODING.
German Patent DS 2653-713. Issued March 2, 1978. Derwent German Patents Abstracts, Vol. A, No. 10, p 8, April, 1978. 1 fig.

Descriptors: *Conduits, *Sewers, *Storage tanks, *Patents, *Waste storage, Deisgn data, Domestic wastes, Pressure conduits, Sewerage, Waste water disposal, Municipal wastes.

A patent has been issued for a ventilated back-pressure tank system connected to a low-pressure sewage system designed for individual buildings. Waste water from the fixtures within the buildings flows through gravity pipes to a collection tank which adjoins a low-pressure sewage conduit. When the waste water level in the tank reaches a maximum, a blocking valve automatically opens to release the effluent into the sewage conduit. A back-pressure tank, located below the building fixtures and above the maximum level of the collection tank, is connected by a conduit to the gravity pipe from the building. The back-pressure tank has an open blocking element at its base where the conduit enters for ventilation from the surface to prevent flooding. (Lisk-FIRL)
W78-08761

COMBINATION TANKER FOR SEWER JETTING AND GULLY EMPTYING.
Surveyor, Vol. 151, No. 4469, p 22, February, 1978.

Descriptors: *Sewers, *Jets, *Pumps, *Scaling, *High pressure, Pressure head, Sludge disposal, Oily water, Pressure, Water pressure, Pipelines, Turbines, Cleaning, Waste water treatment, Municipal wastes.

Whale Tankers Ltd., Solihull, West Midlands, England, has manufactured a 2,600 gal tanker truck for municipal and industrial sewer jetting, washing, and gully emptying. The tank is divided into three compartments: the front for carrying clean water, the center for oily sludges, and the third for sludge and the gully arm. An air-cooled exhauster with a capacity of 60 cu ft/min is used to clear the tanks. A volume up to 75 gal/min is delivered by the high pressure piston pump at a pressure output of at least 700 bars. The tanker is used for sewer jetting and descaling in sewers up to 6 ft in diameter. The high pressure system is also capable of powering turbine rock-cutting heads for clearing blocked or collapsed sewers. (Lisk-FIRL)
W78-08771

8D. Soil Mechanics

GROUND WATER MANUAL, A GUIDE FOR THE INVESTIGATION, DEVELOPMENT, AND MANAGEMENT OF GROUND-WATER RESOURCES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 2F.
W78-08542

8E. Rock Mechanics and Geology

THE STORY OF A DAM,
For primary bibliographic entry see Field 6E.
W78-08351

8F. Concrete

INTERCEPTOR NORTH COMPLETED AHEAD OF SCHEDULE.
Water and Pollution Control, Vol. 116, No. 1, p 17, January, 1978.

Descriptors: *Interceptor sewers, *Tunnel construction, *Conveyance structures, *Concrete construction, *Sewerage, Construction materials, Rock excavation, Explosives, Shafts(Excavations), Waste water treatment, Municipal wastes.

A 25,000 ft portion of the 5-mile sewer interceptor for Montreal, Canada, has been completed by the contractor, Beaver Foundations Ltd., 6 mons ahead of schedule and about $3 million under the original bid. Completion of the 90 city block stretch of sewer is expected by 1980. The tunnel was constructed 100 ft below the surface through four shafts sunk along the 25,000 ft length. Rock blasting was required and the tunnel was excavated from each shaft in the direction of the neighboring shaft. The 16-ft diameter horseshoe-shaped tunnel will intercept all municipal wastes from collector sewers and transport the sewage to a proposed treatment facility at the eastern tip of Montreal Island. The tunnel, which will circle Montreal Island, required 128,000 cu yds of concrete for the initial 25,000 section. (Lisk-FIRL)
W78-08770

8G. Materials

STATE WATER CONSERVATION PROJECTS.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
For primary bibliographic entry see Field 6E.
W78-08235

BROMINE CHLORIDE - AN ALTERNATIVE TO CHLORINE FOR FOULING CONTROL IN CONDENSER COOLING SYSTEMS,
Martin Marietta Corp., Baltimore, MD. Environmental Technology Center.
For primary bibliographic entry see Field 5G.
W78-08247

GROUND WATER MANUAL, A GUIDE FOR THE INVESTIGATION, DEVELOPMENT, AND MANAGEMENT OF GROUND-WATER RESOURCES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 2F.
W78-08542

PROCESS FOR CHELATING AND INHIBITING SCALE IN AQUEOUS SYSTEMS,
Petrolite Corp., St. Louis, MO. (Assignee).
For primary bibliographic entry see Field 5F.
W78-08589

METHOD OF LINING A WATERWAY OR RESERVOIR,
For primary bibliographic entry see Field 4A.
W78-08599

DETERIORATING SEWER LINE RE-LINED IN ARIZONA.
Water and Wastes Engineering, Vol. 15, No. 2, p 27, February, 1978.

Descriptors: *Linings, *Pipelines, *Plastic pipes, *Clay pipes, *Sands, Sewerage, Corrosion control, Joints(Connections), Infiltration, Saturated soils, Conveyance structures, Waste water disposal, Municipal wastes.

A clay tile sewer pipeline in Holbrook, Arizona, transporting municipal wastes to a treatment plant was relined with Phillips Products Co., Inc., 18-inch diam plastic pipe. The highly saturated clay and sandy soil beneath the 21-inch clay tile sewer connector had caused the pipe to sink. Initial attempts to stabilize the pipe bed with 5-ft of rock and concrete encasement were unsuccessful due to the high saturation of the former swamp drainage field. The 21-inch pipe was relined with 18-inch plastic pipe in 38-ft sections. The corrosion-resistant pipe lengths were butt fused and inserted into the existing sewer line. The joints prevent infiltration and exfiltration; the plastic pipe is resistant to mineral accumulation and retains its properties. The 710 ft plastic pipe was assembled in two sections, 298 and 412 ft long, which were emplaced by a Caterpiller loader. The entire relining project was completed in two days by M. M. Sundt Construction. (Lisk-FIRL)
W78-08766

8I. Fisheries Engineering

ANGLED SCREENS AND LOUVERS FOR DIVERTING FISH AT POWER PLANTS,
Stone and Webster Engineering Corp., Boston, MA.
E. P. Taft, III, and Y. G. Mussalli.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY5, Proceedings Paper 13731, p 623-634, May 1978. 5 fig, 2 tab, 11 ref, 1 append.

Descriptors: *Fish handling facilities, *Intakes structures, *Powerplants, *Lake Ontario, Laboratory tests, Fish, Fish conservation, Fish passages, Fish guiding, Cooling water, Structures, Hydraulic structures, Environmental engineering, Fish screens, Angled screens, Louvers.

Angled screens and louvers have been evaluated experimentally and developed for diverting fish to bypass within cooling water intake structures. Louvers have been shown to be greater than 90% effective in diverting a variety of fish species in both laboratory and prototype studies. Recent studies with angled traveling screens have shown them to be 100% effective in guiding fish to bypasses. Angled screen and fish transportation systems are presently under construction at two large power plants on Lake Ontario. (Sims-ISWS)
W78-08271

MATHEMATICAL METHODS TO EVALUATE ENTRAINMENT OF AQUATIC ORGANISMS BY POWER PLANTS,
National Power Plant Team, Ann Arbor, MI.
C. P. Goodyear.
Biological Services Program Report FWS/OBS-76/20.3, Fish and Wildlife Service, U.S. Department of the Interior, September 1977. 17 p, 3 ref, 2 append.

Descriptors: *Aquatic organisms, *Entrainment, *Equations, *Rivers, *Streams, *Lakes, *Reservoirs, *Estuaries, Estimating, Powerplants, Population loss, Water quality, Effects.

Equations are presented which may be used to estimate the percentage loss of populations of aquatic organisms that are entrained by power plants located on rivers and streams, lakes and reservoirs, and estuaries. Important parameters that must be estimated to employ the techniques include the average concentration of organisms in the intake water and in the water body, mortality of entrained organisms, and the average period organisms are vulnerable to entrainment. (See also W78-05260) (Graf-Cornell)
W78-08312

WATER INTAKE AND FISH CONTROL SYSTEM,
Southern California Edison Co., Rosemead. (Assignee).
D. I. Downs, L. E. Larson, and V. J. Schuler.
U.S. Patent No. 4,064,048, 12 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 965, no 3, p 1051, December 20, 1977.

Descriptors: *Patents, *Fish handling facilities, *Fish barriers, *Engineering structures, Fish guiding, Cooling water, Intakes, Screens.

The object of this invention is to provide a water intake system which would satisfactorily remove trash and debris while at the same time avoid injury to the fish drawn into the intake watercourse. An important consideration which must be satisfied is that the primary function of the screening system must be maintained. That is, the screenwell design must provide clean water to the circulating pumps for condenser cooling by means of an effective trash removal system which has minimum hydraulic losses. Intake water flows from the body of water through the intake structure, through the water-course and through debris removing screens. A fish diversion structure is mounted across the water-course for diverting fish from the screens through which the main flow of water passes and fish removal means are located at one end of the fish diversion structure for removing the diverted fish to a holding chamber for return to the body of water. The fish diversion structure includes a continuous flush face across the front extending towards the fish removal means at an angle of about 30 degrees or less, with respect to the direction of flow. The flush face of the structure is generally defined by the upstream face of support piers and the upstream or front face of each assembly of adjacent and vertically traveling rectangular frames positioned between the piers. Each frame includes vertically extending and laterally spaced louver bars mounted perpendicular to the plane of the flush face of the structure. (Sinha-OEIS)
W78-08591

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

WATER QUALITY INDICES: A SURVEY OF INDICES USED IN THE UNITED STATES,
Environmental Protection Agency, Washington, DC. Office of Monitoring and Technical Support.
For primary bibliographic entry see Field 5A.
W78-08265

TRANSFORMATIONS OF HEAVY METALS AND PLANT NUTRIENTS IN DREDGED SEDIMENTS AS AFFECTED BY OXIDATION REDUCTION POTENTIAL AND PH, VOLUME I: LITERATURE REVIEW,
Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 5C.
W78-08381

THE PROVISION OF TECHNICAL INFORMATION IN A REGIONAL WATER AUTHORITY,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 05G.
W78-08502

POTENTIAL EFFECTS ON AQUATIC RESOURCES OF PROCESSING AND/OR CONVERSION OF IOWA COAL,
Iowa Cooperative Fishery Research Unit, Ames.
For primary bibliographic entry see Field 05C.
W78-08648

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W8
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SELECTED WATER RESOURCES ABSTRACTS

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University of Illinois
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VOLUME 11, NUMBER 19
OCTOBER 1, 1978

W78-08801 -- W78-09300
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 19
OCTOBER 1, 1978

W78-08801 -- W78-09300

he Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the ansaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
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Washington, DC 20240

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01 NATURE OF WATER
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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

REDOX PROCESSES AT SURFACES OF MANGANESE OXIDE AND THEIR EFFECTS ON AQUEOUS METAL IONS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-08851

2. WATER CYCLE

2A. General

METHOD FOR EVALUATING THE POSSIBLE CHANGES OF THE HYDROLOGIC CYCLE IN THE LANDSCAPES OF THE EXCESSIVELY WET ZONE AFTER A MODIFICATION OF THE ENVIRONMENT,
K. Ye. Ivanov, and O. G. Sorochan.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 326-333, 1976. 2 fig, 1 tab, 14 ref. Translated from Vestnik Leningradskogo Universiteta, No. 12, p 61-74, 1976.

Descriptors: *Hydrologic cycle, *Wetlands, *Bogs, *Environmental effects, Model studies, Mathematical models, Precipitation(Atmospheric), Runoff, Evaporation, Groundwater, Rivers, Lakes, Humidity, Drainage, Soils, Environment modification.

The changes in the water budget and hydrologic cycle of regions and of landscape transformation under the effect of human activity in the excessively wet zone were investigated. Direct quantitative relations can be established between hydrothermal processes in the atmosphere and the structure of the landscape primarily for its biogenic components since adaptation of phytocenoses and a change in the chemical composition of soils occur relatively rapidly; for the biogenic components of the landscape, the time factor has another order of magnitude than for the transformation of morphological elements and of the physical properties of rocks underlying the soils. At the same time, the biogenic components of the landscape are the most important aspect of the human environment for the restoration and conservation of natural resources. Therefore, the effect of industrial activity must be estimated primarily for these components. (Sims-ISWS)
W78-08815

WATER IN CARBONATE ROCKS-U.S. PROGRESS IN PERSPECTIVE.
National Committee for the International Hydrological Decade, Wash DC.
For primary bibliographic entry see Field 2F.
W78-08819

GENERATION OF ANNUAL STREAMFLOWS USING A FILTERED FRACTIONAL GAUSSIAN NOISE MODEL,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-08826

STOCHASTIC MODELS OF FLOODS,
Montreal Univ. (Quebec) Ecole Polytechnique.
For primary bibliographic entry see Field 2E.
W78-09041

A WATER-BALANCE MODEL FOR DEEP LOESS SOILS,
Iowa State Univ. Ames. Dept. of Agricultural Engineering.
C. E. Anderson, H. P. Johnson, and W. L. Powers.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 2, p 314-320, March-April 1978. 8 fig, 2 tab, 16 ref.

Descriptors: *Water balance, *Iowa, *Soil moisture, *Runoff, *Model studies, Mathematical models, On-site data collections, Watersheds(Basins), Rainfall, Evaporation, Evapotranspiration, Winds, Air temperature, Humidity, Solar radiation, Infiltration, Soils, Loess, Agriculture.

A digital computer model was developed to simulate the moisture balance on an agricultural watershed, including interception, infiltration, surface-depression storage, surface runoff, soil moisture redistribution, deep percolation, and evapotranspiration. The model is for small homogeneous watersheds on deep, well-drained soils, and was calibrated and tested using data from small research watersheds operated in the deep loess hills in western Iowa. The model produced continuous simulation of the moisture balance during the growing season. The correlation between measured and predicted surface runoff depths for individual events during 4 yr of records was 0.80. The correlation between predicted soil moisture in the root zone and bi-weekly measurements during the same 4 yr was 0.91. (Sims-ISWS)
W78-09049

A DETERMINISTIC NON-LINEAR MODEL FOR RAINFALL-RUNOFF RELATION,
Meteorological Office, New Delhi (India).
M. K. Guha.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 28, No. 2, p 243-245, April 1977. 1 tab, 12 ref.

Descriptors: *Rainfall-runoff relationships, *Model studies, *Mathematical models, Hydrographs, Rainfall, Precipitation(Atmospheric), Runoff, Watersheds(Basins), Equations, Mathematics, Hydrology, *India.

A non-linear model for the rainfall run-off relation was discussed by using the Laplace's transform in the equation of continuity and storage. The equation of continuity was converted into a nth order algebraic equation. A simple integration method was indicated for the constant input function. Some particular cases were discussed as a verification of the result, and the linear model was deduced as a special case from the non-linear model. The results were in close agreement with that of observed hydrograph. (Sims-ISWS)
W78-09052

EDUCATION IN HYDROLOGY AND WATER RESOURCES IN THE UNITED STATES--1965-1974--AN OVERVIEW WITH RECOMMENDATIONS.
National Committee for the Internationa Hydrological Decade, Washington, DC. Work Group on Education and Training.
For primary bibliographic entry see Field 9A.
W78-09055

PREDICTING SEDIMENT YIELD FROM AGRICULTURAL LAND,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-09254

EVALUATION OF THE COMPONENTS OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Boise ID.
C. L. Hanson.
Paper No. 77-2533 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 8 p 7 fig, 4 tab, 8 ref.

Descriptors: *Model studies, Hydrology, *Simulation analysis, *Soil water, Runoff, *Idaho, Computer programs, *Watershed management, Arid lands, *USDAHL-74 model.

The USDAHL-74 revised model of watershed hydrology was evaluated on an 83-ha arid rangeland watershed in southwest Idaho. The model simulated soil water adequately, except during periods in late summer and fall. The model did not adequately simulate runoff. (Skogerboe-Colorado State).
W78-09258

A COMPARISON OF DETERMINISTIC MATHEMATICAL WATERSHED MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4D.
W78-09262

A CONTINUOUS WATER BUDGET MODEL FOR WESTERN KANSAS,
Agricultural Research Service, Lafayette, IN.
For primary bibliographic entry see Field 2G.
W78-09263

MODELING INFILTRATION DURING A VARIABLE RAIN,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-09271

2B. Precipitation

CONFIDENCE LIMITS OF EXPECTED MONTHLY RAINFALL FOR SOME SELECTED STATIONS IN PENINSULAR MALAYSIA,
Malaysian Meteorological Service, Kuala Lumpur.
H. H. Chong, and L. J. Tick.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol 28, No 2, p 205-210, April 1977. 2 fig, 4 tab, 5 ref.

Descriptors: *Rainfall, *Analytical techniques, *Statistical methods, *Asia, Precipitation(Atmospheric), Data processing, Statistics, Agriculture, Weather, Meteorology, *Malaysia.

Monthly total rainfall data for 15 stations in Peninsular Malaysia were analyzed. The original rainfall data were normalized by Bartlett's square root transformation. Confidence limits of expected monthly rainfall were calculated from the transformation. Confidence limits of expected monthly rainfall were calculated from the transformed data and reconverted back to the original units. Possible applications of the confidence limits of expected monthly rainfall to agriculture were discussed briefly. (Sims-ISWS)
W78-08825

URBAN, TOPOGRAPHIC AND DIURNAL EFFECTS ON RAINFALL IN THE ST. LOUIS REGION,
Illinois State Water Survey, Urbana.
F. A. Huff, and J. L. Vogel.
Journal of Applied Meteorology, Vol. 17, No. 2, p 565-577, May 1978. 8 fig, 5 tab, 17 ref.

Descriptors: *Rainfall, *Missouri, *Cities, *Topography, *Effects, On-site investigations, Summer, Precipitation(Atmospheric), Rainfall intensity, Raingages, Networks, Industries, Data processing, Storms, Diurnal, Spatial distribution, Temporal distribution, Weather, Weather modification, Meteorology, *St. Louis(MO).

Analyses were made of the summer rainfall distribution (June-August) in 17 areas within the METROMEX network in St. Louis region. The areas were selected to represent areas subject to various types and degrees of inadvertent weather modification, plus a no-effect (control) area. The purpose was to determine the magnitude and relative intensity of urban and topographic effects on rain enhancement. Results indicated that the urban enhancement was greater than that associated with hills and river bluffs in the experimental region. The urban enhancement maximized northeast of the St. Louis urban-industrial complex where it was computed to be approximately 30-35%. The bluffs effect was calculated to be approximately 14%, and the hill effect was 9% for all rainstorms combined during the five summers. The urban and topographic enhancements were most pronounced in heavy storms, defined as those producing gage amounts of 25 mm or more. The enhancement maximized in June in the region of maximum urban effect, but occurred in July or August in other network areas subjected to urban or topographic influences. The urban effect was found to be associated with stimulation of rain output in ongoing storms, as opposed to an increase in frequency of storm events. Analyses of diurnal distributions showed that the major high in the Edwardsville area was produced by a double maximum of nearly equivalent magnitude in late afternoon and late evening. Further evidence was found that the urban effect is substantially greater than the topographic effect. During the diurnal peak rainfall periods, both the rainfall frequency and rainfall amounts were greater in the urban-effect areas, but the enhancement was produced largely by greater rain amounts. (Sims-ISWS)
W78-08830

URBAN EFFECTS ON SEVERE LOCAL STORMS AT ST. LOUIS,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr.
Journal of Applied Meteorology, Vol. 17, No. 5, p 578-586, May 1978. 4 fig, 6 tab, 12 ref. NSF ENV73-07796.

Descriptors: *Storms, *Missouri, *Cities, Effects, On-site investigations, Summer, Thunderstorms, Precipitation(Atmospheric), Rainfall, Hail, Winds, Tornadoes, Cloudbursts, *Precipitation excess, *Precipitation intensity, Weather, Weather modification, Meteorology, *St. Louis(Mo).

As part of METROMEX, a five-year study of how St. Louis affects summer weather, studies were made of possible urban effects on severe local storm phenomena. Localized (within 40 km of the city) increases were found in various thunderstorm characteristics (about 10 to 115%), in hailstorm conditions (3 to 330%), in various heavy rainfall characteristics (35 to 100%) and strong gusts (90 to 100%). No indication of effects on tornado activity was found. The more substantial percentage increases were found in the expressions of storm intensity (very frequent thunder, hailfall impact energy and high rainfall rates). Urban-related increases in severe local storm conditions appeared at midday, were greatest in the evening, and ended by midnight. Urban-induced increases occurred with all synoptic weather types but were most frequent and intense with squall lines and cold fronts. Results suggested that urban-induced factors alter the microphysical and dynamic properties of clouds and storms. (Sims-ISWS)
W78-08831

AMAZON BASIN HYDROMETEOROLOGY,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
A. T. Hjelmfelt, Jr.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY6, Proceedings Paper 13825, p 887-897, June 1978, 20 fig, 9 ref.

Descriptors: *Meteorology, *Wet seasons, *Tropical regions, River systems, Weather patterns, Rainfall, Dry seasons, Convection, Hydrology, *Amazon basin, *Brazil, Equatorial region, Equatorial trough.

The Amazon Basin lies across the equator, so the climate is established by the motion of the equatorial low pressure region. The result is a very rainy wet season and a very dry dry season with two transitions. The wet season is characterized by short periods of rain several times each day, with time distribution of rainfall similar to that expected for thunderstorms. The dry season frequently experiences less than 10 mm of rainfall. (Singh-ISWS)
W78-09038

ACCELERATIONS AND TERMINAL VELOCITIES OF RAINDROPS,
Asian Inst. of Tech. Bangkok (Thailand).
R. B. Banks.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE3, Technical Note, p 527-531, June 1978. 2 fig, 1 tab, 6 ref, 1 append.

Descriptors: *Raindrops, *Velocity, *Impact(Rainfall), Analysis, Theoretical analysis, Rainfall, Mathematical studies, Equations, *Terminal velocity, Raindrip acceleration.

It appears desirable to obtain more information regarding the relationship between rainfall rates and surface reaeration coefficients. Accordingly, at the present time apparatus is being designed and assembled at the Asian Institute of Technology to carry out experiments to determine this relationship. On the basis of the results of the Thames Estuary study, it appears that the surface reaeration coefficient is directly proportional to the power of the rainfall. The main goal of the proposed study is to confirm or modify this correlation. In natural rainfalls, the velocity of a drop at impact is likely to be its terminal velocity. In the proposed experiments, because of insufficient head room in the laboratory, the drops, at least those of the larger diameters, will not yet have attained their terminal velocities. Therefore, the subject of accelerating raindrops was examined. A proposed equation was derived for computation of impact velocity. Impact velocities will be measured in the contemplated study to confirm the validity of the method of computation. (Humphreys-ISWS)
W78-09044

ACIDIC PRECIPITATION IN SOUTH-CENTRAL ONTARIO: RECENT OBSERVATIONS,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5A.
W78-09051

A DETERMINISTIC NON-LINEAR MODEL FOR RAINFALL-RUNOFF RELATION,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2A.
W78-09052

SOVIET DEVELOPMENTS IN WEATHER MODIFICATION, CLIMATE MODIFICATION, AND CLIMATOLOGY,
Informatics, Inc., Rockville, MD.
For primary bibliographic entry see Field 3B.
W78-09214

ECONOMIC BENEFITS OF CLIMATOLOGICAL SERVICES,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 6B.
W78-09226

RAINFALL SIMULATOR FOR EVALUATING EROSION RATES AND SEDIMENT FROM ROW SIDESLOPES,
Agricultural Research Service, oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 7B.
W78-09253

2C. Snow, Ice, and Frost

ICE ON RIVERS AND LAKES--A BIBLIOGRAPHIC ESSAY,
Geological Survey, Reston, VA. Water Resources Div.
E. R. Ficke, and J. F. Ficke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 528. Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-95, October 1977. 173 p, 2 fig, 752 ref.

Descriptors: *Bibliographies, *Ice, *Lakes, *Rivers, Navigation, *Water quality, Ice breakup, Ice jams, Ice loads, Freezing, Melting, Publications, Reviews.

Ice on rivers and lakes influences design and construction of structures, operation of shipping, flow and circulation, water quality, and other factors related to the use of water. Interest in understanding these influences has led to many programs of data collection, research, and investigations for a century or more. The body of literature reporting on these studies includes several thousand items in textbooks, proceedings, journals, and technical reports. By far, the largest portion of the studies were in the United States, Canada, or the Soviet Union. The literature can be classified as dealing with basic characteristics of ice; freezing and melting processes and their prediction and control on rivers, and on lakes; effects of river and lake ice on navigation, flow, and structures; and influences of ice on chemical, biological, and thermal aspects of water quality. This bibliography cites 750 publications, but the body of literature is large and this bibliography is not exhaustive. It does provide, however, a cross section of the scope of work in the field. (Woodard-USGS)
W78-08837

WATER MOVEMENT AND INFILTRATION IN A FROZEN SOIL: THEORETICAL AND EXPERIMENTAL CONSIDERATIONS,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08912

WATER CONDITIONS IN CALIFORNIA, SUMMARY OF CENTRAL VALLEY WATER CONDITIONS, JUNE 1, 1978.
Sacramento Dept. of Water Resources, CA.
For primary bibliographic entry see Field 4A.
W78-09050

INTERMITTENT ARCTIC STREAMS AND THEIR INFLUENCE ON LANDFORMS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
H. J. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 832, Price codes: A02 in paper copy, A01 in microfiche. Catena, Vol. 2, p. 181-192, 1975. 12 fig, 22 ref.

Descriptors: *Permafrost, *Arctic, *Intermittent Streams, *Geomorphology, *Alaska, Ice, Erosion, Deposition, Floodplains, Thermal erosion, Braided streams.

The weather and climate of the arctic to a great extent, control the nature of the processes responsible for morphologic changes in landforms. Much of the area in continuous permafrost experiences a repetition of short periods of heavy flooding separated by long periods of extremely low water. Floodplains, especially along braided streams, are exposed to wind action during most of the snow-free period. Thermal erosion and seasonally concentrated runoff are often responsible for rapid bank retreat along channels and for the construction of a variety of depositional forms many of which are highly ephemeral. Although floodwater is the main agent in erosion, transportation, and deposition, ice which moves downstream during breakup exerts an influence on many forms and is responsible for the presence of non-sorted, randomly located deposits on floodplains. Much morphologic change in the zone of continuous permafrost tends to be concentrated in a short period of time. (Stihler-Mass)
W78-09090

ROLE OF GROUND WATERS IN THE FORMATION OF THE CHEMISTRY OF RIVER WATERS DURING THE SUMMER-AUTUMN LOW-FLOW PERIOD IN PERMAFROST REGIONS, AS EXEMPLIFIED BY THE LENA-INDIGIRKA REGION,
For primary bibliographic entry see Field 2K.
W78-09209

AERIAL PHOTO INTERPRETATION OF A SMALL ICE JAM,
Cold Regions Research and Engineering Lab., Hanover, NH.
S. L. DenHartog.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 870, Price codes: A02 in paper copy, A01 in microfiche. Special Report 77-32, October 1977. 20 p, 3 fig. CWIS 31355.

Descriptors: *Ice jams, *Remote sensing, *Photography, *New Hampshire, Ice, Ice cover, Aerial photography, On-site investigations, Surveys, Analytical techniques, Rivers, *Plymouth(NH), *Pemigewasett River(NH).

Aerial photos of a small ice jam on the Pemigewasett River near Plymouth, New Hampshire, were taken three days after the jam and compared with photos taken after the ice went out. The winter photos show a marked and sudden decrease in floe size, apparently indicative of faster and longer movement of the ice. The spring photos show a number of shallows and obstructions that apparently had no effect on the ice movement. It was concluded that this jam was caused by a change in slope and subsequent reduction in velocity. (Humphreys-ISWS)
W78-09215

DEVELOPMENT OF METHODS FOR CALCULATION OF THE THERMAL REGIME OF ROCK-FILL DAMS IN REGIONS OF SEVERE CLIMATE,
Vsesoyuznyi Nauchno-Issledovatelskii. Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 8G.
W78-09218

CALCULATING THE ICE DISCHARGE FRONT FOR DAMS,
R. R. Chugayev.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 451, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 603, February 1977. 9 p, 1 fig, 3 ref. Translated from Sbornink trudov po gidrotekhnike i gidrostroetel'stva pri stroitel'stve plotin v surovykh klimaticheskikh usloviyakh, p 31-37, 1970.

Descriptors: *Dams, *Spillways, *Ice, Ice cover, Ice jams, Lake ice, Ice breakup, Rivers, Reservoirs, Dam design, Structures, Hydraulic structures, Civil engineering, Ice discharge.

Calculating the length of the so-caled ice discharge front for dams is of great practical significance. The question of this type of calculation, at the basis of which is the concept of the ice discharge capacity of the stream cross section, was discussed. (Sims-ISWS)
W78-09220

2D. Evaporation and Transpiration

EVALUATION OF EVAPORATION FROM LAKE ONTARIO DURING IFYGL BY A MODIFIED MASS TRANSFER EQUATION,
Atmospheric Environment Service, Downsview (Ontario). Hydrometeorology and Marine Applications Div.
D. W. Phillips.
Water Resources Research, Vol. 14, No. 2, p 197-205, April 1978. 4 fig, 4 tab, 28 ref.

Descriptors: *Evaporation, *Lake Ontario, *Great Lakes, Environment, Fetch, Mass transfer, Turbulent flow, Winds, Stability, Water temperature, Equations, Hydrologic budget, Meteorology, *International Field Year, *Lake Hefner, Modified mass transfer technique, Turbulent energy flux, Multi-regression equations, Energy balance, Water budget methods.

Daily evaporation from Lake Ontario during the International Field Year for the Great Lakes (April 1972 to March 1973) was computed by a modified/mass transfer technique. Turbulent energy flux was calculated by using upwind land station data and the surface water temperature at 88 grid points on the lake. Wind speed and humidity at each grid point were determined through multiregression equations that took into account stability, fetch, and water temperature. Daily, monthly, and annual evaporation amounts obtained by this study were compared to amounts obtained by conventional mass transfer, energy balance, and terrestrial water budget methods. discrepancies in the results of the various approaches were examined and discussed. (Roberts-ISWS)
W78-09039

A WATER-BALANCE MODEL FOR DEEP LOESS SOILS,
Iowa State Univ. Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-09049

MODEL FOR SIMULATING SOIL-WATER CONTENT CONSIDERING EVAPOTRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources and California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-09206

EVAPORATION FROM FORESTS,
Institute of Hydrology, Wallingford (England).
J. H. C. Gash, H. R. Oliver, W. J. Shuttleworth, and J. B. Stewart.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 2, p 104-110, March 1978. 1 fig, 27 ref.

Descriptors: *Evaporation, *Forest watersheds, *Water loss, Hydrology, Forests, Watersheds(Basins), Transpiration, Interception, Evaluation, Estimating, Reviews, *Great Britain, *Wales.

Experimental and theoretical evidence has shown that the evaporation from forests is a much more complex process than that from grass land. The rates of evaporation of intercepted and transpired water are similar for grass land, and these components of the total evaporation need not be treated separately. In the United Kingdom, the annual evaporation from grass land can be estimated with adequate accuracy by the Penman formula. The rates of evaporation of intercepted and transpired water are different for forests, even under the same meteorological conditions, and must be estimated or measured separately. Failure to account for this difference will introduce an underestimation of the water lost from the forest which may be effectively zero in low rainfall areas such as East Anglia, but may rise to 100% in the high rainfall areas of Wales. Suitable models are now available for estimating evaporation from forests. After calibration against measurements of actual transpiration and of interception, these models can provide a major improvement on the simpler Penman formula in estimating evaporation. Further improvements in knowledge of the evaporation from forests will be obtained by the use of instruments to measure evaporation directly. For the measurements to be of use to hydrologists, these instruments will have to be sufficiently robust and reliable to operate in the field for long periods unattended. Their use would not only assist in understanding the problem of forest evaporation, but also in understanding evaporation from the whole spectrum of crops, of which grass land and forest are merely extremes. (Humphreys-ISWS)
W78-09212

ESTIMATION OF POND EVAPORATION IN THE GEORGIA COASTAL PLAIN,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, and L. E. Asmussen.
Report ARS-S-89, March 1976. 7 p, 4 tab, 20 ref.

Descriptors: *Evaporation, *Georgia, *Ponds, *Coastal plains, *Estimating, Analysis, Analytical techniques, Estimating equations, Water loss, Statistical methods, Methodology, Data processing, Correlation analysis, Penman method, Weather Bureau method.

Various techniques to estimate pond evaporation were compared on the basis of their ability to reproduce observed evaporation rates from a floating pan. Methods that use only one meteorological factor provided correlation coefficients that were only slightly smaller than those obtained with methods requiring values for two to four meteorological factor. Factor analysis indicated that radiation, humidity, and air temperature have similar effects on the variation in floating-pan evaporation; thus, it is not necessary to use all three factors for predicting evaporation rates. Correlation analysis, sensitivity analysis, and factor analysis indicated that variation in air speed has little effect on variation in evaporation. (Humphreys-ISWS)
W78-09224

2E. Streamflow and Runoff

RECONSTRUCTION OF RIVER DISCHARGES IN THE CONGO BASIN,
Moscow State Univ. (USSR). Dept. of Hydrology.
P. V. Yefremov.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 323-325, 1976. 1 fig, 3 tab, 5 ref. Translated from Vestnik Moskovskogo Universiteta, Geografiya, No. 5, p 115-118, 1976.

Descriptors: *Rivers, *Discharge(Water), *Africa, Data processing, Watersheds(Basins), Runoff, Hydrology, *Congo River basin.

There is still little hydrologic information on the basin of the Congo, the second largest river in Africa. Yearbooks published from 1948 to 1961 contain information on the stages of this river and its tributaries. All the data are reduced to the first and 15th day of each month, and no monthly and annual averages are given. Yearbooks for 1958 and 1959 include, in addition to data on stages, information on daily discharges for these two years at five gaging stations. To reconstruct the runoff records for the Congo, Luaba, and Kasai rivers, data on their stages from 1932 to 1957 were used. Information on daily stages at Kinshase, Kindu, Ubundu, Kutu-Moke, and Ilebo has been published in the hydrologic yearbooks on the Congo basin since 1951. Only the stages on the first and 15th of each month are given for the period 1932-1950. As a result of the reconstruction of data on the runoff of rivers in the Congo basin, information also was obtained on mean annual discharges. Data on the annual runoff of the Congo River were particularly interesting because this river contributes about 40% of the total runoff from the African continent into the ocean according to the data of different researchers. (Sims-ISWS)
W78-08814

LOW-SPEED CALIBRATION OF THE BENDIX Q15R CURRENT METER,
Argonne National Lab., IL. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 7B.
W78-08824

GENERATION OF ANNUAL STREAMFLOWS USING A FILTERED FRACTIONAL GAUSSIAN NOISE MODEL,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. Srikanthan, and T. C. McMahon.
Journal of Hydrology, Vol 37, No 1/2, p 13-21, April 1978. 1 fig, 2 tab, 10 ref.

Descriptors: *Australia, *Synthetic hydrology, *Analytical techniques, *Computer models, *Data processing, Annual, Streamflow, Statistics, Markov processes, Methodology, Model studies, *Fractional Gaussian noise models, *Wilson-Hilferty transformation, Log-transformation, Hurst coefficient.

Filtered fractional Gaussian noise models were used to generate annual streamflows for 13 Australian streams. Problems involved with using the Wilson-Hilferty transformation and Kirby's modifications were noted, and as a consequence, a log-normal transformation was adopted. Comparison of the various parameters obtained from the historical and generated sequences showed that even though the value of the Hurst coefficient (h) was preserved in some cases, other parameters were not preserved very well. (Singh-ISWS)
W78-08826

MARKOVIAN INPUTS AND THE HURST PHENOMENON,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
F. L. S. Gomide.
Journal of Hydrology, Vol 37, No 1/2, p 23-45, April 1978. 9 fig, 1 tab, 23 ref. GK-3152X.

Descriptors: *Markov processes, *Synthetic hydrology, *Statistical methods, Analytical techniques, Storage requirements, Streamflow, Computers, Methodology, Equations, Mathematical studies, *Hurst's phenomenon, Adjusted range, Asymptotic mean range.

Studies of storage capacity of reservoirs lead to the problem of discussing the Hurst phenomenon. In this paper, Hurst's theoretical argument was extended to the case of Markovian inputs. It was shown that processes with a markovian correlation structure preserve the Hurst phenomenon as a long-term transient effect. Other works on the Hurst phenomenon were discussed briefly. The exact distribution of Hurst's conditioned range also was presented. (Singh-ISWS)
W78-08827

LOW-FLOW CHARACTERISTICS OF PENNSYLVANIA STREAMS,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08846

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1977,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08847

PRELIMINARY EVALUATION OF FLOOD FREQUENCY RELATIONS IN THE URBAN AREAS OF MEMPHIS, TENNESSEE,
Geological Survey, Memphis, TN. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-08850

MAUMEE RIVER BASIN LEVEL-B STUDY, WATER SUPPLY TECHNICAL PAPER,
Geological Survey, Indianapolis, IN. Water Resources Div.
W. G. Weist, Jr., M. Planert, and L. D. Arihood.
Great Lakes Basin Commission, Ann Arbor, Michigan, MRB Series No 16, August 1976. 48 p, 9 fig, 13 tab, 47 ref.

Descriptors: *Water supply, *Surface waters, Groundwater resources, *Water quality, *Available water, Water users, Water demand, Projections, Indiana, Michigan, Ohio, *Maumee River basin.

The Maumee River basin includes 8,923 square miles in northwestern Ohio, northeastern Indiana, and southeastern Michigan. Several periods of glaciation have left the basin nearly flat, resulting in drainage and flooding problems. Because much of the glacial deposits are fine grained, erosion and sedimentation also are problems. The basin has adequate water to meet anticipated municipal, industrial, and rural needs through the year 2000. Total water needs in 1975 are estimated to be 1,217 million gallons per day. By 2000 these needs are estimated at 1,447 million gallons per day. Surface-water sources, including Lake Erie, will meet about 90 percent of these needs. Water is available from unconsolidated aquifers and from limestone and dolomite aquifers. In general, unconsolidated deposits are the source of ground water in the part of the basin north of the Maumee River, and bedrock south of the river. Ground water in the basin is generally hard enough to need softening. In places, iron, sulfate, and sulfide concentrations are objectionably high. Quality of surface water is similar to that of ground water, although the dissolved-solids concentration of surface water is generally lower than that of ground water. (Woodard-USGS)
W78-08857

DEVELOPING ZONE CHARACTERISTICS IN AERATED FLOWS,
Indian Inst. of Tech. Madras. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-09030

WAVE PROPAGATION IN STEEP ROUGH MOUNTAIN STREAMS,
Forests Commission of Victoria, Melbourne (Australia).
L. J. Bren, and A. K. Turner.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5 Proceedings Paper 13780, p 745-754, May 1978. 6 fig, 7 ref, 2 append.

Descriptors: *Waves(Water), *Australia, *Channel flow, *On-site tests, *Gradients(Streams), Froude number, Reynolds number, Continuity equation, Hydraulics, Analytical techniques, Simulation, *Rough mountain stream, *Kinematic wave theory, Storage, discharge relationship.

Kinematic wave theory was tested along a small, steep, rough mountain stream in a forest environment. The necessary parameters were measured independently over a length of natural channel and the derived relationship was used to compare physically generated hydrographs to simulated hydrographs, the agreement being good. Certain features of the hydrographs could not be simulated by the theory without a more complex discharge-storage relationship for the channel. Perturbations in a flow regime caused by the measurement technique were transmitted downstream in a stable manner. (Singh-ISWS)
W78-09032

AMERICAN DEVELOPMENTS IN HYDRAULIC MEASUREMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W78-09036

DETERMINATE HYDRAULIC GEOMETRY OF RIVER CHANNELS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 8B.
W78-09037

STOCHASTIC MODELS OF FLOODS,
Montreal Univ. (Quebec) Ecole Polytechnique.
P. Todorovic.
Water Resources Research, Vol. 14, No. 2, p 345-356, April 1978. 7 fig, 1 tab, 26 ref.

Descriptors: *Floods, *Time series analysis, *Model studies, *Flood frequency, Distribution, Hydrology, Streamflow, Methodology, Analytical techniques, *Partial duration series, Flood volume, Flood duration.

Essentially, there are two different approaches to the problem of flood analysis. One approach corresponds to the streamflow annual flood series (AFS), and the other to the streamflow partial duration series (PDS). Here characteristics of these approaches were discussed. Three stochastic models of floods presented in this paper were based on the streamflow PDS. Each model depends on certain assumptions concerning properties of exceedances of a base level x sub o. The second and third models represent improvement vis-a-vis the first one in the sense that they are based on less restrictive assumptions. The time when the largest exceedance occurs also was studied, and the distribution of this time was determined. Each exceedance is characterized, roughly speaking, by its duration and its volume. Here a method was proposed for determining the distribution of this volume. The distribution function of the largest volume in an interval of time (0,t) also was given. Good agreement between theoretical and observed distributions showed that the assumptions concerning the exceedances are not unduly restrictive. (Singh-ISWS)
W78-09041

TRANSIENT MIXING IN RIVER CHANNELS,
Clarkson Coll. of Technology, Potsdam, NY. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-09042

DISCHARGE-DEPTH EQUATION FOR SHALLOW FLOW,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
A. K. Turner, K. J. Langford, M. Win, and T. R. Clift.
Journa of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR1, Proceedings Paper 13626, p 95-110, March 1978. 9 fig, 3 tab, 20 ref, 2 apend.

Descriptors: *Flow, *Overland flow, *Roughness(Hydraulic), *Model studies, Mathematical models, Laboratory tests, Vegetation, Crops, Soils, Shallow waterm, Sheet flow, Discharge(Water), Retardance, Runoff, Surface runoff, Equations.

The application of a discharge-depth equation (with variable coefficient and exponent) was recommended for shallow flows of water over soil and through vegetation. The more flexible nature of this equation over the commonly used channel flow equations was considered, and typical values were given for three conditions, viz, bare uneven soil, artificial vegetation, and pasture and crop covers growing on a sandy soil. (Sims-ISWS)
W78-09045

THE ANALYSIS OF MULTIVARIATE TIME SERIES WITH A VIEW TO APPLICATIONS IN HYDROLOGY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. Ledolter.
Research Memorandum RM-77-11, February 1977. 33 p, 21 ref, append.

Descriptors: *Hydrology, *Time series analysis, *Stochastic processes, *Multivariate autoregressive model, *Streamflow, Methodology, Estimating, Autocovariance, Diagnostic checking, Model studies, Equations, System analysis.

This paper discusses stochastic models for vector processes, in particular the class of multivariate autoregressive moving average models. Special cases of this class have been discussed in the literature on multi-site streamflow generation, and it is shown how these can be brought into a general framework. An iterative model building procedure, consisting of model specification-estimation-diagnostic checking, is stressed. Results on model specification are given, and it is shown how partial autocovariance matrices can be used to check whether multivariate autoregressive models provide adequate representation for (standardized) streamflow sequences. Furthermore, estimation of parameters in multivariate autoregressive moving average models is discussed, and it is mentioned that moment estimators can be inefficient when moving average parameters are present. An approximate maximum likelihood estimation procedure is suggested. The concluding section summarizes important practical implications for hydrologists. (Graf-Cornell)
W78-09177

AN OPTIMAL ADAPTIVE PREDICTION ALGORITHM FOR REAL TIME FORECASTING OF HYDROLOGIC TIME SERIES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09193

A FEATURE PREDICTION MODEL IN SYNTHETIC HYDROLOGY BASED ON CONCEPTS OF PATTERN RECOGNITION,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
U. S. Panu, and T. E. Unny.
Water Resources Research, Vol. 14, No. 2, p 335-344, April 1978. 7 fig, 4 tab, 23 ref.

Descriptors: *Synthetic hydrology, *Hydrologic data, *Mode studies, *Stochastic processes, Streamflow, Time series analysis, Methodology, Hydrology, *Feature prediction model, *Saskatchewan River, Pattern recognition.

It is reasonable to consider that sequences of hydrologic data corresponding to daly, weekly, or monthly measurements occur in well-defined groups. These groups possess collective properties of the data forming them. Such a collection of properties can be called a hydrologic pattern. A pattern is a description of an object; and the objects of concern in this paper were groups of data on hydrologic phenomena observed at regular time intervals. Hydrologic patterns describing each of these groups are expressed by n appropriate properties. Further, the dimensionality, n in number, can be reduced by considering only those characteristic properties, m in number (m less than or = to n), that are common in all hydrologic patterns of the same category. These m characteristic properties are called features. A procedure was presented to extract information present within patterns and among patterns of the pertinent hydrologic data. In addition, on the basis of the above information, a zero-order Markov feature prediction model was postulated. The basic assumptions of the model and their implications were presented. The model was applied to South Saskatchewan River flow data in an effort to demonstrate its usefulness in real situations. (Singh-ISWS)
W78-09201

CHARACTERIZING LOW FLOWS USING THRESHOLD LEVELS,
Lehigh Univ., Bethlehem, PA. Fritz Engineering Lab.
R. N. Weisman.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. IR2, Technical Note, p 231-235, June 1978. 4 fig, 4 ref, 1 append.

Descriptors: *Low flow, *Low-flow frequency, *Statistical methods, *Analytical techniques, Average flow, Analysis, Streamflow, Frequency, Flow duration, Threshold flow.

This note outlined a technique of presenting low flow data. The technique is applicable in situations where duration of flow below a critical threshold is an important parameter. Once a threshold flow rate, Q, is specified, a streamflow record of average daily flows can be scanned to obtain the runs below the threshold value. A run, in this context, is the number of days that the average daily flow remains below Q. For each year of record, the longest run duration was defined as the extreme value run, R. The set of extreme value runs, one vaue for each year of record, form a sample of extreme value data. These data can be assigned a probability or return period using a plotting position formula. This results in a plot of run duration R versus return period T for the given vaue of threshold of Q. Many aspects of this technique remain to be explored, such as using a partial series and applying a probability distribution to extreme value runs. However, even in its simplest form as presented, it may prove meaningful to water resource planners. (Humphreys-ISWS)
W78-09202

FLOOD PROFILES IN COMBINED TIDAL-FRESHWATER ZONES,
Agency for International Development, Dacca (Bangladash).
For primary bibliographic entry see Field 2L.
W78-09204

SELECTING RECONNAISSANCE STRATEGIES FOR FLOODPLAIN SURVEYS,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 7B.
W78-09207

A COMPARISON OF DETERMINISTIC MATHEMATICAL WATERSHED MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4D.
W78-09262

2F. Groundwater

WATER IN CARBONATE ROCKS-U.S. PROGRESS IN PERSPECTIVE.
National Committee for the International Hydrological Decade, Wash DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 548, Price codes: A04 in paper copy, A01 in microfiche.
Final Report of the Work Group on the Hydrology of Carbonate Terranes of the US. National Committee for theInternational Hydrological Decade, Natıcnal Academy of Sciences, Wash, D.C., 1976. 48 p, 1 append. NSF C-310.

Descriptors: *International Hydrological Decade, *Hydrology, *Carbonate rocks, *Aquifers, Karst hydrology, Education, Training, Research priorities, Groundwater, Water resources, Information exchange, Programs, *Carbonate hydrology, Research needs.

Carbonate terranes have been developed only infrequently without unexpected, often costly, undesirable results. Carbonate terranes are often rugged, topographically isolated, and have undependable or localized water supplies. They are characterized by thin, patchy soils, and many carbonate terranes underlie poor or impoverished lands. Many striking exceptions exist, such as the Floridan Aquifer in the southeastern United States, the Edwards in Texas, and other elsewhere around the globe. In many regions, carbonate rock aquifers are the last major sources of groundwater that have not been highly exploited, and their real potential is only now beginning to be considered in the western United States, Northern Mexico, the Middle East, North Africa, and elsewhere. To resolve the practical problems that will be encountered in the development of carbonate terranes, management will require a sound base of scientific knowledge, including hydrological aspects. Specific recommendations were made for educational needs; research needs; transfer, adoption, and use of existing technologies; a center for disciplinary information exchange and assistance; and a committee on the hydrology of carbonate rocks. (Humphreys-ISWS)
W78-08819

HYDROGEOLOGIC CONDITIONS IN THE TOWN OF SHELTER ISLAND, SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08839

WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, MAY 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08843

GROUND-WATER SUPPLIES IN THE MURFREESBORO AREA, TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
D. R. Rima, M. S. Moran, and E. J. Woods.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 171, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 77-86, July 1977. 76 p, 31 fig, 10 tab, 15 ref. TN 74-021.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Limestones, *Water yield, *Water quality, Karst, Groundwater movement, Groundwater recharge, Hydrogeology, Water wells, Groundwater availability, Tennessee, *Murfreesboro area.

Ground water occurs in the Murfreesboro area in solution openings in the otherwise dense paleozoic limestones that underlie most of central Tennessee. Test drilling based on conceptual models of ground-water occurrence in carbonate-rock aquifers indicate that multimillion-gallon-per-day supplies could be developed from strategically located production wells in the Shiloh and Overall Creek localities. The Shiloh locality which encompasses an elongated synclinal depression in the bedrock has the potential to supply 5 to 8 million gallons per day. The Overall Creek locality which straddles a joint-oriented lineament has the potential to supply 3 to 6 million gallons per day. Some local springs could be used as a supplemental source of potable water, but storage facilities would be needed to offset poorly sustained flows during dry periods. An exception is Fox Camp Spring which appears to be a natural well. The quality of ground water in the Murfreesboro area is typically hard, moderately mineralized and moderately to highly alkaline. Although the shallowest aquifers are subject to bacterial contamination from the land surface, aquifers beneath a depth of 100 feet are prone to yield potable water. (Woodard-USGS)
W78-08848

HYDRAULIC CONDUCTIVITY AND WATER QUALITY OF THE SHALLOW AQUIFER, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. B. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 292, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-119, April 1977. 22 p, 10 fig, 3 tab, 13 ref.

Descriptors: *Aquifer characteristics, *Logging(Recording), *Hydraulic conductivity, *Water quality, *Water yield, Water wells, Hydrogeology, Groundwater movement, Permeability, Palm Beach County(Fla), *Florida.

Subsurface geophysical logs were correlated with logs of drill cuttings to determine the permeability of selected zones of the shallow aquifer, Palm Beach County, Fla. The hydraulic conductivity of the aquifer is estimated to range from 1 to 130 feet per day, based on lithology and physical properties. The yield of wells penetrating this aquifer ranges from 100 to more than 1,000 gallons per minute. Water samples were collected from different depths throughout the county and analyzed for chemical constituents. Stiff diagrams illustrate the changes in types of water by depth and area. Water of suitable quality is in the eastern parts of the county. In this area the aquifer is the thickest and most permeable. The concentration of chemical constituents in the water increase in a westerly direction. The water in the western parts of the county is unsuitable for most purposes. (Woodard-USGS)
W78-08854

ALTITUDE AND CONFIGURATION OF THE TOP OF THE FLORIDAN AQUIFER, DUVAL COUNTY, FLORIDA,
Geological Survey, Jacksonville, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08855

THE WINONA-TALLAHATTA AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, MS. Water Resources Division.
For primary bibliographic entry see Field 7C.
W78-08856

NUMERICAL MODEL FOR SATURATED-UNSATURATED FLOW IN DEFORMABLE POROUS MEDIA. 2. THE ALGORITHM,
California Univ., Berkeley. Lawrence Berkeley Lab.
T. N. Narasimhan, P. A. witherspoon, and A. L. Edwards.
Water Resources Research, Vol. 14, No. 2, p 255-261, April 1978. 3 fig, 8 ref.

Descriptors: *Numerical analysis, *Mathematical models, *Porous meida, *Saturated flow, *Unsaturated flow, *Algorithms, Equations, Groundwater movement, Aquifer characteristics, Boundaries(Surfaces), *Integrated-finite-difference method, Explicit-implicit iteration.

An integrated finite difference algorithm was presented for numerically solving the governing equation of saturated-unsaturated flow in deformable porous media. In recognition that stability of the explicit equation is a local phenomenon, a mixed explicit-implicit procedure was used for marching in the time domain. In this scheme, the explicit changes in potential are first computed for all elements in the system, after which implicit corrections are made only for those elements for which the stable time step is less than the time step being used. Time step sizes are controlled automatically in order to optimize the number of iterations, to control maximim change in potential during a time step, and to obtain desired outputs. Time derivatives, estimated on the basis of system behavior during two previous time steps, are used to start the iteration process and to evaluate nonlinear coefficients. Boundary conditions and sources can vary with time or with the dependent variable. Input data are organized into convenient blocks. Accuracy of solutions can be affected by modeling errors, different types of truncation errors, and convergence errors. The algorithm constitutes an efficient tool for analyzing linear and nonlinear fluid flow problems in multidimensional heterogeneous porous media with complex geometry. An important limitation is that the model cannot conveniently handle arbitrary anisotropy and other general tensorial quantities. (Visocky-ISWS)
W78-09195

ANALYSIS OF DYNAMIC AQUIFERS WITH STOCHASTIC FORCING FUNCTION,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.; and Department of the Environment, Ottawa (Ontario) Inland Waters Directorate.
B. Sagar.
Water Resources Research, Vol. 14, No. 2, p 207-216, April 1978. 6 fig, 28 ref.

Descriptors: *Saturated flow, *Aquifers, *Mathematical models, *Stochastic processes, Model studies, Mathematical studies, Analytical techniques, Analysis, Flow, Porous media, Groundwater movement, Equations, Markov processes, Probability, Stochastic forcing function.

The existence of different types of uncertainties in deterministic aquifer models and the need of quantitatively accounting for them were discussed. The case of one-dimensional saturated flow represented by a linear parabolic partial differential equation with a stochastic forcing function was analyzed. The dependence of the autocovariance function of the hydraulic head on properties of the forcing function and nature of the aquifer was brought out. (Humphreys-ISWS)
W78-09197

A FULLY COUPLED CONSOLIDATION MODEL OF THE SUBSIDENCE OF VENICE,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
R. W. Lewis, and B. Schrefler.
Water Resources Research, Vol. 14, No. 2, p 223-230, April 1978. 9 fig, 2 tab, 10 ref.

Descriptors: *Subsidence, *Model studies, *Consolidation, *Potentiometric level, Groundwater, Water table, Aquifers, Theoretical analysis, Analytical techniques, Mathematical models, Compressibility, Flow, Drawdown, Pumping, Foreign research, Foreign countries, *Italy, *Venice(Italy).

The subsidence of Venice, a well-known historical town in Italy, is caused by the extensive withdrawal of groundwater in its industrial area, Marghera. A fully coupled finite element consolidation model was presented to simulate the subsidence and the piezometric decline in the considered area. The model shows clearly the short time delay between changes in the withdrawal rate in Marghera and the resulting hydraulic head decline and subsidence in Venice. A comparison also was made between the coupled model and an analysis in which the flow region was analyzed separately from the subsidence calculations. (Humphreys-ISWS)
W78-09198

STOCHASTIC ANALYSIS OF SPATIAL VARIABILITY IN SUBSURFACE FLOWS. 1. COMPARISON OF ONE-AND THREE-DIMENSIONAL FLOWS,
New Mexico Inst. of Mining and Technology, Socorro.
A. A. Bakr, L. W. Gelhar, A. L. Gutjahr, and J. R. MacMillan.
Water Resources Research, Vol. 14, No. 2, p 263-271, April 1978. 4 fig, 23 ref.

Descriptors: *Stochastic processes, *Hydraulic conductivity, *Subsurface flow, *Aquifers, Groundwater movement, Statistical models, Equations, Hydraulic gradient, Mathematical models, Monte Carlo method, Spatial variability, Covariance function, Spectral analysis.

The complex variation of hydraulic conductivity in natural aquifer materials is represented in a continuum sense as a spatial stochastic process which is characterized by a covariance function. Assuming statistical homogeneity, the theory of spectral analysis was used to solve perturbed forms of the stochastic differential equation describing flow through porous media with randomly varying hydraulic conductivity. From analyses of unidirectional mean flows which are perturbed by one- and three-dimensional variations of the logarithm of the hydraulic conductivity, local relationships between the head variance and the log conductivity variance were obtained. The results showed that the head variance produced by three-dimensional statistical isotropic conductivity perturbations is only 5% of that in the corresponding one-dimensional case. The head variance is also strongly dependent on the correlation distance of the log conductivity covariance function. These results emphasized the importance of including spatial correlation structure and multidimensional effects in stochastic simulation of groundwater flow. (Visocky-ISWS)
W78-09199

THEORY OF FLOW IN UNCONFINED AQUIFERS BY INTEGRODIFFERNTIAL EQUATIONS,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Investigaciones en Matematicas Aplicadas y en Sistemas.
I. Herrera, A. Minzoni, and E. Z. Flores.
Water Resources Research, Vol. 14, No. 2, p 291-297, April 1978. 3 fig, 1 tab, 18 ref, 1 append.

Descriptors: *Aquifers, *Drawdown, *Theoretical analysis, *Mathematical models, Groundwater movement, Unsteady flow, Groundwater, Flow, Compressible flow, Porous media, Analytical techniques, Mathematical studies, Equations, Compressibility, Integrodifferential equations, Leaky aquifers.

It was shown that when the diffusion of the deviation of the drawdown from its average value can be neglected, the unsteady flow in unconfined aquifers is governed by an integrodifferential equation. For incompressible flow, this equation reduces the Boulton's delayed yield equation with epsilon = 3. When the flow is compressible, the kernel can be approximated by Boulton's delayed factor in a range of times whose lower limit approaches zero with the compressibility. (Humphreys-ISWS)
W78-09200

AUTOMATIC ANALYSIS OF PUMPING TEST DATA-APPLICATION TO THE BOULTON AND HANTUSH HYPOTHESES (ANALYSE AUTOMATIQUE DES DONNEES DE POMPAGE D'ESSAI-APPLICATION AUX HYPOTHESES DE BOULTON ET D'HANTUSH),
Lille-1 Univ., Villeneuve d'Ascq (France).
J. Mania, and M. Sucche.
Journal of Hydrology, Vol. 37, No. 1/2, p 185-194, April 1978. 3 fig, 2 tab, 11 ref.

Descriptors: *Drawdown, *Aquifers, *Model studies, *Analytical techniques, Theoretical analysis, Water wells, Porous media, Mathematical models, Equations, Flow, Data processing, Artesian aquifers, Leakage, Test wells, Testing curves, *Drawdown curves, Leaky artesian aquifers.

Classical analysis of pumping test curves under unsteady-state flow conditions with constant discharge rate in a fully penetrating well is based on a manual graphical comparison of drawdowns with theoretical standard curves. This procedure leaves a relative subjectivity to the operator. A more rigorous method was proposed: automatic analysis of drawdown curves. The principle of automatic analysis is based on the minimization of differences between observed drawdowns and those calculated theoretically according to a nonlinear law. The authors used the iterative process in successive degrees of Gauss-Newton applied to the evaluation of least-squares errors for a nonlinear regression. The application of this method to two hydrogeological mechanisms described by N.S. Boulton and M.S. Hantush permits a quick and direct evaluation of the hydraulic parameters of the aquifer by means of partial derivatives with relation to those parameters of the theoretical function. This latter was determined as a generalized integral of a function depending on four (first case) or five (second case) parameters. Permutations of the derivations and integration were justified. At the level of numerical calculation, the difficulty is to evaluate with sufficient precision the generalized integrals containing Bessel function. Applications of automatic analysis have been carried out and were discussed. (Humphreys-ISWS)
W78-09205

ROLE OF GROUND WATERS IN THE FORMATION OF THE CHEMISTRY OF RIVER WATERS DURING THE SUMMER-AUTUMN LOW-FLOW PERIOD IN PERMAFROST REGIONS, AS EXEMPLIFIED BY THE LENA-IN-DIGIRKA REGION,
For primary bibliographic entry see Field 2K.
W78-09209

SEASONAL VARIATIONS OF TRITIUM AND OTHER CONSTITUENTS IN GROUNDWATER IN THE CHALK NEAR BRIGHTON, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 5A.
W78-09210

2G. Water In Soils

COMPACTION EFFECTS ON THE HYDRAULIC CONDUCTIVITY OF A CLAY SOIL,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Agricultural Engineering.
E. Douglas, and E. McKyes.
Soil Science, Vol 125, No 5, p 278-282, May 1978. 6 fig, 7 ref.

Descriptors: *Compaction, *Compacted soils, *Hydraulic conductivity, *Clays, Unsaturated flow, Laboratory tests, Equations, Saturated soils, Porosity, Pressure, Hydraulic gradient, Bulk density, Soil moisture, Darcys Law, Effective porosity.

Unsaturated hydraulic conductivities of laboratory-compacted samples of Ste. Rosalie clay were measured, and the values obtained were corrected for the effective changing porosity under increasing pressure gradients. An equation was presented that permits predicting the corrected hydraulic conductivity as a function of compaction in terms of porosity. (Visocky-ISWS)
W78-08828

FRONTAL MOVEMENT OF AQUEOUS SOLUTIONS DURING REDISTRIBUTION THROUGH AIR-DRY SAND COLUMNS AS A FUNCTION OF COLUMN LENGTH AND TIME,
Battelle Pacific Northwest Labs., Richland, WA.
R. C. Routson, and D. J. Brown.
Soil Science, Vol 125, No 5, p 320-325, May 1978. 5 fig, 3 tab, 19 ref.

Descriptors: *Aqueous solutions, *Sands, *Laboratory tests, *Soil water movement, Sorption, Soils, Depth, Graphical analysis, Equations, Wetting, Time, Frontal movement, Sand columns.

The frontal movement during redistribution of unsorbed waste fronts through an air-dried sand was measured as a function of time and column length for columns 25-200 cm long. All column data fit an equation of the form S = Ex T to the F power. S was found to be significantly correlated with T(at the 1% level). The equation was normalized by dividing S and E by the column length. When this was done, data for all columns fit a single normalized equation. Use of this equation allows estimation of the shortest possible time necessary for the front of a pulse of waste solution to reach a given depth in a homogeneous soil system. (Visocky-ISWS)
W78-08829

MOISTURE PROFILES DURING STEADY VERTICAL FLOWS IN SWELLING SOILS,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
J. V. Giraldez, and G. Sposito.
Water Resources Research, Vol. 14, No. 2, p 314-318, April 1978. 3 fig, 1 tab, 21 ref.

Descriptors: *Soil moisture, *Soil water movement, *Mathematical models, *Equations, Unsaturated flow, Computer models, Steady flow, Loam, Model studies, *Swelling soil, *Moisture profiles.

Practical working equations for numerically describing soil moisture profiles in homogeneous swelling soils during vertical flows were developed. These equations were solved on a computer with soil water and swelling curve data appropriate to Rideau clay loam, which was taken as a typical example of a swelling soil. Unsaturated swelling soils were shown to exhibit either xeric or hydric profiles for downward flows, whereas for upward flows they exhibit only a xeric profile, just as rigid soils do. On the other hand, saturated swelling soils were shown to have hydric profiles in the downward flow situation and either hydric or xeric profiles during upward flows. The overburden or 'envelope pressure' potential was shown to exert a great influence, in almost all circumstances, in reducing the maximum evaporative flow from a shallow water table in a swelling soil as compared to the equivalent nonswelling case. (Visocky-ISWS)
W78-08833

ADSORPTION OF ALUMINUM BY A SMECTITE: I. SURFACE HYDROLYSIS DURING CA2(+)(-)AL3(+) EXCHANGE,
Cornell Univ., Ithaca, NY. Dept. of Agronomy.
P. R. Bloom, M. B. McBride, and B. Chadbourne.
Soil Science Society of American Journal, Vol. 41, No. 6, p 1068-1072, Novenmber-December, 1977. 1 fig, 6 tab, 16 ref.

Descriptors: *Adsorption, *Aluminum, *Montmorillonite, *Clays, Soils, Soil chemistry, Soil properties, *Smectite, Hydrolysis,(Surface), *Ion exchange, *Calcium.

The exchange of Ca by Al in montmorillonite suspensions adjusted to low pH (approximately equal to 4) was investigated by measurement of Ca, Al, and pH in the solution phase before and after the addition of clay. Adsorption of Al was accompanied by a release of protons to solution, indicating that the clay surfaces promoted hydrolysis of Al3+ when only partial coverage of exchange sites by Al had occurred. Calculations showed a two- to nine fold increase in the degree of hydrolysis at the surface relative to the value for solution. (See also W78-08907) (Skogerboe-Colorado State)
W78-08906

ADSORPTION OF ALUMINUM BY A SMECTITE: II. AN AL3(+)(-) CA2(+),
Cornell Univ., Ithaca, NY. Dept. of Agronomy.
M. B. McBride, and P. R. Bloom.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1073-1077, November-December, 1977. 3 fig, 2 tab, 11 ref.

Descriptors: Model studies, Aluminum, *Montmorillonite, *Clays, Soils, Soil chemistry, Soil properties, *Ion exchange, *Adsorption, *Smectite, Hydrolysis.

The adsorption of Al by Ca2+-montmorillonite has been found to be described by a Langmuir-type equation in which the activity of Al3+ in solution is a function of the coverage of the mineral surfaces by Al. The classical mass-action equations were inadequate in describing the exchange reaction where the Ca2+ activity was allowed to vary, weighting the effect of the Ca2+ ion activity on the equilibrium too heavily. The model suggests that the relative solutionlike nature of adsorbed Ca2+ compared to the much more strongly adsorbed Al3+. Hydrolysis and precipitation reactions of Al3+ at higher pH complicated the exchange model by introducing significant quantities of adsorbed hydroxyl-Al into the system. (See also W78-08906) (Skogerboe-Colorado State)
W78-08907

PHOSPHATE ADSORPTION ON AN OXISOL,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.

R. L. Parfitt.
Soil Science Socity of America Journal, Vol. 41, No. 6, p 1064-1067, November-December, 1977. 1 fig, 1 tab, 22 ref.

Descriptors: *Adsorption, *Phosphates, Soil chemistry, Soil properties, *Oxisol, Isotherms, *Irox oxides, *Aluminum hydroxide.

Adsorption isotherms for phosphate on the A and B horizon of an oxisol from Papua New Guinea showed high affinity adsorption at low solution concentrations and a linear increase in adsorption at higher solution concentrations. Adsorption increased with decrease in pH in the range 3 to 8. Comparison with data obtained under similar conditions with synthetic goethite (alpha-FeOOH) and gibbsite (Al(OH)3) suggested that phosphate reacted with FeOH and FeOH2+ groups on soil iron oxide surfaces to form a binuclear bridging FeOP(O2)OFe complex and with exposed Al(OH)H2O on Kaolinite edges and on hydroxy-aluminum species to form a binuclear or bidentate phosphate complex. At higher phosphate concentrations isotherms showed continued adsorption which may be due to a further reaction involving hydroxy-aluminum groups. (Skogerboe-Colorado State)
W78-08908

APPLICATIONS AND MISAPPLICATIONS OF THE LANGMUIR EQUATION TO SOIL ADSORPTION PHENOMENA,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
R. D. Harter, and D. E. Baker.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1077-1080, November-December, 1977. 2 fig, 2 tab, 12 ref.

Descriptors: *Adsorption, Soils, Soil investigations, Soil properties, *Soil chemistry, Isotherms, *Langmuir equation, Equations.

When the development of the Langmuir adsorption equation is critically examined, it is evident that the equation soil scientists have been using (C/x/m = C/k + 1/kb, where C is concentration of adsorbate, x/m is the amount adsorbed per unit weight adsorbent, k is the adsorption maximum, and b is a constant) is in the wrong form. This error is of no great importance when the equation is merely used to obtain a calculated adsorption maximum for comparison to other adsorbent properties. However, it does become important when attempts are made to understand adsorption dynamics and bonding strengths. The commonly reported curvilinear nature of the C/x/m vs. C plots is simply the result of not considering the effect of desorbed ions in the equilibrium solution, rather than being due to multiple adsorption mechanisms. When the equation is corrected by considering desorbed ions, the isotherm becomes linear. In addition, the constant, b, of the Langmuir equation is not simply related to the bonding energy of the adsorbed ion, but to the ratio of adsorbed and desorbed ion bonding energies. (Skogerboe-Colorado State)
W78-08909

AMMONIA VOLATILIZATION FROM SOILS: EQUILIBRIUM CONSIDERATIONS,
Technion - Israel Inst. of Tech. Haifa. Dept. of Agricultural Engineering.
Y. Avnimelech, and M. Laher.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1080-1084, November-December, 1977. 2 fig, 1 tab, 9 ref.

Descriptors: *Ammonium, Soils, *Soil chemistry, Soil properties, *Fertilizers, Nutrients, *Buffer capacity(Soils), Volitilization.

The volatilization of ammonia from soils as a function of the system's properties is analyzed theoretically and experimentally. The final concentration of ammonium held by the soil increases with an increase in hydrogen ion activity, with the initial ammonium concentration, and with partial pressure of ammonia in the air. An increase in the buffer capacity of the soil leads to a decrease in the final ammonium concentration. A good agreement has been found between measured and computed values for NH3 and NH4 concentrations during the process. The pH of the soil is the dominant factor controlling the extent of ammonia volatilization only when the soil's buffer capacity is high, or, when the concentration of ammonium in the soil is low. At high pH and high initial ammonium concentrations, the dominant factor controlling the reaction is the buffer capacity of the soil. (Skogerboe-Colorado State)
W78-08910

ORGANIC PHOSPHATE TRANSPORT AND HYDROLYSIS IN SOIL: THEORETICAL AND EXPERIMENTAL EVALUATION,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 5B.
W78-08911

WATER MOVEMENT AND INFILTRATION IN A FROZEN SOIL: THEORETICAL AND EXPERIMENTAL CONSIDERATIONS,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
T. S. Steenhuis, G. D. Bubenzer, and M. F. Walter.
Paper No. 77-2545. Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Palmer House Hotel, Chicago, Illinois, 31 p, 8 fig, 2 tab, 20 ref, 2 append.

Descriptors: Soil water, *Soil water movement, *Infiltration, Soils, Soil properties, Temperature, Soil temperature, *Frozen soils.

Water movement in a frozen soil was compared theoretically and experimentally with a non-frozen soil. During the winter, water movement was upwards to the surface. Infiltration of water was only possible when the soil temperature was at freezing point, but not below, or when the soil contained macropores. (Skogerboe-Colorado State).
W78-08912

INFILTRATION EQUATION: DERIVATION TO INCLUDE SURFACE EFFECTS,
Missouri Univ. -Columbia. Dept. of Agricultural Engineering.
J. M. Gregory, H. P. Johnson, and D. Kirkham.
Paper No. 77-2552. Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December, 13-16, 1977, Palmer House Hotel, Chicago, Illinois. 31 p, 4 fig, 2 tab, 15 ref.

Descriptors: *Infiltration, *Equations, Model studies, Soil water, *Soil water movement.

An Infiltration equation capable of modeling changing surface conditions has been derived by use of the energy equation. This equation has the surface effects grouped in one function which can be separated from other variables affecting infiltration. When the surface term is set equal to zero, the equation reduces to the same form as the Green-Ampt equation. (Skogerboe-Colorado State).
W78-08913

APPLICATION OF AN INFILTROMETER SYSTEM FOR DESCRIBING INFILTRATION INTO SOILS,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
D. L. Brakensiek, W. J. Rawls, and W. R. Hamon.
Paper No. 77-2553. Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Palmer House Hotel, Chicago, Illinois. 14 p, 7 fig, 4 tab, 24 ref.

Descriptors: *Infiltration, Soil water, *Soil wat movement, Model studies, Equation *Infiltrometer systems.

The design and operation of an infiltromet systems is discussed. The analysis of the inf trometer data is illustrated by estimation of t parameters in the Green and Ampt infiltratic equation. The Green and Ampt equation seems model the observed point infiltration process ve well. Future needs in infiltrometer studies a presented. (Skogerboe-Colorado State)
W78-08914

FINITE ELEMENT MODELING OF UNSATU RATED FLOW,
Idaho Univ., Moscow. Dept. of Agricultural E gineering.
G. L. Bloomsburg, and R. A. Bloomfield.
Paper No. 77-2555. Presented at the 1977 Wint Meeting of the American Society of Agricultur Engineers, December 13-16, 1977, Palmer Hous Hotel, Chicago, Illinois, 21 p, 7 fig, 3 tab, 5 ref.

Descriptors: *Simulation analysis, *Unsaturate flow, Mining, *Infiltration, Rainfall, Evaporatio *Model studies, Soil water movement, Soil wate *Finite element analysis, *Computer programs.

This report concerns the use of a finite elemer computer program to simulate unsaturated flo through retorted oil shale piles under various cor ditions of ponding, infiltration due to rainfall, an evaporation. Field data from seepage ponds cor structed in waste shale near Rifle, Colorado, ar compared with data from computer simulatio (Skogerboe-Colorado State)
W78-08915

COLORIMETRIC DETERMINATIONS O EXCHANGEABLE AMMONIUM, UREA NITRATE, AND NITRITE IN A SINGLE SOI EXTRACT,
Texas A and M Univ., Lubbock. Agricultura Research and Extensions Center.
A. B. Onken, and H. D. Sunderman.
Agronomy Journal, Vol. 69, No. 1, p 49-53, Janua ry-February 1977. 10 tab, 9 ref.

Descriptors: *Ammonium, *Urea, *Nitrates *Nitrites, Fertilizers, Soils, Soil investigations Soil tests.

Interest in N transformations in soils has increased greatly in recent years, particularly with increased use of urea-containing fertilizers. However, only one procedure for determination of exchangeable ammonium, nitrate, nitrite, and urea in a single soi extract has een proposed and it requires the use of both distillation and colorimetric equipment. It would be useful to have a set of colorimetric procedures for the determination of these N forms in a single extract. Previous research indicated sodium sulfate, as an extractant, would be least likely to produce unwanted interferences in these procedures. Thus, research was initiated to determine (1) if Na2SO4 could br used as an extractant for exchangeable NH4+, NO3-, NO2- and urea and (2) necessary modifications to make desirable colorimetric procedures usable in a Na2SO4 extraction system. (Skogerboe-Colorado State)
W78-08924

A TWO-DIMENSIONAL LINEARIZED VIEW OF ONE-DIMENSIONAL UNSATURATED-SATURATED FLOW,
Iowa State Univ., Ames. Dept. of Agronomy.
J. Cushman, and D. Kirkham.
Water Resources Research, Vol. 14, No. 2, p 319-323, April 1978. 4 fig, 16 ref.

Descriptors: *Saturated flow, *Unsaturated flow, *Mathematical models, *Numerical analysis, Equations, Finite element analysis, Infiltration, Moisture content, Pressure head, Theoretical analysis, Two-dimensional flow.

A numerical analysis of the one-dimensional, unsaturated-saturated flow problem was presented. Both the pressure head and moisture content equations were studied for vertical and horizontal infiltration, respectively. The problems were considered in a two-dimensional setting in which time was considered the second dimension. The numerical scheme used was finite element analysis coupled with a simple linearizing assumption. The numerical process was compared with various other analytic and numerical solutions of the same problems. It was shown that if the size of the elements is not too large, the method is very accurate. (Visocky-ISWS)
W78-09040

DISCHARGE-DEPTH EQUATION FOR SHALLOW FLOW,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-09045

A WATER-BALANCE MODEL FOR DEEP LOESS SOILS,
Iowa State Univ. Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-09049

SOIL CONDITIONS, ZONATION AND SPECIES DIVERSITY IN A SEASONALLY FLOODED TROPICAL GRASS-HERB SWAMP IN SIERRA LEONE,
Fourah Bay Coll., Freetown (Sierra Leone). Botany Dept.
For primary bibliographic entry see Field 2I.
W78-09083

A DEVICE FOR THE IRRIGATION OF SOIL COLUMNS (IN GERMAN),
Goettingen Univ. (West Germany). Inst. fuer Bodenkunde und Waldernaehrung.
F. Beese, C. Heuer, and W. Rodewald.
Z Pflanzenernaehr Bodenkd Vol 5, p 581-587, 1976.

Descriptors: *Sprinkler irrigation, Irrigation systems, Irrigation, Control, Flow control, Soil moisture.

An irrigation device was designed for maintaining a constant water flow in soil columns over a long period of time. The apparatus consists of 3 construction elements: a balance for the dosage of the water, a sprinkler to distribute the water on the soil surface and an electronic time control to adjust different time steps. The wide range of possible rain intensities is shown. The mean variation of the water pulses and their distribution over the surface are discussed. The apparatus produced good results in long duration experiments.--Copyright 1977, Biological Abstracts, Inc.
W78-09109

FLOW FROM A LINE SOURCE ABOVE A SHALLOW WATER TABLE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3F.
W78-09112

THE SHEAR RESISTANCE OF ROOT-PERMEATED HOMOGENEOUS AND STRATIFIED SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
L. J. Waldron.
Soil Science Society of America Journal, Vol. 41, No. 5, p 843-849, September-October, 1977. 8 fig, 3 tab, 17 ref.

Descriptors: Soils, *Soil investigations, *Root systems, Root development, Root distribution, Cohesion, Alfalfa, Barley, Model studies, Clays, *Shear(Soils), Soil compaction, *Slope stability.

Mechanical reinforcement which stabilizes soil on slopes has been attributed to plant roots. To measure such reinforcement, direct shear tests were made on 25-cm diameter root-permeated soil columns. Roots of alfalfa, barley, and yellow pine, each increased the shear resistance of homogeneous and compacted layers of silty clay loam at 30-cm depth. One-year-old alfalfa had a much greater reinforcing effect than pine trees 16 months after transplanting or barley at its maximum growth. Barley had a greater effect in the clay loam than pine, but its effectiveness decreased as depth increased from 15 to 30-45 cm. Alfalfa roots were more effective than either pine or barley roots in increasing the resistance to shearing between a dense gravel-sand layer (simulating weathered rock) and the overlying soil, increasing shearing resistance to as much as 5 times that of fallow soil. A model is presented of soil reinforced by nonrigid roots. Calculations are given of slope safety factor increases from root reinforcement. (Skogerboe-Colorado State)
W78-09113

TRACING THE TRANSFORMATIONS OF UREA FERTILIZER DURING LEACHING,
Utah State Univ., Logan. Dept. of Soil Science and Micrometeorology.
R. J. Wagenet, J. W. Biggar, and D. R. Nielsen.
Soil Science Society of America Journal, Vol. 41, No. 5, p 896-902, September-October, 1977. 8 fig, 5 tab, 22 ref.

Descriptors: *Urea, *Fertilizers, Fertilization, Nutrients, *Leaching, Soils, Soil investigations, Mathematical studies, Kinetics, Model studies, *Nitrification, *Denitrification, Nitrates, Nitrogen, Ammonia, Ion transport.

The transport and transformation of urea, NH(4+), and NO(3-) in soil were mathematically described as functions of depth and time, subject to either steady feed or pulse application of N, using relationships derived by assuming diffusion and mass transfer as transport processes and first-order kinetics as a transformational mechanism. The mathematical model was used to study the enzymatic hydrolysis of urea, nitrification, and denitrification in laboratory soil columns. Urea hydrolysis was independent of initial urea concentration and the 02 concentration of the soil atmosphere. The rate of nitrification under transient N conditions was one order of magnitude greater than the rate of denitrification when there was 20% O2 in the soil atmosphere. Populations of nitrifiers increase in response to successive applications of N. (Skogerboe-Colorado State)
W78-09114

PORTLAND CEMENT AS A SOIL AMENDMENT FOR CORN AND SOYBEANS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W78-09118

FACTORS AFFECTING WATER DISTRIBUTION AFTER UNIFORM IRRIGATION,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
G. Sinai, and D. Zaslavsky.
Paper No. 77-2573 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13,16, 1977, Chicago, Illinois, 29 p, 12 fig, 19 ref.

Descriptors: Irrigation, *Irrigation water, *Soil moisture, Soil water, *Soil water movement, Hydraulic conductivity, Irrigation effects, *Infiltration, Distribution systems.

Uniformly distributed irrigation water could infiltrate laterally so that the spatial variability in moisture in the root zone would be very high. This was observed in field experiments and was proved theoretically. A suggested explanation was lateral flow in the soil due to anisotropy in its conductivity. Most cultivated layers are anisotropic so lateral flow could occur in fields. (Skogerboe-Colorado State)
W78-09130

BENEFITS OF SURFACE DRAINAGE,
Arkansas Cooperative Extension Service, Little Rock.
For primary bibliographic entry see Field 4A.
W78-09133

SOIL THERMAL DIFFUSIVITY DETERMINATION FROM OVERSPECIFICATION OF BOUNDARY DATA,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
S. R. Singh, and B. K. Sinha.
Soil Science Society of America Journal, Vol 41, No 5, p 831-834, September-October 1977. 1 fig, 1 tab, 18 ref.

Descriptors: Heat, Diffusivity, Soils, *Soil investigations, *Soil temperature, Soil profiles, Mathematical studies, *Thermal diffusivity(Soils).

The heat conduction equation has been solved for evaluating thermal diffusivity of soils by overspecifying the usual boundary conditions in terms of the thermal gradient at the boundary surface. Solutions have been obtained for different Dirichlet-type boundary conditions describing the boundary temperature. These were (a) linearly rising/falling, (b) exponentially rising, (c) exponentially falling, and (d) sinusoidal. The thermal gradient in the soil profile was evaluated using a cubic spline. Field data were analyzed firstly by representing the surface temperature as linearly rising and secondly as sinusoidal. More consistent results were obtained with the help of the first approximation which represented the boundary data closely. This shows that a close approximation of boundary condition by an appropriate function is essential to get reliable values of the thermal diffusivity. (Skogerboe-Colorado State)
W78-09137

IRRIGATION SCHEDULING WITH NEUTRON PROBE,
Bureau of Reclamation, Boulder City, NV.
For primary bibliographic entry see Field 3F.
W78-09139

ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE. VOLUME 1: TREND IDENTIFICATION AND EVALUATION,
Development Planning and Research Associates, Inc., Manhattan, KS.
S. G. Unger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 233, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-121, October, 1977. 188 p, 37 fig, 32 tab, 55 ref, 1 append.

Descriptors: *Agriculture, *Silviculture, *Environmental effects, Environmental quality, Management.

Current and emerging trends in United States agriculture and silviculture that will have the most significant environmental implications in both the short term (1985) and the long term (2010) are determined and assessed. Five major subsectors of agriculture and silviculture were included in the analysis: (1) nonirrigated crop production, (2) irrigated crop production, (3) feedlot production, (4) range and pasture management, (5) silviculture

and harvest management. Within each subsector, numerous trends and developments were identified and defined. Thereafter, an evaluation workshop, comprised of professionals from throughout the nation, evaluated, rated and rank-ordered the most significant environmentally related trends. (Skogerboe-Colorado State)
W78-09149

AGRONOMY ABSTRACTS, 1977 ANNUAL MEETINGS.
American Society of Agronomy, Madison, WI.
For primary bibliographic entry see Field 3F.
W78-09150

A TENSIOMETRIC CONTROL DEVICE FOR AUTOMATIC IRRIGATION (IN SLOVANIA),
For primary bibliographic entry see Field 3F.
W78-09158

MODEL FOR SIMULATING SOIL-WATER CONTENT CONSIDERING EVAPOTRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources and California Univ., Davis. Dept. of Civil Engineering.
A. Afshar, and M. A. Marino.
Journal of Hydrology, Vol. 37, No. 3/4, p 309-322, May 1978. 8 fig, 15 ref. CSRS CA-D-WSE-3081-H, CA-D-WSE-3479-H.

Descriptors: *Evapotranspiration, *Model studies, *Soil-water plant relationships, Mathematical models, Profiles, Equations, Rainfall, Root zone, Irrigation, Evaporation, Digital computer, *Soil-water content, *Transient field conditions.

A mathematical model was developed to predict the soil water content profile under transient field conditions. The model takes into account a variable transpiration rate and a nonuniform initial soil water content. Rainfall, irrigation, and evaporation were treated as sources of nonuniform potential surface flux. The possibility of no flux at the soil surface also was included in the model. Solutions to the model were obtained numerically by a finite-difference scheme involving predictor-corrector equations. The scheme resulted in a tridiagonal set of simultaneous equations which could be solved rapidly in a digital computer. A step-by-step description of the computational procedure was included. Application of the model to some field conditions and comparison of the results with field measured data showed very good agreement. Sensitivity of the model to changes in rooting zone, root density function, and depth to the bottom boundary also was analyzed. (Roberts-ISWS)
W78-09206

TUBE DRAINAGE IN STRATIFIED SOIL ABOVE AN AQUIFER,
Iran Coll. of Science and Technology, Teheran.
For primary bibliographic entry see Field 4A.
W78-09211

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, DC.
1976, 266 p.

Descriptors: *Research and development, *Soil science, *Water resources development, *Air, Crop production, Farm management, Environment, Environmental effects, Agriculture, Protection, Public health, Effects, Efficiencies, Sediment control, Soil management, Land reclamation, Water pollution, Cultivation, Revegetation, Pollutants, Air pollution, *Environmental quality, Animal health, Solar energy.

Soil, Water and Air resources are of primary concern to the Agricultural Research Service. Research is aimed toward development of cultural practices and cropping systems that assure efficient use of these resources while, at the same time, providing adequate protection for sustained use. In many cases, technology developed is also applicable to enhancing environmental quality for nonagricultural purposes. The reported research deals with many aspects of the husbandry of these vital resources. This research program covers a wide range within the environment, from the hydraulics of flow in irrigation conveyances or natural streams to the relationships among soil properties, efficient production of high quality crops, and the effect of these on animal or human health. The purpose of this report, however, was to provide for those interested in the fruits of this work, a brief overview of the scope of the activities and examples of recent findings, some of which still have not been released by prior publication. No attempt was made at completeness. The research highlights were identified by location and a map of research stations. (See also W77-10917) (Froehlich-ISWS)
W78-09213

AIR-EARTH INTERFACE CONCEPT FOR WIDE-RANGE CONTROL OF INFILTRATION,
Agricultural Research Service, AZ. Southwest Rangeland Watershed Research Center.
R. M. Dixon.
Paper No. 77-2062 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 33 p, 11 fig, 1 tab, 28 ref.

Descriptors: *Infiltration, *Soil water movement, Simulation analysis, Soils, Soil investigations, *Air-earth interfaces.

The air-earth interface concept is formulated and discussed relative to experimental verification, compatibility with Darcy-based infiltration theory, quantification for predictive purposes, and applicability to practical infiltration control problems. This concept appears applicable to cultivated and uncultivated soils, and to soils severely disturbed by road construction and strip mining. (Skogerboe-Colorado State)
W78-09261

A CONTINUOUS WATER BUDGET MODEL FOR WESTERN KANSAS,
Agricultural Research Service, Lafayette, IN.
W. H. Neibling, J. K. Koelliker, and F. E. Ohmes.
Paper No. 77-2056 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 17 p, 5 fig. 3 tab, 22 ref.

Descriptors: *Kansas, *Model studies, *Evapotranspiration, *Soil moisture, Soil water, *Soil profiles, Climate, *Hydrologic budget.

A continuous water-budget model was developed and calibrated for use in western Kansas. Daily potential evapotranspiration (PET), actual ET, and soil moisture changes in a 213 cm soil profile were calculated from inputs of crop and soil moisture characteristics and daily meteorological observations. (Skogerboe-Colorado State)
W78-09263

SEEPAGE CONTROL BY PARTICLE SIZE SELECTION,
Agricultural Research Service, Temple, TX. Grassland-Forage Research Center.
For primary bibliographic entry see Field 4A.
W78-09264

MODELING INFILTRATION DURING A VARIABLE RAIN,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu.
Paper No. 77-2063, Presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 14 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Model studies, *Infiltration, Rainfall intensity, Rainfall-runoff relationships, Equation, *Green Ampt equation.

The Green Ampt equation was modified to describe the infiltration process during a rainfall event with variable intensities. A procedure was introduced to determine the volume of runoff and the distribution of rainfall excess. (Skogerboe-Colorado State)
W78-09271

2H. Lakes

A MODEL TO DESCRIBE THE INHERENT SPATIAL AND TEMPORAL VARIABILITY OF PARAMETERS IN LAKE ONTARIO 1974,
Canada Centre for Inland Waters, Burlington (Ontario).
A. H. El-Shaarawi, and R. E. Kwiatkowski.
Journal of Great Lakes Research, Vol. 3, No. 3-4, p 177-183, December 1977. 3 fig, 3 tab, 14 ref.

Descriptors: *Lake Ontario, *Statistical models, *Limnology, *Lakes, *Water quality, Sampling, Model studies, Mathematical models, Carbon, Water temperature, Chlorophyll, Seasonal, Secchi disks, Variability, On-site investigations, On-site tests, Optical properties, Nitrogen, On-site data collections, Spatial variability, Temporal variability.

A statistical model was developed to evaluate the temporal and spatial variability inherent in limnological sampling of large lakes. The model was applied to Secchi disc, transmissometer readings, temperature, integrated total particulate carbon, integrated total particulate nitrogen, and integrated chlorophyll a. The data were obtained during the 15 Lake Ontario surveillance cruises conducted between April - December, 1974. Based on the model, Lake Ontario was classified into a set of 7 statistical zones for each parameter. An estimate of the seasonal cycle for each parameter also was obtained. It was found that the seasonal variability was more pronounced than the spatial variability for all parameters analyzed. However, a significant horizontal variability did exist, and this variability must be recognized in future modelling efforts. (Humphreys-ISWS)
W78-08817

ANTHROPOGENIC PARTICLES IN THE SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-08820

SEDIMENTATION RATES IN LAKE HURON AND GEORGIAN BAY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-08821

SURFICIAL SEDIMENT REDISTRIBUTION BY WAVE ENERGY: ELEMENT-GRAIN SIZE RELATIONSHIPS,
Michigan Univ. Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 2J.
W78-08822

PRECIPITATION INPUTS OF PCBS TO LAKE MICHIGAN,
Paul Univ., Chicago, IL. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.

W78-08823

INTERNAL KELVIN WAVES IN A FJORD LAKE,
Canada Centre for Inland Waters, Burlington (Ontario).
P. F. Hamblin.
Journal of Geophysical Research, Vol. 83, No. C5, p 2409-2418, May 20, 1978. 6 fig, 1 tab, 11 ref.

Descriptors: *Internal waves, *Lakes, *Fjords, *Canada, On-site investigations, On-site data collections, Model studies, Mathematical models, Circulation, Water circulation, Currents(Water), Velocity, Winds, Stratification, Limnology, *Kamloops Lake(British Columbia).

It was argued theoretically that internal oscillations in a fjord lake have a three-dimensional nature during the stratified period. A dynamical model was proposed that is based on the approximation that for Kelvin waves, the component of flow parallel to the isobaths is much larger than the normal component. A general method of solution of the model equations was outlined which takes into account the details of the shoreline configuration, bathymetry, and density structure and was applied to the long-period oscillations of the thermal structure of Kamloops Lake. Six episodes of internal seiches of the first vertical and longitudinal mode were examined during the period from May to November. Numerical computations predicted that periods range from 33 to 140 hours and that the largest isotherm displacements occur in the region of slower phase speed in the western portion of the lake. These findings were confirmed both by visual inspection and by spectral analysis of the isotherm displacements at three locations in the lake and by wind records. The unusual characteristics of the thermal structure in the lake were shown to exert a stabilizing influence on large-amplitude wave disturbances. Long-period internal waves were generated primarily by suddenly imposed and vigorous wind forcing along the axis of the lake. (Sims-ISWS)
W78-08832

TROPHIC CONDITIONS IN LAKE WINNISQUAM, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-08842

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME I,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08953

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME II,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08954

REPORT FOR THE SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES AND THE ENVIRONMENT, OF THE SENATE COMMERCE COMMITTEE HEARING ON MERCURY CONTAMINATION UNDER THE DIRECTION OF SENATOR PHILLIP A. HART, AT MT. CLEMENS.
Federal Water Quality Administration, Chicago, IL. Great Lakes Region.
For primary bibliographic entry see Field 5G.

W78-08993

DYNAMICS OF RESERVOIR OF MEDIUM SIZE,
California Univ., Berkeley. Dept. of Civil Engineering.
J. Imberger, J. Patterson, B. Hebbert, and I. Loh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13773, p 725-743, May 1978. 5 fig, 22 ref, 2 append.

Descriptors: *Australia, *Reservoirs, *Water quality control, *Model studies, *Hypolimnion, Mixing, Simulation, Oceanography, Methodology, *Salinity, *Water temperature, Calibration, *Reservoir dynamics, *Lagrangian model, *Wellington reservoir.

A Lagrangian one-dimensional model of the dynamics of a reservoir was presented. The model utilizes new formulas to describe the dynamic of both the inflow and outflow. In addition, recent advances pioneered in the oceanographic literature were modified and applied to the dynamics of the mixed layer. Finally, a new model was proposed for deep hypolimnionic mixing. The model so constructed contains only four universal constants. Data from one complete annual cycle of the salinity and temperature distribution from a Western Australian reservoir were used to calibrate the model. (Singh-ISWS)
W78-09031

EVALUATION OF EVAPORATION FROM LAKE ONTARIO DURING IFYGL BY A MODIFIED MASS TRANSFER EQUATION,
Atmospheric Environment Service, Downsview (Ontario). Hydrometeorology and Marine Applications Div.
For primary bibliographic entry see Field 2D.
W78-09039

TIME-DEPENDENT RESPONSE OF A LARGE VARIABLE DEPTH BASIN TO A SUDDENLY IMPOSED WIND STRESS,
Princeton Univ., NJ. Dept. of Geological Sciences; and Princeton Univ., NJ. Dept. of Engineering Sciences.
G. E. Birchfield, and B. P. Hickie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 897, Price codes: A02 in paper copy, A01 in microfiche. Series in Applied Mathematics, Report No. 75-7, October 1975. 20 p, 2 tab, 9 ref, 1 append. NSF GA-25992,NOAA 04-4-022-37.

Descriptors: *Lakes, *Winds, *Waves(Water), Model studies, Mathematical models, Equations, Water bodies, Depth, Topography, Mixing, Turbulence, Water circulation, Limnology.

The time dependent response of a large barotropic basin of variable depth to a suddenly imposed wind stress was investigated. Bottom stress was neglected. The relative roles of gravity and topographic waves were investigated. The response can be described as made up of a fast response consisting of a pseudo-static wind setup and the lowest mode seiche, a slow response consisting of coastal jets moving in the direction of the wind stress, and a broad slow return flow in the interior. Both topographic and gravity waves contribute to the first response, while only topographic waves contribute to the second. (Sims-ISWS)
W78-09056

A NOTE ON THE CONCEPTS OF AGE DISTRIBUTION AND TRANSIT TIME IN NATURAL RESERVOIRS,
Stockholm Univ. (Sweden), Dept. of Meteorology.
A. Bjorkstram.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-31811, Price codes: A02 in paper copy, A01 in microfiche. Report AC-35, April 1976. 10 p, 2 fig, 2 ref.

Descriptors: *Reservoirs, *Lakes, *Time, Mass transfer, Input-output analysis, Travel time, Age, Statistics, Analytical techniques, Limnology, Transit time, Residence time.

A general relation between the average age and the residence time distribution of material in a reservoir at steady-state was derived. Given the average residence time, it was shown that the average age increases with increasing standard deviation in the residence time distribution. (Sims-ISWS)
W78-09057

SOIL CONDITIONS, ZONATION AND SPECIES DIVERSITY IN A SEASONALLY FLOODED TROPICAL GRASS-HERB SWAMP IN SIERRA LEONE,
Fourah Bay Coll., Freetown (Sierra Leone). Botany Dept.
For primary bibliographic entry see Field 2I.
W78-09083

MAPPING WETLANDS ON BEAVER FLOWAGES WITH 35 MM PHOTOGRAPHY,
Southern Illinois Univ., Carbondale. Cooperative Wildlife Research Lab.
For primary bibliographic entry see Field 7C.
W78-09087

AN UNUSUAL BLACK GUM SWAMP IN MAINE,
Vermont Univ., Burlington. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-09092

SEASONAL CHANGES IN STANDING CROP AND PRIMARY PRODUCTION IN A SEDGE WETLAND AND AN ADJACENT DRY OLD-FIELD IN CENTRAL MINNESOTA,
Ithaca Coll., NY. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-09094

BIOMASS AND PRODUCTIVITY OF AN ALDER SWAMP IN NORTHERN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Forestry.
For primary bibliographic entry see Field 2I.
W78-09097

SHORT-TERM PLANT SUCCESSIONS FOLLOWING THE COLONIZATION OF A NORTHERN SWEDISH LAKE BY THE MUSKRAT, ONDATRA ZIBETHICA,
Umea Univ. (Sweden). Dept. of Ecological Zoology.
For primary bibliographic entry see Field 2I.
W78-09100

DECOMPOSITION OF SALT MARSH GRASS, SPARTINA ALTERNIFLORA LOISEL,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
For primary bibliographic entry see Field 2I.
W78-09102

GRAVEL PITS AS NEW WETLAND HABITATS FOR THE CONSERVATION OF BREEDING BIRD COMMUNITIES,
London Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 4C.
W78-09105

THE CRANESVILLE PINE SWAMP,
Maryland Univ., Solomons. Natural Resources Inst.

K. B. Fuller, and P. S. Frank, Jr.
Atlantic Naturalist, Vol 29, No 3, p 101-105, Autumn, 1974. 1 fig, 9 ref.

Descriptors: *Swamps, *Bogs, *Maryland, Lumbering, Wetlands, Coniferous trees, *Cranesville Pine Swamp(MD).

Cranesville Pine Swamp, a 560-acre swamp near Oakland, Maryland, is one of the few remaining boreal bogs in the southern states. Due to its elevation and peculiar topography the temperature within the swamp is lower than that of surrounding areas. Plant and animal life is typical of boreal regions; some species occurring here are at the southernmost extent of their ranges. Logging during the late 1800's lead to the construction of a railway into the swamp. Since that period, logging has been infrequent and of a modest scale. The Nature Conservancy purchased 259 acres of the swamp and Cranes Swamp Nature Sanctuary was established. An additional 38 acres have been acquired, and eventual acquistition of the remaining acreage is planned. The U.S. Department of the Interior has designated the area a natural history landmark. (Stihler-Mass)
W78-09107

PRELIMINARY STUDIES ON CHITIN DECOMPOSITION IN LAKE ERIE SEDIMENTS,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-09152

1977 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
Ministry of Agriculture, Atrim (Northern Ireland). Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5C.
W78-09153

PREIMPOUNDMENT AND IMMEDIATE POST IMPOUNDMENT ADENOSINE TRIPHOSPHATE CONCENTRATIONS IN SOUTHERN INDIAN LAKE: 1975, 1976,
Fisheries and Marine Servie, Winnipeg (Manitoba).
For primary bibliographic entry see Field 5A.
W78-09161

INORGANIC PHOSPHORUS FRACTIONATIONS IN BLACKSTRAP LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-09164

PHYTOPLANKTON SPECIES, BIOMASS, AND DIVERSITY IN LAKE LA CALDERA (SIERRA NEVADA, GRANADA, SPAIN),
Granada Univ. (Spain). Dept. of Ecology.
For primary bibliographic entry see Field 5C.
W78-09169

THE INTENSITY OF MULTIPLICATION OF BACTERIA AND BIOMASS PRODUCTION IN THE WATER OF TWO LAKES,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-09173

LAKE ERIE AIRPORT STUDY,
Howard, Needles, Tammen and Bergendoff, Cleveland, OH. Cleveland Aviation Office.
For primary bibliographic entry see Field 6G.
W78-09186

CONTRIUBITON TO A METHOD FOR CALCULATING THE EXPECTED MINERALIZATION OF RESERVOIR WATER,
M. I. Kriventsov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 417, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 609, March 1977. 17 p, 1 fig, 4 tab, 8 ref. Translated from Gidroteknika i Meloratsiya, No. 8, p 52-63, 1953.

Descriptors: *Reservoirs, *Salts, *Water chemistry, Model studies, Mathematical models, Equations, Lakes, Water pollution, Water quality, Ground water, Evaporation, Runoff, Discharge(Water), Ice, Lake ice, Mineralization, Minerals.

The mineralization of reservoir water was calculated by a formula derived from the equations of water and salt balance of a reservoir or lake. This formal was discussed. (Sims-ISWS)
W78-09221

DATA ANALYSIS AND MODEL DEVELOPMENT FOR ECOSYSTEM MANAGEMENT AT LAKE GEORGE, N.Y.,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Electrical and Systems Engineering.
For primary bibliographic entry see Field 5C.
W78-09243

2I. Water In Plants

FIELD-MEASURED WATER UPTAKE OF SUDANGRASS ROOTS AS AFFECTED BY FERTILIZATION,
California Univ., Riverside.
For primary bibliographic entry see Field 3F.
W78-08926

METABOLISM OF ORGANOPHOSPHORUS COMPOUNDS IN SOYBEAN PLANTS IN FLOODED SOIL (IN RUSSIAN),
Far Eastern Univ., Vladivostok (USSR).
E. A. Belyavskaya, and V. E. Kosmakova.
S-Kh Biol 12(3), p 419-423, 1977.

Descriptors: Soil moisture, *Organophosphorus compounds, *Flooding, *Soybeans, *Phosphorus compounds, *Metabolism, *Nucleic acids.

The effect of flooding (1-7 days) on the content of nucleic acids and P compounds of the acid-soluble fraction in soybean plants was studied. Young leaves showed an increase of nucleic acids and other phosphor-organic compounds and were more active in the responsive metabolically adaptive reaction.--Copyright 1978, Biological Abstracts, Inc.
W78-08966

MISSISSIPPI FLORA. I MONOCOTYLEDON FAMILIES WITH AQUATIC OR WETLAND SPECIES,
Georgia Univ., Athens. Dept. of Botany.
S. B. Jones, Jr.
Gulf Research Reports, Vol. 4, No. 3, p 357-379. December, 1974. 7 fig, 28 ref.

Descriptors: *Aquatic plants, *Mississippi, *Monocota, Wetlands, Rooted aquatic plants, Ecological distribution, Aquatic habitats, Gulf Coastal Plain.

Keys, distribution maps, habitats, references, nonmenclature, and notes are given for some 16 families of monocotyledons occurring naturally or naturalized in Mississippi. These familites all contain one or more species which are found in aquatic or wetland habitats. They are: Alismataceae, Araceae, Cannaceae, Haemodoraceae, Hydrocharitaceae, Juncaginanceae, Lemnaceae, Marantaceae, Mayacaceae, Najadaceae, Ponterderiaceae, Potamogetonaceae, Ruppiaceae, Sparganiaceae, Typhaceae, Zannichelliaceae. (Stihler-Mass)
W78-09078

PRIMARY PRODUCTIVITY OF COASTAL MARSHES IN MISSISSIPPI,
Mississippi State Univ., Mississippi State, Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W78-09079

AQUATIC WEEDS - ERADICATE OR CULTIVATE,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 4A.
W78-09080

PRODUCTIVITY RELATIONS IN A CAREX-DOMINATED ECOSYSTEM,
McGill Univ., Montreal (Quebec). Dept. of Biology.
A. N. D. Auclair, A. Bouchard, and J. Pajaczkowski.
Oecologia, Vol. 26, No. 1, p 9-31. 1976. 12 fig, 2 tab, 69 ref.

Descriptors: *Primary productivity, *Standing crops, *Wetlands, Productivity, Ecosystems, Seasonal, Fertility, Soil properties, Nutrients, Burning, Cattails, Sedges, *Carex.

Seasonal and total primary productivity were measured for a Carex meadow in southern Quebec, Canada. Forty-five quadrats were sampled for dry weight biomass, species composition, structure (species density, diversity, height) and soil parameters. For a 130-day growth period, mean shoot net productivity was 6.3 g/sq m/day and terminal standing crop was 807 g/sq m. Terminal standing crop was very close to total litter mass (779 g/sq m) with peak productivities in mid-June (15.3 g/sq m/day) and mid-July (4.3 g/sq m/day). Decomposition of the previous year's litter was 81% complete by late September. The three most significant gradients resolved by principal components analysis were soil fertility, fire incidence, and topographic position, in that order of importance. The soil fertility component distinguished sediment-rich Typha angustifolia communities near open water from oligotrophic stands of Carex spp. on central areas of the meadow. Patterns of N, P, K, and Ca distribution coincided closely with total shoot production and litter mass levels suggesting closed biotic cycles of these elements. A model accounting for species diversity levels in a Carex marsh was formulated based on the assumption that high productivity results in competitive species elimination. (Stihler-Mass)
W78-09081

NITROGEN FIXATION IN A SALT MARSH,
Lancaster Univ., Bailriggs (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-09082

SOIL CONDITIONS, ZONATION AND SPECIES DIVERSITY IN A SEASONALLY FLOODED TROPICAL GRASS-HERB SWAMP IN SIERRA LEONE,
Fourah Bay Coll., Freetown (Sierra Leone). Botany Dept.
N. H. A. Cole.
Journal of Ecology, Vol. 61, No. 3, p 831-847, November, 1973. 5 fig, 3 tab, 13 ref.

Descriptors: *Swamps, *Vegetation, *Soil moisture, *Seasonal, *Tropical regions, Grasses, Wetlands, Hydrogen ion concentration, Moisutre deficit, *Dominant organisms, *Limiting factors,

Vegetation zonation, *Sierra Leone, Species iversity, Grassnherb swamp.

ive vegetation zones were distinguished in a trop-al grass-herb swamp. The different zones howed characteristic seasonal trends in soil oisture, pH and water-table depths, related to ooding in the wet season and dessication in the ry season. The summation of the duration of ese two adverse extremes of soil moisture was sed to express the unsuitability of the habitats for lant growth; this factor was inversely related to e species diversity. The 'habitat unsuitability' lso altered the normal continuous growing season f the humid tropics. The inverse relationship etween habitat unsuitability and the species iversity of the vegetation zone indicates that the ower grassy zones with a fairly short growing eason tend towards single-species dominance ith a few species having almost all the in-ividuals. There were present wet season phemerals, dry season therophytes, dormant her-aceous perennials and deciduous shrubs. The pecies diversity gradient of the vegetation zones hrows light on the transition process from a com-unity with single-species dominance to one with any species typical of the humid tropics, and de-arture from dominance to one with many species ypical of the humid tropics, and departure from pecies-richness is a characteristic of habitats with dverse or limiting factors. (Maroncelli-Mass)
W78-09083

TIDAL IMMERSION OF SPARTINA MARSH AT BRIDGEWATER BAY, SOMERSET,
Nature Conservancy Roughmoor, Taunton (England).
For primary bibliographic entry see Field 2L.
W78-09084

NITROGEN FIXATION IN FLAX POND: A LONG ISLAND SALT MARSH,
Brookhaven National Lab., Upton, NY. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-09085

A FOUR YEAR ANALYSIS OF VEGETATION FOLLOWING AN OIL SPILL IN A FRESH-WATER MARSH,
Smith Coll., Northampton, Mass. Dept. of the Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-09086

AN UNUSUAL BLACK GUM SWAMP IN MAINE,
Vermont Univ., Burlington. Dept. of Botany.
H. W. Vogelman.
Rhodora, Vol. 78, No. 2, p 326-327, April, 1976.

Descriptors: *Swamps, *Maine, Wetlands, Deciduous trees, *Black gum trees.

A 5-acre hummocky swamp dominated by black gum (Nyssa sylvatica) is located in New Gloucester, Maine. The stand is, for all practical purposes, virgin. About 60 trees over 12 in. d.b.h. were counted; trunks of some trees are over 22-23 inches in diameter. Taller trees reach a height of 80-90 ft. Some trees could be in excess of 400 yr of age. The other vegetation of the swamp is also described. (Stihler-Mass)
W78-09092

SEASONAL CHANGES IN STANDING CROP AND PRIMARY PRODUCTION IN A SEDGE WETLAND AND AN ADJACENT DRY OLD-FIELD IN CENTRAL MINNESOTA,
Ithaca Coll., NY. Dept. of Biology.
J. M. Bernard.
Ecology, Vol. 55, No. 2, p 350-359, Early Spring, 1974. 2 fig, 2 tab, 42 ref.

Descriptors: *Primary productivity, *Standing crops, *Seasonal, Wetlands, *Minnesota, *Carex rostrata, *Sedges, Old fields.

Seasonal changes in above- and below-ground standing crop and primary production in a Carex rostrata wetland and an adjacent dry Poa pratensis old field were determined. Above ground, the sedge standing crop of green material varied from a minimum of 114 g/sq m frozen in the winter ice to a high of 852 g/sq m in late August. Maximum daily production averaged about 11 g/sq m/day from mid-June to mid-July. Below-ground standing crop was highest in winter at 328 g/sq m and declined to a low of 150 g/sq m in late July. Below-ground standing crop then increased at a rate averaging 1 g/sq m/day. The sedge wetland is about 325 g/sq m/yr more productive than the adjacent old field. (Stihler-Mass)
W78-09094

WINTER BIOMASS IN TYPHA GLAUCA GODR. AND SPARGANIUM EURYCARPUM ENGELM,
Ithaca Coll., NY. Dept. of Biology.
J. M. Bernard, and F. A. Bernard.
Bulletin of the Torrey Botanical Club, Vol. 100, No. 2, p 125-127, March-April, 1973. 1 tab, 11 ref.

Descriptors: *Biomass, *Winter, *Cattails, *Minnesota, Rhizmes, Wetlands, Rooted aquatic plants, *Productivity, *Shoots, *Bur-reed.

Winter biomass was determined for Typha glauca and Sparaganium eurycarpum in a central Minnesota wetland after all the current year's growth had died. Typha had 1040 g/sq m of living material of which 954 g/sq m were roots and rhizomes and 86 g/sq m were new shoots. The old shoots which had just died weighed 946 g/sq m. Sparganium had 682 g/sq m total living material consisting of 656 g/sq m roots and rhizomes and 26 g/sq m new shoots. The old dead shoots weighed 543 g/sq m. Annual below-ground rhizome production is estimated to be 371 g/sq m/year in Typha and 225 g/sq m/year in Sparganium. (Stihler-Mass)
W78-09095

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 2L.
W78-09096

BIOMASS AND PRODUCTIVITY OF AN ALDER SWAMP IN NORTHERN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Forestry.
G. R. Parker, and G. Schneider.
Canadian Journal of Forest Research, Vol. 5, No. 3, p 403-409, September, 1975. 6 tab, 11 ref.

Descriptors: *Biomass, *Primary productivity, *Swamps, Trees, *Michigan, Wetlands, Soil texture, Understory, Aboveground productivity, *Adler.

Total aboveground dry weight biomass and annual production were determined for two sites of different soil texture in an alder swamp of Michigan's upper peninsula. The more poorly drained site A averaged 5300 g/sq.m. and 640 g/sq.m. per year while the drier site B averaged 3100 g/sq.m. and 570 g/sq.m. per year. The smaller standing crop biomass on the better-drained site is due to greater abundance of Alnus rugosa. The tree stratum constitutes 97 and 93% of the total biomass and 84 and 80% of the total production on site A and B, respectively. The understory strata constituted the remaining 3 and 16% of the biomass and production of site A and 7 and 20% on site B. (Stihler-Mass)
W78-09097

SHORT-TERM PLANT SUCCESSIONS FOLLOWING THE COLONIZATION OF A NORTHERN SWEDISH LAKE BY THE MUSKRAT, ONDATRA ZIBETHICA,
Umea Univ. (Sweden). Dept. of Ecological Zoology.
K. Danell.
Journal of Applied Ecology, Vol 14, No 3, p 933-947, December, 1977. 9 fig, 2 tab, 44 ref.

Descriptors: *Succession, *Muskrats, *Vegetation, Wildlife, Wetlands, Rooted aquatic plants, *Sweden, Equisetum, Waterfowl, Lakes.

Short-term plant succession following miskrat colonization was studied in a Equisetum stand in a shallow lake in coastal northern Sweden. Vegetational changes were investigated using air photographs and belt transects in the field. Muskrat settlement resulted in a reduction of both Equisetum and Schoenoplectus and the creation of an area of open water around the house site. The area of open water was subsequently colonized by submerged hydrophytes. If the site was later abandoned by the muskrats for several years, or only utilized to a minor extent, Equisetum stands recovered, forcing the zone of submerged hydrophytes towards the center. A model of such short-term plant successions has been developed. When present in moderate densities, muskrats can have a beneficial effect in waterfowl management by maintaining open areas in otherwise over-dense vegetation. (Stihler-Mass)
W78-09100

DECOMPOSITION OF SALT MARSH GRASS, SPARTINA ALTERNIFLORA LOISEL,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
J. G. Gosselink, and C. J. Kirby.
Limnology and Oceanography, Vol 19, No 5, p 825-832, September, 1974. 3 fig, 2 tab, 26 ref.

Descriptors: *Salt marshes, *Microbial degradation, *Biomass, Degradation(Decomposition), Productivity, Marshes.

Studies on the decomposition of Spartina alterniflora indicate the presence of a microflora capable of rapid and efficient conversion of marsh grass into microbial biomass. Spartina alterniflora stems and leaves were ground, dried, separated into four size fractions from 67 to 213 microns average diameter, and incubated in the dark at 30 degrees C in inoculated artificial seawater: particulate nitrogen, oxidizable carbon, dry weight, and metabolic rate were followed for 30 days. Conversion efficiency of substrate particle size increased. (Stihler-Mass)
W78-09102

TROPHIC RELATIONSHIPS IN A SEAGRASS COMMUNITY (THALASSIA TESTUDINUM), IN CARD SOUND, FLORIDA. FISH DIETS IN RELATION TO MACROBENTHIC AND CRYPTIC FAUNAL ABUNDANCE,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
I. M. Brook.
Transactions of the American Fisheries Society, Vol 106, No 3, p 219-229, 1977. 1 fig, 4 tab, 38 ref.

Descriptors: *Fish diets, *Food chains, *Biomass, Benthos, Macrobenthos, Trophic level, *Mollusks, Killfish, Invertebrates, Predators, *Florida, Gulf of Mexico, *Seagrass, *Faunal abundance, Foragers, Primary consumers, *Card Sound(Fla).

The marine spermatophyte Thalassia testudinum is the dominant species in the seagrass community of the marine wetland systems of southeast Florida and the Florida Gulf coast. The trophic interaction between the fishes and the macrobenthic and cryptic fauna found in this area was examined. Based on digestive tract analysis, the principal in-

teraction between the primary consumers of the study area and the higher trophic level predators was via the polychaetes and peracaridean crustaceans. The mollusks which contributed significantly to the benthic biomass were not a preferred food for the animals frequenting the study site. The maximum mollusk biomass in any benthic and cryptic sample was 2.31 g dry/ sq. m. It was felt that the predator population was limited by the small stock of polychaetes and peracaridean crustaceans which had a maximum biomass in any one sample equivalent to 1.74 g dry/sq. m. The majority of the fish captured were foragers over a wide area. The main residents were the syngnathids and the gold-spotted killifish, Floridichthys carpio. (Maroncelli-Mass)
W78-09103

THE INFLUENCE OF TIDAL FLUX ON MICROBIAL BIOMASS IN SALT MARSH CREEKS,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
C. W. Erkenbrecher, and I. H. Stevenson.
Limnology and Oceanography, Vol 20, No 4, p 618-625, July, 1975. 10 fig, 1 tab, 16 ref.

Descriptors: *Tides, *Streams, *Salt marshes, *Microorganisms, *Biomass, Tidal effects, Tidal waters, Water level fluctuations, Tidal marshes, Marshes, Wetlands.

The influence of tides on the concentration of the microflora in the water column of salt marsh creeks was assessed by investigating the fluctuations of aerobic, heterotrophic bacteria, particulate organic carbon (POC), and adenosine triphosphate (ATP) in two marsh creeks. Both reached maximum densities of bacteria just before low tide. The mean concentration at station 1 (located at the entrance to a small intertidal creek) over a tidal cycle was an order of magnitude greater than at station 2 (located at a sandy bottom creek draining both marsh and pine forest). POC increased twofold to fourfold during ebbtide in both systems. ATP concentrations at station 2, during ebbtide, increased about fourfold, and the fraction of the total carbon regarded as 'living' ranged from 2-24%. The abundance of microorganisms and organic carbon in tidal marsh creeks is neither static nor homogeneous over a tidal cycle. Level and flow of the tide and differences between creeks should be examined before extrapolating these sample results to a larger system. (Maroncelli-Mass)
W78-09104

SALT SPRAY AS A MICROENVIRONMENTAL FACTOR IN THE DISTRIBUTION OF BEACH PLANTS AT POINT REYES, CALIFORNIA,
California Univ., Davis. Dept. of Botany.
M. G. Barbour.
Oecologia, Vol 32, No 2, p 213-224, Spring, 1978, 5 fig, 3 tab, 20 ref

Descriptors: *Beaches, *Sea spray, *Vegetation, *Distribution, *California, Topography, Winds, Tide Level, *Beach plants, Wind speed, *Point Reyes(CA).

Measurements of salt spray were made weekly for 15 spring weeks using a grid of 50 traps in a 32 m X 24 m plot of beach vegetation. Trap centers were 14 cm above the ground. Regressions or analyses of variance of wind speed and direction, rainfall, tide level, plot topography, and plant distribution were performed against salt spray. An ecologically and statistically significant salt spray gradient, which correlated with distance back from, and elevation above, mean tide line, was revealed. The front-most, lowest traps received 4-5 times the spray that the back-most, highest traps received. Steeper gradients resulted during weeks with moderate wind and spray, than in weeks with lower or higher wind speed. Plant distribution correlated with salt spray, and there is some evidence that it is a functional relationship. It appears that the salt spray load just above the beach plant canopy ranges from less than 1 to nearly 200 mg/sq dm. vertical trap surface/day depending on trap height, distance back from tide line, and wind speed. The plant canopy and sand surface received an order of magnitude less spray than that received by vertical traps. (Stihler-Mass)
W78-09106

RESPONSE OF LEAF WATER POTENTIAL TO PRESSURE CHANGES AT THE ROOT SURFACE OF CORN PLANTS,
Guelph Univ. (Ontario). Dept. of Land Resources Science.
R. A. Nulsen, G. W. Thurtell, and K. R. Stevenson.
Agronomy Journal, Vol 69, No 6, p 951-954, November-December 1977. 4 fig, 15 ref.

Descriptors: *Roots, Root systems, *Corn(Field), Soil water, Soil moisture, Transpiration, Crop response, Psychrometers, *Leaves.

The nature of the hydraulic continuum between the roots and leaves of intact plants requires further study to improve understanding of the effect of pressure changes. A large pressure chamber was designed to apply hydrostatis pressure to the roots of intact corn plants. The chamber permitted application of up to 6 bars pressure and allowed for in situ watering of the plants. Changes in leaf water potential resulting from changes in pressure applied to the roots were monitored in situ using a thermocouple dewpoint hygrometer. Responses of leaf water potential were consistently between 0.94 and 1.19 times the change in applied pressure, regardless of whether the pressure was being increased or decreased. When pressure was applied to very turgid plants, leaf water potential increased until it reached a value equal to the osmotic pressure of expressed xylem sap. Some time after this value was reached water droplets appeared on the leaf surface. The experiments showed that the hydraulic system within intact plants acts as a true continuum in that pressure changes at one end of the system are faithfully manifested at the other end of the system. If such changes are not observed some additional mechanism must be operating. (Skogerboe-Colorado State)
W78-09119

RECENT AND PLANNED MARSH ESTABLISHMENT WORK THROUGHOUT THE CONTIGUOUS UNTED STATES-A SURVEY AND BASIC GUIDELINES,
Environmental Concern, Inc., St. Michaels, MD.
E. W. Garbisch, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 464, Price codes: A13 in paper copy, A01 in microfiche. Contract Report D-77-3, April 1977. 276 p, 28 fig, 76 tab, 2 append. DACW 39-75-M-4215.

Descriptors: *Marshes, *Habitat improvement, *United States, Marsh plants, Estuarine environment, Estuaries, Dredging, Aquatic environment, Aquatic plants, Sediments, *Marsh establishment, Marsh development research.

Information on deliberate marsh establishment work that was planned, underway, or completed throughout the contiguous United States within the period of 1970-1976 was identified through literature review, interviewing sources of pertinent information, and the completion of distributed information request forms by various correspondents. Projects at 105 district locations have been completed for at least one year. Nine were totally unsuccessful due to vandalism and other reasons. Variation encountered in projects included 18 that existed in freshwater, 68 on the east coast, 17 on the Gulf Coast, 8 on the west coast, and 12 inland. Of the 105 projects, 59 were purely experimental as opposed to applied or partly s
Three principal maintenance and manageme
requirements for marsh establishment determin
by the study were removal of debris and lit
dispositions, protection against water fo
depredation, and fertilization. (Roberts-ISWS)
W78-09217

2J. Erosion and Sedimentation

**MASS TRANSPORT IN SHALLOW WATE
WAVES,**
British Columbia Univ., Vancouver Dept. of Ci
Engineering.
For primary bibliographic entry see Field 8B.
W78-08805

**DISPERSION IN RIVERS AS RELATED T
STORAGE ZONES,**
New Mexico State Univ., University Park. De
of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08808

**ANTHROPOGENIC PARTICLES IN THE SED
MENTS OF LAKE ERIE,**
Canada Centre for Inland Waters, Burlingto
(Ontario).
C. I. Dell, and W. G. Booth.
Journal of Great Lakes Research, Vol 3, No 3-4,
204-210, December 1977. 5 fig, 2 tab, 17 ref.

Descriptors: *Lake Erie, *Deposition(Sediments
*Lakes, *Sediments, Distribution patterns, San
pling, Surveys, On-site investigations, On-si
data collections, Sediment distribution, Analysi
Trace elements, Carbon, *Anthropogenic part
cles, Chemical composition.

Several types of anthropogenic sand-sized part
cles have been identified in Lake Erie sediment
These types occur most abundantly along shippi
lanes and in the southern part of the lake offsho
from major industrial ports. The composition an
distribution of the particles suggest that the 4 mo
common types are derived from the activities
coal-burning and coal-carrying ships. There
probably little impact on the chemistry of the lak
system from these sand-sized particles. Howeve
this study indicated that a major increase in th
numbers and variety of anthropogenic particle
occurred early in the 20th century, and therefor
they provide a useful time horizon for the study
modern sedimentary processes. (Humphreys
ISWS)
W78-08820

**SEDIMENTATION RATES IN LAKE HURO
AND GEORGIAN BAY,**
Canada Centre for Inland Waters, Burlingto
(Ontario).
A. L. W. Kemp, and N. S. Harper.
Journal of Great Lakes Research, Vol 3, No 3-4,
215-220, December 1977. 2 fig, 2 tab, 23 ref.

Descriptors: *Lake Huron, *Sedimentation rates
*Deposition(Sediments), *Lakes, On-site in
vestigations, Methodology, Surveys, On-site dat
collections, Pollen, Sampling, Polynology, Dating
Distribution patterns, Sediment distribution, Anal
ysis, *Georgian Bay(Canada), Ambrosia pollen.

Present-day sedimentation rates were determine
at 10 offshore locations, representative of deposi
tional basins in Lake Huron and Georgian Bay
Sedimentation rates were calculated by averagin
the weight of sediment deposited above the Am
brosia pollen horizon, dated at 1870. The rates are
variable, ranging from a low of 35 g/sq m/yr to a
maximum value of 780 g/sq m/yr. Sedimentation
rates were greater in Lake Huron than in Georgian
Bay, with the highest sedimentation rate in
Saginaw Bay. The sedimentation rates in the main

sin of Lake Huron are in the same range as ose found in Lake Michigan, Lake Ontario, and ke Superior, but are less than those found in ke Erie. The sedimentation rates in the 3 cores om Georgian Bay are generally less than those und in the other Great Lakes. (Humphreys-WS)
78-08821

IRFICIAL SEDIMENT REDISTRIBUTION BY AVE ENERGY: ELEMENT-GRAIN SIZE ELATIONSHIPS,
ichigan Univ. Ann Arbor. Great Lakes Research v.
Rossmann, and E. Seibel.
urnal of Great Lakes Research, Vol 3, No 3-4, p 8-262, December 1977. 5 fig, 3 tab, 12 ref.

escriptors: *Lake Michigan, *Sediments, *Lake ores, *Waves(Water), *Great Lakes, Shores, n-site investigations, Particle size, Data collec-ons, Lakes, Velocity, Sediment transport, Move-ent, Sediment distribution, Sediment sources, ysical composition, Chemical composition.

issipation of wave energy as waves begin to feel e lake floor determines grain size variations for e surficial nearshore sediments of southeastern ake Michigan. Variations of sediment composi-on mimic those of the silt- and clay-sized sedi-ent fractions. Both grain size and compositional ariations can be used to define the nearshore one in the Great Lakes. (Humphreys-ISWS)
V78-08822

AILURE SEQUENCE OF GULLY HEAD-VALLS IN WESTERN IOWA,
Missouri Agricultural Experimental Station, Columbia.
For primary bibliographic entry see Field 4D.
W78-08835

EDIMENT YIELDS FOR SELECTED TREAMS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
C. T. Welborn, and R. B. Bezant.
Open-file Report 78-83, February 1978. 30 p, 3 fig, tab, 6 ref.

Descriptors: *Sediment transport, *Texas, Streams, *Sediment yield, *Sediment load, Data collections, Sediment discharge, Particle size, Suspended load, Sediment distribution, Sedimen-ation rates, Bed load, Streamflow, Flow rates.

The U.S. Geological Survey began a study to determine sediment yields for selected streams in Texas during the 1966 water year to provide infor-mation for areas in which sediment-yield data were meager or lacking. These data will aid in delineating problem areas and planning for water-resources development in the State. This report presents estimates of suspended-sediment loads and yields from 20 drainage basins ranging in area from 26 to 1,410 square miles. These estimates are based on samples collected periodically during water years 1966-74. Sediment loads ranged from 1,500 tons per year at the station North Fork Hub-bard Creek near Albany to 278,000 tons per year at the station Wichita River at Wichita Falls. Sedi-ment yields ranged from 15 tons per square mile per year in the drainage area of East Yegua Creek near Dime Box to 500 tons per square mile per year in the drainage area of Denton Creek near Justin. Sediment yields from drainage areas generally decrease from northwest to southeast across the State. (Woodard-USGS)
W78-08853

LAND ACCRETION AND AVULSION: THE BATTLE OF BLACKBIRD BEND,
For primary bibliographic entry see Field 6E.
W78-08968

DIFFUSION OF SEDIMENT IN LONG CHANNELS,
Uppsala Univ. (Sweden). Dept. of Mathematics.
G. Aronsson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No HY6, Proceedings Paper 13845, p 821-837, June 1978. 7 fig, 12 ref, 1 append.

Descriptors: *Dispersion, *Diffusion, *Sediments, *Model studies, Mathematical models, Distribution, Distribution patterns, Sediment distribution, Spatial distribution, Channels, Turbulence, Sediment transport, Sedimentation, Mathematics, *Long channels.

A model was presented, treating the transport of suspended material in a broad channel under simplifying assumptions. The motion of sediment was treated as a diffusion process, and a differential equation was derived. The form of an 'equilibrium distribution' g(y) was derived, corresponding to the classical distribution of Prandtl and Rouse. Mathematically the following two results were proven: (1) if a stationary (time dependent) state prevails downstream at a certain point P, then the distribution downstream P tends (with increasing distance to P) exponentially to the 'equilibrium distribution'; and (2) if the sediment distribution in the incoming downstream P will tend to the stationary solution exponentially with time. Although these results seem to be physically evident, they apparently have not been proven before. (Sims-ISWS)
W78-09035

DETERMINATE HYDRAULIC GEOMETRY OF RIVER CHANNELS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 8B.
W78-09037

EARTHFLOWS IN FRANCISCAN MELANGE, VAN DUZEN RIVER BASIN, CALIFORNIA,
National Park Service, Orick, CA. Redwood National Park.
H. M. Kelsey.
Geology, Vol. 6, No. 6, p 361-364, June 1978. 3 fig, 1 tab, 13 ref.

Descriptors: *Landslides, *California, *Geomorphology, *Erosion, On-site investigations, Sediment yield, Surveys, Rivers, Watersheds(Basins), Gullies, Movement, *Van Duzen River Basin(Calif), Earthflow.

Large earthflows are a significant source of sediment in the highly sheared and easily eroded Franciscan melange of the northern California Coast Ranges. Earthflows are active during the winter wet season, and their movement averages 2.4 to 4.0 m/yr. Fluvial sediment yield from the gullied and broken earthflow surface is about equal to sediment yield by mass movement. Indirect evidence suggests that changes in vegetation cover due to grazing beginning in the nineteenth century may have increased the rate of earthflow movement. (Humphreys-ISWS)
W78-09054

SHOALING RATE PREDICTION USING A SEDIMENTATION TANK,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-09059

INTERMITTENT ARCTIC STREAMS AND THEIR INFLUENCE ON LANDFORMS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C
W78-09090

NUTRIENT LOSSES IN SURFACE RUNOFF FROM A NATIVE PRAIRIE,
Agricultural Research Service, Morris, MN. North Central Soil Conservation Research Center.
D. R. Timmons, and R. F. Holt.
Journal of Environmental Quality, Vol. 6, No. 4, p 369-373, October-December 1977. 5 tab, 22 ref.

Descriptors: *Nutrients, Fertilizers, Fertilization, Runoff, *Minnesota, *Snowmelt, Rainfall, Rainfall-runoff-relationships, *Nitrogen, *Phosphorus, Potassium, Sodium, Calcium, Chemical oxygen demand, *Agricultural runoff, Magnesium.

Nutrient losses in surface runoff from a native prairie were determined for 5 years. The prairie, dominated by little bluestem was on a Barnes loam soil in west-central Minnesota. Snowmelt runoff accounted for 80% of the average annual runoff. After spring thaw, rainfall caused appreciable runoff (37% of annual) during 1 year only. Depending on chemical parameter, 63 to 88% of the average annual nutrient loads were transported by snowmelt runoff. Average annual total nitrogen (N) and total phosphorus (P) losses were 0.8 and 0.1 kg/ha, respectively, and organic N and organic (+ hydrolyzable) P comprised 68 and 82% of their respective annual losses. Average annual cation losses ranged from about 0.1 to 1.8 kg/ha and, except for 1 year, were in the order K>Ca>Mg>Na. Average weighted concentrations for all parameters were higher for rainfall runoff than for snowmelt runoff. Nutrient losses from native prairie represent natural levels for comparing the effects of different land uses on nutrient loads in surface runoff. (Skogerboe-Colorado State)
W78-09110

RESOURCE ADEQUACY IN LIMITING SUSPENDED SEDIMENT DISCHARGES FROM AGRICULTURE,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
E. O. Heady, and A. D. Meister.
Journal of Soil and Water Conservation, Vol. 32, No. 6, p 289-293, November-December 1977. 3 fig, 6 tab, 3 ref.

Descriptors: *Computer programs, Model studies, Pollution, Agriculture, Water surface, Irrigation, Erosion, Sediments, *Suspended solids, *Sediment discharge, *Economic impact.

The Iowa State University national programming model was used to evaluate the economic impacts of controlling nonpoint pollution from agriculture and to assess whether environmental improvement goals could be met in conjunction with high agricultural exports. Alternatives analyzed included a base solution, high exports, land and water conservation, and environmental enhancement. High expots could be attained simultaneously under the land and water conservation alternative. Exports must be reduced, however, under the environmental enhancement alternative. To meet exports under the land and water conservation alternative, 10 million acres of wetlands would need to be converted to cropland. Returns to land would increase considerably under all alternatives other than the base solution. There would be wide variations among regions, however. In general, a relative redistribution of income from irrigated to dry lands and from erosive to nonerosive farming regions would occur. (Skogerboe-Colorado State)
W78-09141

PRELIMINARY STUDIES ON CHITIN DECOMPOSITION IN LAKE ERIE SEDIMENTS,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-09152

LACK OF CORRELATION BETWEEN THE COMPOSITION OF SEDIMENTS AND THEIR TOXICITY TO ALGAE,
Naval Research Lab., Washington, DC. Ocean Sciences Div.
For primary bibliographic entry see Field 5A.
W78-09160

INORGANIC PHOSPHORUS FRACTIONATIONS IN BLACKSTRAP LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-09164

SUSPENDED SEDIMENT DISCHARGE OF THE SUSQUEHANNA RIVER TO NORTHERN CHESAPEAKE BAY, 1966 TO 1976,
Johns Hopkins Univ., Baltimore, MD. Chesapeake Bay Inst.
M. G. Gross, M. Karweit, W. B. Cronin, and J. R. Schubel.
Estuaries, Vol. 1, No. 2, p 106-110, June 1978. 4 fig, 2 tab, 13 ref.

Descriptors: *Sediment discharge, *Chesapeake Bay, *Maryland, *Suspended load, Rivers, Sediment load, Data collections, Sediment yield, Streamflow, Flood flow, *Susquehanna River(Md).

Between 1966 and 1976, the Susquehanna River at Conowingo, Maryland, discharged approximately 50 million metric tons of suspended sediment to Northern Chesapeake Bay. About 40 million metric tons were discharged in two floods associated with hurricanes: Agnes (24-30 June 1972) and Eloise (26-30 September 1975). In the six years with complete records and no major floods, the Susquehanna River discharged 0.9 plus or minus 0.3 million metric tons of suspended sediment per year at Conowingo Dam. About 50 to 60% of the annual sediment discharge usually is discharged in the spring floods (March, April) resulting from snowmelt. Except for years with major floods, suspended sediment transport at Harrisburg, Pennsylvania, exceeds sediment discharge at Conowingo, Maryland, probably due to sediment deposition in the lower river and behind three hydroelectric dams. (Humphreys-ISWS)
W78-09208

AN EXPERIMENTAL STUDY OF GEOMORPHIC THRESHOLDS,
Colorado State Univ., Fort Collins. Dept. of Geology.
S. A. Schumm.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 527, Price codes: A03 in paper copy, A01 in microfiche. Final Report 11515.4-EN, April 1, 1977. 25 p, 4 fig, 12 ref. ARO DAHCO4-74-G-0020.

Descriptors: *Erosion, *Sedimentation, *Rivers, *Geomorphology, Laboratory tests, Model studies, Alluvial fans, Sediments, Fluvial sediments, Sediment transport, Sediment yield, Watersheds(Basins), On-site investigations, Sedimentology.

Both the experimental and field phases of the project indicated that geomorphic thresholds exist and that this concept can be of significance in the recognition of incipiently unstable components of the landscape. For example, within a given region, valley floor slopes, alluvial fan slopes, and channel sinuosity usually vary over an order of magnitude. It should be possible to identify at what range of slopes the landforms are unstable and subject to major erosional or depositional change, as a result of a triggering hydrologic event or due to man's intervention. The results of this project have a significant contribution to make not only in the development of preventive conservation but also to river control engineering. The geomorphic approach requires an understanding of landform history, which can provide a basis for working with the natural system in order to accomplish conservation or river stability goals. (Sims-ISWS)
W78-09216

A MODEL TO INVESTIGATE THE INFLUENCE OF SUSPENDED SEDIMENT ON THE MASS TRANSPORT OF A POLLUTANT IN OPEN CHANNEL FLOW,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-09219

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION. APPENDIX A: SAN FRANCISCO BAY SAMPLING DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects lab.
For primary bibliographic entry see Field 5B.
W78-09225

RAINFALL SIMULATOR FOR EVALUATING EROSION RATES AND SEDIMENT FROM ROW SIDESLOPES,
Agricultural Research Service, oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 7B.
W78-09253

PREDICTING SEDIMENT YIELD FROM AGRICULTURAL LAND,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
C. H. Shelton.
Paper No. 77-2526, presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 16 p, 4 fig, 3 tab, 6 ref.

Descriptors: Sediments, *Sediment yield, Agriculture, Simulation analysis,Runoff, Soil erosion, *Forecasting, Equations, *Watershed management, Rainfall-runoff relationships, *Rainfall intensity.

Three forms of sediment-yield prediction equations were developed and tested with data from 105 runoff events on five watersheds. Runoff volume accounted for variations in yield better than maximum 30-minute intensity ranfall, erosive-potential rainfall factor, or peak runoff rate; and the best prediction equation was obtained after logarithmic transformation of variables. (Skogerboe-Colorado State)
W78-09254

WATER QUALITY LOADINGS DURING THIRTEEN STORMS ON THE CADDO RIVER, ARKANSAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5B.
W78-09255

THE ANSWERS MODEL: A PLANNING TOOL FOR WATERSHED RESEARCH,
Arkansas Univ., Fayetteville. Dept. oof Agriculture Engineering.
D. B. Beasley, E. J. Monke, and L. F. Huggins.
Paper No. 77-2532 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977. Chicago, Illinois, 21 p, 12 fig, 2 tab, 15 ref.

Descriptors: *Model studies, *Computer programs, Hydrology, Erosion, Soil erosion,Watershed management, *Simulation analysis, *ANSWERS model, Planning.

The ANSWERS model, a distributed paramete watershed hydrology and erosion simulator presented. The basic concepts and the watershe hydrology and erosion simulator is presented. Th basic concepts and the pertinent component rel tionships are described. In addition, sample ou puts from the ANSWERS model are include (Skogerboe-Colorado State).
W78-09257

FILTRATION OF NON-HOMOGENEOUS SED MENT BY SIMULATED VEGETATION,
Kentucky Univ., Lexington. Dept. of Agricultur Engineering.
J. C. Hayes, and B. J. Barfield.
Paper No. 77-2513, presented at the 1977 Winte Meeting of the American Society of Agricultur Engineers, December 13-16, 1977, Chicago, I linois, 18 p, 7 fig, 2 tab, 14 ref.

Descriptors: *Model studies, *Sediment filtration Sedimentation, Sediment loads, Open channels Simulation analysis, Hydrographs, Vegetation *Vegetation effects.

A nonsteady state model is presented for deter mining the sediment filtration of an artificial gras filter under varying flowrates, sediment loads particle sizes, channel slopes, andmedia density Good agreement was found between predicted an observed profiles for given flow conditions and in flow hydrographs using laboratory data (Skogerboe-Colorado State).
W78-09259

SOIL EROSION AND SEDIMENTATION ANALYSIS OF APPLICABLE LAW,
Virginia Polytechnic Inst. and State Univ. Blacksburgh Virginia Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W78-09273

2K. Chemical Processes

SOME METHODS AND INSTRUMENTS FOR AUTOMATED MONITORING OF THE CHEMICAL COMPOSITION OF SURFACE WATERS,
Hydrochemical Inst. Novocherkassk (USSR).
For primary bibliographic entry see Field 5A.
W78-08812

SOME THEORETICAL ASPECTS OF STABILITY AND SOLUBILITY OF INORGANIC ARSENIC IN THE FRESHWATER ENVIRONMENT,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W78-08834

GROUND-WATER SUPPLIES IN THE MURFREESBORO AREA, TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08848

REDOX PROCESSES AT SURFACES OF MANGANESE OXIDE AND THEIR EFFECTS ON AQUEOUS METAL IONS,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. D. Hem.
Chemical Geology, Vol 21, p 199-218, 1978. 4 fig, 3 tab, 32 ref.

Descriptors: *Chemical reactions, *Manganese, *Oxidation-reduction potential, *Metals, *Aqueous solutions, Reviews, Publications, Evaluation, Ion exchange, Cobalt, Lead, Nickel.

This paper reviews recent literature relating to Mn oxide deposition and sorption processes and explores the thermodynamics of certain surface redox mechanisms that may occur at the water--oxide interface. Such processes may help explain the behavior of some of the metal ions that occur in low concentrations in aqueous systems. Diversion of some electron transfers from Mn species to other metal ions can greatly decrease the equilibrium solubility of Co, Pb, Ni and some other elements in the presence of mixed-valence Mn oxides. Some scavenging and coprecipitation effects involving Mn oxides may be attributable to redox processes. Equilibrium solubilities for Mn, Co and Pb are summarized in four graphs. (Woodard-USGS)
W78-08851

STABILITY OF FLUORIDE COMPLEX WITH SILICA AND ITS DISTRIBUTION IN NATURAL WATER SYSTEMS,
Geological Survey, Menlo Park, CA. Water Resources Div.
C. E. Roberson, and R. B. Barnes.
Chemical Geology, Vol 21, p 239-256, 1978. 2 fig, 7 tab, 30 ref.

Descriptors: *Geochemistry, *Fluorides, *Silica, *Acidic water, *Thermal water, Boron, Chemical reactions, Analytical techniques, Electrodes, Hawaii, *Complexes, Fluoride ion, *Silicic acid, *Stability constant, Boric acid, Volcanic condensates.

The stability constant at 25 deg C for the reaction to form SiF6 was calculated from experimental data using ion-specific electrodes. Use of fluoride activity measurements along with appropriate data permits one to evaluate readily the importance of silicic acid and fluoride complexing in aqueous solutions. Such complexing can be very significant as illustrated by a very restricted class of natural solutions, volcanic condensates. Most other acidic natural water solutions are likely to contain other constituents (for example, Fe and Al) which effectively compete with Si for the fluoride. (Woodard-USGS)
W78-08852

ADSORPTION OF ALUMINUM BY A SMECTITE: I. SURFACE HYDROLYSIS DURING CA2(+)(-)AL3(+) EXCHANGE,
Cornell Univ., Ithaca, NY. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-08906

ADSORPTION OF ALUMINUM BY A SMECTITE: II. AN AL3(+)(-) CA2(+),
Cornell Univ., Ithaca, NY. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-08907

APPLICATIONS AND MISAPPLICATIONS OF THE LANGMUIR EQUATION TO SOIL ADSORPTION PHENOMENA,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 2G.
W78-08909

AMMONIA VOLATILIZATION FROM SOILS: EQUILIBRIUM CONSIDERATIONS,
Technion - Israel Inst. of Tech. Haifa. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08910

ORGANIC PHOSPHATE TRANSPORT AND HYDROLYSIS IN SOIL: THEORETICAL AND EXPERIMENTAL EVALUATION,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 5B.
W78-08911

COLORIMETRIC DETERMINATIONS OF EXCHANGEABLE AMMONIUM, UREA, NITRATE, AND NITRITE IN A SINGLE SOIL EXTRACT,
Texas A and M Univ., Lubbock. Agricultural Research and Extensions Center.
For primary bibliographic entry see Field 2G.
W78-08924

EVALUATION OF A WATER ANALYSIS KIT,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5A.
W78-09111

ROLE OF GROUND WATERS IN THE FORMATION OF THE CHEMISTRY OF RIVER WATERS DURING THE SUMMER-AUTUMN LOW-FLOW PERIOD IN PERMAFROST REGIONS, AS EXEMPLIFIED BY THE LENA-INDIGIRKA REGION,
V. M. Ivanik, and N. V. Veselovskiy.
Soviet Hydrology: Selected Papers, Vol. 15, No. 3, p 226-234, 1976. 2 fig, 2 tab, 30 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 60, p 17-29, 1974.

Descriptors: *Rivers, *Water chemistry, *Groundwater, *Permafrost, Discharge(Water), Groundwater movement, Chemicals, Ions, Low flow, Summer, Autumn, Mountains, Karst, Surface waters, Meltwater, Hydrology, *USSR.

The conditions of groundwater inflow into rivers in permafrost regions are unusual and very different from conditions in regions outside the permafrost zone. The degree of influence of groundwaters on the chemistry of river water is determined by the rate of groundwater inflow into rivers and their chemical composition. Most of the rivers of the permafrost zone are fed in the summer-autumn, low-flow period by the suprapermafrost waters of the active layer (i.e., essentially soil-groundwaters). Waters of this genetic category are represented in their purest form in the channels of rivers in the basins of which permafrost is continuous. Such conditions are typical of all large lowland areas in the Lena-Indigirka region and of a considerable part of the Central Siberian tableland (including Central Yakutia), where deep waters seldom discharge at the surface. In the region of island and discontinuous permafrost and also where the permafrost table is deep, the water in the rivers during the summer-autumn, low-flow period is represented by 'typical' groundwaters in nearly pure form. Furthermore, deep circulating groundwaters (i.e., subpermafrost waters) discharge into some rivers together with the waters of the upper aquifers. Discharges of groundwaters are local and confined mainly to tectonic fault zones and karst areas. (Sims-ISWS)
W78-09209

SEASONAL VARIATIONS OF TRITIUM AND OTHER CONSTITUENTS IN GROUNDWATER IN THE CHALK NEAR BRIGHTON, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 5A.
W78-09210

2L. Estuaries

WAVE FORCES ON MULTIPLE VERTICAL CYLINDERS,
Chicago Bridge and Iron Co., Plainfield, IL. Marine Research and Development.
For primary bibliographic entry see Field 8B.
W78-08801

HYDRODYNAMIC DRAG FORCES ON GROUPS OF FLAT PLATES,
Manchester Univ. (England). Simon Engineering Labs.
For primary bibliographic entry see Field 8B.
W78-08802

FINITE ELEMENT MODELLING OF NEARSHORE CURRENTS,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 8B.
W78-08803

VIRTUAL MASS OF COARSE GRANULAR MEDIA,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08804

MASS TRANSPORT IN SHALLOW WATER WAVES,
British Columbia Univ., Vancouver Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08805

WAVE SETUP AND DESIGN WATER LEVEL,
Technische Univ., Brunswick (West Germany). Leichtweiss Inst. for Water Research.
For primary bibliographic entry see Field 8B.
W78-08806

REVIEW OF OSCILLATORY BOUNDARY LAYER FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08811

INTRA-ANNUAL VARIATIONS IN THE CONCENTRATION OF BIOGENIC ELEMENTS AND DISSOLVED GASES IN THE EASTERN PART OF THE BALTIC SEA,
For primary bibliographic entry see Field 5B.
W78-08816

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 1 AND 2.
Winzler and Kelly Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 210, Price codes: A25 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-17, August 1977, 400 p. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental Shelf, Geology, Baseline studies, Resources development, Water resources, *Outer Continental Shelf, Physical oceanography, Environmental conditions.

The summary of conflicts and hazards, geological features, climate, and physical oceanography are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, informational and data gaps, ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08895) (Sinha-OEIS)
W78-08894

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 211, Price codes: A07 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-17, August 1977, 494 p.

Descriptors: *California, *Coasts, *Continental Shelf, *Water quality, Baseline studies, Resources development, Water resources, Environment, Deltas, Bays, *Outer Continental Shelf, Physical oceanography, Chemical oceanography, Environmental conditions.

The chemical oceanography; physical and chemical oceanography of San Francisco Bay; and water quality of the rivers and streams, embayments and sloughs, and the nearshore oceanic water of central and northern California are included in this section of a comprehensive literature survey abnd interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, informational and data gaps, ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08894) (Sinha-OEIS)
W78-08895

CONTINENTAL SHELF DEVELOPMENT: A BIBLIOGRAPHIC BACKGROUND FOR ALASKA. VOLUMES 1 AND 2.
Alaska Dept. of Education, Juneau. Div. of State Libraries and Museums.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 534, Price codes: A18 in paper copy, A01 in microfiche. Alaska Department of Education, Division of State Libraries and Museums Final Report to NOAA, Office of Coastal Zone Management, 1977, 421 p. Rosier, K. (compiler). NOAA Grant No 04-6-158-44029.

Descriptors: *Alaska, *Continental Shelf, *Bibliographies, *Resources development, *Baseline studies, *Oil pollution, Water pollution effects, Ecosystems, Environmental effects, *Outer Continental Shelf, Petroleum development.

The bibliography lists publications and materials on offshore oil development and the impact of offshore oil development on the onshore areas. It contains full bibliographic information and the location of the material in Juneau, Alaska. It contains 2176 titles and is indexed by personal author, corporate author, title, and subject. The bibliography is divided into the following broad categories: (1) directories, encyclopedias and indexes, (2) bibliographies and abstracts, (3) general works, (4) physical and earth sciences, (5) bibliogical sciences, (6) technology, (7) industries, (8) pollution, (9) social and economic considerations, and (10) law and legislation. The citations were selected for application to Alaskan oil development from a wide range of other geographical areas including Canada, the North Sea, Continental Europe, the Gulf of Mexico, the California Coast and Alaska. (Sinha-OEIS)
W78-08896

DETERMINATION OF PHOSPHATE FLUXES ACROSS THE SEDIMENT-WATER SURFACE OF THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.

For primary bibliographic entry see Field 5B.
W78-08897

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 1 OF 3.
Winzler and Kelly, Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 212, Price codes: A23 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-19, August 1977, 538 p. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental shelf, *Resources development, Environmental effects, Baseline studies, Water pollution, Benthos, Plankton, *Outer Continental shelf, Marine biology.

Chapters describing the benthic fauna, benthic flora, phytoplankton and zooplankton of central and northern California are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, information and data gaps ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08929 and W78-08930) (Sinha - OEIS)
W78-08928

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 2 OF 3.
Winzler and Kelly, Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 213, Price codes: A19 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-20, August 1977, 431 p. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental shelf, *Resources development, Environmental effects, Baseline studies, Water pollution, Mammals, Fisheries, Ecology, *Outer Continental Shelf, Marine biology.

Chapters describing marine mammals and fisheries of central and northern California are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socio-economic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, information and data gaps, ongoing research, recommendations for futher research, and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-8928 and W78-08930) (Sinha - OEIS)
W78-08929

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 3 OF 3,
Winzler and Kelly., Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 214, Price codes: A25 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-21, August 1977. 58[illegible] p, numerous fig, tab, ref. Contract AA550-CT6-52

Descriptors: *California, *Coasts, *Continental Shelf, *Resources development, Environmental effects, Baseline studies, Water pollution, Birds, Vegetation, Wildlife, Ecology, *Outer Continental Shelf, Marine biology, Petroleum development.

Chapters describing the marine and shore birds, terrestrial vegetation and wildlife, and specially protected biota of central and northern California are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, information and data gaps, ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08928 and W78-08929) (Sinha - OEIS)
W78-08930

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 1 OF 2.
Winzler and Kelly, Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 215, Price codes: A99 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-22, August 1977, 636 p. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental Shelf, *Resources development, Environmental effects, Baseline studies, Water pollution, Sociology, Economics, Land use, Resources, *Outer Continental Shelf, Petroleum development.

Chapters describing the industrial, commercial, and military activity, petroleum industry, transportation systems, demography and socioeconomic considerations, and land and water use of central and northern California are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, information and data gaps, ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08932) (Sinha-OEIS)
W78-08931

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly, Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 216, Price codes: A22 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-23, August 1977, 518 p. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental Shelf, *Resources development, Environmental effects, Baseline studies, Water pollution, Sociology, Economics, Land use, Resources, Water resources, *Outer Continental Shelf, Petroleum development.

Chapters describing the pollution sources, historical and archaeological resources, and recreational site vulnerability of central and northern California are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, information and data gaps, ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08931) (Sinha-OEIS)
W78-08932

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME IV: MASTER BIBLIOGRAPHY.
Winzler and Kelly, Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 217, Price codes: A99 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-24, August 1977, 791 p. Contract AA550-CT6-52.

Descriptors: *Bibliographies, *California, *Coasts, *Continental Shelf, Water pollution, Ecology, Environment, Baseline studies, Biota, Fisheries, Birds, Mammals, Resources, Resources development, *Outer Continental Shelf, Petroleum development.

Over 12,000 citations are included in the master bibliography section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties of central and northern California from Ventura county to the Oregon Border, inclusive of the Northern Channel Islands. The bibliography cntains all references cited in the individual subject chapters as well as other uncited references relevant to a particular subject. An effort has been made to minimize redundancy between chapters and to provide cross-references to assist the reader in locating either more detailed or complementary information in the companion chapters of the summary. A chapter which condenses certain data of obvious significance to the assessment of the possible effects on the environment of offshore energy resource development has been provided within each broad subject area. The chapters are: Summary of Conflicts and Hazards (Physical Conditions); Specially Protected Biota (Biological Conditions); and Recreational Site Vulnerability (Socioeconomic Conditions). (Sinha-OEIS)
W78-08933

PROCEEDINGS OF A WORKSHOP ON PATTERN RECOGNITION APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs; and Coast Guard Research and Development Center, Groton, CT.; And TEEE Computer Society, Long Island, CA.
For primary bibliographic entry see Field 5A.
W78-08934

ECOLOGICAL STUDIES ON HYDROCARBON-OXIDIZING BACTERIA IN JAPANESE COASTAL WATERS - II. DISTRIBUTION OF HYDROCARBON-OXIDIZING BACTERIA IN THE OIL-POLLUTED AREAS CAUSED BY THE MIZUSHIMA OIL REFINERY ACCIDENT (IN JAPANESE),
Simonoseki Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 5C.
W78-08964

THE NEWFOUNDLAND OFFSHORE CLAIMS: INTERFACE OF CONSTITUTIONAL FEDERALISM AND INTERNATIONAL LAW,
Toronto Univ. (Ontario). Faculty of Law.
For primary bibliographic entry see Field 6E.
W78-08981

THAT GULF OF MAINE DISPUTE: CANADA AND THE UNITED STATES DELIMIT THE ATLANTIC CONTINENTAL SHELF,
For primary bibliographic entry see Field 6E.
W78-08983

SYMPOSIUM ON COASTAL ZONE MANAGEMENT, THE UNIVERSITY OF WEST FLORIDA.
University of West Florida, Pensacola.
For primary bibliographic entry see Field 6B.
W78-08985

GUIDELINES FOR EVALUATING PROPOSED WETLANDS ALTERATIONS IN SOUTH CAROLINA,
South Carolina Wildlife and Marine Resources Dept., Columbia.
For primary bibliographic entry see Field 6E.
W78-08987

COASTAL ZONE ACT.
For primary bibliographic entry see Field 6E.
W78-08994

VERTICAL MIXING IN STRATIFIED TIDAL FLOWS,
Hydraulic Research Station, Wallingford (England). Estuary Div.
N. V. M. Odd, and J. G. Rodger.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY3, Proceedings Paper 13599, p 337-351, March 1978. 7 fig, 11 ref, 2 append.

Descriptors: *Mixing, *Tidal waters, *Stratified flow, Mathematical models, Model studies, On-site investigations, On-site data collections, Turbulence, Turbulent flow, Tides, Salinity, Suspended solids, Estuaries.

A set of mixing length functions based on a adaptation of the theories of Prandtl, Rossby, Montgomery, and Ellison were presented as a means of calculating the internal shear stresses and vertical flux of solutes in gradually varying turbulent stratified tidal flows. Field observations, made in a straight canalized reach of an estuary, were used to determine the best-fit values of empirical coefficients in generalized relationships between the mixing lengths and gradient Richardson Number. The main purpose of the research was to improve the representation of vertical exchange processes in mathematical models of estuaries. (Sims-ISWS)
W78-09029

COASTAL BARRIER CHANGES, 1770-1867, BISCAYNE BAY AREA, FLORIDA,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
R. E. Chardon.
Geology, Vol. 6, No. 6, p 333-336, June 1978. 3 fig, 25 ref.

Descriptors: *Shores, *Barrier islands, *Florida, *Geomorphology, Coasts, Beaches, Sand spits, Movement, Inlets(Waterways), Analytical techniques, Analysis, Estuaries, *Biscayne Bay(Fla).

Examination of properly evaluated historical maps of the preurban (that is, 1770-1867) sedimentary barrier bordering northern Biscayne Bay in southeastern Florida indicated: (1) net shore retreat averaging about 3.0 m/yr in the northern Atlantic portion of the barrier; (2) net spit accretion in two areas to the south, the first averaging about 70 m/yr and the second adding about 1,000,000 sq m to the barrier; (3) the migration and subsequent closing of a tidal inlet by A.D. 1822; (4) the opening of a new tidal inlet sometime between 1829 and 1838; (5) a probable association between these processes and bedrock topography; and (6) the positive value of historical maps as data bases for certain types of coastal change, especially in urban areas. (Humphreys-ISWS)
W78-09053

CHANNEL ENTRANCE RESPONSE TO JETTY CONSTRUCTION,
Army Engineer District, Galveston, TX.
For primary bibliographic entry see Field 8B.
W78-09058

SHOALING RATE PREDICTION USING A SEDIMENTATION TANK,
Coastal Engineering Research Center, Fort Belvoir, VA.
C. H. Everts.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 725, Price codes: A02 in paper copy, A01 in microfiche. American Society of Civil Engineers, Proceedings of the Specialty Conference on 'Civil Engineering in the Oceans/III' held at the University of Delaware, Newark, Delaware, p 294-312, June 9-12, 1975. 7 fig, 1 tab, 4 ref.

Descriptors: *Coasts, *Harbors, *Sedimentation rates, *Alaska, *Shoals, Sedimentation, Tidal effects, Currents(Water), Suspended solids, Tides, *Tidal flats, *Enclosed-type harbors, River stage.

Results are reported of an experiment carried out in a tidal flat near Anchorage, Alaska, where a sedimentation tank was used to obtain data related to shoaling rate in the tide harbor. Depositional conditions within the tank were evaluated for testing the similarity to those in a half-tide harbor at Dillingham, Alaska. In most cases, it was observed that the tank did not account for the effects of a long navigational channel. The pattern of sedimentation in the tank indicated that it was similar to enclosed-type harbor situations where suspended sediment enters or is released from the harbor when water surface rises or falls as under the action of a tide or changing river stage. The sedimentation rate was uniform throughout the harbor. (Bhowmik-ISWS)
W78-09059

THE CLYDE ESTUARY AND FIRTH: AN ASSESSMENT OF PRESENT KNOWLEDGE.
Natural Environment Research Council, London (England). Clyde Study Group.
For primary bibliographic entry see Field 6G.
W78-09070

PRIMARY PRODUCTIVITY OF COASTAL MARSHES IN MISSISSIPPI,
Mississippi State Univ., Mississippi State, Dept. of Zoology.
A. A. De La Cruz.
Gulf Research Reports, Vol. 4, No. 3, p 351-356, December, 1974. 1 fig, 3 tab, 12 ref.

Descriptors: *Primary productivity, *Coastal marshes, *Mississippi, Productivity, Marsh plants, Rooted aquatic plants, Marshes, Gulf Coastal Plain, Wetlands, Spartina, Juncus.

The annual net primary production of nine types of marsh communities common in Mississippi Gulf Coast estuaries were studied by means of the Harvest Method. Production values ranged from 600 g/sq m/yr for a Sagittaria lancifolia marsh to 2330 g/sq m/yr for a Phragmites communis marsh. Primary productivity values for the other marsh types are Juncus roemerianus - 1697 g/sq m/yr, Scirpus robustus - 1056 g/sq m/yr. Spartina cynosuroides -

2190 g/sq m/yr, Spartina patens - 1922 g/sq m/yr, Spartina alterniflora tall form - 1964 g/sq m/yr, S. alterniflora short form - 1089 g/sq m/yr, and Distichlis spicata - 1484 g/sq m/yr. Annual net productivity in Mississippi marshes are generally slightly higher than those reported for the Atlantic marshes. (Stihler-Mass)
W78-09079

NITROGEN FIXATION IN A SALT MARSH,
Lancaster Univ., Bailriggs (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-09082

TIDAL IMMERSION OF SPARTINA MARSH AT BRIDGEWATER BAY, SOMERSET,
Nature Conservancy Roughmoor, Taunton (England).
J. V. Morley.
Journal of Ecology, Vol. 61, No. 2, p 383-386, July, 1973. 2 fig, 6 ref.

Descriptors: *Marshes, *Tidal effects, *Water level fluctuations, Coastal marshes, Salt marshes, Tides, Water levels, Wave action, *Spartina, Bridgewater Bay(Somerset).

The seaward spread of Spartina anglica at Bridgewater Bay, Somerset, is examined in relation to periods of tidal immersion. Spartina growing at the lowest level immersed for a maximum of 4.4 h duration during spring tides, with an annual total of 2000 h. As this is less than one-third of the amount of immersion recorded at Poole Harbour where immersion has been shown to be the critical factor limiting the spread of Spartina, the marsh at Bridgewater Bay should still be advancing seawards. Recent observations have shown that during the last 10 years little or no seaware advance has occurred, and it is suggested that wave action is responsible. (Maroncelli-Mass)
W78-09084

NITROGEN FIXATION IN FLAX POND: A LONG ISLAND SALT MARSH,
Brookhaven National Lab., Upton, NY. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-09085

A SUMMARY OF POPULATION SURVEYS OF THE AMERICAN ALLIGATOR IN LOUISIANA COASTAL MARSHES, 1970-1974,
Louisiana Wildlife and Fisheries Commission, Grand Chenier. Refuge Div.
T. Joanen, and L. McNease.
Preliminary report prepared by the Refuge Division of the Louisiana Wild Life and Fisheries Commission, September 19, 1974. 5 p, 3 tab, 3 ref.

Descriptors: *Coastal marshes, *Louisiana, Reptiles, Surveys, Animal populations, *Alligators.

Alligator nests were counted in early July of each year from 1970 through 1974 using a helicopter to fly predetermined transects. Nesting density was used to estimate total population size. The Louisiana coastal alligator population was estimated at 214,000 in 1974, a 33 percent increase over the average of the previous 3 years. Fifty-seven percent of the 1974 population was located on privately owned land; 43 percent was on refuges and wildlife management areas. Three distinct coastal marsh zones characterized by age, origin and physiographic features, percent of total area occupied by each marsh zone, and percent of the alligator population occurring in each marsh zone were: chenier plain, 34.9, 67.1; sub-delta, 57.2, 26.6; active delta, 6.3, 7.9. (Stihler-Mass)
W78-09088

LANDSAT APPLICATION OF REMOTE SENSING TO SHORELINE FORM ANALYSIS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 7B.
W78-09093

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
R. H. Chadreck, and A. W. Palmisano.
Ecology, Vol. 54, No. 5, p 1118-1123. Late Summer, 1973. 1 fig, 3 tab, 18 ref.

Descriptors: *Hurricanes, *Marshes, *Vegetation, Rooted aquatic plants, Coastal marshes, Effects, Wetlands, Louisiana, Mississippi River, Recovery.

The active delta of the Mississippi River was sampled in August 1968 to determine plant species composition, plant coverage, and soil and water chemistry. Hurricane Camille struck this area in August 1969. The delta was resampled 2 weeks following the hurricane and again 1 year after the hurricane. The hurricane resuled in a drastic reduction of vegetation. Regrowth was rapid in the delta marshes and after 1 year plant coverage approached pre-hurricane levels of abundance; recovery was slower in ponds and lakes, however. Loss of vegetation was mainly a result of the sweeping action of wind and water. Plants were either uprooted or ripped apart and carried away by the current. Water salinity increased with the hurricane but declined by the following year and appeared to have only a slight effect on marsh vegetation. Plant species varied in their response to the hurricane. (Stihler-Mass)
W78-09096

A METHOD OF MEASURING SALT MARSH INUNDATION,
Aarhus Univ. (Denmark). Botanical Inst.
For primary bibliographic entry see Field 7B.
W78-09098

PRODUCTION AND DYNAMICS OF SALT MARSH VEGETATION AND THE EFFECTS OF EXPERIMENTAL TREATMENT WITH SEWAGE SLUDGE: BIOMASS, PRODUCTION, AND SPECIES COMPOSITION,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W78-09099

CONSERVATION OF COASTAL HABITATS OF WADERS IN THE SOUTH-WESTERN CAPE, SOUTH AFRICA,
Cape Town Univ. (South Africa). Percy Fitz-Patrick Inst. of African Ornithology.
J. Cooper, R. W. Summers, and J. S. Pringle.
Biological Conservation, Vol 10, No 4, p 239-247, December, 1976. 1 fig, 3 tab, 20 ref.

Descriptors: *Shorebirds, *Wetlands, Conservation, *Africa, Birds, Habitats, South Africa, *Waders.

Counts of waders (Aves: Charadrii) in the coastal regions of the southwestern Cape. South Africa were made in the austral summer 1975/76. Forty-four coastal wetlands and 49 sections of coastline were visited. The total wader population was estimated to be 119,000, of which 103,000 (86%) were Palaerctic migrants. No species can be considered to be endangered in the south-western Cape but a decrease in available wader habitat has occurred. As a Contracting Party to the 'Ramsar Convention on Wetlands of International Importance, Especially as Waterfowl Habitat', South Africa should increase its protected wetlands habitats. Ten major wetlands in the south-western Cape, containing 68% of the estimated total wader population, are recommended for elevation to nature reserve status. (Stihler-Mass)
W78-09101

TROPHIC RELATIONSHIPS IN A SEAGRASS COMMUNITY (THALASSIA TESTUDINUM), IN CARD SOUND, FLORIDA. FISH DIETS IN RELATION TO MACROBENTHIC AND CRYPTIC FAUNAL ABUNDANCE,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2I.
W78-09103

THE INFLUENCE OF TIDAL FLUX ON MICROBIAL BIOMASS IN SALT MARSH CREEKS,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 2I.
W78-09104

COASTAL MARSH PRODUCTIVITY: A BIBLIOGRAPHY.
Gulf South Research Inst. Baton Rouge, LA.
For primary bibliographic entry see Field 5C.
W78-09108

DISTRIBUTION AND BIOTIC EFFECTS OF NUTRIENTS IN FLATHEAD LAKE, MONTANA,
Montana Univ., Flathead Lake. Biological Station.
For primary bibliographic entry see Field 5C.
W78-09155

OBSERVATIONS OF ALGAL ZONATION RESULTING FROM COMPETITION,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-09159

PHYTOPLANKTON GROWTH AND CHLOROPHYLL LEVELS IN THE SACRAMENTO - SAN JOAQUIN DELTA THROUGH SAN PABLO BAY,
Bureau of Reclamation, Sacramento, CA. Mid-Pacific Region.
For primary bibliographic entry see Field 5C.
W78-09163

FLOOD PROFILES IN COMBINED TIDAL-FRESHWATER ZONES,
Agency for International Development, Dacca (Bangladash).
J. D. Jenkins, and H. M. Johnson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, NO. HY6, Technical Note, p 919-922, June 1978. 5 fig.

Descriptors: *Flood profiles, *Tidal waters, *Rivers, *Florida, Estuaries, Freshwater, Frequency, Flood flow, Analytical techniques, Water levels, Flood peak, Flood routing, Flood frequency, *Peace River(Fla).

A problem of interest in flood frequency studies is the establishment of flood profiles near coastal areas where a tidal influence exists or where backwater may affect small streams entering large reservoirs. This paper described a solution used for a flood study in Florida on Peace River from Punta Gorda to Arcadia. The paper described how the 100-yr flood profile was calculated in the river reach affected by both tidal and freshwater runoff flooding. The standard-step method for computing gradually varied flow was used for defining the necessary freshwater flood profiles. Mean high tide was used as the starting elevation. The U.S.

Geological Survey E-431 computer program was used for computations. The tidal surge profile was assumed to be horizontal. The true 100-yr flood profile was defined by the locus of points of the intersections of tidal and freshwater flood profiles of which the sum of their probabilities equals 1%. As an alternate solution, tidal and freshwater stage-frequency curves were generated at desired locations. The true probability of exceedance of the combined tidal and freshwater flood events for a stated flood elevation was computed as the sum of the separate probabilities minus the product of the separate probabilities. It is interesting to note that the backwater curve produced by simultaneous occurrence of tidal and freshwater floods is similar in form to the curve produced by combined probabilities of the tidal and freshwater events. (Humphreys-ISWS)
W78-09204

SUSPENDED SEDIMENT DISCHARGE OF THE SUSQUEHANNA RIVER TO NORTHERN CHESAPEAKE BAY, 1966 TO 1976,
Johns Hopkins Univ., Baltimore, MD. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2J.
W78-09208

RECENT AND PLANNED MARSH ESTABLISHMENT WORK THROUGHOUT THE CONTIGUOUS UNTED STATES-A SURVEY AND BASIC GUIDELINES,
Environmental Concern, Inc., St. Michaels, MD.
For primary bibliographic entry see Field 2I.
W78-09217

REGULATION OF HARBORS AND PONDS OF MARTHA'S VINEYARD,
Woods Hole Oceanographic Institution, MA. Marine Policy and Ocean Management Program.
For primary bibliographic entry see Field 6E.
W78-09222

ESTIMATION OF POND EVAPORATION IN THE GEORGIA COASTAL PLAIN,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2D.
W78-09224

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION. APPENDIX A: SAN FRANCISCO BAY SAMPLING DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects lab.
For primary bibliographic entry see Field 5B.
W78-09225

NO. 2 FUEL OIL SPILL IN BOURNE, MASSACHUSETTS: IMMEDIATE ASSESSMENT OF THE EFFECTS ON MARINE INVERTEBRATES AND A 3-YEAR STUDY OF GROWTH AND RECOVERY OF A SALT MARSH,
Woods Hole Oceanographic Institution, Woods Hole, MA.
For primary bibliographic entry see Field 5C.
W78-09274

LONG-TERM EFFECTS OF AN OIL SPILL ON FUCUS MACROFAUNA IN A SMALL BALTIC BAY,
Swedish Water and Air Pollution Research Lab., Nykoping. Baltic Sea Lab.
For primary bibliographic entry see Field 5C.
W78-09275

OBSERVATION OF A COLD-WATER INTERTIDAL COMMUNITY AFTER 5 YEARS OF A LOW-LEVEL, PERSISTENT OIL SPILL FROM THE GENERAL M.C. MEIGS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-09276

RECOVERY OF BENTHIC MACROFAUNA FROM CHRONIC POLLUTION IN THE SEA AREA OFF A REFINERY PLANT, SOUTHWEST FINLAND,
Abo Akademi, Turku (Finland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-09277

BENTHIC HYDROCARBONS OF RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-09279

THE MARINE ALGAE OF THE POLLUTED INNER PART OF THE OSLOFJORD,
For primary bibliographic entry see Field 5C.
W78-09281

EFFECTS OF THE ORGANOPHOSPHORUS INSECTICIDES TEMEPHOS (ABATE) AND CHLORPYRIFOS (DURSBAN) ON POPULATIONS OF THE SALT-MARSHES MELAMPUS BIDENTATUS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
For primary bibliographic entry see Field 5C.
W78-09285

DINOFLAGELLATE TOXINS AS PROBABLE CAUSE OF AN ATLANTIC HERRING (CLUPEA HARENGUS HARENGUS) KILL, AND PTEROPODS AS APPARENT VECTOR,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5B.
W78-09288

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

SOVIET DEVELOPMENTS IN WEATHER MODIFICATION, CLIMATE MODIFICATION, AND CLIMATOLOGY,
Informatics, Inc., Rockville, MD.
G. S. Gordon.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 675, Price codes: A05 in paper copy, A01 in microfiche. September 1975. 89 p, 29 fig, 2 tab, 62 ref. DARPA MDA-903-76C-0099.

This report focused on Soviet developments in weather modification, climate modification, and climatology during the period from late 1973 through mid-1975. Current Soviet work in solar meteorology and laser applications in atmospheric sounding also were surveyed. The source literature included regular Soviet scientific journals, recent monographs, popular science periodicals, and the daily press. (Sims-ISWS)
W78-09214

ESTIMATION OF POND EVAPORATION IN THE GEORGIA COASTAL PLAIN,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2D.
W78-09224

ECONOMIC BENEFITS OF CLIMATOLOGICAL SERVICES,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 6B.
W78-09226

3C. Use Of Water Of Impaired Quality

OUR SALTY RIVERS: LEGAL AND INSTITUTIONAL APPROACHES TO SALINITY MANAGEMENT,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W78-08973

3D. Conservation In Domestic and Municipal Use

TRANSFER OF SYSTEMS TECHNOLOGY TO URBAN WATER MANAGEMENT,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W78-08952

REGIONAL GOVERNMENTAL ARRANGEMENTS IN METROPOLITAN AREAS: NINE CASE STUDIES,
Institute for Community Studies, Kansas City, MO.
For primary bibliographic entry see Field 6E.
W78-09069

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE - PROCEEDINGS.
Water Research Foundation of Australia, Sidney.
For primary bibliographic entry see Field 6B.
W78-09247

WATER SUPPLY CATCHMENT POLICIES AND STUDIES FOR METROPOLITAN MELBOURNE,
For primary bibliographic entry see Field 6B.
W78-09250

3E. Conservation In Industry

EFFECT OF PROCESS MODIFICATIONS ON THE REDUCTION OF WATER USE AND WASTE IN A CASE STUDY DAIRY PLANT,
Ohio State Univ., Columbus.
R. E. Carawan.
Available from University Microfilms International, Ann Arbor, MI 48106; Order No 780 5820. PhD Thesis, 1977. 394 p.

Descriptors: *Dairy industry, *Food processing industry, *Analytical techniques, *Model studies, *Optimization, Cost analysis, Design criteria, Biochemical oxygen demand, Computer programs, Industrial wastes.

Modification at a multi-product dairy plant were developed for cost-effective operation and water and waste reductions. A linear economic model was derived to compare alternative processes on the basis of increased cost, effluent quality standards, and selected process alternatives. The implementation of 21 process alterations provided a 50% reduction in water consumption and waste load, resulting in the conservation of 72.4 million gal of water/yr at a net savings of $921,000. A linear economic analysis model, based on water use, effluent surcharge, and waste restriction costs, identified optimum operational efficiency processes, least cost operation, marginal restriction costs, and activity of the parameters within

the specific plant configuration. The solution to the linear model demonstrated the impact of BOD and other waste parameters on plant processes, such as milk, ice cream, and cottage cheese production, which would be severely restricted by high waste water surcharges. With an effluent restriction of 2,000 mg/liter BOD and implementation of available process alternatives, the plant attained optimum production capacities. (Lisk-FIRL)
W78-08890

A FORMAT FOR PLANNING A COMMECIAL MODEL AQUACULTURE FACILITY,
Kramer, Chin and Mayo, Inc., Seattle, WA.
For primary bibliographic entry see Field 6B.
W78-09228

A SOCIAL AND ECONOMIC IMPACT STUDY OF OFFSHORE PETROLEUM AND NATURAL GAS DEVELOPMENT IN ALASKA, (PHASE I).
Mathematical Sciences Northwest, Inc., Bellevue, WA.; and Human Resources Planning Inst., Seattle, WA.
For primary bibliographic entry see Field 6B.
W78-09229

WATER RIGHTS IN THE COAL FIELDS OF THE YELLOWSTONE RIVER BASIN,
Bureau of Indian Affairs, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-09241

3F. Conservation In Agriculture

WATER--A CRISIS MORE SERIOUS THAN ENERGY,
United Nations Center for Economic and Social Information, New York.
For primary bibliographic entry see Field 6B.
W78-08916

IRRIGATION COSTS, WHICH METHOD IS BEST FOR YOU.
Water and Irrigation, p 12-13, 24-25, November, 1977. 3 fig, 2 tab.

Descriptors: Irrigation systems, *Irrigation practices, Economics, Cost analysis, *Cost comparisons, *Costs, Furrow irrigation, Sprinkler irrigation, Surface irrigation, California.

One of the most persistent questions in the minds of farmers who are considering changing their method of irrigation, is 'What will it cost.' The Cooperative Extension Service of the University of California assigned several of its experts to provide a perspective on irrigation costs in California. (Skogerboe-Colorado State)
W78-08917

DRIP IRRIGATION MANAGEMENT,
Agricultural Research Service, Riverside, CA.
S. Davis.
Water and Irrigation, p 14-15, 29-30, November, 1977. 2 fig.

Descriptors: Irrigation, Irrigation systems, Irrigation practices, *Irrigation efficiency, *Drip irrigation, *Water management(Applied).

Management is unquestionably the most important factor in the use of drip irrigation. To be successful and to accomplish its purpose, drip irrigation requires sound decisions on the part of designers, installers and operators. If the proper equipment is not selected for the soil and water conditions and the equipment installed and operated as designed, then drip irrigation will not fulfill its full capacity to most efficiently utilize energy and water. (Skogerboe-Colorado State)
W78-08918

DRIP/TRICKLE IRRIGATION SCHEDULING,
Superior Farming Co., Bakersfield, CA. Dept. of Irrigation Engineering.
R. Rodriguez.
Water and Irrigation, p 21-26. November, 1977. 1 tab.

Descriptors: Irrigation, *Irrigation practices, Irrigation efficiency, Irrigation methods, Soil moisture, Evapotranspiration, *Drip irrigation, *Trickle irrigation.

The preliminary results obtained so far have been plotted. The applied water, crop evapotranspiration (ET) and the soil moisture content are plotted against time. Applied water and ET are plotted in inches per week, every week. The moisture content (as measured with the neutron probe) is shown in inches of water per foot of soil. (Skogerboe-Colorado State)
W78-08919

CENTER PIVOT WITH DROP OUTLETS DIRECTS WATER TO ROOT ZONE,
N. Rodgers.
Irrigation Age, Vol. 11, No. 5, p 36-37, 39, February, 1977. 2 fig.

Descriptors: *Irrigation efficiency, Water conservation, Irrigation methods, *Irrigation practices, Surface irrigation, Evaporation, *Root zone.

The use of a pivot sprinkler now on loan to the Texas Agricultural Experiment Station (TAES) could revolutionize sprinkler systems where evaporation losses are high due to wind velocity. The newest idea in center pivot irrigation and an old idea called furrow diking to hold rainfall have been combined at the TAES in Lubbock. The melding of the latest idea in irrigation and the hold-dover damming practice from the dust bowl days is a totally new way to get maximum returns out of a limited amount of water. (Skogerboe-Colorado State)
W78-08920

STRAIGHT SHOT HERBIGATION,
NEBCO Corp., Holyoke, CO.
G. Welsh.
Irrigation Age, Vol. 11, No. 5, p 46, February, 1977. 2 fig.

Descriptors: *Herbicides, Sprinkler irrigation, *Colorado, *Irrigation practices, Crop production, Corn(Field).

Direct injection of a herbicide through sprinklers has not been attempted on a large scale in Colorado. At least not until last year when Gene Welsh, Manager of NEBCO Corporation in Holyoke, applied straight Sutan+ with atrazine through center pivots on several circles of corn. Most growers who herbigate corn dilute the chemical in a holding tank before injecting it into the sprinkler. Because herbicides require small amounts of chemical per acre, many farmers claim it is too difficult to accurately inject the proper rates in this manner, so they blend it with large batches of water before injection. This popular method has proved to be effective but according to Welsh, who has used both methods, 'It's definitely easier to inject the straight herbicide. It's a trouble-free process and calibration is much simpler.' (Skogerboe-Colorado State)
W78-08921

YIELDS AND NUTRIENT ACCUMULATION BY DETERMINATE SOYBEANS, AS AFFECTED BY APPLIED NUTRIENTS,
National Fertilizer Development Center, Muscle Shoals, AL.
G. L. Terman.
Agronomy Journal, Vol. 69, No. 2, p 234-238, March-April 1977. 2 fig, 5 tab, 12 ref.

Descriptors: Fertilizers, *Fertilization, *Soybeans, *Nutrients, Crop response, *Crop production.

Most published results with southern determinate soybeans are concerned with only a single fertilizer treatment and/or one or two sampling dates. Consequently, field experiments were conducted to determine effects of applied N and K on dry matter yields, nutrient concentrations, and nutrient uptake at several sampling dates and on final grain yields. Rates of 0, 86, and 172 kg of applied K/ha and 0 and 70 kg of N were compared in a field experiment on Sango sil in 1973 and K rates of 0, 75, and 150 kg/ha in 1974. Marked responses to applied K were obtained. Maximum dry matter yields and nutrient uptake occurred during the early pod filling stage of growth. Dry matter yields then declined as a result of greater loss of leaf and petiole drop than of increase in grain filling. Concentrations of K in leaves, topgrowth, and grain increased with amount of applied K, but top trifoliate leaf blade concentrations were lower than some published recommended levels for high yields. Marked reciprocal relationships occurred among concentrations of K and Ca or Mg in top trifoliate leaves and topgrowth. Several combinations of N, P, K, and S foliar- and soil-applied during pod filling were also compared in a 1976 pot experiment on Sango sil. Grain yields and concentrations of each applied nutrient were increased in leaves and grain. Pod numbers were highly correlated with grain yields. (Skogerboe-Colorado State)
W78-08922

INFLUENCE OF THREE SOIL-WATER REGIMES ON ROOT POROSITY AND GROWTH OF FOUR RICE VARIETIES,
National Bureau of Soil Survey and Land Use Planning, New Delhi (India).
D. K. Das, and R. L. Jat.
Agronomy Journal, Vol. 69, No. 2, p 197-200, March-April 1977. 4 fig, 2 tab, 20 ref.

Descriptors: Soil moisture, Soil water, Root systems, *Root development, *Rice, Saturated soils, *Crop production.

A better understanding of the growth response of rice to waterlogged soil conditions is desirable. The objective of this study was to measure the influence of soil water regime on root porosity, growth, and nutrient content of four varieties of rice at various dates after transplanting. Four rice varieties were grown under three soil water regimes (continuous flooding, alternate flooding, and no flooding) in a greenhouse on a clay loam soil. Root porosity, growth of plants and nutrient (N, P, K, Ca, and Mg) content of shoots were determined at four different plant ages (30, 60, 85, and 110 days after transplanting). Root porosity was greatest in plants grown with continuously flooding. Porosity of roots in all four varieties reached maximum values between 30 and 60 days and then started to decline. Padma and BC6 had higher root porosities than IR8 and IR22. High root porosity was associated with greater root length, increased dry weight of roots and shoots, and higher nutrient content in shoots. (Skogerboe-Colorado State)
W78-08923

PREDICTION OF LATE SEASON NITRATE-NITROGEN CONTENT OF SUGARBEET PETIOLES,
South Dakota State Univ., Redfield. James Valley Research and Extension Center.
J. F. Giles, A. E. Ludwick, and J. O. Reuss.
Agronomy Journal, Vol 69, No 1, p 85-88, January-February 1977. 6 fig, 1 tab, 8 ref.

Descriptors: *Nitrates, *Nitrogen, *Sugarbeets, Nutrients, Fertilizers, Fertilization, Colorado, Forecasting.

Nitrate nitrogen levels in sugarbeet petioles have been used as an aid to diagnose nutritional status of the plants. The purpose of this study was to evaluate a theoretical approach to the prediction of the rate of change in N03(-)N concentration of sugarbeet petiles. petiole samples were collected from sugarbeet N fertilizer trials conducted over a 2-year period on cooperator farm sites in central and eastern Colorado. Results showed the N03(-) N concentration of sugarbeet petioles through the growing season decreased exponentially. The rate of change was a function of soil N03(-) content (0-120 cm depth) measured in the spring and the amount of N applied as preplant fertilizer. Calculation of the rate of change with this function and the measurement of one early petiole sample enables the prediction of the N03(-) N concentration during the remainder of the growing season. (Skogerboe-Colorado State)
W78-08925

FIELD-MEASURED WATER UPTAKE OF SUDANGRASS ROOTS AS AFFECTED BY FERTILIZATION,
California Univ., Riverside.
H. Fluhler, M. S. Ardakani, T. E. Szuszkiewicz, and L. H. Stolzy.
Agronomy Journal, Vol 69, No 2, p 269-274, March-April 1977. 8 fig, 23 ref.

Descriptors: Fertilizers, *Fertilization, Groundwater, *Nitrates, Leaching, *Roots, Evapotranspiration, Groundwater resources, Water quality control, *Sudangrass, *Absorption.

Cultural practices could affect the flow of water and solutes toward groundwater. In this field experiment we analyzed the effect of fertilization on water uptake of sudangrass and its indirect influence on deep drainage and nitrate leaching. Root water uptake was calculated as sink term in the continuity equation using successive measurements of water content and matric potential profiles in connection with field measured hydraulic conductivity fuctions. The experiment was conducted in three field plots on Hanford fine sandy loam. Fertilization increased dry matter production and water uptake significantly and reduced deep drainage and nitrate leaching. Water uptake patterns and root length distribution was not correlated. Mainly due to fertilization with nitrate nitrogen, the evapotranspiration approximated the amount of irrigation water applied. These results indicate that optimum water and fertilizer use and minimum groundwater pollution per unit crop production are intimately linked together. (Skogerboe-Colorado State)
W78-08926

SEASONAL ANHYDROUS AMMONIA COMPARISON FOR CORN WITH AND WITHOUT A NITRIFICATION INHIBITOR,
Georgia Univ., Experiment. Dept. of Agronomy.
F. C. Boswell.
Agronomy Journal, Vol 69, No 1, p 103-106, January-February 1977. 6 tab, 21 ref.

Descriptors: *Ammonia, *Corn(Field), *Nitrification, *Nitrogen, Crop production, Leaching, Denitrification, Inhibitors.

With increased interest in 'off-season' N application and emphasis on better management of N with respect to environmental pollution and economic considerations, information is needed relative to seasonal anhydrous ammonia comparisons for corn with and without an inhibitor. Field studies compared rates of N applied preplant with December application either with or without the nitrification inhibitor did not affect yield, number of ears, average ear weight, and percent N, P, K, Ca, and Mg in the tissue or concentrations of various other elements in tissue sampled early in the growing season, at early silking, or in corn grain. Both low (90 kg/ha) and high (180 kg/ha) N levels increased yields above check plots (zero N) when applied in December for the three-year average but both levels were significantly less than the high N level applied preplant. (Skogerboe-Colorado State)
W78-08927

METABOLISM OF ORGANOPHOSPHORUS COMPOUNDS IN SOYBEAN PLANTS IN FLOODED SOIL (IN RUSSIAN),
Far Eastern Univ., Vladivostok (USSR).
For primary bibliographic entry see Field 2I.
W78-08966

CORN-SOYBEAN TILLAGE SYSTEMS: EROSION CONTROL, EFFECTS ON CROP PRODUCTION, COSTS,
Illinois Univ. at Urbana-Champaign, Dept. of Agricultural Engineering.
J. C. Siemens, and W. R. Oschwald.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 2, p 293-302, March-April 1978. 1 fig, 23 tab, 12 ref.

Descriptors: *Erosion control, *Farm management, *Crop production, *Costs, On-site investigations, Erosion, Soil erosion, Vegetation effects, Infiltration, Runoff, Simulated rainfall, Herbicides, Corn(Field), Soybeans, Crops, Agriculture, *Tillage, Tillage systems, Tillage practice.

Seven tillage systems for producing corn and soybeans were compared in terms of erosion control, effects on production, and cost. The systems were fall moldboard plow and six conservation tillage systems, spring moldboard plow, disk-chisel, coulter-chisel, chisel, disk, and plant. Conservation tillage systems greatly reduced soil loss caused by simulated rain. Yields tended to be lower with conservation tillage. Total costs for the different systems were equivalent. The lower soil loss resulting from conservation tillage is so important that a continued effort must be made to overcome the detriments so that the practice is acceptable to most farmers. (Sims-ISWS)
W78-09048

A DEVICE FOR THE IRRIGATION OF SOIL COLUMNS (IN GERMAN),
Goettingen Univ. (West Germany). Inst. fuer Bodenkunde und Waldernaehrung.
For primary bibliographic entry see Field 2G.
W78-09109

FLOW FROM A LINE SOURCE ABOVE A SHALLOW WATER TABLE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
A. W. Warrick, and D. O. Lomen.
Soil Science Society of America Journal, Vol. 41, No. 5, p 849-852, September-October 1977. 3 fig, 1 tab, 8 ref.

Descriptors: Irrigation, Irrigation practices, *Irrigation systems, *Subsurface irrigation, Hydraulic conductivity, Soil water, *Soil water movement, Porous media, *Trickle irrigation, Flow, Water table, Matrix flux potential.

An analytical solution is developed for a buried line source with an underlying constant potential surface. The geometry is appropriate to describe flow from a trickle or subsurface irrigation system of porous pipe or emitters spaced closely in a line above a shallow water table or in a lysimeter. Assumptions include steady-state conditions and a hydraulic conductivity exponentially related to the pressure head. The soil water pressure head distribution is calculated for two geometries, one for which the water table dominates over the line source throughout the flow medium, and a second for which most of the flow region is as if the source were above an infinitely deep lower boundary. (Skogerboe-Colorado State)
W78-09112

THE SHEAR RESISTANCE OF ROOT-PERMEATED HOMOGENEOUS AND STRATIFIED SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W78-09113

UNIFORM IRRIGATION WITH A LOW-HEAD BUBBLER SYSTEM,
Agricultural Research Service, Riverside, CA. Salinity Lab.
S. L. Rawlins.
Agricultural Water Management, Vol 1, No 2, p 167-178, September 1977. 8 fig, 1 tab, 3 ref.

Descriptors: Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Gravitational water, Irrigation engineering, Hydraulics, *Distribution systems.

Existing closed-conduit irrigation systems are capable of saving water by increasing application uniformity. But, because most of them require pumping to pressurize water for distribution, the water is saved often at the expense of increased energy consumption. A new irrigation system is described that reduces the energy requirement by using inexpensive, thin-walled, corrugated plastic pipe of sufficient diameter that the pressure head often available from a surface ditch is sufficient. A simple installation technique, giving extremely high application uniformity, is described for the system for permanent crops. Costs for the system can be less than for comparable sprinkler or drip irrigation systems. (Skogerboe-Colorado State)
W78-09115

VIAFLO, A REVOLUTIONARY IRRIGATION SYSTEM (IN SPANISH),
Universidad del Norte Arica (Chile). Dept. of Agriculture.
J. Acuna Gonzalez.
Idesia Vol 4, p 157-158, 1976.

Descriptors: *Crops, Irrigation system, Surface irrigation, *Plastic pipes, Beans, Infiltration, Irrigation, Viaflo.

The system involves the extension of a porous plastic hose between rows of crops. It allows irrigation by infiltration, with minimum water waste. Functioning is briefly explained and the advantages of the system in raising bean crops in arid climates are discussed as an example.--Copyright 1977, Biological Abstracts, Inc.
W78-09116

THE USE OF LONG-THROATED FLUMES TO MEASURE FLOWS IN IRRIGATION AND DRAINAGE CANALS,
International Inst. for Land Reclamation and Improvement, Wageningen, (Netherlands).
M. G. Bos.
Agricultural Water Management, Vol 1, No 2, p 111-126, September 1977. 7 fig, 2 tab, 9 ref.

Descriptors: *Water measurement, *Flow measurement, Measurement, Flumes, Flow rates, Hydraulics, Irrigation water, Weirs, Canals.

Presented is a set of easy-to-use formulae that give an accurate head-discharge relationship for long-throated flumes with a prismatic throat cross-section. The method by which the formula have been derived is the same for all long-throated flumes, regardless of the shape of their throat cross-sections. As a result, the value of the discharge coefficient is independent of this shape and is a function of the ratio of the upstream energy head over the flume to the flow-wise length of the throat. The formula and coefficient values also apply to brad-crested weirs with rounded upstream nose. (Skogerboe-Colorado State)
W78-09117

PORTLAND CEMENT AS A SOIL AMENDMENT FOR CORN AND SOYBEANS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
R. K. Stivers, D. Swartzendruber, and W. E. Nyquist.
Agronomy Journal, Vol 69, No 6, p 961-964, November-December 1977. 3 tab, 7 ref.

Descriptors: *Corn(Field), *Soybeans, *Soil ammendment, Soil water, Hydraulic conductivity, Infiltration, Soil properties, Soil physical properties, Soil treatment, Soil water movement, *Cements, Soil aggregates, Crop yield.

In the corn belt there are many areas of imperfectly drained soils, often adjacent to well-drained soils in the same fields. Tile drainage of these imperfectly drained soils helps remove excess water within the profile. Slow movement of water into and through the Ap horizon of these soils is thought to contribute to reduced crop yields in wet years. Since application of Portland cement (the binding material in concrete) to soil in a laboratory experiment increased water-stable soil aggregate size as well as hydraulic conductivity of a soil, it was assumed that cement would act similarly in the field and increase crop yields, particularly under wet conditions. Cement did have a significant effect on grain yield in all cases. (Skogerboe-Colorado State)
W78-09118

RESPONSE OF LEAF WATER POTENTIAL TO PRESSURE CHANGES AT THE ROOT SURFACE OF CORN PLANTS,
Guelph Univ. (Ontario). Dept. of Land Resources Science.
For primary bibliographic entry see Field 2I.
W78-09119

UPTAKE AND LOSSES OF 15N APPLIED TO ANNUAL GRASS AND CLOVER IN LYSIMETERS,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 5B.
W78-09120

CLOVER N-FIXATION MEASUREMENT BY TOTAL-N DIFFERENCE AND 15N A-VALUES IN LYSIMETERS,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 7B.
W78-09121

SHORT TERM SPRINKLER PATTERNS BY DYE-CONCENTRATION METHOD,
Idaho Univ., Aberdeen. Dept. of Agricultural Engineering.
G. M. McMaster.
Paper No. 77-2566 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 5 p, 2 fig, 6 ref.

Descriptors: Sampling, Sprinklers, *Sprinkler irrigation, Irrigation, *Irrigation effects, Irrigation efficiency, *Dyes, Measurement, Fluorometer, Dye releases, *Dye dispersion.

A procedure was tested to determine the sprinkler head pattern resulting from a few revolutions of the head. A fluorescent dye, detectable at low concentration in water, was injected upstream from a sprinkler head. Precipitation collectors were charged with a measured volume of water. The precipitation rate on each collector was determined by measuring dye concentration with a flourometer. Tests of several time durations were conducted and compared. (Skogerboe-Colorado State)
W78-09123

ANALYSIS OF THE DIMENSIONLESS LINEAR CUMULATIVE FREQUENCY DISTRIBUTION OF WATER DEPTHS UNDER SPRINKLER IRRIGATION,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
D. Karmeli, and G. Peri.
Paper No. 77-2567 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 36 p, 12 fig, 2 tab, 4 ref.

Descriptors: *Sprinkler irrigation, Irrigation, *Model studies, Irrigation efficiency, Irrigation effects, *Distribution patterns, *Regression analysis, Depth.

The linear regression model is used to describe sprinkler distribution patterns. The linear fit is found to approximate the distribution very well in a wide range of experimental data. The use of the model allows for additional information regarding irrigation quality parameters. Associated with the linear regression, a new coefficient, UCL, is suggested for practical use. (Skogerboe-Colorado State)
W78-09124

DIGITAL ELECTRONIC MEASUREMENT AND RECORDING OF IRRIGATION FIELD WATER DEPTHS,
ICE Corp., Manhattan, KS.
W. H. Dawes, M. R. Casey, J. D. Scharplaz, and H. L. Manges.
Paper No 77-2577 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 3 p, 1 fig.

Descriptors: *Furrow irrigation, Water table, Sampling, *Irrigation practices, Irrigation effects, *Measurement, Depth.

A system is described for measuring water depths at twelve locations in a three-furrow irrigation field with capacitance type level sensors. The data from the sensors are recorded on a cassette tape at one or five minute intervals. The system is battery operated. Methods for retrieving data from a cassette tape are discussed. (Skogerboe-Colorado State)
W78-09125

ALLOCATION PROCEDURE OF FARM RESOURCES IN RELATION TO SOME IRRIGATION QUALITY PARAMETERS,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
D. Karmeli.
Paper No. 77-2018 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, North Carolina State University, 15 p, 1 fig, 3 tab, 5 ref.

Descriptors: Crop production, Agriculture, Irrigation, Irrigation effects, *Irrigation systems, *Irrigation efficiency, *Water allocation.

Land, water, labor and capital are optimally allocated to crops on a farm, using a procedure that also relates to irrigation frequency and level of improvement in the irrigation system. The procedure is based on formulating outputs and expenditures as well as the functions of irrigation frequency--water and yield. The Generalized Geometric Programming is used to solve the objective function as nonlinear equations are involved. (Skogerboe-Colorado State)
W78-09126

COMPUTERIZED DESIGN AND ANALYSIS OF SPRINKLER IRRIGATION SYSTEMS,
Maine Univ. at Orono. Dept. of Agricultural Engineering.
W. E. Hedstrom, and D. P. Bevilacqua.
Paper No 77-2568 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago Illinois, 13 p, 9 ref.

Descriptors: *Sprinkler irrigation, Irrigation, *Irrigation design, *Computer programs, Economics, Hydraulics, Hydraulic design.

The elements of the sprinkler irrigation design procedure which may be computerized are discussed. These include hydraulic analysis, application rate analysis, and an economic analysis as well as other applications. The conditions under which use of the computer is most worthwhile include design of solid-set systems on irregularly-shaped, steep fields. (Skogerboe-Colorado State)
W78-09127

MANAGEMENT OF IRRIGATION STREAM SIZE FOR IMPROVED RUNOFF WATER QUALITY,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-09128

CANAL SEEPAGE REDUCTION BY SEDIMENT LADEN WATER,
Nebraska Univ. Panhandle Station at Scottsbluff.
For primary bibliographic entry see Field 4A.
W78-09129

FACTORS AFFECTING WATER DISTRIBUTION AFTER UNIFORM IRRIGATION,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-09130

A LYSIMETER SYSTEM FOR WATER TABLE CONTROL,
Agricultural Research and Education Center, Belle Glade, FL.
S. F. Shih, G. J. Gascho, and J. W. Mishoe.
Paper No. 77-2575 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 12 p, 4 fig, 2 tab, 13 ref.

Descriptors: *Lysimeters, *Water table, *Sugarcane, *Irrigation, Irrigation effects, Crop production.

Lysimeters were constructed from plastic-lined, above-ground swimming pools in order to control water tables at 30, 60 and 90 cm below the surface of muck soil for sugarcane culture. Details of the construction and water table maintenance data are included. The water tables were well maintained for a low installation cost of about $20/sq m of soil surface area. (Skogerboe-Colorado State)
W78-09131

EFFECT OF DRAIN DIAMETER, OPENINGS AND ENVELOPS ON WATER TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W78-09132

BENEFITS OF SURFACE DRAINAGE,
Arkansas Cooperative Extension Service, Little Rock.
For primary bibliographic entry see Field 4A.
W78-09133

NITROGEN RESPONSES OF TALL FESCUE AND RYEGRASS SURVIVOR POPULATIONS FROM A RATE-OF-NITROGEN EXPERIMENT,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.
V. Harris, and A. Lazenby.
New Zealand Journal of Agricultural Research, Vol. 20, No. 3, p 327-330, August, 1977. 2 tab, 8 ref.

Descriptors: *Nitrogen, *Fertilizers, Fertilization, Nutrients, Crop production, Crop response, *Grasses, *Ryegrass, *Fescues.

Survivor populations of ryegrass and tall fescue from an experiment in which nitrogen was applied at rates of 0 to 1344 kg/ha/year were tested for nitrogen response in the range from 0 to 4352 kg N/ha in a single application. Applications above 544 kg N were supra-optimal and were totaly toxic at 4352 kg N. There were no indications of adaptation of the different survivor populations to either sub-optimal or supra-optimal levels of nitrogen. (Skogerboe-Colorado State)
W78-09134

THE BRIGHT SIDE OF LOW PRESSURE.
Irrigation Age, Vol 11, No 4, p 52, January, 1977, 1 fig.

Descriptors: *Sprinkler irrigation, Irrigation, Energy, Economics, Sprinklers, *Nozzles, Pressure.

The benefits of low pressure nozzles for sprinkler irrigation are described. (Skogerboe-Colorado State)
W78-09135

MORE GROWERS TURN TO HERBIGATION FOR WEED CONTROL.
Irrigation Age, Vol 11, No 4, p 47-48, January, 1977. 2 fig, 1 tab.

Descriptors: Herbigation, Weed control, Herbicides, Irrigation, Irrigation practices, Chemicals.

The beneficial effects of herbigation and equipment to accomplish herbigation are described. (Skogerboe-Colorado State)
W78-09136

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES.
American Society of Civil Engineer, New York. Hydraulics Div.
For primary bibliographic entry see Field 4A.
W78-09138

IRRIGATION SCHEDULING WITH NEUTRON PROBE,
Bureau of Reclamation, Boulder City, NV.
R. D. Gear, A. S. Dransfield, and M. D. Campbell.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 103, No IR 3, p 291-298, September 1977. 3 fig, 3 ref.

Descriptors: Irrigation, *Irrigation practices, Soil water, *Soil water, *Soil moisture, *Soil water movement, Soil properties.

A simple accurate technique has been worked out to schedule irrigations, using a graphic display of neutron probe measurements. The neutron probe design has been changed to combine the scaler with the shield and provide a useful field tool from what has traditionally been used almost exclusively for research. The technique used for scheduling irrigation requires only the identification of the refill point for each field and the neutron measured water content with time. (Skogerboe-Colorado State)
W78-09139

HYDRODYNAMICS OF BORDER IRRIGATION--COMPLETE MODEL,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
N. D. Katopodes, and T. Strelkoff.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 103, No. IR 3, p 309-324, September 1977. 5 fig, 1 tab, 6 ref.

Descriptors: *Border irrigation, Irrigation, *Irrigation practices, Irrigation systems, *Model studies, Simulation analysis, *Hydrodynamics, Irrigation engineering, Surface irrigation.

The phenomenon of surface irrigation from start to finish is modeled mathematically, using the method of characteristics. The solution, based on prescribed time increments, is correct to second order accuracy, and the iterative scheme had second-order rate of convergence. The cost and accuracy of the model were tested against existing field data and other models. Approximately 400 FORTRAN statements are required for the complete code. The processing time on a Burroughs 6700 digital computer ranges from 3 to 5 minutes for a complete irrigation. At $165/hr, this amounts to $10-15 per run. The aim of this work was a complete hydrodynamic model that can be trusted and operated by anyone at moderate expense. It is not intended for design or specific applications. (Skogerboe-Colorado State)
W78-09140

ECONOMIC IMPACT OF DIMINISHING GROUNDWATER RESERVES ON CORN PRODUCTION UNDER CENTER-PIVOT IRRIGATION,
Washington Univ., St. Louis, MO. Center for the Biology of Natural Systems.
A. K. Sanghi, and R. Klepper.
Journal of Soil and Water Conservation, Vol. 32, No. 6, p 282-285, November-December, 1977. 4 tab, 18 ref.

Descriptors: Groundwater, *Groundwater resources, Groundwater basins, Groundwater potential, Aquifers, *Corn(Field), Sprinkler irrigation, *Irrigation, Nebraska, Crop response, Crop production, Water conservation, *Economic impact.

A method for analyzing the on-farm economic consequences of diminishing groundwater reserves was developed. The method uses two functions. One relates well yield to an aquifer's saturated thickness. The other is a yield-response function that recognizes a critical period of plant growth. The application of the method to corn under center-pivot irrigation in Holt County, Nebraska, showed net returns to be far more sensitive to insufficient irrigation water during the critical period of corn growth than to price increases for energy or other inputs. The analysis also suggested that farmers motivated by short-run economic gain will find it profitable to modify wells to sustain well yield as water tables decline. Conservation of groundwater, therefore, cannot be left to market forces. (Skogerboe-Colorado State)
W78-09142

IMPLICATIONS OF IRRIGATION SYSTEM EFFICIENCIES,
Agricultural Research Service, Fort Collins, CO.
E. G. Kruse, and D. F. Keermann.
Journal of Soil and Water Conservation, Vol. 32, No. 6, p 265-270, November-December, 1977. 32 ref.

Descriptors: Irrigation, *Irrigation efficiency, Irrigation water, *Irrigation systems, Irrigation engineering, Sprinkler irrigation, Surface irrigation, Furrow irrigation, Tailwater, Water quality, Water resources, Water shortage, Water supply, Water conservation.

Field or farm irrigation efficiencies vary greatly, depending on water supply, type of irrigation system, crop, soil, and especially the level of management provided by the irrigator. Sprinkler and trickle systems simplify some management decisions by virtue of their design, at the expense of higher capital costs. Both generally have higher application efficiencies than conventional surface systems. But surface irrigation, using tailwater return facilities or level-basin concepts, may also be efficient. Irrigation efficiency is more important today than ever before because of limited supplies of water and energy. Irrigators must look closely at attainable efficiencies of new or improved irrigation systems if they are pumping water, if their seasonal water supplies are only marginally adequate for crop needs, or if water lost from their systems degrades water quality for downstream users. There are situations, however, where gravity flow provides adequate water, and the quaity of surface and subsurface return flow equals that of the irrigation water supply. In these cases, use of water over an entire project or river basin is a more important consideration than irrigation efficiencies on individual farms. (Skogerboe-Colorado State)
W78-09143

LONG-TERM STRATEGIES FOR SUPPLYING NITROGEN TO CROPS,
Los Alamos Scientific Lab., NM.
V. P. Gutschick.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-6700-MS, Price codes: A05 in paper copy, A01 in microfiche. Publication No. LA-6700-MS, May, 1977. 73 p, 136 ref, 3 append.

Descriptors: *Nitrogen, *Fertilizers, Fertilization, *Crop production.

Raising food for present population requires nitrogenous fertilizers in addition to indirect management of the biosphere's nitrogen cycle. The Haber process for making the ammonia base of fertilizers is increasingly pressed by shortages of energy, while only minor improvements are still possible. The Haber process and 15 alternatives for increasing the nitrogen available to crops using less fossil energy is discussed. These alternatives span technology of fertilizer synthesis, farm management and technology, crop genetics, and market management. (Skogerboe-Colorado State)
W78-09144

IRRIGATION RETURN FLOW MODELING--A STATE OF THE ART,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W78-09147

SIMULATION OF NUTRIENT LOSSES FROM CROPLAND,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-09148

AGRONOMY ABSTRACTS, 1977 ANNUAL MEETINGS.
American Society of Agronomy, Madison, WI.
Published by Americay Society of Agronomy, Madison, Wisconsin, (1977).

Descriptors: *Bibliographies, *Abstracts, Model studies, Fertilization, Land use, Climatology, Environmental quality, *Crop production, Soil chemistry, Nutrients, *Soils, Soil water, Fertilizers, Soil physics.

This booklet contains over 1,000 abstracts of papers that was presented at the 1977 Annual Meetings of American Society of Agronomy, Crop

Science Society of America, and Soil Science Society of America, Los Angeles, California, November 13-18, 1977. (Skogerboe-Colorado State)
W78-09150

A TENSIOMETRIC CONTROL DEVICE FOR AUTOMATIC IRRIGATION (IN SLOVANIA),
B. Maticic.
Zb Bioteh Fak Univ Ljublij Kmetijstvo Vol 25, p 219-224, 1975.

Descriptors: *Sprinkler irrigation, Tensiometers, Soil water, Irrigation, Equipment, Sorption, Control.

The tensiometric control device makes possible automatic irrigation in connection with stationary sprinkler irrigation systems. It turns on the irrigation system according to the need-where there is a deficit of water in the soil. The device consists of a mercury type tensiometer and automatic elements-relays and contactor. The device can be used to turn off an electric pump of a stationary irrigation system or magnetic valve if the irrigation system is connected with a water supply system. Desorption characteristics of the soil should be known for proper adjustment of detector pins.
W78-09158

WATER PROBLEMS IN THE INDUS FOOD MACHINE,
Colorado State Univ., Fort Collins. Dept. of Economics.
S. H. Johnson, III, A. C. Early, and M. K. Lowdermilk.
Water Resources Bulletin, Vol. 13, No. 6, p 1253-1268, December 1977. 17 tab, 16 ref.

Descriptors: *Water management(Applied), *Irrigation efficiency, *Farms, *Indus Basin(Pakistan), *Developing countries, Agriculture, Constraints, Water allocation(Policy), *Food production, Crops, Socio-economic aspects, Technical aspects.

Examples are drawn from the Indus Basin to explain why on-farm water management problems restrict the output of agricultural products in many developing countries (LDC's). Data is presented to illustrate the low level of water management knowledge of both the farmers and the current extension agents. Examples of the level of corruption and its effect on the operating system are presented. Several requirements that must be met before a large-scale irrigation scheme will actually increase welfare of LDC's farmers are given. It is concluded that the combination of lack of knowledge concerning irrigation practices and no government advice or assistance has resulted not only in some of the world's lowest yields, but also has salinized and waterlogged large areas of the Indus Basin. General recommendations that are practical and implementable are listed. (Graf-Cornell)
W78-09179

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, DC.
For primary bibliographic entry see Field 2G.
W78-09213

WATER TABLE DEPTH AND IRRIGATION EFFECTS ON WATER USE EFFICIENCIES OF THREE CROPS,
Agricultural Research Service, Mandan, ND. Northern Great Plains Research Center.
L. C. Benz, G. A. Reichman, E. J. Doering, and R. F. Follett.
Paper No. 77-2039 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 17 p, 7 fig, 3 tab, 14 ref.

Descriptors: Irrigation, Irrigation efficiency, *Corn(Field), *Sugarbeets, *Water table, *Irrigation effects, Irrigation practices, *Alfalfa.

Production and applied water-use efficiencies (AWUE) of corn, sugarbeets, and alfalfa from a 3-year field experiment at three water table depths and four irrigation rates were highest from the shallow water table treatment without irrigation. (Skogerboe-Colorado State)
W78-09260

SEEPAGE CONTROL BY PARTICLE SIZE SELECTION,
Agricultural Research Service, Temple, TX. Grassland-Forage Research Center.
For primary bibliographic entry see Field 4A.
W78-09264

A PROPOSED TECHNIQUE FOR TESTING AND EVALUATION OF HARDENED IRRIGATION DITCH CONCRETE,
Darco Engineering International, El Centro, CA.
For primary bibliographic entry see Field 8G.
W78-09265

SIMULATING THE RESPONSE OF CORN TO IRRIGATION IN HUMID AREAS,
Kentucky Univ., Lexington. Dept. oof Agricultural Engineering.
B. J. Barfield, W. G. Duncan, and C. T. Haan.
Paper No. 77-2005 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 23 p, 5 fig, 1 tab, 21 ref, 1 append.

Descriptors: *Simulation analysis, *Model studies, *Corn(Field), Irrigation, *Irrigation effects, Tropic regions, *Duncan model.

The Duncan Model for simulating the growth and yield of corn is described. The accuracy of the model for predicting yields of irrigated and nonirrigated corn is evaluated using 12 plot years of data. (Skogerboe-Colorado State)
W78-09266

COMPUTERIZED IRRIGATION SCHEDULING USING NEUTRON PROBES,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
J. F. Buchheim, and L. F. Ploss.
Paper No. 77-2004 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 12 p, 5 fig, 3 ref, 6 equ.

Descriptors: *Scheduling(Irrigation), *Soil moisture, Soil water, *Computer programs, Irrigation, Irrigation practices, *Neutron probes.

The development and evaluation of computer-supported irrigation scheduling are discussed. The use of neutron probes is being initiated in several areas to enhance the scheduling procedure. The results of one year of operation using these procedures in many areas including an analysis on an irrigation district confirmed the practical use of neutron probes. (Skogerboe-Colorado State)
W78-09267

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
J. W. Gilliam, R. W. Skaggs, and S. B. Weed.
Paper No. 77-2030 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 16 p, 8 fig, 11 ref.

Descriptors: Drainage, *Nitrates, Agriculture, *Drainage effects, *Drainage water, Drainage systems, Nutrients, Nitrogen, *Control structures, Water quality control.

Flashboard riser type water level control structures were installed in four tile mains or outlet ditches at two locations. Under controlled drainage conditions, there was a large decrease in both nitrate and drainage water lost through the artificial drainage systems. The effect on nitrate ultimately entering surface waters, however, is believed to depend on soil type. (Skogerboe-Colorado State)
W78-09268

GROUNDWATER STORAGE RIGHTS IN THE WESTERN STATES,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W78-09269

LIMITED TILLAGE SAVES SOIL, WATER, AND ENERGY,
Southwestern Great Plains Research Center, Bushland, TX.
R. R. Allen, and D. W. Fryrear.
Paper No. 77-2029 presented at the 1977 Annual Meeting, American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 14 p, 6 tab, 22 ref.

Descriptors: *Herbicides, Soil conservation, Erosion, Runoff, *Soil moisture, Soil water, *Agriculture, Mulching, Nebraska, *Crop production, *Cultivation, Texas, Great Plains, Kansas, Cotton.

Limited and higher cost energy since 1973 has added to the pressures upon agricultural production. How limited tillage can conserve energy as well as soil and water on the Great Plains is described. Stubble-mulch tillage, which began on the Great Plains for wind erosion control, was the forerunner of present limited tillage systems. Stubble-mulch reduced annual wind erosion from 6.5 to 2.0 metric tons/ha in western Nebraska and increased wheat production by 13 percent at Bushland, Texas, while using equal or less energy than clean tillage. Use of herbicides, or herbicides plus sweep tillage on fallow, increased soil water storage and reduced energy use in Kansas, Nebraska, and Texas. On sandy soils of the Southern Great Plains, crops such as cotton may not leave enough residue to prevent soil blowing. This may require additional energy to spread a mulch such as cotton gin trash or perform emergency surface-roughening tillage. With deep well irrigation of crops, energy for tillage is overshadowed by energy to pump water and manufacture fertilizer. Pumping and fertilizer energy can be 10 to 25 times higher than for tillage. (Skogerboe-Colorado State)
W78-09272

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

MODIFIED PROPORTIONAL V-NOTCH WEIRS,
Indian Inst. of Science, Bangalore (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08810

ECONSTRUCTION OF RIVER DISCHARGES N THE CONGO BASIN,
oscow State Univ. (USSR). Dept. of Hydrology.
or primary bibliographic entry see Field 2E.
78-08814

ENERATION OF ANNUAL STREAMFLOWS SING A FILTERED FRACTIONAL GAUSSIAN OISE MODEL,
onash Univ., Clayton (Australia). Dept. of Civil ngineering.
or primary bibliographic entry see Field 2E.
78-08826

ARKOVIAN INPUTS AND THE HURST HENOMENON,
olorado State Univ., Fort Collins. Dept. of Civil ngineering.
or primary bibliographic entry see Field 2E.
78-08827

VATER RESOURCES DATA FOR ALABAMA, VATER YEAR 1977.
eological Survey, University, AL. Water esources Div.
or primary bibliographic entry see Field 7C.
78-08836

CE ON RIVERS AND LAKES--A BIBLIO-RAPHIC ESSAY,
eological Survey, Reston, VA. Water Resources iv.
or primary bibliographic entry see Field 2C.
78-08837

VATER RESOURCES DATA FOR KENTUCKY, VATER YEAR 1977.
eological Survey, Louisville, KY. Water esources Div.
or primary bibliographic entry see Field 7C.
78-08844

VATER RESOURCES DATA FOR SOUTH AKOTA, WATER YEAR 1977.
eological Survey, Huron, SD. Water Resources iv.
or primary bibliographic entry see Field 7C.
78-08845

OW-FLOW CHARACTERISTICS OF ENNSYLVANIA STREAMS,
eological Survey, Harrisburg, PA. Water esources Div.
or primary bibliographic entry see Field 7C.
78-08846

RELIMINARY EVALUATION OF FLOOD REQUENCY RELATIONS IN THE URBAN REAS OF MEMPHIS, TENNESSEE,
eological Survey, Memphis, TN. Water esources Div.
. W. Boning.
vailable from the National Technical Informa-on Service, Springfield, VA 22161 as PB-280 310, rice codes: A04 in paper copy, A01 in microfiche. Vater-Resources Investigations 77-132, 1977. 50 , 25 fig, 5 tab, 10 ref.

escriptors: *Flood frequency, *Flood recurrence nterval, *Frequency analysis, *Regression analy-is, *Rainfall-runoff relationships, Computer nodels, Analytical techniques, Urban hydrology, ennessee, *Memphis area.

storm-runoff relation for streams in the urban reas of Memphis, Tenn., was determined by a tatistical evaluation of 59 flood discharges from 9 gaging stations. These flood discharges were re-ated to drainage area, percent imperviousness of he drainage basin, and rainfall occurring over 120-minute periods. The defined relation was used to synthesize sets of annual flood peaks for drainage basins ranging from .05 square miles to 10 square miles and imperviousness ranging from 0 to 80 percent for the period of rainfall record at Memphis. From these series of flood peaks, frequency relations are presented for 2, 5, 10, 25, 50 and 100 year recurrent intervals. (Woodard-USGS)
W78-08850

MAUMEE RIVER BASIN LEVEL-B STUDY, WATER SUPPLY TECHNICAL PAPER,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-08857

WATER--A CRISIS MORE SERIOUS THAN ENERGY,
United Nations Center for Economic and Social Information, New York.
For primary bibliographic entry see Field 6B.
W78-08916

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES, AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME 3, SELECTED TECHNICAL PAPERS.
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 6B.
W78-08955

STOCHASTIC MODELS OF FLOODS,
Montreal Univ. (Quebec) Ecole Polytechnique.
For primary bibliographic entry see Field 2E.
W78-09041

DISCHARGE-DEPTH EQUATION FOR SHALLOW FLOW,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-09045

WATER CONDITIONS IN CALIFORNIA, SUMMARY OF CENTRAL VALLEY WATER CONDITIONS, JUNE 1, 1978.
Sacramento Dept. of Water Resources, CA.
Special Summary, June 1, 1978. 5 p, 12 fig, 2 tab.

Descriptors: *California, *Water resources, *Data collections, Rivers, Lakes, Reservoirs, Runoff, Discharge(Water), Watersheds(Basins), Snow, Snow surveys, Moisture content, *Sacramento River Basin, *San Joaquin River Basin, *Tulane Lake Basin, *American River Basin, *Kern River Basin.

This special report summarized June 1 water conditions for Central Valley river basins. Several unusual factors made the 1977-78 winter and spring seasons unique. The precipitation season produced heavy rainfall, near record snow accumulation, and an irregular snowmelt period, all this following a two-year drought. The resulting patterns of water yield from the snow zones have complicated water supply forecasting but has aided water management activities this spring. Snow and related data, collected as of June 1, were presented to illustrate the effects of these unusual patterns and to define the current water supply conditions. Additional snow course and aerial depth marker measurements were made to define June 1 snow conditions. Reevaluation of streamflow forecasts, following the below-normal precipitation during May, resulted in reductions in volume forecasts for the April through July and water year periods. June 1 data shows that total runoff volumes for the April through July period will range from 132% of average in the Upper Sacramento River to 286% for the Kern River. Reservoir storage is about average on Sacramento Valley streams. (Humphreys-ISWS)
W78-09050

A DETERMINISTIC NON-LINEAR MODEL FOR RAINFALL-RUNOFF RELATION,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2A.
W78-09052

FEDERAL EVALUATION OF RESOURCE INVESTMENTS: A CASE STUDY,
Cornell Univ., Ithaca, NY. Water Resources and Marine Sciences Research Center.
For primary bibliographic entry see Field 6B.
W78-09062

FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME II, MORGAN COUNTY - WASHINGTON COUNTY, COLORADO.
Army Engineer District, Omaha, NB.
Prepared for Morgan County-Washington County and Colorado Water Conservation Board, May 1977, 19 p, 27 plates, 7 tab.

Descriptors: *Flood flow, *Streamflow forecasting, *Flood forecasting, *Flood profiles, *Flood data, Floods, Indirect flood measurement, Historic floods, Flood recurrence interval, Flood stages, Stage-discharge relations, Peak discharge, Flood plains, Flood protection, Non-structural alternatives, Land use, Planning, *Colorado, *South Platte River(CO), Morgan County(CO), Washington County(CO), 100-year flood, 500-year flood.

The study area involves the portions of Morgan and Washington counties, Colorado, that are subject to flooding from the South Platte River. The flood plain consists primarily of agricultural land uses, with some residential and commercial development. Flood data were obtained from topographic maps, field studies, historic sources, and U.S. Geological Survey stream gage records from Morgan County. The main flood season occurs from May through September. Flooding results from heavy general rains, intense local thunderstorms, or snowmelt. The worst flood recorded at the gage at the Morgan-Washington County line occurred on June 18, 1965, discharging 123,000 cubic feet per second (cfs). At the same location, the 100-year flood would discharge 94,000 cfs and would crest at 4104 feet mean sea level (msl), while the 500-year flood would discharge 240,000 cfs and would crest at 4108 feet msl. Historic flood data and future flood projections are presented for the entire study area. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-09074

FLOOD PLAIN INFORMATION: SACRAMENTO RIVER, REDDING, CALIFORNIA.
Army Engineer District, Sacramento, CA.
Prepared for Shasta County, and City of Redding, CA, December 1975. 51 p, 23 fig, 9 plates, 7 tab.

Descriptors: *California, *Flood forecasting, *Flood profiles, *Flood data, Floods, Regional flood, Flood flow, Streamflow forecasting, Historic floods, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Building codes, Zoning, Control structures, Levees, Floodwalls, Dams, Reservoirs, Channel improvement, Redding(CA), *Sacramento River(CA), Shasta County(CA), Intermediate Regional Flood.

The study area involves the portions of the City of Redding and Shasta County, California that are subject to flooding from the Sacramento River.

Urban and residential land uses dominate the flood plain, although there is substantial agricultural development. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. Shasta Dam, a multi-purpose project first operated for flood control in 1943, provides some protection from rain and snowmelt floods originating in the Sacramento River Basin above Shasta Lake. Shasta County has adopted a flood plain regulation ordinance. The main flood season above Shasta Dam occurs from September through April and results from heavy general rainfall and some snowmelt. Below the dam, intense local thunderstorms cause flooding. Snowmelt runoff is contained by the dam. The worst flood recorded at Keswick Dam inflow occurred in January 1970, at the rate of 210,000 cubic feet per second (cfs). At the same location, the peak flow for the Intermediate Regional Flood would discharge 79,000 cfs and it would crest at 518 feet mean sea level (msl), while the peak flow for the Standard Project Flood (SPF) would be 308,000 cfs, and it would crest at 541 feet msl. Three bridges would obstruct the SPF flow. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. Guidelines for reducing flood damage are presented, including conventional methods such as dams, levees and floodwalls, channel improvements, and watershed treatment; and nonconventional methods such as zoning, building codes and subdivision ordinances, development policies, and warning systems. (Nessa-NC)
W78-09075

FLOOD PLAIN INFORMATION: TRINITY RIVER, LEWISTON LAKE TO JUNCTION CITY, TRINITY COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, CA.
Prepared for Trinity County, CA, April 1976, 26 p, 10 fig, 40 plates, 7 tab.

Descriptors: *California, *Flood forecasting, *Flood profiles, *Flood data, Floods, Flood flow, Indirect flood measurement, Historic floods, Flood frequency, Flood stages, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Control structures, Dams, *Trinity River(CA), Trinity County(CA), Lewiston Lake(CA), Intermediate Regional Flood.

The study area involves the flood plain of the Trinity River from Lewiston Lake to Junction City in Trinity County, California. The flood plain is primarily either forest or ranchland, although more resort areas are being developed. Flood data were obtained from topographic maps, historic sources, field studies, and stream gage records. The main flood season lasts from October through April and results from heavy general rainfall. Flooding upstream of Lewiston is partially controlled by dams. The worst flood of record occurred in December 1955, with an estimated peak discharge at the Lewiston gage of 71,600 cubic feet per second (cfs). However, the most damaging flood occurred in 1964, producing $10,000,000 in flood damages in Trinity County. The 1964 flood caused Trinity Lake to rise 35 feet. At Junction City above Canyon Creek, the Intermediate Regional Flood (IRF) is expected to discharge 46,000 cfs and would crest at 1460 feet mean sea level (msl), while the Standard Project Flood (SPF) would discharge 104,000 cfs and would crest at 1467 feet msl. Two bridges in the study area would be affected by the IRF and SPF. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-09076

AQUATIC WEEDS - ERADICATE OR CULTIVATE,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
R. P. Bates, and J. F. Hentges, Jr.
Economic Botany, Vol. 30, No. 1, p 39-50, January-March, 1976. 1 fig, 2 tab, 71 ref.

Descriptors: *Aquatic weeds, *Control, *Cultivation, Biocontrol, Aquatic plants, Water hyacinth, Foods, Products, Manatee, Human food.

Unless spectacular breakthroughs in biological control occur, control of aquatic weeds will involve a combination of mechanical and chemical methods and will incur considerable expense. Because aquatic weeds appear to be a stable component of tropical environment, it seems logical to use these plants to serve man and his environment. Foremost recent research efforts can be classed as: herbivorous marine culture, harvested aquatic weed products, and processed aquatic weeds for animal food. Promising research efforts have had too little time to yield spectacular solutions to the problem of aquatic weed infestation. (Stihler-Mass)
W78-09080

NUTRIENT LOSSES IN SURFACE RUNOFF FROM A NATIVE PRAIRIE,
Agricultural Research Service, Morris, MN. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 2J.
W78-09110

THE USE OF LONG-THROATED FLUMES TO MEASURE FLOWS IN IRRIGATION AND DRAINAGE CANALS,
International Inst. for Land Reclamation and Improvement, Wageningen, (Netherlands).
For primary bibliographic entry see Field 3F.
W78-09117

CANAL SEEPAGE REDUCTION BY SEDIMENT LADEN WATER,
Nebraska Univ. Panhandle Station at Scottsbluff.
R. J. Edling.
Paper No. 77-2572 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977. Chicago, Illinois, 15 p, 3 fig, 3 tab, 4 ref.

Descriptors: *Seepage, *Canal seepage, Sediments, *Sediment load, Economics, Canals, Interstate Canal(North Platte River).

The influence of artificially induced sediment laden water on Interstate Canal seepage loss was studied. The Interstate Canal is the largest canal in the North Platte project. Substantial seepage loss reduction due to sediment laden water was realized in one of the four years studied. The practice of artificially inducing sediment laden water to reduce seepage loss is being threatened by environmental and economical concerns. (Skogerboe-Colorado State)
W78-09129

EFFECT OF DRAIN DIAMETER, OPENINGS AND ENVELOPS ON WATER TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W78-09132

BENEFITS OF SURFACE DRAINAGE,
Arkansas Cooperative Extension Service, Little Rock.
R. D. Estes, and W. S. Harris.
Paper No. 77-2587 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 3 p, 3 tab, 3 ref.

Descriptors: *Drainage, Drainage effects, Economics, Surface drainage, Operating costs.
Land was graded in approximately 40 ha. fields with a 40 ha. field left ungraded as a check. Records of operating costs and yields were kept for a three-year period. There was no appreciable difference in operating costs or yeilds. The difference was in management benefits. (Skogerboe-Colorado State)
W78-09133

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES.
American Society of Civil Engineer, New York. Hydraulics Div.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY 8, p 889-903, August 1977, 183 ref.

Descriptors: *Flow measurement, *Bibliographies, *Discharge measurement, Flow rates, Irrigation, Irrigation efficiency.

The ASCE Task Committee on Discharge Measurement charge relative to flow measurement included a review of techniques available, the encouragement of research in flow measurement and the preparation of a final report. A review of the literature was made, resulting in the substantial bibliography which constitutes this report. (Skogerboe-Colorado State)
W78-09138

HYDRODYNAMICS OF BORDER IRRIGATION--COMPLETE MODEL,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 3F.
W78-09140

IMPLICATIONS OF IRRIGATION SYSTEM EFFICIENCIES,
Agricultural Research Service, Fort Collins, CO.
For primary bibliographic entry see Field 3F.
W78-09143

AQUATIC PLANTS: MANAGEMENT AND CONTROL,
Pennsylvania State Univ., University Park. Agricultural Extension Service.
For primary bibliographic entry see Field 5C.
W78-09154

THE ANALYSIS OF MULTIVARIATE TIME SERIES WITH A VIEW TO APPLICATIONS IN HYDROLOGY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2E.
W78-09177

RECLAMATION OF OPEN-PIT QUARRIES FOR MULTIPLE USES,
Bissell and Karn, Inc., San Leandro, CA.
For primary bibliographic entry see Field 6F.
W78-09182

MAINTAINING WATER QUALITY IN VOYAGEURS NATIONAL PARK,
Minnesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5G.
W78-09183

AN UNUSUAL CHALLENGE--AMERICAN RIVER PARKWAY,
Sacramento County Dept. of Parks and Recreation, CA.
For primary bibliographic entry see Field 6B.
W78-09184

ESTRAINTS ON WATER TRANSMISSION
AIN CONSTRUCTION,
artner, Black and Veatch, Denver, CO.
or primary bibliographic entry see Field 8B.
V78-09187

VORKSHOP ON THE VISTULA AND TISZA
IVER BASINS,
nternational Inst. for Applied Systems Analysis,
axenburg (Austria).
or primary bibliographic entry see Field 6A.
V78-09188

HE VISTULA RIVER PROJECT,
or primary bibliographic entry see Field 6A.
V78-09189

YSTEMS ANALYSIS BASIS OF WATER
IANAGEMENT IN THE TISZA RIVER VAL-
EY,
lational Water Authority, Budapest (Hungary).
Vater Resources Center.
or primary bibliographic entry see Field 6A.
V78-09190

N OPTIMAL ADAPTIVE PREDICTION AL-
ORITHM FOR REAL TIME FORECASTING
F HYDROLOGIC TIME SERIES,
nternational Inst. for Applied Systems Analysis,
axenburg (Austria).
or primary bibliographic entry see Field 6A.
V78-09193

LGORITHMS FOR THE STOCHASTIC IN-
LOW-NONLINEAR OBJECTIVE WATER
ESERVOIR CONTROL PROBLEM,
nternational Inst. for Applied Systems Analysis,
axenburg (Austria).
or primary bibliographic entry see Field 6A.
V78-09194

FEATURE PREDICTION MODEL IN
YNTHETIC HYDROLOGY BASED ON CON-
EPTS OF PATTERN RECOGNITION,
Vaterloo Univ. (Ontario). Dept. of Civil Engineer-
ng.
or primary bibliographic entry see Field 2E.
V78-09201

HARACTERIZING LOW FLOWS USING
HRESHOLD LEVELS,
ehigh Univ., Bethlehem, PA. Fritz Engineering
ab.
or primary bibliographic entry see Field 2E.
V78-09202

REDICTIONS OF HEAT AND MASS
RANSFER IN OPEN CHANNELS,
arlsruhe Univ. (West Germany).
or primary bibliographic entry see Field 5B.
V78-09203

UBE DRAINAGE IN STRATIFIED SOIL
BOVE AN AQUIFER,
ran Coll. of Science and Technology, Teheran.
I. Najamii, D. Kirkham, and M. D. Dougal.
ournal of the Irrigation and Drainage Division,
merican Society of Civil Engineers, Vol. 104,
lo. IR2, Proceedings Paper 13829, p 209-228, June
978. 5 fig, 3 tab, 10 ref, 2 append. NSF ENG76-
3598.

Descriptors: *Drainage, *Drainage systems, Subsurface drains, *Model studies, Mathematical models, Tubes, Tiles, Tile drains, Soils, Stratification, Groundwater, Water table, Seepage, Drains, Artesian heads, Artesian aquifers, Drainage engineering, Irrigation, Potential flow, Drain spacing.

Potential flow theory was developed to give the relation of the drain spacing to the water table height midway between equally spaced tube drains in a two-layer stratified soil overlying an artesian aquifer under pressure. The tube drains, which are located in the upper layer, receive both steady downward recharge from the soil surface and upward seepage from the aquifer. The ratio of the drain spacing for a layered soil to the spacing for a homogeneous soil is 3.8 for these conditions: (1) the hydraulic conductivity ratio of the upper soil layer to the lower is 10; (2) the upper layer is 1/5 the combined thickness of the two; (3) the recharge is 0; (4) the ratio of the artesian head (measured with respect to the level of the drain tubes) to the desired maximum water table head above the drain centers is 2; and (5) the drain diameter is 0.02 times the combined thickness of the two layers. If the conductivity ratio is 100, for these conditions, the drain spacing ratio changes from 3.8 to 12.7, and if 1,000, to 41.1. (Sims-ISWS)
W78-09211

CALCULATING THE ICE DISCHARGE FRONT FOR DAMS,
For primary bibliographic entry see Field 2C.
W78-09220

REGULATION OF HARBORS AND PONDS OF MARTHA'S VINEYARD,
Woods Hole Oceanographic Institution, MA. Marine Policy and Ocean Management Program.
For primary bibliographic entry see Field 6E.
W78-09222

'VOGTIA MALLOI,' A NEWLY INTRODUCED PYRALID (LEPIDOPTERA) FOR THE CONTROL OF ALLIGATORWEED IN THE UNITED STATES,
Florida Univ., Gainesville.
J. L. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 946, Price codes: A05 in paper copy, A01 in microfiche. 1973. 70 p, 4 fig, 19 tab, 17 ref.

Descriptors: *Vogtia malloi, *Aquatic weed control, *Biocontrol, *Insects, *Alligatorweed, *Agasicles hygrophilia, Alternanthera philoxeroides, Alligatorweed stem borer, Alligatorweed flea beetle, Nutrients, Lakes, Streams, Plant growth, Southeast U.S., Florida, South Carolina, Lepidoptera, Regression analysis.

Vogtia malloi, alligatorweed stem borer, is evaluated as a biological control agent for alligatorweed (alternanthera philoxeroides). Additional studies included insect-host relationships between V. malloi and Agasicles hygrophilia (alligatorweed flea beetle) and alligatorweed, nutrient levels and alligatorweed growth, growth of the weed in lakes and in streams, alligatorweed productivity in greenhouse and field plot studies, and multivariate regression analysis measuring the significance of each of 12 variables influencing growth and spread of alligatorweed. In the latter study all variables but chlorides were significant at 0.01, the most important being iron, turbidity, nitrates, hardness, water depth, and Agasicles. Vogtia malloi, introduced into the U.S. in 1971 for biocontrol in South Carolina and Florida, expanded randomly as alligatorweed became damaged. Both Vogtia and Agasicles survived subfreezing temperatures at Columbia, South Carolina indicating they can extend their range to the northern limit of alligatorweed infestation. At Garden's Corner, South Carolina, as Agasicles subsided during the summer, Vogtia increased and stressed alligatorweed the entire growing season. This study shows that Agasicles prefer younger leaves, and that as stem density increases, Vogtia abundance decreases and Agasicles increases. Alligatorweed grows better in shallow, fertile ponds than in deep, clean water. (Lynch-Wisconsin)
W78-09239

SEEPAGE CONTROL BY PARTICLE SIZE SELECTION,
Agricultural Research Service, Temple, TX. Grassland-Forage Research Center.
V. L. Hauser.
Paper No. 77-2016 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 326-29, 1977, Raleigh, North Carolina, 10 p, 5 fig, 1 tab, 12 ref.

Descriptors: *Seepage control, Seepage, Canal seepage, *Hydraulic conductivity, *Soil particles, Clays, Soil aggregates.

The hydraulic conductivity of soils can be substantially reduced by the addition of gravel or aggregates which are at least 15 times larger than the particle size of the soil. The amount of clay required to control seepage can be reduced by half by the addition of aggregates at least 15 times larger than the particle size of the base soil. (Skogerboe-Colorado State)
W78-09264

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W78-09268

4B. Groundwater Management

WATER IN CARBONATE ROCKS-U.S. PROGRESS IN PERSPECTIVE.
National Committee for the International Hydrological Decade, Wash DC.
For primary bibliographic entry see Field 2F.
W78-08819

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1977.
Geological Survey, University, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08836

HYDROGEOLOGIC CONDITIONS IN THE TOWN OF SHELTER ISLAND, SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08839

CHEMICAL QUALITY OF GROUND WATER IN THE CENTRAL SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-08841

WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, MAY 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08843

WATER RESOURCES DATA FOR KENTUCKY, WATER YEAR 1977.
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08844

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1977.
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08845

GROUND-WATER SUPPLIES IN THE MURFREESBORO AREA, TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08848

GEOHYDROLOGIC EVALUATION OF A LANDFILL IN A COASTAL AREA, ST. PETERSBURG, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08849

HYDRAULIC CONDUCTIVITY AND WATER QUALITY OF THE SHALLOW AQUIFER, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08854

ALTITUDE AND CONFIGURATION OF THE TOP OF THE FLORIDAN AQUIFER, DUVAL COUNTY, FLORIDA,
Geological Survey, Jacksonville, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08855

THE WINONA-TALLAHATTA AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, MS. Water Resources Division.
For primary bibliographic entry see Field 7C.
W78-08856

WATER-QUALITY CONDITIONS IN SOUTHERN ROCKINGHAM COUNTY, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.; and Southern Rockingham Regional Planning District Commission, Salem, NH.
For primary bibliographic entry see Field 5B.
W78-08858

GEOTHERMAL RESOURCES: WATER AND OTHER CONFLICTS ENCOUNTERED BY THE DEVELOPER,
Vranesh, Raisch, and Schroeder, Boulder, CO.
For primary bibliographic entry see Field 6E.
W78-08975

WATER THAT IS NOT WATER.
Utah Univ., Salt Lake City. Coll. of Law.
For primary bibliographic entry see Field 6E.
W78-08976

PROCEEDINGS ON CONFERENCE ON GEOTHERMAL ENERGY AND THE LAW HELD IN SANTA BARBARA, CALIFORNIA ON FEBRUARY 3, 4 AND 5, 1975.
For primary bibliographic entry see Field 6E.
W78-08991

CONTAMINANT TRANSPORT TO DEEP WELLS,
Weston (Roy F.), Inc., Roslyn, NY.
For primary bibliographic entry see Field 5G.
W78-09034

ECONOMIC IMPACT OF DIMINISHING GROUNDWATER RESERVES ON CORN PRODUCTION UNDER CENTER-PIVOT IRRIGATION,
Washington Univ., St. Louis, MO. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 3F.
W78-09142

GROUND WATER POLLUTION. PART 2. POLLUTION FROM IRRIGATION AND FERTILIZATION,
National Technical Information Service, Springfield, VA.
For primary bibliographic entry see Field 5B.
W78-09151

THE USE OF SYSTEMS DIAGRAMS FOR ENVIRONMENTAL IMPACT ASSESSMENT: PROCEDURES AND AN APPLICATION,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-09174

A FULLY COUPLED CONSOLIDATION MODEL OF THE SUBSIDENCE OF VENICE,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-09198

AUTOMATIC ANALYSIS OF PUMPING TEST DATA-APPLICATION TO THE BOULTON AND HANTUSH HYPOTHESES (ANALYSE AUTOMATIQUE DES DONNEES DE POMPAGE D'ESSAI-APPLICATION AUX HYPOTHESES DE BOULTON ET D'HANTUSH),
Lille-1 Univ., Villeneuve d'Ascq (France).
For primary bibliographic entry see Field 2F.
W78-09205

GROUNDWATER STORAGE RIGHTS IN THE WESTERN STATES,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W78-09269

4C. Effects On Water Of Man's Non-Water Activities

METHOD FOR EVALUATING THE POSSIBLE CHANGES OF THE HYDROLOGIC CYCLE IN THE LANDSCAPES OF THE EXCESSIVELY WET ZONE AFTER A MODIFICATION OF THE ENVIRONMENT,
For primary bibliographic entry see Field 2A.
W78-08815

URBAN EFFECTS ON SEVERE LOCAL STORMS AT ST. LOUIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-08831

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME I,
New England Council of Water Center Directors, Boston, MA.
R. W. Hardy, R. A. Andrews, R. B. Davis, H. B. Gunner, and E. C. Leduc.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 514, Price codes: A08 in paper copy, A01 in microfiche. Completion Report, September 1977. 172 p, 14 fig, 8 tab, 75 ref. OWRT C5342 (No. 4240)(4).

Descriptors: *Lakes, *Urbanization, *New England, *Methodology, *Regional analysis, *Regional development, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Connecticut, Regional economics, Path of pollution, Pesticides, Nutrients, Phosphates, Toxins, Paleolimnology, Limnology, Watersheds, Regions, River basin commissions, Project planning, Social aspects, Human population, Management, Planning, Multiple-purpose projects, Research and development, Model studies, Prototypes, Institutions, Water policy, *Interdisciplinary research, *Research management, *Lakeshed, *Regional research, *Multi-university, Communication process, Public involvement(Or participation), Trace metals, Research coordination, Economic development, Social attitudes, Lake profile, Multi-state institutions.

Research management for interdisciplinary multi-university programs for multi-state areas was analyzed. Conclusions were reached about identifying research needs, phasing, lead time, public communication, and selecting a research team. Some conclusions are: (1) an integrated, multi-university team approach with central management is feasible and desirable for most regional projects; (2) a model has to be developed for defining and organizing research components; (3) a regional overview combined with case studies is appropriate; (4) a communication and technology transfer strategy should be used; and (5) coordination and research leadership are joint functions. Urbanization is defined as a social and physical process. Impacts of urbanization on New England lakesheds are explained. Economic and political implications are analyzed in terms of public and private attitudes and responsibilities. Most direct impacts and lake management efforts are local. Six lakeshed profiles were developed after an analysis of the lakesheds' social changes (urbanization), ecologies and management problems. Local attitudes are analyzed and compared. Major conclusions were: (1) the immediate problem is control of nutrients, primarily phosphates; (2) toxic materials represent a growing public health issue; (3) remedial measures such as chemical treatment, tend to create more problems than they solve; (4) airborne pollutants from precipitation represent newly recognized and growing problems; and (5) managers must address complex social as well as natural lakeshed problems. Information and technical assistance as well as long range planning are recommended. (See also W78-08954 and W78-08955)
W78-08953

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME II,
New England Council of Water Center Directors, Boston, MA.
R. W. Hardy, R. A. Andrews, R. B. Davis, H. B. Gunner, and E. C. LeDuc.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 515, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, December 1977. 24 p, 8 fig, 1 tab, 26 ref. OWRT C5342(No. 4240)(5).

Descriptors: *Lakes, *Urbanization, *New England, *Regional analysis, *Regional development, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Connecticut, Path of pollution, Limnology, Watersheds, Regions, River basin commissions, Social aspects, Human population, Management, Institutions, Water policy, *Lakeshed, *Regional research, *Multi-university, Communication process, Public involvement(Or participation), Economic development, Social attitudes, Lake profile, Multi-state institutions.

is volume represents a summary of the main re-
rt, Volume I, and was prepared for public infor-
tion and education. Urbanization is defined as a
cial and physical process. Impacts of urbaniza-
n on New England lakesheds are explained.
onomic and political implications are analyzed
terms of public and private attitudes and respon-
ilities. Despite an array of distant causes most
ect impacts and lake management efforts are
al. Six lakeshed profiles were developed after
analysis of the lakesheds' social changes
banization), ecologies and management
oblems. Local attitudes are analyzed and com-
red. Major conclusions were: (1) the immediate
oblem is control of nutrients, primarily
osphates; (2) toxic materials represent a grow-
public health issue; (3) remedial measures such
chemical treatment, tend to create more
oblems than they solve; (4) airborne pollutants
m precipitation represent newly recognized and
owing problems; and (5) managers must address
mplex social as well as natural lakeshed
oblems. Information and technical assistance as
ll as long range planning are recommended.
ee also W78-08953 and W78-08955)
78-08954

RTHFLOWS IN FRANCISCAN MELANGE, AN DUZEN RIVER BASIN, CALIFORNIA,
ational Park Service, Orick, CA. Redwood Na-
nal Park.
r primary bibliographic entry see Field 2J.
78-09054

HE UTILIZATION OF BLANKET BOG EGETATION BY GRAZING SHEEP,
ill Farming Research Organization, Edinburgh
cotland).
A. Grant, W. I. C. Lamb, C. D. Kerr, and G. R.
lton.
urnal of Applied Ecology, Vol. 13, No. 3, p 857-
9, December, 1976. 1 fig, 6 tab, 17 ref.

escriptors: *Grazing, *Sheep, *Bogs, Wetlands,
cotland, Livestock, Domestic animals, Vegeta-
n, Foods, Diets, Patterns of utilization,
ocking rates.

ree bog areas were grazed at monthly intervals
the times of the year when sheep would graze
ese areas in hill sheep production systems incor-
rating areas of improved pasture. Three
ocking rates were used on each site. During May-
ly grazing was confined mainly to Molinia caeru-
a, Trichophorum caespitosum and scattered
ants of Deschampsia flexuosa, Agrostis canina
d Carex species. Calluna vulgaris, Eriophorum
ginatum and E. angustifolium were hardly eaten.
the year advanced, the grazing of the first
oup of species decreased, and that of the second
oup increased. During January-March Calluna
lgaris and E. vaginatum formed the basis of the
et. Utilization patterns are discussed in relation
seasonal patterns of availability and in vitro
gestibility. Stocking rate had little effect on level
utilization where preferred species were in
ort supply and utilization was high. Where
eferred species were plentiful stocking rate had
arge effect. (Stihler-Mass)
78-09077

AN'S INFLUENCE ON THE DEVELOPMENT F THE ESTUARINE MARSH, FLAX POND, OND ISLAND, NEW YORK,
ew York Univ., NY. Dept. of Biology.
r primary bibliographic entry see Field 6G.
78-09091

RAVEL PITS AS NEW WETLAND HABITATS OR THE CONSERVATION OF BREEDING IRD COMMUNITIES,
ondon Univ. (England). Dept. of Zoology.
K. Catchpole, and C. F. Tydeman.
iological Conservation, Vol 8, No 1, p 47-59,
ly, 1975. 3 fig, 2 tab, 31 ref.

Descriptors: *Wetlands, *Quarries, *Birds, Habitats, Breeding, Marshes, Recreation, *Gravel pits, Great Britain.

Breeding bird communities in gravel pit wetland habitats contain a wide variety of species, often at high breeding densities. As natural wetlands come under increasing pressure, it is suggested that these new wetlands are important for the future conservation of marshland and aquatic species, and may also act as reservoirs of diversity and abundance in a rapidly changing environment. Conservation of some gravel pits should be based on their overall value as conservation, education, and recreation areas near urban centers; other gravel pit wetlands may relieve the increasing public pressure on natural wetlands. Present trends in the utilization of gravel pits for recreation are discussed. (Stihler-Mass)
W78-09105

THE CRANESVILLE PINE SWAMP,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 2H.
W78-09107

DEICING SALT MOVEMENT AND ITS EFFECTS ON SOIL PARAMETERS AND VEGETATION,
Maryland Univ., College Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-09122

4D. Watershed Protection

FAILURE SEQUENCE OF GULLY HEADWALLS IN WESTERN IOWA,
Missouri Agricultural Experimental Station, Columbia.
J. M. Bradford, R. F. Piest, and R. G. Spomer.
Soil Science Society of America Journal, Vol. 42, No. 2, p 323-328, March 1978. 6 fig, 1 tab, 20 ref.

Descriptors: *Erosion, *Iowa, *Missouri, *South Carolina, Soil strength, Sedimentation, Slope stability, Gully erosion, Loess, Alluvium, Geomorphology, Soil structure, *Soil morphology, Gully erosion rates, Gully erosion control, Popout, Alcove failure.

A characterization of the failure sequence of gully headwalls and banks is necessary to predict gully erosion rates and to develop controls. A model was given for the sequential nature of gully growth in the thick loessial area of western Iowa. The failure sequence includes a popout or alcove failure near the toe of a near-vertical wall; columnar sloughing of the overhanging material; and finally, the transport of the eroded material downstream. The initiating failure at the base of the wall is a result of weakening of the soil material by wetting. The gully bank failure sequence and geometry in the western Iowa loess region were compared to gully erosion studies in the glacial drift region of northwestern Missouri and in the Piedmont of South Carolina. (Lee-ISWS)
W78-08835

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1977,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08847

WATER-QUALITY ASSESSMENT OF THE MUDDY FORK SILVER CREEK WATERSHED, CLARK, FLOYD, AND WASHINGTON COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08859

CORN-SOYBEAN TILLAGE SYSTEMS: EROSION CONTROL, EFFECTS ON CROP PRODUCTION, COSTS,
Illinois Univ. at Urbana-Champaign, Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-09048

A WATER-BALANCE MODEL FOR DEEP LOESS SOILS,
Iowa State Univ. Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-09049

EARTHFLOWS IN FRANCISCAN MELANGE, VAN DUZEN RIVER BASIN, CALIFORNIA,
National Park Service, Orick, CA. Redwood National Park.
For primary bibliographic entry see Field 2J.
W78-09054

CANAL SEEPAGE REDUCTION BY SEDIMENT LADEN WATER,
Nebraska Univ. Panhandle Station at Scottsbluff.
For primary bibliographic entry see Field 4A.
W78-09129

RESOURCE ADEQUACY IN LIMITING SUSPENDED SEDIMENT DISCHARGES FROM AGRICULTURE,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 2J.
W78-09141

EVAPORATION FROM FORESTS,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2D.
W78-09212

AN EXPERIMENTAL STUDY OF GEOMORPHIC THRESHOLDS,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-09216

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE - PROCEEDINGS.
Water Research Foundation of Australia, Sidney.
For primary bibliographic entry see Field 6B.
W78-09247

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE,
For primary bibliographic entry see Field 6B.
W78-09248

THE USE OF CATCHMENT AREAS AS FLORA AND FAUNA RESERVES,
National Parks, Victoria (Australia).
For primary bibliographic entry see Field 6G.
W78-09251

PREDICTING SEDIMENT YIELD FROM AGRICULTURAL LAND,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-09254

THE ANSWERS MODEL: A PLANNING TOOL FOR WATERSHED RESEARCH,
Arkansas Univ., Fayetteville. Dept. oof Agriculture Engineering.
For primary bibliographic entry see Field 2J.
W78-09257

EVALUATION OF THE COMPONENTS OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Boise ID.
For primary bibliographic entry see Field 2A.
W78-09258

FILTRATION OF NON-HOMOGENEOUS SEDIMENT BY SIMULATED VEGETATION,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-09259

A COMPARISON OF DETERMINISTIC MATHEMATICAL WATERSHED MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
E. R. Perrier, J. Harris, and W. B. Ford, III.
Paper No. 77-2047 presented at the 1977 Annual Meeting, American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 33 p, 10 fig, 3 tab, 13 ref, 1 append.

Descriptors: *Simulation analysis, *Model studies, *Watershed management, Watersheds(Basins), *Mathematical models, Drainage basins, Arkansas, Caddo River basin(Ark).

Mathematical Watershed Models Hydrocomp, SWM, SSARR, HEC-1 and United States Department of Agriculture-HL75 were reviewed using input data from the Caddo River drainage basin for mathematical simulation comparisons. The attributes of each model are presented permitting the selection of a model most appropriate for a specific application to chemical washoff algorithms. (Skogerboe-Colorado State)
W78-09262

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

SOME METHODS AND INSTRUMENTS FOR AUTOMATED MONITORING OF THE CHEMICAL COMPOSITION OF SURFACE WATERS,
Hydrochemical Inst. Novocherkassk (USSR).
V. B. Stradomskiy, A. P. Belousov, V. M. Mukhin, and A. A. Nazarova.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 300-308, 1976. 10 fig, 1 tab, 11 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 63, p 32-51, 1976.

Descriptors: *Pollutant identification, *Water chemistry, *Monitoring, *Sampling, *Automation, Instrumentation, Equipment, Measurement, Water pollution effects, Hydrogen ion concentration, Oxidation-reduction potential, Ions, Organic compounds, Water temperature, Dissolved oxygen, Electrical conductance, Suspended solids, Water levels, Water pollution, Water quality, Pollutants, Electronic equipment, *USSR.

The principles of instrumentation for monitoring the chemical composition of surface water must be developed. Just as the construction of models of automatic measuring equipment, these principles have not yet been worked out sufficiently, although they must supply the automatic stations and portable and laboratory instruments being developed with the necessary sensors and automatic devices. At the present time, the chemical characteristics of water are being determined by potentiometric, conductometric, volt-ampere, and photocolorimetric methods. The instruments used in these methods do not operate automatically. Therefore, the Section of Complex Automation of Surface Water Analysis of the Hydrochemical Institute is investigating the automation of the aforementioned instruments, mainly the use of the electrode systems (sensors) of automatic stations, the effect of pollutants on the instruments and methods of protecting the instruments from pollutants. The section also works on new sensors for measuring several additional surface water characteristics. Experimental models of instruments and an automatic water quality monitoring station have been developed and constructed. (Sims-ISWS)
W78-08812

PROBLEM OF ESTIMATING THE RELIABILITY OF INFORMATION OBTAINED BY AN AUTOMATED WATER QUALITY MONITORING AND CONTROL SYSTEM,
Hydrochemical Inst. Novocherkassk (USSR).
A. P. Belousov, A. P. Sibilev, and V. B. Stradomskiy.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 309-312, 1976. 4 fig, 1 tab, 4 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 63, p 86-91, 1976.

Descriptors: *Data processing, *Water quality, *Monitoring, *Sampling, Water pollution, Measurement, Water chemistry, Pollutants, Chemicals, Water temperature, Dissolved oxygen, Chlorides, Electrical conductance, Analytical techniques, *USSR.

The hydrochemical information obtained by the automatic stations of automated water quality monitoring and control systems is unavoidably distorted as it is being transmitted, transformed, and processed. These distortions stem from the uneven distribution of the concentration of ingredients being monitored, the imperfections of the measuring and conversion sections of an automatic station, and the information retrieval methods. The effect of the uneven distribution of the concentration of the monitored ingredient along a section and of the errors introduced by the measuring and converting parts of stations on the reliability of the information obtained by a water quality monitoring and control system were examined. It was concluded that with the proper selection of the distance from the site of waste water discharge to the automatic monitoring station site, the measurement error stemming from the uneven distribution of the measured characteristic along a section lies within 10% of the average value. The component of the error produced by the imperfection of the measuring and converting devices of an automatic station must be of the same order of magnitude as the error stemming from the irregularity of concentration along a section. (Sims-ISWS)
W78-08813

INTRA-ANNUAL VARIATIONS IN THE CONCENTRATION OF BIOGENIC ELEMENTS AND DISSOLVED GASES IN THE EASTERN PART OF THE BALTIC SEA,
For primary bibliographic entry see Field 5B.
W78-08816

SOME THEORETICAL ASPECTS OF STABILITY AND SOLUBILITY OF INORGANIC ARSENIC IN THE FRESHWATER ENVIRONMENT,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
R. Wagemann.
Water Research, Vol. 12, No. 3, p 139-145, 1978. 3 fig, 3 tab, 39 ref.

Descriptors: *Arsenic compounds, Water chemistry, *Sodium arsenite, Chemical properties, *Phase diagrams, Chemical analysis, Inorganic compounds, Stability, Solubility, Physical properties, Hydrogen ion concentration, Theoretical analysis, Chromium, Iron, Copper, Freshwater, *Arsenic, *Arsenates, *Metal arsenates.

The concentrations of some major and minor ionic constituents of different freshwater systems were listed, and 'typical' concentration estimates were given for freshwater in general. Fourteen different metals were examined for a possible controlling influence on total dissolved arsenic in freshwater. Four metals (Ba, Cr, Fe, Cu) emerged as possible candidates and were examined more closely. The total dissolved arsenic concentration allowed by each of these metal arsenates is shown as a function of pH when the metal ion activity itself is controlled by a relatively insoluble compound. Barium ion at a concentration typical for freshwater emerges as the most convincing candidate capable of holding total dissolved arsenic to rather low concentrations, while chromium and iron emerge as possibilities. A new E sub h-pH diagram for arsenic showing the relative stability domain for barium arsenate was presented in which the arsenic sulfide domains have been included and somewhat simplified and clarified. (Henley-ISWS)
W78-08834

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1977.
Geological Survey, University, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08836

WATER RESOURCES DATA FOR KENTUCKY, WATER YEAR 1977.
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08844

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1977.
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08845

GROUND-WATER SUPPLIES IN THE MURFREESBORO AREA, TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08848

REDOX PROCESSES AT SURFACES OF MANGANESE OXIDE AND THEIR EFFECTS ON AQUEOUS METAL IONS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-08851

STABILITY OF FLUORIDE COMPLEX WITH SILICA AND ITS DISTRIBUTION IN NATURAL WATER SYSTEMS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-08852

HYDRAULIC CONDUCTIVITY AND WATER QUALITY OF THE SHALLOW AQUIFER, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08854

MAUMEE RIVER BASIN LEVEL-B STUDY, WATER SUPPLY TECHNICAL PAPER,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-08857

WATER-QUALITY ASSESSMENT OF THE MUDDY FORK SILVER CREEK WATERSHED, CLARK, FLOYD, AND WASHINGTON COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08859

LARVAL FISH DRIFT IN A LARGE RIVER WITH A COMPARISON OF SAMPLING METHODS,
Ichthyological Associates, Inc., Berwick, PA.
W. F. Gale, and H. W. Mohr, Jr.
Transactions of the American Fisheries Society, Vol 107, No 1, p 46-55, 1978. 5 fig, 4 tab, 25 ref.

Descriptors: *Larval growth stage, *Aquatic drift, *Temporal distribution, *Diurnal distribution, *Sampling, *Bottom sampling, Fish behavior, *Nets, *Spatial distribution, *Fish reproduction, Growth stages, On-site data collections, Fresh water fish, Fish migration, Pennsylvania, *Larval fish drift, *Susquehanna River(Penn).

Larval fish drift in the rocky-bottomed Susquehanna River (northeastern Pennsylvania) was investigated during 1974-1975. At least 18 species of drifting larvae were collected by nets mounted on a stationary boat or by pumping. Maximum densities of 15.4 and 27.1 larvae/10 m3 were found in June 1974 and 1975, respectively. Quillback, (56%), minnows (25%), and carp, (14% of the total) were the most abundant larvae caught in 1974 by pumping. The few larvae that drifted during the day were mostly near the bottom. large numbers of quillback, white sucker shorthead redhorse and tessellated arter larvae drifted near the river surface at night. Drift was maximum at about 2400 h. Overall, the day/night drift ratio was 1/3.8. Boat-mounted nets and the pump sampler had equal sampling efficiencies. Condition of larvae in pump samples was related to net material, mesh size, net shape, and pumping duration. Larvae in best condition were in 5-min samples pumped into slender nets (mouth/length ratio 1/10) made of fine-meshed monofilament nylon. (EIS-Deal)
W78-08867

THE IMPLICATIONS OF COMMUNITY STRUCTURE FOR BENTHIC MONITORING STUDIES,
Leeds Univ. (England). Wellcome Marine Lab.
J. R. Lewis.
Marine Pollution Bulletin, Vol. 9, No. 3, p 64-66, 1978. 2 fig.

Descriptors: *Biological communities, *Benthos, *Water pollution effects, *Monitoring, *Sampling, *On-site data collections, *Estimating, *Statistical methods, *Ecosystems, *Population, Water quality, Marine biology.

The author suggests that, when monitoring the effects of pollution, collecting every bit of information about each individual of each species in a transect or grid is highly wasteful of effort and resources. He proposes that, if the pre-pollution ecology is well understood, it would be both adequate and most practical to concentrate upon relatively few, relatively manageable species. This assumes that the key species are not more resistant to pollutants than are species of different life-form and competitive ability. (EIS-Deal)
W78-08870

UPTAKE OF RADIOACTIVITY BY MARINE SEDIMENTS AND IMPLICATIONS FOR MONITORING METAL POLLUTANTS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. A. Hetherington, and B. R. Harvey.
Marine Pollution Bulletin, Vol. 9, p 102-106, 1978. 2 fig, 4 tab, 9 ref.

Descriptors: *Absorption, *Sediments, *Monitoring, *Radioactivity, Data collections, Analytical techniques, Water quality, Water properties, Metals, Sedimentology, Sediment discharge, Sediment distribution, Suspended solids, *Radionuclide sedimentation.

The value of studying artificially-produced radionuclides in the marine environment was discussed in the wider context of monitoring sediments for other metal pollutants. Differences in the dispersion of selected radionuclides discharged from the same known source were used to illustrate the sort of changes in phase or speciation which must occur with other metal pollutants, but which cannot be demonstrated directly because of the multiplicity of sources. Various chemical and physical procedures were discussed which can be applied to a study of heavy metal associations with marine sediments, as were questions such as the existence, or otherwise, of mechanism for the slow release of adsorbed material from the buried sediment back into the water column. Suggestions were made as to how radionuclide studies may be helpful in answering questions such as these, which were considered to be vital for the meaningful interpretation of sediment analyses. (EIS-Klein)
W78-08871

FISH COUGH RESPONSE - A METHOD FOR EVALUATING QUALITY OF TREATED COMPLEX EFFLUENTS,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-08874

ZINC CONTENT IN OTOLITHS OF MACKEREL FROM THE AEGEAN,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
C. Papadopoulou, G. D. Kanias, and E. M. Kassimati.
Marine Pollution Bulletin, Vol. 9, p 106-108, 1978. 5 fig, 1 tab, 12 ref.

Descriptors: *Metals, *Zinc, *Fish physiology, *Marine fish, Analytical techniques, Oceans, Metabolism, Fish diets, Fish behavior, Path of pollutants, Life history studies, *Pollutant identification, *Mackerels, Bioaccumulation, *Aegean Sea, Tissue analysis, *Otoliths, Scomber japonicus colias.

The zinc content in otoliths of the mackerel Scomber japonicus colias was determined by instrumental neutron activation analysis. Six groups of twelve specimens were selected from 3 areas of the Aegean sea. The zinc content was found to be a linear function of age and body length. The decrease of the metal concentration in the older was considered to be due to metabolic factor differences, to food intake or larger fish, or to fish movement. (EIS-Klein)
W78-08876

RECOVERY OF INDICATOR BACTERIA IN ACID MINE STREAMS,
West Virginia Univ., Morgantown.
C. R. Hackney, and G. K. Bissonnette.
Journal of the Water Control Federation, Vol 50, p 775-780, 1978. 4 fig, 18 ref.

Descriptors: *Bioindicators, *Bacteria, *Acidic water, *Acid streams, Mine wastes, Coliforms, Microbiology, Pathogenic bacteria, Sewage bacteria, E coli, Streptococcus, Analytical techniques, Laboratory tests, Sampling, Population, Toxicity, Methodology, *Microbiological tests, Media, Bacteriology, E aerogenes, S faecalis, Bacteria recovery.

The recovery characteristics of three sanitary-indicator bacteria were examined as a function of exposure to the environment of two acid mine streams. Membrane filter chambers containing pure cultures of Streptococcus faecalis, Escherichia coli, or Enterobacter aerogens were placed into acid mine streams. Samples were withdrawn periodically from the chambers and were enumerated simultaneously with rich nonselective media and specific selective media so that both injury and survival characteristics could be investigated. E. coli and E. aerogenes had similar recovery characteristics, as reflected by rapid die-away. In addition, these coliforms were sublethally injured rapidly in the acid mine streams, perhaps indicating that the use of selective media for their enumeration would give an erroneous impression of the number of coliforms actually present. Compared to the coliforms tested, S. faecalis persisted much longer. No significant injury was incurred by S. faecalis. (EIS-Klein)
W78-08882

USE OF HYDROPONICS TO MAINTAIN QUALITY OF RECIRCULATED WATER IN A FISH CULTURE SYSTEM,
Southern Illinois Univ., Carbondale. Fisheries Research Lab.
For primary bibliographic entry see Field 5G.
W78-08884

PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET SOUND AREA--A PILOT DESIGN STUDY,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5B.
W78-08887

DETERMINATION OF PHOSPHATE FLUXES ACROSS THE SEDIMENT-WATER SURFACE OF THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W78-08897

FIELD INFRARED METHOD TO DISCRIMINATE NATURAL SEEPS FROM NON-SEEPS (SANTA BARBARA, CALIFORNIA AREA),
Coast Guard Research and Development Center, Groton, CT.
D. Eastwood, and D. F. Grant.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A042 861, Price codes: A02 in paper copy, A01 in microfiche. Final Report No. CG-D-32-77, December 1976. 25 p, 8 fig, 1 tab.

Descriptors: *Oil spills, *Seepage, *Pollutant identification, Water pollution sources, California, *Outer Continental Shelf, *Santa Barbara Channel(Calif).

A field infrared method has been developed to distinguish oil due to natural seepage in the Santa Barbara (California) Channel region from closely similar oils derived from spills at offshore drilling platforms or from shipping accidents. Differences between seep and non-seep oils have been found to persist in weathering studies carried out in outdoor tanks for one week. This method involves simple infrared instrumentation and a minimum of sample preparation. It permits rapid on-site analysis without special training. The major differences

between seep and non-seep oils appear in the comparison between the 13.8 micron and 13.5 micron peaks (for both weathered and unweathered oils) and in the carbonyl region at 5.85 micron (for unweathered oils only). (Sinha-OEIS)
W78-08900

METHOD OF IDENTIFYING SOURCE OF PETROLEUM FOUND IN THE MARINE ENVIRONMENT. REPORT II,
Stanford Research Inst., Menlo Park, CA.
M. E. Scolnick, A. C. Scott, and M. Anbar.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A046 256, Price codes: A05 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Final Report No. CG-D-37-77, November 1976. 94 p, 23 fig, 15 tab, 14 ref, append. DOT-CG-81-74-1187.

Descriptors: *Pollutant identification, *Oil pollution, Water pollution sources, *Outer Continental Shelf, Petroleum, Mass spectrometry.

The identification of oils by field ionization mass spectrometry is reported. Two multivariate data analysis models are described; a parametric statistical model that is based on the assumption of stochastic independence and an empirical model that can be used in a 'learning machine' mode. The results of applying the empirical model to 154 quadrupole spectra and 42 sector magnet spectra are reported. (Sinha-OEIS)
W78-08901

USE OF PATTERN RECOGNITION TECHNIQUES FOR TYPING AND IDENTIFICATION OF OIL SPILLS,
Rice Unic., Houston, TX.
H. L. Curtis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 802, Price codes: A02 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Final Report No. CG-D-38-77, April 1977. 20 p, 5 fig, 2 tab, 9 ref. DOT-CG-81-75-1383.

Descriptors: *Pollutant identification, *Oil spills, *Analytical techniques, Water pollution, Oil pollution, *Outer Continental Shelf, *Pattern recognition.

The infrared spectra of oils have many sharp peaks and good identification results from reading just the amplitudes of these peaks. About fifteen properly chosen peaks will usually suffice. Simply reading peak amplitudes of fluorescene spectra will not suffice to give good identification, nor will the amplitudes at the valleys in between the peaks. Howeve, by assigning a sharpness factor to valleys and peaks, one can extract sufficient information to result in very reliable identification. An algorithm for doing this has been devised and implemented in the form of a computer program. A second purpose of the contract was to test the independence of the infrared and fluorescence spectra. A conservative formula is given based on the limited information currently available. (Sinha-OEIS)
W78-08902

THE MEASUREMENT OF OIL SPILL VOLUME BY A PASSIVE MICROWAVE IMAGER,
Coast Guard, Washington, DC. Office of Research and Development.
B. E. Troy, Jr., and J. P. Hollinger.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 821, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. CG-D-55-77, May 1977. 67 p, 16 fig, 2 tab, 27 ref, append.

Descriptors: *Oil spills, *Water pollution, *Pollutant identification, Remote sensing, Measurement, *Outer Continental Shelf, Microwave images.

An airborne passive microwave system has been developed and used in a test program to detect a marine oil spill and to determine its thickness and volume. A controlled spill of 2040 liters (538 gallons) of No. 2 fuel oil was conducted from a Coast Guard vessel 20 miles off the Virginia shore. Microwave images of the spill were obtained at both 22.4 and 31.0 GHz on five consecutive aircraft passes over the visible oil slick. Wind and weather conditions were moderate during the test. The microwave images were processed on a computer and shown on a color television display system. These color images revealed a small region of relatively thick oil, surrounded by a larger region of much thinner oil, in agreement with results from an earlier program. The thin oil region corresponded to the visible oil slick and showed up clearly in the color images against the unpolluted open sea. It is thus possible to outline the entire visible slick and to locate the thick oil regions within it by means of a microwave image. Maximum oil thickness was approximately 0.6 mm in the thick region which was located on the downwind side of the visible slick. The oil spill volume was determined by integrating the oil thickness over area in the computer. Each microwave image of the spill was made in the few seconds necessary for the aircraft to pass over the spill. This rapid data-taking capability is a significant improvement over the earlier developmental program which used fixed downward-looking radiometers, and required approximately one hour and a dozen aircraft passes to gather the data necessary to reconstruct a microwave picture of the slick. (Sinha-OEIS)
W78-08903

A FLUME FOR THE STUDY OF CONTAINED OIL SLICKS,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 5B.
W78-08905

PROCEEDINGS OF A WORKSHOP ON PATTERN RECOGNITION APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs; and Coast Guard Research and Development Center, Groton, CT.; And TEEE Computer Society, Long Island, CA.
Institute of Electrical and Electronics Engineers, Inc., New Yori, N.Y. IEEE Catalog No. 76CH1247-6C, 1977. Workshop held at Coronado, California, November 11-12, 1976. 175 p. Chien, Y. T. and Killeen, T. J. (Eds.).

Descriptors: *Pollutant identification, *Oil pollution, *Oil spills, *Monitoring, *Conferences, Oil wastes, Analytical techniques, *Waste identification, Methodology, *Outer Continental Shelf, *Pattern recognition,(Oil pollution), Pollution monitoring, Path of pollutants.

This Proceedings is a collection of the papers presented at the Workshop during a two-day informal gathering at Coronado, California on November 11-12, 1976. It represents the latest views and analyses of more than thirty specialists on the subject of oil identification and its relation to pattern recognition. Theories, laboratory experiments and on-site-tests were all cross-examined in an atmosphere of critical assessment and learning from each other. (See W78-08935 thur W78-08951) (Sinha-OEIS)
W78-08934

THE INFLUENCE OF WEATHERING ON IDENTIFICATION OF SPILLED OIL SAMPLES,
Coast Guard Research and Development Center Groton, CT.
A. P. Bentz.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 5-14, 6 fig, 8 ref.

Descriptors: *Oil spills, *Weathering, *Pollutant identification, Water pollution sources, Oil pollution, *Spectroscopy, Pattern recognition, Spectroscopic analysis.

Infrared spectroscopic analysis of oils is used as an example to discuss the influence of weathering on pattern recognition. Simulated weathering of suspect oils is recommended to facilitate pattern matching. (See also W78-08934) (Sinha - OEIS)
W78-08935

PATTERN RECOGNITION AND OIL SPILL IDENTIFICATION,
Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
Y. T. Chien, and T. J. Killeen.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 15-33, 12 fig, 14 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, Oil pollution, *Pattern recognition(Oil pollution), Computer systems.

A brief review of pattern recognition technology as applied to oil spill identification is presented. Two computer-based systems that are potentially useful for oil spill identification are described. The first is an interactive graphics system which is most suitable for manipulating discrete waveforms (such as FL or IR Spectra), with the aid of graphical display. The other system is a general 2-dimensional pictorial information processor, which is potentially useful for identifying oil images such as those produced by the TLC technique. (See also W78-08934) (Sinha - OEIS)
W78-08936

STATISTICAL PROBLEMS IN OIL IDENTIFICATION,
Standard Oil Co. (Ohio), Cleveland.
D. Frazier.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 34-36.

Descriptors: *Pollutant identification, *Oil spills, *Statistics, Water pollution sources, *Probability, Oil pollution, Pattern recognition, 'Prior probabilities'.

None of our statistical methods really calculate probabilities. All they provide are changes in probabilities. Two experts using impeccable statistics, will come to diametrically opposite conclusions because their prior probability assumptions are different and statistical theory is no help at all in assigning prior probabilities. The methods of statistical analysis of data that are used today work well in the laboratory where scientists can carefully explain to each other what they are doing, but the methods are little help in leading a modern American jury to a fair verdict in an oil spill case. (See also W78-008934) (Sinha - OEIS)
W78-08937

MEASUREMENT OF INDEPENDENCE OF FLUORESCENCE AND INFRARED SPECTRA OF OILS,
Rice Univ., Houston, TX. Dept. of Electrical Engineering; and Rice Univ., Houston, TX. Dept. of Mathematics.
S. A. Starks, and M. L. Curtis.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 37-46, 5 fig, 2 tab, 3 ref.

Descriptors: *Oil pollution, *Pollutant identification, *Oil spills, Water pollution sources, *Fluorescence, *Infrared radiation.

Numerous methods have been proposed and developed for the solution of the oil spill identification problem. Until recently not much attention was focused on the problem of a combined approach involving more than one of the analytical techniques. The objective of this study is to study the degree of dependence or conversely independence between results obtained from a dual library of digitized fluorescence and infrared spectral data. Standard results based on a lumped convariance matrix were inclusive. As a result, a method based on distance measures and cluster analysis was developed. (See also W78-08934) (Sinha - OEIS)
W78-08938

ARITHMETIC OPERATIONS ON SPECTRAL ARRAYS,
Digilab Inc., Cambridge MA.
A. W. Mantz.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 47-59, 1 fig, 24 ref.

Descriptors: *Pollutant identification, *Oil pollution, Water pollution sources, *Spectroscopy, *Arithmetic operations, Spectral arrays(Oil pollution), Fourier transform.

Arithmetic Operations in entire Spectral Arrays are now routine with computer based infrared Fourier transform Spectrophotometers. Absorbance subtraction of spectral arrays is used for spectral separation of mixtures without requiring wet chemistry which is time consuming and costly. Correlation programs applied to specific technical areas such as oil spill analysis may provide an even more powerful method for completely automatic identification. The general problems of Array Arithmetic Operations are considered as well as the utilization of correlation programs and the instrumental requirements (which are severe), necessary to accomplish such a goal. (See also W78-08934) (Sinha - OEIS)
W78-08939

PATTERN RECOGNITION PROGRAMS: APPLICATION TO OIL IDENTIFICATION,
Washington Univ., Seattle. Dept. of Chemistry.
B. R. Kowalski, and D. L. Duewer.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 60-65, 18 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, Chemistry, Oil pollution, *Pattern recognition(Oil pollution), Software system.

A large software system of pattern recognition and associated multivariant methods has been developed, tested, and applied to several different chemical studies. This paper presents a description of the development and philosophy of this software system and, in accordance with the goals of this workshop, briefly describes the results of the application of the system to the problem of oil spill identification. (See also W78-08934) (Sinha-OEIS)
W78-08940

A PROBABILITY MODEL FOR MATCHING SUSPECTS WITH SPILLS--OR DID THE REAL SPILLER GET AWAY,
Connecticut Univ., Storrs.
T. J. Killeen, and Y. T. Chien.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 66-72, 1 fig, 2 tab, 2 ref.

Descriptors: *Pollutant identification, *Oil spills, Water pollution sources, *Probability, Model studies, Methodology, Oil pollution.

A method of revising the probability of guilt of suspects in an oil spill case is developed. This technique utilizes the information contained in spectra obtained from suspects and spill samples. It also considers the possibility that the true spiller escaped without being sampled. (See also W78-08934) (Sinha-OEIS)
W78-08941

SOME RELIEF FROM THE EFFECTS OF SYSTEMATIC ERROR IN THE APPLICATION OF STATISTICAL MODELS FOR THE ANALYSIS OF FIELD IONIZATION MASS SPECTROMETRIC DATA,
Stanford Research Inst., Menlo Park. Mass Spectrometry Research Center.
M. E. Scolnick.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 73-83, 5 fig, 1 tab, 3 ref.

Descriptors: *Pollutant identification, *Oil spills, Statistical models, Water pollution sources, Spectroscopy, *Mass spectrometry, Oil pollution, Mass spectrometric data, 'Fingerprinting'(Oil).

Integrated multiscan field ionization mass spectrometry has been used as a means of 'fingerprinting' oils. Inadequate control of the rate of which oils are evaporated into the ionization source produces systematic errors in the data. In addition to increasing spectral variances, these errors are responsible for at least some of the stochastic dependence that is observed between variations in peak intensity at different mass numbers and, therefore, precludes the use of relatively simple data analysis models. By normalizing the magnitude of each peak to the sum of the areas of its neighbors, rather than to the sum of all the peaks in the spectrum, the correlation between peaks with sufficient separation can be made to vanish. The dependence between neighboring peaks will increase, however, and some spectral information will be lost. The average spectral variance and the magnitude of the correlation coefficient can, nonetheless, be reduced, as demonstrated by the application of this technique to thirteen replicate spectra. (See also W78-08934) (Sinha-OEIS)
W78-08942

INFRARED SPECTRA OF PETROLEUM - DATA BASE INFORMATION AND APPLICATION TO REAL SPILLS,
Rhode Island Univ., Kingston. Dept. of Chemistry.
C. W. Brown, P. F. Lynch, and M. Ahmadjian.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 84-96, 5 fig, 6 tab, 6 ref.

Descriptors: *Oil spills, *Pollutant identification, *Water pollution sources, Baseline studies, Distribution, Path of pollutants, Data collections, Oil pollution, Infrared spectra(Oil).

Infrared spectra of 198 unweathered oils and 647 weathered oils were 'ratioed', and a statistic derived from the ratios was used to determine the distribution of spectral data. Distribution were obtained for pairs of same oils and for pairs of different oils. These two distributions have been used to determine the probability of a suspect being guilty. The method is applied to an actual spill case involving 12 suspects. (See also W78-08934) (Sinha-OEIS)
W78-08943

AN ON-LINE COMPUTERIZED INFRARED IDENTIFICATION SYSTEM,
Beckman Instruments, Inc., Irvine, CA. Scientific Instruments Div.
R. J. Obremski, H. J. Sloane, and J. Diaz-Rueda.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 97-112, 12 fig.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, Spectroscopy, *Instrumentation, Oil pollution.

An on-line search and match routine has been developed for the Wang 2200 interfaced to a Beckman 4260 Infrared Spectrophotometer. A small file of standards was coded according to the locations of peaks, weighting them for importance. For identification, an unknown spectrum is similarly coded either manually, using human intelligence, or on-line by machine as the spectrum is produced, using predetermined criteria for acceptable bands. The coded unknown is then compared to the standards file and high-scored 'hits' reported. The system has been successfully applied to the identification of single- and multi-component unknowns tested against the standards file of OSHA-listed toxic substances. (See also W78-08934) (Sinha-OEIS)
W78-08944

STATISTICAL CONSIDERATIONS OF OIL IDENTIFICATION BY INFRARED SPECTROSCOPY,
National Oceanic and Atmospheric Administration, Washington, DC. Center for Experiment Design and Data Analysis.
J. S. Mattson.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 113-121, 1 tab, 16 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, Statistical methods, *Spectroscopy, Analytical techniques, Instrumentation, Oil pollution, 'Fingerprinting'(Oil).

In any analytical method, it is important that the analyst be cognizant of both the analytical precision of an individual measurement and the degree of accuracy to which the measurement must be made in order to answer the question posited. In the field of oil identification, it is not legally sufficient merely to show that a given suspect could have spilled the oil in question. The 'burden of proof' imposed on the expert analyst is to show that it is highly probable that the spilled oil originated from the suspect source. This paper discusses the burden of proof problem from the point of view of the analytical chemist, using infrared spectroscopic 'Fingerprinting' as an example. (See also W78-08934) (Sinha - OEIS)
W78-08945

THE FUTURE OF MINI-COMPUTERS AND MICROPROCESSORS IN INFRARED ANALYSIS,
The Perkin-Elmer Corp., Norwalk, CT.
R. W. Hannah, and M. V. Zeller.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76H1247-6C, 1977. p 122-126.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, *Computers, Oil pollution, *Infrared analysis, Mini-computers, Microprocessors.

Significant changes are occurring in the specification, design and utilization of infrared spectrophotometers which are related to the influence of minicomputers and microprocessors. Data

reduction such as that involved in the characterization of oil spills has up to this time been carried out largely on minicomputer systems either directly interfaced to the infrared instrument or by operator entry of the relevant data from the plotted infrared spectrum. Infrared instruments are now appearing which contain a microprocessor and which are capable of performing at least some of the preliminary data processing. Certainly the process of extending the capability of the microprocessor will continue but the problem of meeting a specific demand will undoubtedly depend on how well the spectroscopic problem is defined and whether that problem can be solved by a generally useful instrument which can be adapted are discussed and a look at the possible future presented. (See also W78-08934) (Sinha - OEIS)
W78-08946

THE CLASSIFICATION OF LUBRICATING OILS USING DIGITAL INFRARED DATA,
Wilks Science Co., South Norwalk, CT.
W. Truett.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 127-128, 1 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, *Infrared radiation, Oil pollution, Lubricating oils, Digital infrared data.

The classification of lubricating oils and the measurement of their degradation is a matter of current concern. A number of approaches for data reduction have been explored including spectral overlays and numerical data reduction. The latter technique holds the greatest promise for completely automated analysis; however, until very recently, all absorbance data had to be manually collected from IR scans. The recent advent of the Wilks Model 80 microcomputer controlled IR spectrometer with digital output makes possible the rapid classification of lubricating oils with low cost instrumentation. A program of seventeen diagnostic wavelengths and one reference wavelength has been selected in the infrared from 2.5 to 14.5 microns and six widely differing products characterized before and after use treatment. Printout of the data requires less than two minutes, giving both wavelength and absorbance at each wavelength. (See also W78-08934) (Sinha - OEIS)
W78-08947

OIL CHARACTERIZATION BY MULTICOMPONENT FLUORESCENCE ANALYSIS,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Pathology.
I. M. Warner, J. B. Callis, E. R. Davidson, and G. Christian.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 129-135, 2 fig, 2 tab, 12 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, *Fluorescence, Oil pollution, Pattern recognition.

Strategies for the simultaneous analysis of multicomponent fluorescent samples are presented. The algoithms require as input data the emission-excitation matrix, whose matrix elements are the fluorescence intensity values for excitation. The matrix can be analyzed to obtain (a) a lower bound to the number of spectral components, (b) the amounts of each if the component if the components are unknown. These techniques offer an excellent means for preprocessing multicomponent fluorescence data to achieve an efficient dimensionality reduction for input to pattern recognition programs which seek to identify the source of the oil. (See also W78-08934) (Sinha - OEIS)
W78-08948

CONTOUR LUMINESCENCE SPECTRA AND THEIR INTERPRETATION,
Baird-Atomic, Inc., Bedford, MA.
A. W. Hornig.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 136-150, 9 fig, 3 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, Fluorescence phosphorecene, Oil pollution, *Luminescence.

Luminescence (Fluorescence and Phosphorescence) has become an increasingly important tool for monitoring and identification of oil, toxic and hazardous materials, and biological materials. The full utility of luminescence analysis requires the assimilation and interpretation of the total luminescence data, i.e., the observed intensity as a function of all possible excitation and emission wavelengths. Traditionally this is approximated by visual comparison and interpretation of selected excitation and emission spectra. This approach is slow and inefficient, since the data are too numerous for complete assimilation by eye. Data interpretation may be approached from a general pattern recognition point of view, but there is also room for a less general, more intuitive approach which stresses those characteristics of luminescence spectra which differentiate them from general abstract patterns. This latter approach is stressed while awaiting development of more general methods. The use of contour difference spectra for oil analysis is discussed. (See also W78-08934) (Sinha - OEIS)
W78-08949

PATTERN RECOGNITION OF OUTPUT FROM GC-MS-COM FOR CRUDE OIL CLASSIFICATION,
Exxon Production Research Co., Houston, TX.; and Spectrix Corp., Houston, TX.
C. B. Koons, M. A. Rogers, J. N. Mercer, D. A. Flory, and A. E. Rubenstein.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 151-161, 5 fig, 10 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, *Gas chromatography, *Mass spectrometry, Oil pollution, *Crude oil, *Pattern recognition(Oil wastes), Ion monitoring.

Until recently geochemical methods for crude oil characterization and classification into genetically related families have been based on such techniques as determination of stable carbon isotope ratios on selected fractions, analyses of individual hydrocarbons in the low molecular weight range, and of classes of hydrocarbons in the high molecular weight range. Subsequent application of pattern recognition techniques, such as factor and discriminant function analyses, have been used to evaluate and simplify the immense amount of data collected through these analyses. This paper presents a new effort in the identification of oils involving the use of computerized gas chromatograph mass spectrometry (GC-MS-COM). Selected fractions have been analyzed by GC-MS and their fingerprints plotted by computer. Specific ions indicative of indigenous biological markers have been monitored. Preliminary indications are that this technique of selective ion monitoring should prove useful in the correlation of crude oils. (See also W78-08934) (Sinha-OEIS)
W78-08950

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VIII. SUMMARY OF RESULTS,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-08960

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VII. INHIBITION OF NITROGEN ASSIMILATION AND AMMONIA REGENERATION BY PLANKTON IN SEAWATER SAMPLES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W78-08961

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VI. DENITRIFICATION BY MARINE BACTERIA,
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W78-08962

STUDIES IN COPPER METABOLISM IN FISHES - III. EXISTENCE OF METALLOTHIONEIN-LIKE PROTEIN IN CARP HEPATOPANCREAS (IN JAPANESE),
Kyoto Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W78-08963

ACIDIC PRECIPITATION IN SOUTH-CENTRAL ONTARIO: RECENT OBSERVATIONS,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
P. J. Dillon, D. S. Jeffires, W. Snyder, R. Reid, and N. D. Yan.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 6, p 809-815, June 1978. 1 fig, 4 tab, 35 ref.

Descriptors: *Rainfall, *Acidity, *Lakes, *Streams, *Canada, Surveys, Sampling, Chemical analysis, Hydrogen ion concentration, Precipitation(Atmospheric), Alkalinity, Acids, Chemistry of precipitation, Air pollution, Water pollution, *Ontario, *Acidic rain, Buffering capacity.

Precipitation in south-central Ontario, with mean pH between 3.95 and 4.38 and frequent event pH's of less than 4.0, is more acidic than that in the Sudbury, Ontario, region and in Scandinavia, and as acidic as that in the northeastern USA. As in New England, a major component of the total acidity is strong mineral acid. Because most lakes in south-central Ontario have very low buffering capacities (10-200 micro eq/L), high acid loadings are likely to lead to acidification of many lakes and streams in the forseeable future. Although it is not yet possible to estimate the time required for this to happen, there is already some evidence of declining buffering capacity in a few lakes. (Sims-ISWS)
W78-09051

ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1976,
Illinois State Water Survey, Urbana.
S. D. Lin, R. L. Evans, and D. B. Beuscher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 462. Price codes: A03 in paper copy, A01 in microfiche. Report of Investigation 86, 1978. 41 p, 1 fig, 6 tab, 25 ref.

Descriptors: *Illinois, *Aquatic algae, *Streams, *Data collections, Natural streams, Water quality, Scenedesmus, Aquatic life, Algae, Diatoms, Sampling, Density, On-site investigations, Testing procedures, Methodology, Analytical techniques,

Analysis, Algal composition, Algal succession, Diversity index.

During the 5-year period, October 1971 through September 1976, samples of water from 21 Illinois streams at 26 locations were collected monthly and examined to determine the concentration and genera of algae. Data were evaluated for algal composition, density, diversity indices, and seasonal succession for each stream location. At most sampling locations, algal densities ranged from 500 to 2000 cts/ml. The 5-year geometric means extended from 880 to 1500 cts/ml. From 24 to 30 different algal genera were recovered for each station and, in all, 56 genera were detected. The average diversity index for each station ranged from 1.11 to 1.36 bits per individual. The highest density of 60,000 cts/ml occurred on July 11, 1975, in the Fox River at Algonquin. The diatoms Navicula and Cyclotella were the most frequently observed algae. In addition to these, the green algae Scenedesmus and Crucigenia and the diatom Melosira were often dominant. From sample to sample, season to season, and year to year, the genera found at any sampling station varied considerably. Generally, the annual maximum population occurred in the spring. However, the experience gained from this study supported the conclusion that it is possible to predict algal density, composition, or succession in the flowing streams of Illinois. (Humphreys-ISWS)
W78-09060

THE TOXICITY OF THE RIOT CONTROL AGENT CS (O-CHLOROBENZYLIDENE MALONONITRILE) AND ITS HYDROLYSIS PRODUCTS TO THE MUMMICHOG, FUNDULUS HETEROCLITUS (LINNAEUS),
Edgewood Arsenal, Aberdeen Proving Ground, MD. Biomedical Lab.
For primary bibliographic entry see Field 5C.
W78-09063

A PRE-IMPOUNDMENT WATER QUALITY INVESTIGATION FOR THE PROPOSED GATHRIGHT RESERVOIR.
Environmental Protection Agency, Philadelphia, PA. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 124, Price codes: A04 in paper copy, A01 in microfiche. June 1973, 48 p, 5 fig, 4 tab, 6 ref, 8 append.

Descriptors: *Environmental effects, *Impoundments, *Rivers, *Multiple purpose reservoirs, *Water quality, Virginia, Nutrients, Eutrophication, Dissolved oxygen, Bacteria, Potable water, Standards, Population, Industries, Biological properties, Chemical properties, Agricultural watersheds, Forest watersheds, Water supply, *Gathright Reservoir(VA), Jackson River(VA), Downstream effects, Waste sources.

The proposed impoundment will be located on the Jackson River in west-central Virginia, draining 344 square miles of agricultural and forest land. Population densities are low and no industries or large municipalties are located in the drainage basin. Designed by the U.S. Corps of Engineers to provide for flood control, flow augmentation, recreation and a downstream cold water fishery, the reservoir will cover 2530 acres of maximum pool. The study summarizes the physical and chemical characteristics of the Jackson River basin waters and then inventories the basin's biological characteristics. Conclusions are that nutrient concentrations are not great enough to cause any post-impoundment eutrophication; population trends are such that the region will retain a minimum population density with no industrial development; thermal stratification will occur in the lake along with deoxygenation of bottom waters, and since the outflow is scheduled to be multi-outlet, no low dissolved oxygen problems below the dam are anticipated; and bacterial content will be 'desirable' rather than the higher 'permissible' levels listed for drinking water standards, although this is not expected to affect contact recreation. (Zayac-NC)
W78-09072

EVALUATION OF A WATER ANALYSIS KIT,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd.
Journal of Environmental Quality, Vol. 6, No. 4, p 381-384, October-December, 1977. 3 tab, 10 ref.

Descriptors: *Laboratory tests, *Laboratory equipment, Water analysis, Water chemistry, Water pollution, Water pollution control, Water quality, Water quality control, *Pollutant identification.

A Hach DR-EL/2 Direct Reading Engineer's Laboratory Kit was evaluated by comparison to standard analytical methods. Results of Hach kit methods were highly correlated with concentrations of standard solutions. The y-intercepts (1) did not differ from 0 for most methods, but for 11 methods regression coefficients (2) differed from 1.0. For each of the 20 parameters, three natural water samples were analyzed seven times by Hach kit and by the standard method. Mean values obtained by the two analytical systems were usually significantly different and the standard method sometimes gave higher precision from the Hach kit. Nevertheless, the Hach kit usually gave close approximations of values obtained by standard methods. Comparisons also included analyses of a large series of natural water samples. Correlation coefficients between Hach kit and standard methods were often greater than 0.99. Although a = 0 for 14 methods, b = 1.0 for only eight methods. Reliability of the Hach kit was adequate for general surveys of water quality, fisheries management decisions, and research requiring only approximate data on water quality. (Skogerboe-Colorado State)
W78-09111

LACK OF CORRELATION BETWEEN THE COMPOSITION OF SEDIMENTS AND THEIR TOXICITY TO ALGAE,
Naval Research Lab., Washington, DC. Ocean Sciences Div.
P. Hannan, C. Patouillet, and D. Morris.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 528, Price codes: A02 in paper copy, A01 in microfiche. Report 8019, August 1976. 18 p, 4 fig, 5 tab, 19 ref.

Descriptors: *Pollutant identification, *Algae, *Sediments, *Toxicity, *Bioassay, *Standard Elutriate Test, *Methodology, *Heavy metals, Phaeodactylum tricornutum, Hydrogen ion concentration, Carbon dioxide, Chlorophyll, Plant growth, Soils, Washington, Hood Canal(WA), Bangor Annex(WA), Lead, Copper, Zinc, Cadmium, Dredging, Spoils, Waste disposal.

Algal bioassay proved more suitable for determining toxicity of sediment samples than the Standard Elutriate Test, the presently used test method. Sediment and soil samples from 12 sites in the Trident submarine base under development at Bangor Annex, Washington, on the Hood Canal and three from California coastal waters were used in the tests. Analyses for 24 elements were made on the samples, and for lead, cadmium, copper, and zinc on the algal cells cultured in nutrient-enriched extracts of the samples. Although some of the samples were toxic according to the algal assay, there was almost no correlation between concentrations of lead, copper, zinc in the algal cells and those in test samples; no data was available on the cadmium content of the soil and sediment samples. It is concluded that the Standard Elutriate Test, based on chemical analyses of sediment elutriates, has limited value; more meaningful data can be obtained from bioassay. To deal with the problem of measuring algal growth continuously, a procedure developed in which the carbon dioxide uptake of algae was measured hourly by automatic monitoring of pH. Fluorescence was also measured, providing an indication of chlorophyll content of the algal cells. The assay organism was Phaeodactylum tricornutum. The study was undertaken in connection with naval dredging operations and subsequent spoils disposal. (Lynch-Wisconsin)
W78-09160

PREIMPOUNDMENT AND IMMEDIATE POST IMPOUNDMENT ADENOSINE TRIPHOSPHATE CONCENTRATIONS IN SOUTHERN INDIAN LAKE: 1975, 1976,
Fisheries and Marine Servie, Winnipeg (Manitoba).
S. Guildford.
Fisheries and Marine Service Technical Report No. 749, December 1977. 15 p, 3 fig, 2 tab, 10 ref.

Descriptors: *Pre-impoundment, *Post-impoundment, *Southern Indian Lake(Manitoba Canada), Impoundments, *Adenosine triphosphate, *Indicators, *Phytoplankton, *Zooplankton, Reservoirs, Hydroelectric power, Nelson River(Canada), Churchill River(Canada), Biomass, Dams, Plankton, Algae, Bays, Diversion, Water levels, Lakes, Water management(Applied), Rivers, Pollutant identification.

Adenosine triphophate (ATP) concentrations, which monitor changes in planktonic biomass, were used to measure environmental effects of impoundment of Southern Indian Lake (Manitoba, Canada) and diversion of the Churchill River. The lake's level was raised and its water diverted into the Nelson River drainage system to augment hydroelectric capacity of the Nelson River. ATP in 1976 more than doubled over the 1975 levels at two stations in South Bay after diversion of the Churchill River through the bay. Size fractionation of ATP revealed a shift in size distribution of planktonic biomass from 1975 to 1976. A detailed study of ATP levels in Long Bay, a seven-sq km area on the 2530-sw km lake, showed low spatial variability there. Distribution of mean total ATP in the lake indicated strong influence of the flow of the Churchill River. ATP is a rapid and relatively reliable method of estimating planktonic biomass. Between 1973 and 1975 coffer and control dams were constructed south of Notigi Lake, cutting off flow of the Rat River. In 1974-75 similar dams were built at Missi Falls to regulate Churchill River outflow from Southern Indian Lake. In June 1976 a man-made channel was completed connecting South Bay to Isset Lake, and the Rat River was again permitted to flow through Notigi Lake. In July-August 1976 regulation by the Missi Falls dam initiated flow out of the diversion channel. (Lynch-Wisconsin)
W78-09161

ANALYSIS OF LASER FLUOROSENSOR SYSTEMS FOR REMOTE ALGAE DETECTION AND QUALIFICATION,
National Aeronautics and Space Asministration, Langley Station, VA. Langley Research Center.
E. V. Browell.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-26480, Price codes: A03 in paper copy, A01 in microfiche. NASA Technical Note D-8447, June 1977. 39 p, 16 fig, 5 tab, 30 ref. 176-20-32-07.

Descriptors: *Pollutant identification, *Lasers, *Fluorosensors, *Algae, *Remote sensing, *Chlorophyll, Fluorescence, Primary productivity, Rhodophyta, Chlorophyta, Cyanophyta, Phaeophyta.

The development and use of single- and multiple-wavelength laser fluorosensor systems in remote detection and quantification of algae are

discussed, as well as the importance of algae and algal measurements, and the spectral characteristics of algae. An equation for fluorescence power received by a laser fluorosensor system is derived in detail; results differ by as much as a factor of 10 from those reported by other studies. The multiple-wavelength system is capable of selectivity exciting algae in the four primary algal color groups: green, golden-brown, red, and blue-green. A comprehensive error analysis is reported which evaluates the uncertainty in reote determination of chlorophyll-a concentration by laser fluorosensor systems. Factors which can greatly affect the fluorescence cross-section of algae include long- and short-run light history, and nutrient and age effects. Results of the error analysis indicate that remote quantification of chlorophyll-a by a laser fluorosensor system requires optimum excitation wavelengths, remote measurement of marine attenuation coefficients, and supplemental instrumentation. In these systems, the laser excites the chlorophyll-a pigment in the algae, and a collocated telescope receiver detects the emitted fluorescence at 685 nm. The system can be used as night and when there is a high-altitude cloud cover, and can distinguish the algal color groups, in contrast to passive techniques relying on spectral characteristics of reflected sunlight. (Lynch-Wisconsin)
W78-09166

EFFECT OF CADMIUM OF ALKALINE PHOSPHATASE ACTIVITY IN DIFFERENT TISSUE OF LEPOMIS GIBBOSUS L. (PISCES; CENTRARCHIDAE) (IN FRENCH),
Lab. Invest. Endocrinol., Kain (Belgium).
For primary bibliographic entry see Field 5C.
W78-09175

HYGIENIC SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF BASUDIN IN WATER BODIES (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Inst. Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
I. B. Boiko, and B. A. Pulatov.
Gig Sanit 8, p 105-107, 1977.

Descriptors: *Insecticides, *Lethal limit, *Basudin, *Water quality standards, *Organophoric compounds, Toxicity.

A series of tests were made to determine the permissible water levels of basudin (insecticide), a highly-effective organophosphoric compound used to control of basudin and the sanitary condition of water bodies, as well as results of toxicological studies (the non-active dose in chronic 10 mo. experiments on albino rats was 0.48 mg/kg), permits recommendation of the permissible dose of 0.3 mg/l in water bodies, which is the organoleptically limited index of harmfulness.--Copyright 1978, Biological Abstracts, Inc.
W78-09181

SEASONAL VARIATIONS OF TRITIUM AND OTHER CONSTITUENTS IN GROUNDWATER IN THE CHALK NEAR BRIGHTON, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
R. A. Downing, D. B. Smith, and S. C. Warren.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 2, p 123-136, March 1978. 4 fig, 4 tab, 10 ref.

Descriptors: *Tritium, *Ground water, *Variability, *Water quality, *Radioisotopes, Fallout, Hydrogen, Radioactivity, Fluctuations, Aquifer characteristics, Ground water movement, Groundwater resources, Water wells, Base flow, Tracers, Sampling, Analytical techniques, *Brighton(England), Chalk aquifer study.

Tritium and several other chemical parameters were measured at monthly or more frequent intervals between July 1973 and June 1975 in three wells in the Chalk near Brighton. The data indicated that recharge of groundwater in the Chalk is by rapid transit of water through macrofissures and by piston displacement of water in the microfissures and larger pores of the unsaturated zone. In general, about 10% of the total recharge is transported rapidly through the unsaturated zone. The results supported the view that tritium and other solutes diffuse into the Chalk matrix from water moving slowly in the microfissures and larger pores. The Beta-activity of the groundwater appeared to reach maximum values 7 years after peak values in rainfall. It was suggested that this is due to the delay in the flow of groundwater from the less permeable areas into the more permeable peripheral parts of the aquifer. The groundwater consists of at least two components: a recent water, replenished and discharged seasonally, and an older 'base flow' component which includes 10% derived from post-1953 rainfall. (Henley-ISWS)
W78-09210

CONTRIUBITON TO A METHOD FOR CALCULATING THE EXPECTED MINERALIZATION OF RESERVOIR WATER,
For primary bibliographic entry see Field 2H.
W78-09221

MODIFICATIONS OF CONTINUOUS-FLOW TOXICITY TEST METHODS FOR SMALL AQUATIC ORGANISMS,
Proctor and Gamble Co., Cincinnati, Ohio. Ivorydale Technical Center.
A. W. Maki.
The Progressive Fish Culturist, Vol. 39, No. 4, p 172-174, October 1977. 2 fig, 1 tab, 3 ref.

Descriptors: *Toxicity, *Bioassay, *Methodology, Bioindicators, Pollutant identification, *Daphnia, *Equipment, Laboratory tests, Water Quality Standards, Invertebrates, Analytical techniques, Water quality, Larvae, Laboratory equipment, *Continuous-Flow Tests.

Modifications of the standard proportional diluter are described for the continuous-flow toxicity testing of small aquatic organisms; the modifications provide for a 95% water volume replacement time of 2.5 h or less, with no perceptible current-induced effects on the test individuals. The system permits the automatic introduction of known concentrations of food at each diluter cycle and has application to the testing of pelagic invertebrates or larval fish. (EIS-Katz)
W78-09286

BIOCIDES IN RELATION TO WATER POLLUTION PART I: BIOASSAY STUDIES ON THE EFFECTS OF A FEW BIOCIDES ON FRESH WATER FISH, CHANNA GACHUA,
D. A. V. Coll., Muzaffarnagar (India). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-09293

PHOTOSYNTHESIS/RESPIRATION RATIOS IN AQUATIC MICROCOSMS UNDER ARSENIC STRESS,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5C.
W78-09297

ACUTE EFFECTS OF WOOD-PULP ON SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W78-09299

CONCENTRATION OF THREE METALS IN OYSTERS (CRASSOSTREA VIRGINICA) OF BILOXI AND PASCAGOULA, MISSISSIPPI ESTUARIES,
Jackson State Coll., MS. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-09300

5B. Sources Of Pollution

INTRA-ANNUAL VARIATIONS IN THE CONCENTRATION OF BIOGENIC ELEMENTS AND DISSOLVED GASES IN THE EASTERN PART OF THE BALTIC SEA,
T. S. Komarova, Yu. N. Sergeyev, O. P. Savchuk, B. F. Drobyshev, and A. V. Grigor'yev.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 334-339, 1976. 2 fig, 1 tab, 9 ref. Translated from Vestnik Leningradskogo Universiteta, No. 18, p 118-129, 1976.

Descriptors: *Marine biology, *Water pollution, *Surveys, Data processing, *Dissolved oxygen, Salinity, Carbon dioxide, Nitrates, Nitrites, Phosphates, Silicates, Water temperature, Sampling, Chemicals, Biology, *Baltic Sea.

One of the most important tasks of marine sciences is to develop scientific recommendations for the rational use of the biological resources of the ocean and for pollution control of this medium. Successful solution of these problems requires, qualitative and quantitative analysis of physical-dynamic, hydrochemical, and hydrobiological processes in the ocean from the viewpoint of systems theory. Field data required for simulating a specific marine biogeocenosis were collected in 1972-1973 by an expedition of the Oceanology Department of Leningrad State University in the eastern part of the Baltic Sea. An analysis of these observations was performed for the purpose of describing the main characteristics of the seasonal variations of the components of the hydrochemical complex of the biogeocenosis investigated. Isopleths of the seasonal variations of temperature, salinity, relative oxygen content, partial carbon dioxide pressure, and of the concentrations of nitrites, nitrates, phosphates, and silicic acid were presented. The seasonal dynamics of all the hydrochemical characteristics observed were generally typical of the seas of temperate latitudes, particularly of the shallow areas of the eastern part of the Baltic Sea under the strong effect of coastal runoff. Processes of organic-matter breakdown and mineralization involve the entire water column, including the surface layers, throughout the year. This promotes the virtually continuous extension of the growing period, which begins in April and lasts to the end of September-early October. (Sims-ISWS)
W78-08816

PRECIPITATION INPUTS OF PCBS TO LAKE MICHIGAN,
Paul Univ., Chicago, IL. Dept. of Chemistry.
T. J. Murphy, and C. P. Rzeszutko.
Journal of Great Lakes Research, Vol 3, No 3-4, p 305-312, December 1977. 3 fig, 2 tab, 32 ref. EPA 803915.

Descriptors: *Great Lakes, *Fallout, *Water pollution sources, *Lake Michigan, *Polychlorinated biphenyls, Precipitation(Atmospheric), On-site data collections, Pollutants, Sampling, Analysis, Rainfall, Analytical techniques, Instrumentation, *Beaver Island(Mich).

Event precipitation samples were collected in Chicago, Illinois, and on Beaver Island, Michigan, and were analyzed for polychlorinated biphenyls (PCBs). The weighted mean concentration of PCBs in 31 samples of rain was 119 ng/L, which indicates a deposition of 5,000 kg/yr of PCBs to Lake Michigan from wet precipitation. The concentrations of PCBs in rainfall were found to be as

nigh on Beaver Island as in Chicago, which was interpreted as indicating that the sources of PCBs to the atmosphere are diffuse and/or that residence times in the atmosphere are long. Precipitation is now the major source of these materials to the lake, and future problems in the lake with PCBs will be determined mainly by the magnitude of the atmospheric inputs of PCBs to the lake. (Humphreys-ISWS)
W78-08823

HYDROGEOLOGIC CONDITIONS IN THE TOWN OF SHELTER ISLAND, SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
J. Soren.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 401, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-77, 1978. 22 p, 8 fig, 3 tab, 5 ref.

Descriptors: *Groundwater resources, *Water quality, *Water supply, *Aquifer characteristics, *Water pollution sources, Saline water intrusion, Septic tanks, Cesspools, Infiltration, Pumping, Water wells, Drawdown, Hydrogeology, New York, *Long Island, *Shelter Island.

Shelter Island, an area of about 11 square miles, in Suffolk County, N.Y., is situated between the north and south forks of eastern Long Island. The upper glacial aquifer is the sole source of freshwater supply for Shelter Island's population, which currently ranges seasonally from 2,000 to 8,000. Fresh ground water seems to be limited to sand and gravel deposits in the aquifer, which is thin and can be readily infiltrated by surrounding saline ground water. The aquifer is underlain by confining clay formations that contain saline water, and the geologic formations below the clay probably contain saline water also. The fresh ground water is mostly soft and has low dissolved-solids concentrations; however, several wells near shorelines have yielded excessive amounts of chloride. Man-induced contamination of the aquifer is evident but not severe, as shown by somewhat elevated concentrations of nitrate nitrogen and methylene blue active substances (MBAS). Increased pumping will cause deterioration of the fresh ground-water supply by inducing saline-water infiltration and by adding greater volumes of septic-tank and cesspool effluents to the aquifer. Test drilling could help in water-supply management by determining the extent of the aquifer and of fresh ground-water storage, and observation wells could provide early detection of saline-water infiltration. (Woodard-USGS)
W78-08839

REAERATION CAPACITY OF THE ROCK RIVER BETWEEN LAKE KOSHKONONG, WISCONSIN AND ROCKTON, ILLINOIS,
Geological Survey, Madison, WI. Water Resources Div.
R. S. Grant.
Water-Resources Investigations 77-128, March 1978. 33 p, 18 fig, 3 tab, 21 ref.

Descriptors: *Path of pollutants, *Streams, Tracking techniques, *Dye releases, Discharge(Water), Streamflow, Flow rates, Model studies, Forecasting, Dissolved oxygen, Aeration, Open channel flow, Evaluation, Wisconsin, Illinois, *Rock River, *Stream reaeration capacity.

The reaeration capacity of the Rock River from Lake Koshkonong, Wisconsin, to Rockton, Illinois, was determined using the energy-dissipation model. The model was calibrated using data from radioactive-tracer measurements in the study reach. Reaeration coefficients (K2) were computed for the annual minimum 7-day mean discharge that occurs on the average of once in 10 years (Q7,10). A time-of-travel model was developed using river discharge, slope, and velocity data from three dye studies. The model was used to estimate traveltime for the Q7,10 for use in the energy-dissipation model. During one radiotracer study, 17 mile per hour winds apparently increased the reaeration coefficient about 40 times. (Woodard-USGS)
W78-08840

CHEMICAL QUALITY OF GROUND WATER IN THE CENTRAL SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-08841

TROPHIC CONDITIONS IN LAKE WINNISQUAM, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-08842

GEOHYDROLOGIC EVALUATION OF A LANDFILL IN A COASTAL AREA, ST. PETERSBURG, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
C. B. Hutchinson, and J. W. Stewart.
Water-Resources Investigations 77-78, February 1978. 40 p, 12 fig, 4 tab, 16 ref.

Descriptors: *Landfills, *Leachate, *Path of pollutants, *Groundwater, *Florida, Hydrogeology, Water quality, Aquifer characteristics, Solid wastes, Sludge, Domestic water, Water supply, Evaluation, Pinellas County(Fla).

The 250-acre Toytown landfill site is in a poorly-drained area in coastal Pinellas County, Florida. Average altitude of land surface at the landfill is less than 10 feet. About 1000 tons of solid waste and about 200,000 gallons of digested sewage sludge are disposed of daily at the landfill. The velocity of ground-water flow through the 23-foot thick surficial aquifer northeast from the landfill toward Old Tampa Bay probably ranges from 1 to 10 feet per year, and downward velocity through the confining bed is about 0.00074 foot per day. The horizontal and vertical flow velocities indicate that leachate moves slowly downgradient, and that leachate has not yet seeped through the confining bed after 12 years of landfill operation. Untreated surface run-off from the site averages about 15 inches per year, and ground-water outflow averages about 3.3 inches per year. The Floridan aquifer is used as a limited source of water for domestic supply in this area. (Woodard-USGS)
W78-08849

WATER-QUALITY CONDITIONS IN SOUTHERN ROCKINGHAM COUNTY, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.; and Southern Rockingham Regional Planning District Commission, Salem, NH.
W. D. Silvey, and R. L. Wheeler.
Open-file report 78-224, March 1978. 51 p, 27 fig, 5 tab, 10 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Water pollution sources, Waste disposal, Data collections, Sampling, Chemical analysis, Nutrients, Dissolved solids, Pesticides, Coliforms, Polychlorinated biphenyls, Bottom sediments, *New Hampshire, Southern Rockingham County(NH).

Physical, chemical, and biological characteristics of water were measured at 26 surface-water sites, 17 ground-water sites, and in effluent from two sanitary landfills as part of planning for area-wide waste management in four watersheds within the Southern Rockingham Regional Planning District in Southern New Hampshire. Dissolved minerals concentration in water at all but one of 26 surface-water-sampling sites is low and within recommended limits of the U.S. Environmental Protection Agency. Water at the 26 surface-water-sampling sites generally was enriched with nitrogen and phosphorus and contained at least some coliform bacteria, indicating contamination, probably from waste disposal systems. PCBs (polychlorinated biphenyls) and pesticides were not present in the water, but small amounts of DDE, DDD, dieldrin, chlordane, and heptachlor were present in stream-bottom materials at 11 of the 26 sites, and PCBs were present at 7. Iron and manganese were present in concentrations that in some cases exceeded recommended limits. Coliform bacteria were present at 5 of the 17 ground-water-sampling sites; concentrations of iron exceeded recommended limits at 8 sites, and manganese exceeded recommended limits at 9 sites. PCBs and pesticides were not present in any samples collected at the ground-water-sampling sites. (Woodard-USGS)
W78-08858

WATER-QUALITY ASSESSMENT OF THE MUDDY FORK SILVER CREEK WATERSHED, CLARK, FLOYD, AND WASHINGTON COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
M. A. Hardy.
Open-file report 78-202, February 1978. 41 p, 8 fig, 7 tab, 23 ref.

Descriptors: *Water quality, *Water pollution sources, *Streams, *Indiana, Evaluation, Water analysis, Chemical analysis, Pesticides, Domestic wastes, Municipal wastes, Bacteria, Coliform, Phytoplankton, Dissolved solids, Regulated flow, Reservoir releases, Bottom sediments, *Muddy Fork Silver Creek watershed, Clark County, Floyd County, Washington County.

Data collected for a wide range of flow conditions from September 8, 1975, to July 13, 1976, reveal that human and animal waste loading of streams and pesticides use in the Muddy Fork Silver Creek watershed, Indiana, are probably the most significant water-quality problems. Generally, the type(s) of water in tributary streams in the south and southwest parts of the watershed was calcium bicarbonate and in other tributaries were calcium sulfate and magnesium sulfate. Dissolved-solids concentrations of discharge from top-spill reservoirs were lower and more consistent over a range of flows than concentrations from uncontrolled streams. Concentrations of fecal coliform bacteria and fecal streptococcal bacteria ranged from 5 to 65,000 colonies per 100 milliliters and from 5 to 14,000 colonies per 100 milliliters, respectively. Data on periphyton, phytoplankton, and benthic communities collected during low flow in September 1975 indicate organic loading of Muddy Fork downstream from the town of Speed. Phytoplankton community structures varied temporally and spatially. Ranges of concentration (In micrograms per kilogram) of various chlorinated hydrocarbons in samples of bed materials were: chlordane, from 0 to 14; DDT, from 0 to 19; and PCB's, from 0 to 11. Concentrations of aldrin, DDD, DDE, heptachlor, and heptachlor epoxide of 5.1 micrograms per kilogram or less were also detected. The presence of these compounds makes them potentially available for accumulation in the biological food chain. (Woodard-USGS)
W78-08859

CHEMISTRY AND BIOLOGICAL HAZARD OF A COAL ASH SEEPAGE STREAM,
Oak Ridge National Lab., TN.
C. C. Coutant, C. S. Wasserman, M. S. Chung, D. B. Rubin, and M. Manning.
Journal of the Water Pollution Control Federation, Vol 50, p 747-53, 1978. 1 fig, 3 tab, 12 ref.

Descriptors: *Coal mine wastes, *Acidic water, *Seepage, Toxicity, Coal mines, Hydrogen ion concentration, Water quality, Tennessee, Environmental effects, Chemistry, Iron, Silts, Sulfates, Industrial wastes, Mortality, Catfishes, Metals, Sampling, Analytical techniques, Thermal pollution, Electric powerplants, Tennessee, *Coal ash, Clinch River(Tenn).

Water seeping through coal ash settling pond produced a seepage effluent that was acidic (pH 3.2 or less) and high in sulfate and iron. Dissolved ferrous iron predominated in the upper end of the seepage ditch, but partially transformed to ferric ion and a ferric hydroxide/FeOOH precipitate. When discharged to the Clinch River, the iron remaining in solution precipitated immediately at the pH of river water (about 7.9). The large amounts of iron silt were lethal to juvenile catfish near the discharge, but not beyond a few meters. (EIS-Klein)
W78-08862

THE DISTRIBUTION OF METHYL MERCURY IN CONTAMINATED SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, GA.
W. S. Gardner, D. R. Kendall, R. R. Odom, H. H. Windom, and J. A. Stephens.
Environmental Pollution, Vol 15, p 243-251, 1978. 1 fig, 6 tab, 19 ref.

Descriptors: *Mercury, *Metals, *Ecosystems, *Marshes, Water pollution sources, Path of pollutants, Sediments, Biota, Plants, Aquatic life, Industrial wastes, Food chains, Biological communities, Analytical techniques, *Methyl mercury, Bioaccumulation, Tissue analysis.

Elevated levels of mercury occurring in a polluted marsh ecosystem as a result of industrial discharge were relected in the sediment and in most biota from the region. The predominant form of the metal varied in different components of the ecosystem examined. Most Hg in sediments and plants were not methylated (less than 0.002 ppm), whereas in higher trophic level organisms (mammals, birds, fish), Hg existed mainly as methyl mercury (less than 1-60 ppm). Tissues of animals which feed on plants and detrital meterial in the sediments tended to contain lower, burt measurable, concentrations of MeHg. (EIS-Klein)
W78-08863

UPTAKE OF POLYCHLORINATED BIPHENYL (AROCLOR 1254) FROM SEDIMENT AND FROM SEAWATER IN TWO INTERTIDAL POLYCHAETES,
London Univ. (England). Dept. of Zoology.
W. A. M. Courtney, and W. J. Langston.
Environmental Pollution, Vol 15, p 303-309, 1978. 2 fig, 2 tab, 19 ref.

Descriptors: *Aroclors, *Absorption, *Worms, Invertebrates, *Polychlorinated biphenyls, Sediments, Water quality, Benthic fauna, Metabolism, Water pollution, Laboratory tests, Path of pollutants, Water pollution effects, *Aroclor 1254, *Polychaetes, Bioaccumulation.

The intertidal polychaetes Arenicola marina and Nereis diversiocolor accumulated similar body residues whether held in 1 ppm Aroclor 1254 in sand or in 1.1 microgram/liter 1254 in seawater, indicating no evidence that benthic infauna of polluted areas are more contaminated as a result of these insoluble pollutants adsorbing to their particulate habitat. However, fine sediments were found to sequester all of the pollutants when shaken with seawater in the laboratory. This indicated that benthic polychaetes would become contaminated in less polluted conditions in the field and that short-term experiments would indicate persistent loads of PCB. Intertidal polychaetes of the Norfolk coast showed similar levels of PCB contamination to other species in the North Sea. (EIS - Klein)
W78-08865

IRON IN MAINE COASTAL WATERS; SEASONAL VARIATION AND ITS APPARENT CORRELATION WITH A DINOFLAGELLATE BLOOM,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.
H. E. Glover.
Limnology and Oceanography, Vol 23, No 3, p 534-537, 1978. 5 fig, 12 ref.

Descriptors: *Iron, *Metals, *Seasonal, *Phytoplankton, *Dinoflagellates, Gymnodium, Primary productivity, Aquatic productivity, Water pollution sources, Environmental effects, Water quality, *Maine, Cycling nutrients, Population, Path of pollutants, Runoff, Growth rates, *Boothbay Harbor(Maine).

During 1975, 12 km south of Boothbay Harbor, soluble iron concentrations in the first 20 m of water were three times greater in October and November than in August and September, while particulate iron concentrations only inreased transiently before the fall bloom. Nutrient enrichment experiments and chlorophyll a:cytochrome f1 ratios indicated that low iron concentration limited phytoplankton populations. In August 1976, 1-4 km from Monhegan Island, increased iron concentrations from land runoff preceeded a dinofagellate bloom. (EIS - Klein)
W78-08866

LARVAL FISH DRIFT IN A LARGE RIVER WITH A COMPARISON OF SAMPLING METHODS,
Ichthyological Associates, Inc., Berwick, PA.
For primary bibliographic entry see Field 5A.
W78-08867

MARINE ENVIRONMENTAL IMPACT DUE TO MINING ACTIVITIES OF EL SALVADOR COPPER MINE, CHILE,
Universidad Catolica de Chile, Santiago. Lab. de Zoologia.
J. C. Castilla, and E. Nealler.
Marine Pollution Bulletin, Vol 9, No 3, p 67-70, 1978. 1 fig, 2 tab, 21 ref.

Descriptors: *Copper, *Mining, *Mine wastes, *Sediments, *Suspended solids, Unconsolidated sediments, *Mortality, *Molybdenum, *Benthos, Water pollution sources, Metals, Arsenic compounds, Water pollution effects, Benthos, Marine animals, Chile(El Salvado Copper Mine).

The dumping of untreated mine wastes into a coastal bay was found to have hindered harbor activities, caused geomorphological coastal modifications and seriously affected marine coastal ecosystems and recreational activities. Tailing discharges are accumulating at the rate of 25,000 tons of fine sediments per day. Marine organisms are inhibited by the unstable benthic habitat, the poor light penetration due to suspended solids, and the presence of large quantities of copper, arsenic, and other chemicals in the discharges. (EIS-Deal)
W78-08869

MUSSEL MORTALITY IN THE GULF OF LA SPEZIA, ITALY,
Atkins Research and Development, Epson (England).
For primary bibliographic entry see Field 5C.
W78-08872

MOLECULAR STRUCTURE - BIOLOGICAL PROPERTIES RELATIONSHIPS IN ANIONIC SURFACE-ACTIVE AGENTS,
Institut National de Recherche Chimioue Appliouee, Vert-le-Petit (France).
For primary bibliographic entry see Field 5C.
W78-08873

ZINC CONTENT IN OTOLITHS OF MACKEREL FROM THE AEGEAN,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
For primary bibliographic entry see Field 5A.
W78-08876

MONITORING POLLUTION.
Surveyor, Vol. 151, No. 4469, p 22, February, 1978.

Descriptors: *Monitoring, *Instrumentation, *Dissolved oxygen, *Temperature, *Electrodes, Data collections, On-site data collections, Measurement, Hydrologic data, Water pollution, Water pollution sources, Thermal pollution.

A dissolved oxygen and temperature monitor has been developed by pHOX Systems Ltd. of Baldock, Herfordshire, England. The Series 67 measures and records the dissolved oxygen data in percent saturation or mg/liter. The selfcontained, waterproof unit was designed for remote field stations and waste water treatment plant trials. The unit is operated by an internally-mounted cell with a one-month power supply; overnight recharging restores the one-month power supply. Dissolved oxygen and temperature levels are measured by a patented cartridge-type pHOX Mackereth electrode. The inkless 'chopper bar' type recorder for maintaining oxygen and temperature values is available with a variety of chart speeds. (Lisk-FIRL)
W78-08878

DISPOSAL IN THE MARINE ENVIRONMENT: AN OCEANOGRAPHIC ASSESSMENT.
National Research Council, Washington, DC. Ocean Disposal Study Steering Committee.
For primary bibliographic entry see Field 5G.
W78-08886

PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET SOUND AREA--A PILOT DESIGN STUDY,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
W. D. MacLeod, Jr., D. W. Brown, R. G. Jenkins, L. S. Ramos, and V. D. Henry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 591. Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Report No EPA-600/7-77-098, September 1977. 63 p, 5 fig, 12 tab, 2 append. Also as: NOAA Technical Memorandum ERL MESA-8.

Descriptors: *Water pollution sources, *Baseline studies, *Pollutant identification, *Oil pollution, Washington, Monitoring, *Outer Continental Shelf, Petroleum hydrocarbons, Aromatic hydrocarbons, Tanker traffic.

Hydrocarbon baseline data are needed to assess the potential impact of oil contamination from increased tanker traffic in the Strait of Juan de Fuca. Initial studies were directed to intertidal sediments, mussels and snails from two physically similar areas: Port Angeles, WA and Dungeness Bay, WA. Latest analytical techniques of solvent/slurry extraction, silica gel chromatography and glass capillary gas chromatography were adapted for analyzing large numbers of samples. The methods apply to alkanes in the C14 -C32 range, or to aromatics from substituted benzenes through benzpyrenes. Individual hydrocarbons were determined within 20% standard error at the 10 ng/g level. Lowest hydrocarbon levels were found at Dungeness Bay, a relatively pristine area. The profile of the alkanes suggests that the Dungeness hydrocarbons arise biogenically. Hydrocarbon levels were substantially greater at Port Angeles Harbor, especially adjacent to Peabody Creek. The even distribution of C14 - C22 n-al

anes from creekside sediment is consistent with nown fuel oil seepage upstream. Above C22, the -alkane pattern appears more biogenic, although he levels are high. Significant divergences etween the two areas were found in the henanthrene fluroanthene, and pyrene levels. eventeen aromatic hydrocarbons are proposed or baseline monitoring. (Sinha-OEIS)
W78-08887

MERCURY IN SOUTHERN CALIFORNIA WATERS: INPUTS, DISTRIBUTION, AND FATE,
Southern California Coastal Water Research Project, El Segundo.
R. P. Eganhouse, J. N. Johnson, D. R. Young, and D. J. McDermott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 465, Price codes: A04 in paper copy, A01 in microfiche. Report No TM 227, March 1976. 63 p, 19 fig, 14 tab, 47 ref.

Descriptors: *Mercury, *Water pollution sources, *California, Industrial wastes, Municipal wastes, Sediments, *Outer Continental Shelf, Ocean dumping, Outfall sewers, *Southern California Bight.

The identified sources of mercury to the Southern California Bight include municipal wastewaters, discrete industrial wastes, vessel-related activities, surface runoff, aerial fallout, ocean dumping, and ocean current advection. Ocean currents transport the greatest quantities of mercury through the Bight; however, municipal wastewaters are responsible for the localized buildup of high sediment concentrations of mercury in the vicinity of submarine outfalls. The 'background' level of mercury in sediments, approximately 0.05 mg/dry kg, is found in most regions of the Bight. However, levels up to 100 times greater have been reported for surface sediments near the outfalls of Los Angeles City (Hyperion) and Los Angeles County (Joint Water Pollution Control Plant, JWPCP). Recent model studies indicate that the dominant form of mercury in sewage is the insoluble sulfide. Upon mixing with seawater, the sewage particulates may release some of the associated mercury to the surrounding waters. Mercury that is not released or otherwise solubilized may become incorporated into sediments, where further biogeochemical transformations may occur. (Sinha-OEIS)
W78-08888

MARINE INPUTS OF POLYCHLORINATED BIPHENYLS AND COPPER FROM VESSEL ANTIFOULING PAINTS,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, T. C. Heesen, D. J. McDermott, and P. E. Smokler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 412, Price codes: A02 in paper copy, A01 in microfiche. Report No TM 212, May 1974. 23 p, 1 fig, 12 tab, 3 ref.

Descriptors: *Water pollution sources, *Polychlorinated biphenyls, *Copper, Antifouling materials, *California, Paints, *Outer Continental Shelf.

During 1973 an estimated 37,000 recreational vessels (5-21 m long) were docked within 14 major marinas in Southern California. Detailed surveys of major brands and quantities of antifouling paint applied to such craft and to commercial and naval vessels in Los Angeles/Long Beach and San Diego harbors were conducted. These studies revealed that approximately 300,000 liters of antifouling paint are applied annually to vessels in southern California. Only 7 of the 28 paints most commonly used yielded detectable CPB levels. Median concentrations of mixtures resembling Aroclor 1242 and 1254 were less than 0.3 and 0.1 mg/l, respectively, and the maximum PCB concentration measured was 40/mg/l. However, the median copper concentration in these paints was estimated to be 600 g/l, corresponding to an annual copper application rate of about 180 metric tons. This copper, which is designed to be available and toxic to marine organisms, may have a larger environmental impact than the 600 metric tons of copper discharged annually via municipal wastewaters. (Sinha-OEIS)
W78-08889

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 1 AND 2.
Winzler and Kelly Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08894

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08895

DETERMINATION OF PHOSPHATE FLUXES ACROSS THE SEDIMENT-WATER SURFACE OF THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
J. W. Morse, and J. de Kanel.
Technical Memorandum ERL MESA-14, April 1977. 10 p, 2 tab.

Descriptors: *Pollutant identification, *Sediment-water interfaces, *Water pollution sources, *Phosphates, New York, Bioturbation, *Outer Continental Shelf, *New York Bight, Interstitial waters.

Only a small portion of the total dissolved phosphate can be accounted for as distinct species in the interstitial waters of the site which was investigated. Visual inspection of the cores indicated that there was intense infaunal activity. Worms and living crabs were observed in the cores. It is suggested that bioturbation not diffusion is the dominant transport mechanism at the sediment-water interface. Data are not available on bioturbation rates which are probably variable both laterally and seasonally. Consequently, a flux rate cannot be calculated. Significant fluxes are possible. If 2 ml/sq cm of interstitial water are exchanged per day, the total phosphate added to a stagnant column of overlying water 15 meters deep would be enough to raise the concentration by approximately 0.6 micromoles/liter. (Sinha-OEIS)
W78-08897

BIODEGRADATION OF OIL IN SEAWATER FOR NAVAL POLLUTION CONTROL,
Naval Civil Engineering Lab., Port Hueneme, CA.
For primary bibliographic entry see Field 5G.
W78-08898

FIELD INFRARED METHOD TO DISCRIMINATE NATURAL SEEPS FROM NON-SEEPS (SANTA BARBARA, CALIFORNIA AREA),
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5A.
W78-08900

METHOD OF IDENTIFYING SOURCE OF PETROLEUM FOUND IN THE MARINE ENVIRONMENT. REPORT II,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-08901

CONTINUING DEVELOPMENT OF THE VULNERABILITY MODEL,
Enviro Control, Inc., Rockville, MD.
A. H. Rausch, N. A. Eisenberg, and C. J. Lynch.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 197, Price codes: A15 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Final Report No. CG-D-53-77, February 1977. 341 p, 9 fig, 9 tab, 3 append. DOT-CG-33-377-A.

Descriptors: *Hazards, *Water pollution effects, Measurement, Chemical wastes, Toxicity, Oil pollution, *Simulation analysis, Model studies, *Computer studies, *Outer Continental Shelf, *Computer simulations.

The continuing development of the Vulnerability Model (VM), a computer simulation which provides a quantitative measure of the consequences of a marine hazardous chemical spill is described. Included are improvements in the modeling of fires, injury to indoor populations, additional toxicological analysis and modeling of ingestion of contaminated water. (Sinha-OEIS)
W78-08904

A FLUME FOR THE STUDY OF CONTAINED OIL SLICKS,
Massachusetts Inst. of Tech., Cambridge.
J. Milgram, and R. Van Houten.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 160, Price codes: A03 in paper copy, A01 in microfiche. Sea Grant Program Report No. MITSG-77-19, Index No. 77-319-Nom, July 1977. 45 p, 17 fig, 1 tab, 8 ref.

Descriptors: *Oil pollution, *Flumes, *Water pollution sources, Flow, Pollutant identification, Equipment, *Outer Continental Shelf, Oil slicks.

A basic design that is a 'hybrid' of the sump type of flume and the 'wind tunnel circuit' type of flume is described and the overall geometry is shown. The fluid from the test section spills into a sump tank through a combination weir having fluid passing over it and under it. The remainder of the circuit is of the 'wind tunnel type'. From the sump tank, the flow passes through a contracting and then diverging nozzle section. From the nozzle section, the flow passes through a diffuser in which the flow area is expanded. The flow is then turned through ninety degrees from a horizontal direction to a vertical direction by means of a cascade of turning vanes. Then a second cascade of turning vanes turns the flow direction back to horizontal so that a flowing fluid is above the bottom branch of the circuit. A stilling section containing screens and a 'honeycomb' made from sections of tubing follows the upper vanes. A contraction of the natural drawn type follows the stilling section. The test section extends from the contraction outlet to the combination weir which controls the subcritical flow both over and under the weir. (Sinha-OEIS)
W78-08905

ORGANIC PHOSPHATE TRANSPORT AND HYDROLYSIS IN SOIL: THEORETICAL AND EXPERIMENTAL EVALUATION,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
C. L. Castro, and D. E. Rolston.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1085-1091, November-December, 1977. 7 fig, 1 tab, 28 ref.

Descriptors: *Phosphates, Soils, Soil chemistry, Fertilizers, Irrigation, Irrigation water, *Hydrolysis, Kinetics, Soil water movement, *Path of pollutants, *Organic compounds.

An understanding of the movement, hydrolysis, and retention of organic phosphates in soils is necessary to evaluate possible advantages of the compounds as fertilizers, based upon their characteristic of increased vertical movement over that of inorganic phosphates when applied with irrigation water. Pulses of chloride and glycerophosphate were applied to 4-, 10-, and 20-cm long Panoche clay loam soil columns maintained slightly water-unsaturated. The concentration of glycerophosphate in th pulse applications varied from 386 to 1,110 ppm P. An analytical solution assuming first-order kinetics and a reversible, linear isotherm for gylcerophosphate hydrolysis and sorption, respectively, was compared with measured glycerophosphate concentrations in the column effluent. An analytical solution of the coupled equations for simultaneous transport of organic phosphate and orthophosphate assuming a linear, reversible isothern for orthophosphate adsorption is given. (Skogerboe-Colorado State)
W78-08911

SEASONAL ANHYDROUS AMMONIA COMPARISON FOR CORN WITH AND WITHOUT A NITRIFICATION INHIBITOR,
Georgia Univ., Experiment. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W78-08927

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08932

PROCEEDINGS OF A WORKSHOP ON PATTERN RECOGNITION APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs; and Coast Guard Research and Development Center, Groton, CT.; And TEEE Computer Society, Long Island, CA.
For primary bibliographic entry see Field 5A.
W78-08934

A PROBABILITY MODEL FOR MATCHING SUSPECTS WITH SPILLS--OR DID THE REAL SPILLER GET AWAY,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5A.
W78-08941

INFRARED SPECTRA OF PETROLEUM - DATA BASE INFORMATION AND APPLICATION TO REAL SPILLS,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-08943

ON MERCURY AND SELENIUM IN TUNA FISH TISSUES VII. SELENIUM LEVEL IN MUSCLES OF YELLOWFIN TUNA AND IN LIVERS AND SPLEENS OF TUNA AND MARLIN (IN JAPANESE),
Shimonoseki University of Fisheries (Japan).
For primary bibliographic entry see Field 5C.
W78-08959

ECOLOGICAL STUDIES ON HYDROCARBON-OXIDIZING BACTERIA IN JAPANESE COASTAL WATERS - II. DISTRIBUTION OF HYDROCARBON-OXIDIZING BACTERIA IN THE OIL-POLLUTED AREAS CAUSED BY THE MIZUSHIMA OIL REFINERY ACCIDENT (IN JAPANESE),
Simonoseki Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 5C.
W78-08964

WATER QUALITY OF THE OHIO RIVER, LOUISVILLE, KENTUCKY-EVANSVILLE, INDIANA.
National Field Investigations Center-Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 157, Price codes: A07 in paper copy, A01 in microfiche. September, 1970. 143 p.

Descriptors: *Water quality, *Ohio River, *Kentucky, *Indiana, *Ohio, Rivers, Water pollution, Federal government, United States, Administration, Administrative agencies, Surveys, Fish, Aquatic microbiology, Bacteria, Coliforms, Dissolved oxygen, Sewage, Aquatic environment, River systems.

A water quality survey of the Ohio River between Louisville, Kentucky and Evansville, Indiana was made in 1967. Its purpose was to determine bacteriological quality, specifically the causes of high coliform densities and probable causes of fish flesh tainting. Eight general subjects were considered: As part of the survey, average river discharges were estimated and water temperatures of the river were calculated. Dissolved oxygen concentrations in the river were found to be higher than the Indiana and Kentucky water quality standards for aquatic life now specify, and bacterial pollution from inadequately treated sewage was found to create a health hazard in the survey area. In addition, plankton, the river's food web base, was discovered to be detrimental because it imparted tastes and odors to domestic water supplies; sludge from organic pollution was shown to be detrimental to fish; fish captured downstream proved to be unpalatable; and many catfish were of unacceptable quality. Since the preparation of this report, state standards have been upgraded to its water quality standards. (Quarles-Florida)
W78-08989

DYNAMICS OF RESERVOIR OF MEDIUM SIZE,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W78-09031

DILUTION IN A VERTICAL ROUND BUOYANT JET,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
For primary bibliographic entry see Field 8B.
W78-09033

CONTAMINANT TRANSPORT TO DEEP WELLS,
Weston (Roy F.), Inc., Roslyn, NY.
For primary bibliographic entry see Field 5G.
W78-09034

TRANSIENT MIXING IN RIVER CHANNELS,
Clarkson Coll. of Technology, Potsdam, NY. Dept. of Civil and Environmental Engineering.
H. T. Shen.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE3, Proceeding Paper 13810, p 445-459, June 1978. 7 fig, 28 ref, 2 append.

Descriptors: *River flow, *Mixing, *Model studies, *Dispersion, Mathematical studies, Mathematical models, Steady flow, Ice cover, Channel flow, Open channel flow, Hydraulics, Convection, Water quality, Water pollution, Pollutants, Distribution patterns, Analytical techniques, Analysis, Natural streams, Transient mixing, Two dimensional flow.

A mathematical model was developed for two-dimensional transient mixing in natural river channels based on an existing steady-state formulation. Nonuniformities of the flow and river geometry were treated by an orthogonal curvilinear coordinate system and the use of a cumulative discharge. Relationships between the unit width discharge and depth were presented, for both the ice-covered case and the open water case, to enable the construction of synthetic transverse flow distributions when there is no field measurement available. Under restrictive assumptions, the governing equation can be reduced to the conventional Fickian equation that can be solved analytically. Analytical solutions for the dispersion of nonconservative substances from line sources of variable strength were derived. In general, these analytical solutions are in integral or series forms that can be evaluated efficiently by existing numerical techniques. Examples were presented to show the pattern of concentration distributions and effects of various parameters. (Humphreys-ISWS)
W78-09042

THE CLYDE ESTUARY AND FIRTH: AN ASSESSMENT OF PRESENT KNOWLEDGE.
Natural Environment Research Council, London (England). Clyde Study Group.
For primary bibliographic entry see Field 6G.
W78-09070

TRACING THE TRANSFORMATIONS OF UREA FERTILIZER DURING LEACHING,
Utah State Univ., Logan. Dept. of Soil Science and Micrometeorology.
For primary bibliographic entry see Field 2G.
W78-09114

UPTAKE AND LOSSES OF 15N APPLIED TO ANNUAL GRASS AND CLOVER IN LYSIMETERS,
California Univ., Davis. Dept. of Agronomy and Range Science.
M. B. Jones, C. C. Delwiche, and W. A. Williams.
Agronomy Journal, Vol. 69, No. 6, p 1019-1023, November-December 1977. 2 fig, 3 tab, 10 ref.

Descriptors: *Nitrogen-15, Lysimeters, Fertilizers, Fertilization, Nutrients, California, *Leaching, Denitrification, Nitrate-nitrogen, Ammonia-nitrogen, *Grasses, *Clovers, *Absorption.

The California annual grasslands comprise about one-third of the state, and they play a large role in the hydrology of most watersheds in central and northern California. Apparent recovery of applied N has been low, and a large percentage has been unaccounted for in N balance studies. An experiment was done with 15N to determine the fate of applied N, especially that leached and that volatilized (by difference). Conclusions: There was modest leaching loss but essentially no gaseous loss from moderate rates of N applied to grass in October; there was almost negligible leaching loss but modest gaseous loss from moderate rates of N applied to grass in February; recovery of fertilizer by clover was poor; and a single large application (500 kg N/ha) resulted in a substantial leaching and gaseous losses under both grass and clover. (Skogerboe-Colorado State)
W78-09120

DEICING SALT MOVEMENT AND ITS EFFECTS ON SOIL PARAMETERS AND VEGETATION,
Maryland Univ., College Park. Dept. of Agronomy.
C. A. Buzio, G. W. Burt, and J. E. Foss.

Agronomy Journal, Vol. 69, No. 6, p 1030-1032, November-December 1977. 3 fig, 1 tab, 13 ref.

Descriptors: *Salts, Soils, Soil investigations, *Soil properties, Chlorides, Salinity, Saline soils, Toxicity, *Deicing, Salt tolerance, Vegetation.

Salt damage to the environment occurs in restricted areas in humid regions as a result of factors such as industrial waste, sea water, and deicing salt. A study was conducted, therefore, to determine the distribution of salt leached from a deicing salt pile, and its effects on soil parameters (pH, Mg, P, and K) and plant successional changes in a hardwood forest area. Lateral movement and leaching of chloride was studied as it occurred in an adjacent slope by sampling the soil to a depth of 76 cm at 17 sites. The soil samples collected from the field were then analyzed for salt content by using the conductivity bridge. Lateral movement (of chloride) was extensive with subsequent leaching to a depth greater than 76 cm. Of the measured soil parameters, only K was correlated with NaCl concentration. Within 3 years of the establishment of the salt stockpile, all the trees in the sampled area were dead. Out of 29 plant species found to have invaded the sites with less than 5,000 ppm of NaCl, only 10 were found in sites with concentrations greater than 15,000 ppm. Recommendations to be considered when establishing a deicing salt pile are presented. (Skogerboe-Colorado State)
W78-09122

TILLAGE SYSTEM EFFECTS ON RUNOFF WATER QUALITY: PESTICIDES,
Iowa State Div., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-09145

TILLAGE SYSTEM EFFECTS ON RUNOFF WATER QUALITY: SEDIMENTS AND NUTRIENTS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
H. P. Johnson, J. L. Baker, W. D. Shrader, and J. M. Laflen.
Paper No. 77-2504 presented at the 1977 Winter Meeting, American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 15 p, 2 fig, 3 tab, 9 ref.

Descriptors: Corn, Nitrogen, Erosion, Soil erosion, Phosphorus, Soil conservation, Water quality, Sediments, Nutrients.

Three tillage systems were utilized for growing corn on six paired small watersheds. The tillage systems retained a range of residue cover on the soil varying from about three to forty-five percent. Most of the nitrogen losses were associated with erosion. Soluble phosphorus losses were greatest with conservation tillage. Surface residue reduced markedly the soil losses. (See also W78-09145) (Skogerboe-Colorado State)
W78-09146

IRRIGATION RETURN FLOW MODELING--A STATE OF THE ART,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W78-09147

SIMULATION OF NUTRIENT LOSSES FROM CROPLAND,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
L. J. Tubbs, and D. A. Haith.
Paper No. 77-2502 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 34 p, 17 fig, 14 tab, 34 ref.

Descriptors: *Model studies, Nitrogen, Phosphorus, Runoff, *Nutrients, Infiltration, *Simulation analysis, *Agricultural runoff.

A mathematical model has been developed to predict losses of nitrogen and phosphorus in cropland runoff and percolation water. The model is based on daily hydrologic and monthly soil nutrient balances. The model does not require calibration and has been validated using data from monitored field plots. Reasonable predictions of annual losses are obtained for dissolved inorganic nitrogen in runoff and percolation and dissolved inorganic phosphorus in runoff. Seasonal variations are well-predicted for nitrogen but not for phosphorus. (Skogerboe-Colorado State)
W78-09148

GROUND WATER POLLUTION. PART 2. POLLUTION FROM IRRIGATION AND FERTILIZATION,
National Technical Information Service, Springfield, VA.
E. I. Lehmann.
Available from the National Technical Information Service, Springfield, VA 22161 as NTIS/PS-78/0141, Price codes: N01 in paper copy, N01 in microfiche. Bibliography NTIS/PS-77-0008, February 1977, 240 p.

Descriptors: *Bibliographies, *Abstracts, *Groundwater, Pollutants, *Fertilization, *Irrigation effects, Waste water(Pollution), Solid wastes, Nitrates, Phosphates, Abatement, Water pollution, Irrigation water conservation.

This bibliography contains abstracts and citations from the NTIS data base of Federally-funded research covering all aspects of groundwater pollution from irrigation and fertilization. Topics deal with the pollution from sewage and waste water irrigation, land spreading of sludges and solid wastes, nitrate and phosphate accumulation in soils, pollution control and abatement planning, salt build-up from irrigation, the use of tile drains in groundwater pollution control, and groundwater recharge studies. (This updated bibliography contains 240 abstracts, 18 of which are new entries to the previous edition.) (Skogerboe-Colorado State)
W78-09151

DISTRIBUTION AND BIOTIC EFFECTS OF NUTRIENTS IN FLATHEAD LAKE, MONTANA,
Montana Univ., Flathead Lake. Biological Station.
For primary bibliographic entry see Field 5C.
W78-09155

OBSERVATIONS OF ALGAL ZONATION RESULTING FROM COMPETITION,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-09159

PHYTOPLANKTON GROWTH AND CHLOROPHYLL LEVELS IN THE SACRAMENTO - SAN JOAQUIN DELTA THROUGH SAN PABLO BAY,
Bureau of Reclamation, Sacramento, CA. Mid-Pacific Region.
For primary bibliographic entry see Field 5C.
W78-09163

INORGANIC PHOSPHORUS FRACTIONATIONS IN BLACKSTRAP LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-09164

DETERMINATION OF THE RATE AND EFFICIENCY OF NITROGEN TRANSFER FROM PHYTOPLANKTON TO ZOOPLANKTON USING NITROGEN-15 AS A TRACER,
Columbia Univ., New York. Teachers Coll.
For primary bibliographic entry see Field 5C.
W78-09167

PREDICTIONS OF HEAT AND MASS TRANSFER IN OPEN CHANNELS,
Karlsruhe Univ. (West Germany).
A. K. Rastogi, and W. Rodi.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY3, Proceedings Paper 13639, p 397-420, March 1978. 6 fig, 24 ref, 2 append.

Descriptors: *Mass transfer, *Heat transfer, *Open channels, *Model studies, Mathematical models, Effluents, Water pollution, Flow, Channel flow, Rivers, Temperature, Water temperature, Turbulence, Dispersion, Cooling water, Channels, Buoyancy, Fluid flow, Froude number, Hydraulics.

The paper described a three-dimensional model for calculating the distribution of velocity, temperature, and pollutant concentration in open channel flows, and a depth-averaged two-dimensional version for situations with insignificant stratification and secondary currents. Both models were restricted to parabolic flows, where influences cannot be transmitted upstream. The turbulent stresses and heat concentration fluxes appearing in these equations were determined from the so-called k-epsilon turbulence model that solves differential transport equations for the turbulence kinetic energy k and the rate of its dissipation epsilon. In the depth-averaged model, the bottom shear stress surface heat flux and turbulence production due to bottom shear stress are accounted for by source/sink terms in the relevant equations. The 3D calculations compared favorably with available measurements. The 2D and 3D predictions agreed well for high Froude numbers; for a Froude number of 5 they agreed only for the rough bed, while for the smooth bed they start to deviate significantly at a Froude number of 10. (Sims-ISWS)
W78-09203

A MODEL TO INVESTIGATE THE INFLUENCE OF SUSPENDED SEDIMENT ON THE MASS TRANSPORT OF A POLLUTANT IN OPEN CHANNEL FLOW,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
R. S. Chapman.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-20380, Price codes: A05 in paper copy, A01 in microfiche. Masters of Engineering Thesis, March 1977. 71 p, 25 fig, 1 tab, 33 ref.

Descriptors: *Sediment transport, *Suspended load, *Pollutants, *Open channel flow, Channels, Mass transfer, Metals, Pesticide drift, Herbicides, Mathematical models, Turbulence, Stratified flow, Sorption, Alluvial channels, Water quality, Model studies, Transport process, Finite difference model.

In this study, an explicit two-dimensional finite difference model, designed to investigate the influence of suspended sediment on the pollutant transport process, was presented. Specific attention was directed toward examining the role of suspended sediment in (1) the turbulent vertical transport mechanism in a stratified flow, and (2) pollutant uptake due to sorption. Results presented indicated that suspended sediment plays a major role in the pollutant transport process, and subsequently, any meaningful attempt to model the fate of a pollutant in an alluvial channel must account for the presence of a suspended sediment concentration profile. Similarly, the vertical and

longitudinal pollutant concentration distributions provided by the model may be utilized to improve upon the predictive capacities of existing water quality models. (Bhowmik-ISWS)
W78-09219

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION. APPENDIX A: SAN FRANCISCO BAY SAMPLING DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects lab.
E. J. Leaky, W. B. Lane, T. M. Tami, L. B. Inman, and W. R. McLoud.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 133, Price codes: A06 in paper copy, A01 in microfiche. Technical Report N-76-1-App-A, May 1976. 124 p.

Descriptors: *On-site data collections, *Sediments, *Dredging, *California, Bays, Sampling, Data collections, Spoil banks, Estuaries, *San Francisco Bay, *Dredged material.

This appendix is a tabulation of the San Francisco Bay Sampling Data. The tabulations included locations of sampling holes and sampling depths, locations of hopper samples, sampling dates, and analytical results for each sample. (See also W78-03257) (Humphreys-ISWS)
W78-09225

IDENTIFICATION AND SPECIFICATION OF INPUTS FOR BENEFIT-COST MODELING OF PESTICIDE USE,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 6A.
W78-09238

WATER QUALITY LOADINGS DURING THIRTEEN STORMS ON THE CADDO RIVER, ARKANSAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
E. R. Perrier, H. E. Westerdahl, and J. F. Nix.
Paper No. 7702529 American Society of Agricultural Engineers, Saint Joseph, Michigan (1977) 28 p, 5 fig, 11 tab, 14 ref.

Descriptors: *Water quality, Sediments, Sedimentation, *Sediment loads, Sedimentary basins, *Arkansas, *Caddo River(Ark), Water pollution sources, *Storms, *Nonpoint pollution sources.

Nonpoint source loadings of twenty-five selected water quality parameters have been described for thirteen storm events on the Caddo River drainage basin in Arkansas. These parameters were functionally related to onsite measurements although wide variation was attributable to hysteresis and the stochastic nature of the system. (Skogerboe-Colorado State)
W78-09255

OBSERVATION OF A COLD-WATER INTERTIDAL COMMUNITY AFTER 5 YEARS OF A LOW-LEVEL, PERSISTENT OIL SPILL FROM THE GENERAL M.C. MEIGS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-09276

RECRUITMENT OF BENTHIC ANIMALS AS A FUNCTION OF PETROLEUM HYDROCARBON CONCENTRATIONS IN THE SEDIMENT,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-09278

BENTHIC HYDROCARBONS OF RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. D. Boehm, and J. G. Quinn.
Estuarine and Coastal Marine Science, Vol. 6, p 471-494, 1978. 7 fig, 6 tab, 34 ref.

Descriptors: Sediments, *Bottom sediments, *Bottom sampling, *Clams, *Shellfish, Cores, *Core drilling, Animal metabolism, *Oil pollution, *Geochemistry, *Oil, *Dredging, *Sedimentation, *Polychlorinated biphenyls, Organic compounds, Path of pollutants, Rhode Island, Quahog, Arctica, Tissue analysis, Bioaccumulation, *Rhode Island Sound(RI).

The hydrocarbon contents of surface sediments, sediment cores and ocean quahogs from Rhode Island Sound have been determined. Hydrocarbon concentrations in surface sediments normally range from 1.0 to 56.1 micrograms/g, largely dependent on sediment type and sedimentation rates. However, concentrations up to 301 micrograms/g are observed in surface samples from a dredge spoil deposit located in the study area. Hydrocarbon contents of the ocean quahog do not reflect the sediment distributions qualitatively or quantitatively. Throughout the study area the clams' hydrocarbon contents vary by a factor of 2.5 (2.6-6.4 micrograms/g wet) while the sediment concentrations vary by two orders of magnitude. A sediment core from the area shows a decreasing concentration of hydrocarbons and a decreasing percentage of unresolved components (UCM) with increasing depth. It is proposed that the rapid increase in the quantity of the UCM observed at a certain depth within the sediment, can serve as a chemical marker in the recent sedimentary record. This marker corresponds to the increased usage of petroleum products at the end of the 19th century. (EIS-Deal)
W78-09279

PERSISTENCE OF POLYCHLORINATED BIPHENYLS IN MARINE BIVALVES,
London Univ. (England). Dept. of Zoology.
W. J. Langston.
Marine Biology, Vol. 46, p 35-40, 1978. 4 fig, 3 tab, 18 ref.

Descriptors: *Bivalves, *Aroclors, *Halogenated pesticides, *Chlorinated hydrocarbon pesticides, *Chlorination, *Chlorine, Chemical reactions, Animal physiology, Animal metabolism, *Polychlorinated biphenyls, *Pesticide residues, Bioindicators, Water temperature, Suspended solids, Path of pollutants, Metabolism, Organic compounds, Isomers, Macoma, Cerastoderma, Bioaccumulation, Tissue analysis.

Bivalves which had previously been exposed to Aroclors 1242, 1254, and 1260 were able to reduce their tissue burdens of chlorobiphenyls with 2 to 5 chlorine atoms in short-term static assay systems. Elimination rates decreased with increasing chlorination and removal of isomers with more than 5 chlorine atoms was not recorded. Position, in addition to the number, of chlorine atoms influenced the persistence of chlorobiphenyls. Isomers with most 'ortho'-substituted chlroine atoms were least persistent. Experiments with single isomers indicated variation in the elimination of low chlorinated isomers between bivalve species. These biological and chemical influences on tissue residues, together with environmental parameters such as temperature and suspended solids, are considered in relation to the use of bivalves as bio-indicators of marine pollution. (EIS-Deal)
W78-09280

THE MARINE ALGAE OF THE POLLUTED INNER PART OF THE OSLOFJORD,
For primary bibliographic entry see Field 5C.
W78-09281

DINOFLAGELLATE TOXINS AS PROBABLE CAUSE OF AN ATLANTIC HERRING (CLUPEA HARENGUS HARENGUS) KILL, AND PTEROPODS AS APPARENT VECTOR,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
A. W. White.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 2421-2424, 1977. 1 tab, 12 ref.

Descriptors: *Fishkills, *Toxins, *Dinoflagellates, *Food chains, *Herrings, *Path of pollutants, *Algal toxins, *Vectors(Biological), Commercial fish, Aquatic microorganisms, Microbiology, Mortality, Eutrophication, Clupea harengus, Limacina, Pteropods, Gonyaulax, *Bay of Fundy.

Stomachs of Atlantic herring (Clupea harengus harengus) from a kill that occurred in the Bay of Fundy during a bloom of the toxic dinoflagellate Gonyaulax excavata contained pteropods, algal remains, and paralytic toxins. Experiments show that comparable amounts of G. excavata toxins can kill herring rapidly. It is likely that the kill was caused by paralytic dinoflagellate toxins, and that the pteropod Limacina retroversa, a planktonic herbivore, acted as a vector of the toxins. (EIS-Katz)
W78-09288

POPULATION DYNAMICS OF DAPHNIA GALEATA MENDOTAE AS MODIFIED BY CHRONIC CADMIUM STRESS,
For primary bibliographic entry see Field 5C.
W78-09289

COMPARATIVE METABOLISM OF PCB ISOMERS BY THREE SPECIES OF FISH AND THE RAT,
Wisconsin Univ., Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W78-09295

5C. Effects Of Pollution

TROPHIC CONDITIONS IN LAKE WINNISQUAM, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.
L. R. Frost, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 022, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-137, 1977. 36 p, 12 fig, 12 tab, 11 ref. NH 76-020C.

Descriptors: *Trophic level, *Lakes, *Sewage effluents, *Sewage treatment, *Water quality, Phytoplankton, Nutrients, Water analysis, Limnology, Thermal stratification, Epilimnion, Hypolimnion, Dissolved oxygen, New Hampshire, *Lake Winnisquam, Chemical analysis.

Lake Winnisquam has received treated domestic sewage for approximately 50 years and since June 1961 has been treated with copper sulfate to control the growth of nuisance algae. The Laconia City secondary sewage-treatment plant was upgraded in 1975 to include phosphorus removal. Phosphorus was not removed effectively until early 1976, and, therefore, the 1976 data are considered baseline or pre-phosphorus removal with respect to anticipated changes in the trophic condition of the lake. Effluent from the Laconia State School primary-treatment plant was diverted to the Laconia City plant in October 1976. Dissolved oxygen concentrations showed marked differences between the two basins comprising Lake Winnisquam. Phytoplankton samples showed similarities by algal group for all stations but algal genera varied between the upper and lower basins. Total phosphorus concentrations in the epilimnion ranged from 0.01 to 0.10 milligram per liter, and ac-

cumulation of total phosphorus in the hypolimnion resulted in concentrations up to 0.59 milligrams per liter. Chemical states of nutrients varied among the stations corresponding to the degree of depletion of hypolimnetic dissolved oxygen. Dissolved oxygen profiles were used to illustrate zones of algal production, respiration, and bacterial decomposition. The rate of depletion of dissolved oxygen in the hypolimnion was linearly related to time. Because change in the rate of hypolimnetic dissolved oxygen depletion is more easily measured than change of nutrient load in the lake, it is suggested it be used as an indicator of the response of the lake to change in trophic condition. (Woodard-USGS)
W78-08842

CHANGES IN THE PREDATOR-PREY BEHAVIOR OF FATHEAD MINNOWS (PIMEPHALES PROMELAS) AND LARGEMOUTH BASS (MICROPTERUS SALMOIDES) CAUSED BY CADMIUM,
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.
J. F. Sullivan, G. J. Atchison, D. J. Kolar, and A. W. McIntosh.
Journal of the Fisheries Research Board of Canada, Vol 35, p 446-451, 1978. 1 fig, 4 tab, 20 ref.

Descriptors: *Toxicity, *Predation, *Fish behavior, *Cadmium, *Bass, *Minnows, *Fish physiology, *Food habits, *Bioassay, Path of pollutants, Water pollution effects, Metals, *Sublethal effects.

Increased prey vulnerability was demonstrated for fathead minnows undergoing acute (24-h) and subacute (21-d) sublethal cadmium exposure prior to interacting with largemouth bass. The lowest acute and subacute cadmium concentrations that increased prey vulnerability were 0.375 and 0.025 mg Cd/L, respectively, with the latter well below the maximum acceptable toxicant concentration for fathead minnows. Prey exposed to cadmium displayed altered behavoir patterns, including abnormal schooling behavior. (EIS-Deal)
W78-08861

THE DISTRIBUTION OF METHYL MERCURY IN CONTAMINATED SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5B.
W78-08863

EFFICACY OF COPPER SULPHATE IN THE SUPPRESSION OF APHANIZOMENON FLOS-AQUAE BLOOMS IN PRAIRIE LAKES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5G.
W78-08864

UPTAKE OF POLYCHLORINATED BIPHENYL (AROCLOR 1254) FROM SEDIMENT AND FROM SEAWATER IN TWO INTERTIDAL POLYCHAETES,
London Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-08865

IRON IN MAINE COASTAL WATERS; SEASONAL VARIATION AND ITS APPARENT CORRELATION WITH A DINOFLAGELLATE BLOOM,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.
For primary bibliographic entry see Field 5B.
W78-08866

TOXICITY OF A MIXTURE OF METALS ON FRESHWATER ALGAE,
Canada Centre for Inland Waters, Burlington (Ontario).
P. T. S. Wong, Y. K. Chau, and P. L. Luxon.
Journal of the Fisheries Research Board of Canada, Vol 35, p 479-481, 1978. 1 tab, 10 ref.

Descriptors: *Arsenic compounds, *Cadmium, *Chromium, *Copper, *Iron, *Lead, *Mercury, *Nickel, *Selenium, *Zinc, *Toxicity, Heavy metals, Metals, *Great Lakes, *Water quality standards, *Diatoms, *Primary productivity, *Chlorophyta, *Cyanophyta, *Food chains, Water pollution effects, Growth rates, Biological communities, Ecosystems, Lethal limit.

Recommended levels of a number of metals for Great Lakes Water Quality Objectives were found to be very toxic to freshwater algae when these metals were present simultaneously in lake water and culture medium. The diatom tested was more sensitive to metal toxicity than the blue-green and green algae. The metals tested were arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, and zinc. (EIS-Deal)
W78-08868

MARINE ENVIRONMENTAL IMPACT DUE TO MINING ACTIVITIES OF EL SALVADOR COPPER MINE, CHILE,
Universidad Catolica de Chile, Santiago. Lab. de Zoologia.
For primary bibliographic entry see Field 5B.
W78-08869

THE IMPLICATIONS OF COMMUNITY STRUCTURE FOR BENTHIC MONITORING STUDIES,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5A.
W78-08870

UPTAKE OF RADIOACTIVITY BY MARINE SEDIMENTS AND IMPLICATIONS FOR MONITORING METAL POLLUTANTS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W78-08871

MUSSEL MORTALITY IN THE GULF OF LA SPEZIA, ITALY,
Atkins Research and Development, Epson (England).
R. I. Collinson, and C. P. Rees.
Marine Pollution Bulletin, Vol. 9, p 99-101, 1978. 1 fig, 9 ref.

Descriptors: *Mussels, *Mortality, *Dissolved oxygen, *Dredging, Animal physiology, Sampling, Metabolism, Shellfish, Mollusks, Invertebrates, Biochemical oxygen demand, Copper, Benthic fauna, Aquatic life, Mud, Water quality, Aquatic life, Environmental effects, Italy, La Spezia(Italy), Mud particles.

High mortality of mussels on culture-ropes observed during dredging operations in the Gulf of La Spezia, Italy, was due primarily to reduced levels of dissolved oxygen. Mud particles blocking the mantle cavity produced suffocation, and their presence on the valves and in the vicinity of the mussels produced a high biochemical oxygen demand which markedly reduced the oxygen concentration in the water. The effect of soluble and insoluble phases of copper released from the perturbed mud and re-suspended in the water column was difficult to ascertain, but under certain conditions it might have introduced additional mechanical and physiological stress. (EIS-Klein)
W78-08872

MOLECULAR STRUCTURE - BIOLOGICAL PROPERTIES RELATIONSHIPS IN ANIONIC SURFACE-ACTIVE AGENTS,
Institut National de Recherche Chimioue Appliouee, Vert-le-Petit (France).
P. Lundahl, and R. Cabridenc.
Water Research, Vol. 12, p 25-30, 1978. 2 fig, 3 tab, 13 ref.

Descriptors: *Toxicity, *Organic compounds, Chemistry, *Molecular structure, Chemical properties, Water structure, Anions, Aquatic life, Biochemistry, Sulfonates, Organophosphorus compounds, Analytical techniques, Surfaces, Water quality, Mathematics, Daphnia, Chlamydomonas, Microorganisms, Surfactants, Freshwater fish, *Surface-active agents, Phoxinus.

Molecular structure-toxicity relationships in anionic surface-active agents were studid, using aquatic organisms for the bioassays. In a series of homologs the toxicity increased sharply when the hydrophobic chain length increased. A simple logarithmic equation described the relationship. This equation can be used to predict the toxicities. A simplified thermodynamic interpretation was proposed. Variations of the biodegradability with the chain length were tentatively explained. The organisms studied were Chlamydomonas, Phoxinus, and Daphnia, the latter being the most sensitive to anionic surface-active agents. (EIS-Klein)
W78-08873

FISH COUGH RESPONSE - A METHOD FOR EVALUATING QUALITY OF TREATED COMPLEX EFFLUENTS,
Environmental Research Lab.-Duluth, MN.
R. W. Carlson, and R. A. Drummond.
Water Research, Vol. 12, p 1-6, 1978. 2 fig, 2 tab, 22 ref.

Descriptors: *Fish physiology, *Industrial wastes, *Sunfishes, *Effluents, Fish behavior, Sewage effluents, Environmental effects, Path of pollutants, Water quality, Lethal limit, Toxicity, Mortality, Evaluation, Water pollution effects, Bioindicators, *Bluegill sunfishes, *Fish Cough Response, Lepomis macrochirus, Sublethal response.

Bluegill sunfish (Lepomis macrochirus) showed increases in cough frequency commensurate with effluent concentration when exposed for 24 h to different industrial and municipal effluents. Effluents known to be toxic caused steadily increasing cough rates in the fish as effluent concentrations approached acutely toxic levels. Bluegills exposed to three different samples of effluent, collected from the same source over an 8-month period, showed decreased levels of cough rate as the effluent improved in quality. Cough frequency was found to be rapid and sensitive physiological characteristic for evaluating the quality of industrial and municipal effluents and variation in quality of same-source effluents before discharge into receiving waters. (EIS-Klein)
W78-08874

MECHANICAL CUTTING OF SUBMERSED MACROPHYTES: IMMEDIATE EFFECTS ON LITTORAL WATER CHEMISTRY AND METABOLISM,
Wisconsin Univ.-Madison. Dept. of Botany.
For primary bibliographic entry see Field 5G.
W78-08875

A COMPARISON OF THE EFFECTS OF CHLORDANE AND PCB ON THE GROWTH, PHOTOSYNTHESIS, AND CELL SIZE OF ESTUARINE PHYTOPLANKTON,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
D. C. Biggs.
Environmental Pollution, Vol. 15, p 253-263, 1978. 3 fig, 2 tab, 26 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Aroclors, *Polychlorinated biphenyls, *Phytoplankton, Biological communities, Organic compounds, Absorption, Growth rates, Chlorides, Environmental effects, Primary productivity, Chlorophyll, Photosynthesis, Diatoms, Water quality, Dimensions, *Chlordane, *Aroclor 1254, Cell size.

Daily additions of 10 micrograms chlordane or 5 or 10 micrograms Aroclor 1254 to 1 liter of dialysis culture of mixed species of estuarine phytoplankton, reduced algal growth rate and 14C-uptake per unit chlorophyll a. Inhibition of chlordane lasted 24-48 h, and the community cell-size distribution was not substantially altered. Aroclor caused longer-term effects, inhibiting the growth of phytoplankton larger than 8 micrometers in equivalent spherical diameter (i.e. large centric diatoms) more strongly than that of smaller forms (pennate diatoms and microflagellates), so that the community composition shifted in favor of small-size algae. Aroclor was found to be more inhibitory than chlordane in all the parameters tested. (EIS-Klein)
W78-08879

EFFECTS OF LABORATORY PROCEDURE ON FUEL OIL TOXICITY,
Massachusetts Univ., Gloucester. Marine Station.
A. D. Michael, and B. Brown.
Environmental Pollution, Vol. 15, p 277-287, 1978. 6 fig, 21 ref.

Descriptors: *Methodology, *Research and development, *Laboratory tests, *Testing procedures, Toxicity, Fuels, Amphipods, Sediment, Sand, Lethal limit, Water temperature, Testing, Analytical techniques, Water quality, *Laboratory procedure, *No. 2 Fuel Oil, Experimental conditions.

Laboratory testing of No. 2 fuel oil toxicity to the amphipod Neohaustorius schmitzi in artificial sea water demonstrated that each of several experimental factors produced significant variation in test results. Variables examined were: presence of substrate (sand), concentration of oil (0.05 or 0.025 ml/liter), stirring rate, age of the oil/water mixture, evaporation and temperature. (EIS-Katz)
W78-08880

MARINE ECOLOGY AND OIL POLLUTION,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
J. M. Baker.
Journal of the Water Pollution Control Federation, Vol 50, p 442-449, 1978. 25 ref.

Descriptors: Environmental effects, *Oil pollution, *Aquatic life, Biological communities, Testing procedures, Ecology, Monitoring, Surveys, On-site data collections, Bioindicators, Ecosystems, Analysis, Water pollution effects.

An outline of approaches used by the Oil Pollution Research Unit to find the effects of oils and related pollutants on the marine environment was presented. Priority was given to field surveys, biological monitoring and field experiments. Results indicated that no generalization can be made about biological damage caused by oil pollution. A number of factors appeared to be important in determining the extent of damage including type and volume of discharge, type of oil, cleaning treatment, climate and topography, and characteristics of the biological communities involved. The objectives, methods, and difficulties of biological monitoring were discussed. (EIS-Klein)
W78-08881

RECOVERY OF INDICATOR BACTERIA IN ACID MINE STREAMS,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5A.
W78-08882

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 1.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08891

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 2.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08892

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 3.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08893

CONTINENTAL SHELF DEVELOPMENT: A BIBLIOGRAPHIC BACKGROUND FOR ALASKA. VOLUMES 1 AND 2.
Alaska Dept. of Education, Juneau. Div. of State Libraries and Museums.
For primary bibliographic entry see Field 2L.
W78-08896

ECOLOGICAL EVALUATION OF PROPOSED DISCHARGE OF DREDGED MATERIAL INTO OCEAN WATERS.
California Univ., Bodega Bay. Bodega Marine Lab.; and Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 209, Price codes: A07 in paper copy, A01 in microfiche. Army Corps of Engineers and U.S. Environmental Protection Agency Joint Implementation Manual, July 1977. 126 p, 8 append. Peddicord, R.K. (Ed.).

Descriptors: *Water pollution effects, *Dredging, *Environmental effects, *Regulation, Ecology, Resources development, *Outer Continental Shelf, *Ocean dumping, Dredge material, Spoil disposal, Biological effects.

In accordance with Section 227.27(b) of the Federal Register, Vol 42, No 7, 11 Jan 1977, an implementation manual has been developed jointly by the Environmental Protection Agency and the Corps of Engineers. Procedures are presented for evaluating potential environmental impacts of the discharge of dredged material into ocean waters, an evaluation that is required in considering permit applications for transporting dredged material for ocean dumping. This manual represents a multidisciplinary effort of both agencies to develop procedurally sound, routinely implementable guidance for complying with the technical requirements of the Register. The procedures are applicable to evaluating the potential ecological effects of dumping from hopper dredges, barges, and scows. Detailed guidance is provided on sediment and water sample collection, preparation, and preservation; chemical analysis of the liquid phase; bioassays of liquid, suspended particulate, and solid phases; estimation of bioaccumulation potential; and estimating the initial mixing. (Sinha-OEIS)
W78-08899

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 1 OF 3.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08928

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 2 OF 3.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08929

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 3 OF 3,
Winzler and Kelly., Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08930

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME IV: MASTER BIBLIOGRAPHY.
Winzler and Kelly. Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08933

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME I,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08953

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME II,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08954

ON MERCURY AND SELENIUM IN TUNA FISH TISSUES VII. SELENIUM LEVEL IN MUSCLES OF YELLOWFIN TUNA AND IN LIVERS AND SPLEENS OF TUNA AND MARLIN (IN JAPANESE),
Shimonoseki University of Fisheries (Japan).
M. Takeda, and T. Ueda.
The Journal of the Shimonoseki University of Fisheries, Vol. 26, No. 3, p 267-279. 1978. 14 ref, 13 fig, 2 tab.

Descriptors: *Heavy metals, *Mercury, Size, *Commercial fish, *Marine fish, *Weight, Metals, Public health, Pacific Ocean, Indian Ocean, Bioaccumulation, *Selenium, Tissue analysis, *Tuna, *Marlin, Yellowfin Tuna.

Selenium levels were determined in the muscle tissues of 39 yellowfin tuna and in the livers and spleens of 29 tuna of 3 species and 10 marlin of 4 species from the Pacific and East Indian Oceans. Selenium levels in muscle tissues of yellowfin tuna were independent of fish size or total mercury level. There is no significant correlation between selenium level in the dorsal muscle (mean 0.54 micro g/g) and that in the dark muscle (mean 5.24 micro g/g) for yellowfin tuna. Mean selenium levels in livers and spleens were 21.49 and 27.07 for tuna and 9.04 and 7.16 micro g/g for marlin, respectively. There was no significant difference (at 0.01 level) between the selenium level in livers and in spleens for both tuna and marlin. Selenium levels in livers and spleens of marlin were significantly correlated (at 0.1 level) with total mercury and body weight. Selenium levels of tuna were independent of total mercury, methylmercury, and weight. Whether the correlation of selenium level

to weight or to total mercury level is significant may depend on the relative magnitude of the increment in the level of selenium which is accumulated, with mercury even beyond the substantial basal level. The Se/Hg (molar basis) in the livers and spleens were significantly inversely correlated (at 0.01 level) with weight throughout tuna and marlin. (See also W78-04144(IV), W78-03942(III), and W78-03941(II)) (EIS-Katz)
W78-08959

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VIII. SUMMARY OF RESULTS,
Woods Hole Oceanographic Institution, MA.
D. G. Grice, and D. W. Menzel.
Marine Science Communications, Vol 4, No 1, p 23-31, 1978. 10 ref.

Descriptors: *Mercury, Ecosystems, Biological communities, *Bacteria, *Phytoplankton, *Zooplankton, Fish populations, Water chemistry, *Metabolism, *Nitrates, *Toxicity, *Diatoms, Populations, *Eutrophication, *Copper, Path of pollutants, Water pollution effects, *Controlled experimental ecosystems.

This paper summarizes the results of seven previous papers of the Controlled Ecosystem Pollution Experiment group. The articles documented the reactions to mercury of plankton communities maintained in 1300 m3 plastic enclosures for a period of 72 days. A summary of the effects of bacteria, phytoplankton, zooplankton, fish and water and sediment chemistry is presented. (See also W78-05144) (EIS-Deal)
W78-08960

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VII. INHIBITION OF NITROGEN ASSIMILATION AND AMMONIA REGENERATION BY PLANKTON IN SEAWATER SAMPLES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
W. G. Harrison, E. H. Renger, and R. W. Eppley.
Marine Science Communications, Vol 4, No 1, p 13-22, 1978. 3 fig, 1 tab, 14 ref.

Descriptors: *Mercury, *Toxicity, *Nitrates, *Ammonia, *Bacteria, *Phytoplankton, *Phosphates, Enzymes, Metabolism, *Absorption, *Inhibition, *Zooplankton, Biological communities, *Nitrogen, Path of pollutants, Ecosystems, *Controlled experimental ecosystems.

Additions of mercury at concentrations greater than 1 microgram/liter -1 to natural samples of coastal seawater resulted in the inhibition of nitrate and ammonia assimilation (by phytoplankton) and ammonia regeneration (by bacteria and/or microzooplankton) in short-term (24-48 hr) experiments. Phosphate uptake was similarly affected. Synthesis of nitrate reductase was stimulated by low concentrations of mercury and inhibited by higher concentrations (greater than 1 microgram/liter -1). (EIS-Deal)
W78-08961

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VI. DENITRIFICATION BY MARINE BACTERIA,
Tokyo Univ. (Japan). Ocean Research Inst.
I. Koike, A. Hattori, and J. J. Goering.
Marine Science Communications, Vol 4, No 1, p 1-12, 1978. 4 fig, 1 tab, 13 ref.

Descriptors: *Mercury, *Nitrates, *Denitrification, *Bacteria, *Radioactivity techniques, *Tracers, *Saturation, *Adaptation, *Biological communities, Path of pollutants, Ecosystems, Eutrophication, *Controlled experimental ecosystems, *Selection.

Sixty-two day effects of 5 micrograms/liter -1 mercury on denitrification by natural populations of marine bacteria in large volume (1300 m3) Controlled Experimental Ecosystems (CEES) were investigated using 15N labeled nitrate as a tracer. Denitrifying activities, i.e., N2 production, 27 days after addition of mercury were similar in bottom water and in newly formed sediments in a CEE containing 5 micrograms/liter -1 mercury (Hg CEE) and one with no mercury (Control CEE). After 62 days the denitrifying activity in Hg CEE sediments exhibited a six fold higher half saturation constant (Km) for nitrate than did the control CEE sediments. Apparently a selection for denitrifying bacteria with a high Km occurs when natural populations of marine denitrifiers are exposed to 5 micrograms/liter -1 mercury for two months.
W78-08962

STUDIES IN COPPER METABOLISM IN FISHES - III. EXISTENCE OF METALLOTHIONEIN-LIKE PROTEIN IN CARP HEPATOPANCREAS (IN JAPANESE),
Kyoto Univ. (Japan). Dept. of Fisheries.
Y. Yamamoto, T. Ishii, and S. Ikeda.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 44, No 2, p 149-153, 1978. 1 tab, 5 fig, 13 ref.

Descriptors: Biochemistry, Fish physiology, *Copper, *Carp, *Metabolism, *Zinc, *Proteins, Separation techniques, *Bioassay, Metals, Analytical techniques, Chromatography, Biological properties, Chemical properties, Freshwater fish, Environmental effects, *Copper-binding protein, Induction, Sub-lethal effects.

The present study was undertaken to determine the appearance of copper-bound metallothionein in the hepatopancreas of carp kept in an 0.1 ppm copper solution for 2 weeks. The hepatic soluble fraction from control and copper-exposed fish were gel-filtrated on a Sepahadex G-75 column, and the following results were obtained. (1) Copper as well as zinc was eluted in two fractions and most of the copper appeared in the second fraction (F-2) in the control. (2) Copper and free SH-group contents in F-2 from copper-exposed fish significantly increased as compared to those from control fish. (3) By incubation of the soluble fraction with p-chloromercuribenzoic acid it was shown that copper, zinc and free SH-groups diminished in F-2 from copper-exposed fish. (4) When the soluble fractions from control and copper-exposed fish were incubated with copper, incorporation of the additive copper into F-2 was much higher in the copper-exposed fish than the control. In addition, the zinc in F-2 was replaced by copper and the free SH-groups in this fraction disappeared. (5) The molecular weight of F-2 was estimated to be about 10,000 by gel-filtration on Sephadex G-75. These findings indicaate that, in carp hepatopancreas, copper induces the synthesis of a copper-binding protein which can be identified as a metallothionein-like protein. (EIS-Katz)
W78-08963

ECOLOGICAL STUDIES ON HYDROCARBON-OXIDIZING BACTERIA IN JAPANESE COASTAL WATERS - II. DISTRIBUTION OF HYDROCARBON-OXIDIZING BACTERIA IN THE OIL-POLLUTED AREAS CAUSED BY THE MIZUSHIMA OIL REFINERY ACCIDENT (IN JAPANESE),
Simonoseki Univ. of Fisheries (Japan).
H. Fujisawa, M. Murakami, and T. Manabe.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 44, No 2, p 91-104, 1978. 5 fig, 1 tab, 28 ref.

Descriptors: *Oil spills, *Biodegradation, *Microbial degradation, *Self-purification, Biological communities, Populations, *Marine bacteria, *Seasonal, *Water pollution effects, Oil, Sediments, Microorganisms, Water quality, Aquatic bacteria, Water pollution sources, Bottom sediments, *Straits of Bisan(Japan), *Hydrocarbon-oxidizing bacteria.

The distribution of hydrocarbon-oxidizing bacteria and heterotrophic bacteria in the Straits of Bisan were investigated for one year to assess bacteriological self-purification of the areas following a spill of 7500 to 9500 kl of a heavy oil from the Mizushima Oil Refinery. The populations of heterotrophic bacteria, hydrocarbon-oxidizing bacteria Groups A and B per ml of seawater were 10 to the 2nd power, to 10 to the 5th power, 10 to 10 to the 5th power, and 10 to 10 the 4th power, respectively, and their populations per g of bottom sediments were 10 the 4th power, to 10 the 6rth power, 10 the the 3rd power, to 10 the 6th power, and 10 to the 3rd power, to 10 to the 5th power. The population density of hydrocarbon oxidizers Group A was higher than that of Group B in both seawater and bottom sediments of surveyed areas. The ratio of the number of hydrocarbon oxidizers (Group B) in bottom sediments of the Straits of Bisan to that of heterotrophic bacteria was higher than the ratio in other areas unaffected by accidental oil spills. On the basis or these and other results, it may be said that these hydrocarbon oxidizers contribute to decomposing oil pollutants in these oil-polluted areas. (EIS-Katz)
W78-08964

COMPARATIVE ECOPHYSIOLOGY OF GAMMARIDS (CRUSTACEA: AMPHIPODA FROM MARINE, BRACKISH-AND FRESH-WATER HABITATS EXPOSED TO THE INFLUENCE OF SALINITY-TEMPERATURE COMBINATIONS. IV. BLOOD SODIUM REGULATION,
Amsterdam Univ., (Netherlands). Lab. of Aquatic Ecology.
J. Dorgelo.
Netherlands Journal of Sea Research, Vol. 11, No. 2, 1977, p 184-199, 3 fig, 2 tab, 73 ref.

Descriptors: *Environmental effects, *Salinity, *Temperature, Physiology, *Amphipoda, *Crustaceans, Ecology, Sea water, Brackish water, Freshwater, Water pollution effects.

Blood sodium regulation as a function of salinity and temperature was determined for the test species (Chaetogammarus marinus, Gammarus tigrinus, and G. fossarum) to obtain quantitative data on their regulatory characteristics in relation to the salt regime in which they occur in nature. The three species were found to be hypersomatic over the whole salinity range, tested at 5, 15, and 25C, except for G. fossarum in supranormal, potentially lethal salinities. They showed hyperregulation at homoiosmotic levels that decrease from coastal to brackish water to fresh water origin. Temperature influence on the level of regulation had no ecological implications for the populations of the three species. In its osmotic regulation G. tigrinus resembled C. marinus more than G. fossarum. Small males of C. marinus had a higher blood sodium content than larger ones. (See also W77-07397) (Chilton-ORNL)
W78-08965

MARINE DIATOMS GROWN IN CHEMOSTATS UNDER SILICATE OR AMMONIUM LIMITATION. III. CELLULAR CHEMICAL COMPOSITION AND MORPHOLOGY OF CHAETOCEROS DEBILIS, SKELETONEMA COSTATUM, AND THALASSIOSIRA GRAVIDA,
Washington Univ., Seattle. Dept. of Oceanography.
P. J. Harrison, H. L. Conway, R. W. Holmes, and C. O. Davis.
Marine Biology, Vol. 43, No. 1, 1977, p 19-31, 1 fig, 4 tab, 47 ref.

Descriptors: Environmental effects, *Nutrients, Nutrient removal, *Diatoms, Phytoplankton, *Ammonium compounds, *Silicates, Cytological studies, Plant morphology, Water pollution effects.

The test species used in this study were grown under conditions of no limitation and ammonium or silicate limitation or starvation. Distinct differences in cell morphology resulted under the different conditions. Morphological changes in starved cells were not as striking as in limited cells. In all species, cell volume was largest in non-limited cells. Cells grown under silicate starvation showed an increase in carbon, chlorophyll a, nitrogen and phosphorus and a small decrease in silica, on a per cell volume basis. Under silicate limitation the cells showed a similar pattern. Ammonium limitation resulted in a decrease in chlorophyll a, carbon and nitrogen per unit cell volume. Cells grown under ammonium starvation showed similar trends to those under ammonium limitation, except that carbon, silica, phosphorus, and nitrogen per unit cell volume were higher. (Chilton-ORNL)
W78-08967

WATER QUALITY OF THE OHIO RIVER, LOUISVILLE, KENTUCKY-EVANSVILLE, INDIANA.
National Field Investigations Center-Cincinnati, OH.
For primary bibliographic entry see Field 5B.
W78-08989

ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1976,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W78-09060

THE TOXICITY OF THE RIOT CONTROL AGENT CS (O-CHLOROBENZYLIDENE MALONONITRILE) AND ITS HYDROLYSIS PRODUCTS TO THE MUMMICHOG, FUNDULUS HETEROCLITUS (LINNAEUS),
Edgewood Arsenal, Aberdeen Proving Ground, MD. Biomedical Lab.
J. G. Pearson, and R. A. Renne.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A007 800, Price codes: A02 in paper copy, A01 in microfiche. Technical Report EB-TR-74095, July-November 1971. 25 p, 7 fig, 6 tab.

Descriptors: *Environmental effects, Aquatic environment, *Aquatic habitats, *Toxicity, Aquatic animals, Chemical properties, Chemical wastes, Runoff, Estuarine environments, Chemcontrol, O-chlorobenzylidene malononitrile, *Chemical safety investigations, O-chlorobenzaldehyde, *Malononitrile, *Mummichog, Morphological effects, Histological effects, Riot control agents, Carroll Island(MD).

The study was undertaken to determine the aquatic toxicity of CS (O-Chlorobenzylidene Malononitrile) and its hydrolysis products (o-chlorobenzaldehyde and malononitrile). CS is a riot control agent and it had been thought that its release into the environment might have deleterious effects on aquatic species. The mummichog was used as the experimental animal because it was a fish representative of the estuarine environment near Carroll Island, Edgewood Arsenal's main outdoor test facility, where the experimental testing had been done from July 1964 to December 1971. Since the water runoff from the testing areas emptied into Hawthorne Cove, the agents disseminated there were potentially harmful to the aquatic environment surrounding Carroll Island. O-Chlorobenzaldehyde was found not to be acutely toxic at 35.0 mg/l and caused no detectable behavioral, morphological or histological effects on the mummichog. The threshold LC50 (median lethal threshold concentration) for CS was 3.9 mg/l, causing external hemorrhages, secretion of copious amounts of mucus and disruption of the epithelium and gill filaments. The threshold LC50 for malononitrile was 0.7 mg/l; no histological or morphological effects were observed. Because of its toxilogical properties, contamination of aquatic environments should be minimized or eliminated during manufacturing, testing, field use or disposal of CS. The amount of CS tested on any given day at Carroll Island and the climatic conditions which prevailed at the time of testing make it highly improbable that any adverse environmental effects on the surrounding waters took place. (Zayac-NC)
W78-09063

THE CLYDE ESTUARY AND FIRTH: AN ASSESSMENT OF PRESENT KNOWLEDGE.
Natural Environment Research Council, London (England). Clyde Study Group.
For primary bibliographic entry see Field 6G.
W78-09070

PRIMARY PRODUCTIVITY OF COASTAL MARSHES IN MISSISSIPPI,
Mississippi State Univ., Mississippi State, Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W78-09079

PRODUCTIVITY RELATIONS IN A CAREX-DOMINATED ECOSYSTEM,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-09081

NITROGEN FIXATION IN A SALT MARSH,
Lancaster Univ., Bailriggs (England). Dept. of Biological Sciences.
K. Jones.
Journal of Ecology, Vol. 62, No. 2, p 553-565, July 1974. 13 tab, 24 ref.

Descriptors: *Salt marshes, *Nitrogen fixation, *Cyanophyta, *Nitrogen fixing bacteria, Nitrogen, Marshes.

The amounts of nitrogen fixed by blue-green algae and bacteria in the salt marsh are estimated using the acetylene reduction technique and the fate of this fixed nitrogen is traced by use of 15 N. The salt marsh is divided into four main zones characterized by the higher plants present. Mud samples, selected at random, were taken at monthly intervals from each of the zones of the marsh. Nitrogen fixation was found to occur in all zones of the salt marshes. Blue-green algae in pools and on the banks of creeks fix nitrogen throughout the year whenever the temperature and light intensity permit. Bare areas in the lower marsh become progressively colonized with blue-green algae during the year and maximum rates of nitrogen fixation by bacteria are found in many parts of the marsh but at levels below those for blue-green algae. Nitrogen fixation is stimulated in the rhizosphere of Puccinellia maritima. The products of bacterial and algae nitrogen fixation are rapidly utilized by higher plants in the salt marsh. (Maroncelli-Mass)
W78-09082

NITROGEN FIXATION IN FLAX POND: A LONG ISLAND SALT MARSH,
Brookhaven National Lab., Upton, NY. Dept. of Biology.
D. E. Whitney, G. M. Woodwell, and R. W. Howarth.
Limnology and Oceanography, Vol 20, No 4, p 640-643, July, 1975. 1 fig, 2 tab, 17 ref.

Descriptors: *Nitrogen fixation, *Salt marshes, Nitrogen, Cyanophyta, Marshes, Coastal marshes, *Flax pond, Long Island(New York).

Nitrogen fixation was measured by the acetylene reduction technique during summer 1973. Six areas within the marsh were selected for sampling: panne areas of the high marsh; pools of standing water on the high marsh; sediments beneath stands of Spartina alterniflora; mudflats exposed only at low tide; water from the tidal creeks and channels; and blue-green algal mats of the high marsh. Rates of fixation in the top 4 cm of all sediments ranged from 12 to about 800 micrograms N/sq. m./hour. Fixation diminished with depth with none at 20 cm or below. Blue-green algal mats fixed at rates that ranged from 260-8,900 micrograms N/sq. m/hour. No fixation was detected in the tidal water column, but rates of 8.6 - 4,800 micrograms N/liter/hour occurred in small stagnant pools on the marsh surface. Rates of fixation appeared not to vary between day and night. (Macroncelli-Mass)
W78-09085

A FOUR YEAR ANALYSIS OF VEGETATION FOLLOWING AN OIL SPILL IN A FRESHWATER MARSH,
Smith Coll., Northampton, Mass. Dept. of the Biological Sciences.
C. J. Burk.
Journal of Applied Ecology, Vol 14, No 2, p 515-522, August, 1977. 3 tab, 18 ref.

Descriptors: *Oil spills, *Vegetation, *Freshwater marshes, Effects, Marshes, Wetlands, Oil, Species diversity, Recovery, Oil pollution, *Water pollution effects.

Composition of vegetation was studied for four years following an accidental oil spillage. Total plant cover, total number of species, mean number of species per quadrat and the Shannon-Wiener function progressively reduced in both high and mid-marsh zones for two years after the spillage. Eighteen of the species found before the spill were not found the following season. Perennial species generally were less affected than annual species immediately following the spill. Some species declined in abundance the second season following the spill. Marked changes in relative abundance of the dominant species of high and mid-marsh zones occurred from year to year. The vegetation of the high and mid-marsh zones had substantially recovered by the third and fourth years. Low marsh vegetation was apparently unaffected immediately following the oil spillage but in succeeding years the species diversity declined and luxuriant growth of Elodea nuttallii, Potamogeton crispus and P. epihydrus occurred. These observations to some extend parallel those of workers in salt marshes. (Stihler-Mass)
W78-09086

ACCUMULATION OF DRY MATTER, NITROGEN AND PHOSPHORUS BY CULTIVATED WATER, HYACINTHS,
Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 5G.
W78-09089

MAN'S INFLUENCE ON THE DEVELOPMENT OF THE ESTUARINE MARSH, FLAX POND, LOND ISLAND, NEW YORK,
New York Univ., NY. Dept. of Biology.
For primary bibliographic entry see Field 6G.
W78-09091

PRODUCTION AND DYNAMICS OF SALT MARSH VEGETATION AND THE EFFECTS OF EXPERIMENTAL TREATMENT WITH SEWAGE SLUDGE: BIOMASS, PRODUCTION, AND SPECIES COMPOSITION,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
I. Valiela, J. M. Teal, and W. J. Sass.
Journal of Applied Ecology, Vol. 12, No. 3, p 973-981, December, 1975. 4 fig, 1 tab, 32 ref.

escriptors: *Salt marshes, *Productivity, Primary productivity, *Sewage sludge, Rooted uatic plants, Wetlands, Plant morphology, itrogen, Ferilization, Standing crops.

ertilization with a 10-6-4 sewage sludge fertilizer creased total peak standing crops of salt marsh getation in spite of the presence of considerable nounts of heavy metals and chlorinated drocarbons in the sludge. Standing crop increases were detected in the second year of treatent and remained for three years of treatement. partina alterniflora, the dominant species in low arsh areas, progressively excluded Salicornia p. from fertilized plots after an initial increase of licornia. In high marsh areas, fertilization inially increased the standing crop of Distichlis icata but this was later replaced by Spartina tens. S. alterniflora did not respond to fertilizaon in the high marsh. The amount of dead matter as highest in the fall and decreased slowly to a w point in midsummer. Productions achieved by e most heavily fertilized plots are among the ghest recorded for marsh plants. Results suggest at dwarf and tall forms of S. alterniflora are a sponse to nitrogen supply. (Stihler-Mass)
/78-09099

ECOMPOSITION OF SALT MARSH GRASS, PARTINA ALTERNIFLORA LOISEL,
ouisiana State Univ., Baton Rouge. Dept. of Marine Science.
or primary bibliographic entry see Field 2I.
/78-09102

ROPHIC RELATIONSHIPS IN A SEAGRASS OMMUNITY (THALASSIA TESTUDINUM), IN ARD SOUND, FLORIDA. FISH DIETS IN ELATION TO MACROBENTHIC AND CRYPIC FAUNAL ABUNDANCE,
osenstiel School of Marine and Atmospheric cience, Miami, FL.
or primary bibliographic entry see Field 2I.
/78-09103

OASTAL MARSH PRODUCTIVITY: A IBLIOGRAPHY.
Gulf South Research Inst. Baton Rouge, LA.
ish and Wildlife Service, Biological Services Program, FWS/OBS-77/3, October, 1977, 300 p.

Descriptors: *Bibliographies, *Coastal marshes, Productivity, Marshes, Wetlands, Primary roductivity, Aquatic plants, Swamps, Food hains, Detritus, Decomposing organic matter, Vildlife, Fish, Mammals, Birds, Reptiles, Inverebrates, Estuaries.

The bibliography consists of five major sections: Marshes and Marsh Vegetation; Primary Productivity of Marsh Plants; Detritus in the Food Chain; Marsh Estuaries as Fish Havens; and Marshes as Habitat and Feeding Grounds for Wildlife. Each of he major sections is divided into subsections. Each of the 401 entries includes an abstract and a st of keywords. Also included are author, scientific name, and keyword indices. (Stihler-Mass)
V78-09108

PRELIMINARY STUDIES ON CHITIN DECOMPOSITION IN LAKE ERIE SEDIMENTS,
Ohio State Univ., Columbus. Dept. of Microbiology.
C. E. Warnes, and C. I. Randles.
Ohio Journal of Science, Vol. 77, No. 5, p 224-230, 977. 5 fig, 17 ref.

Descriptors: *Lake sediments, *Lake Erie, Sediments, *Chitin, Degradation(Decomposition), *Bacteria, Cycling nutrients, Great Lakes, Sediment-water nterfaces, Microorganisms, Aerobic conditions, Anaerobic conditions, Ammonia, Ecosystems, Heterotrophy, Lakes, Nitrogen, Carbon, Nutrients, Succession.

In an October 1973 study, about 10% of heterotrophic bacteria found in sediments from the western basin of Lake Erie were able to decompose chitin. Chitin decomposition is important in the aquatic ecosystem because of the large quantity present and its relatively high nitrogen content. Release from the chitin of organically-bound nitrogen, as well as carbon, is a significant factor in carbon and nitrogen cycling in the ecosystem, and bacterial activity is the primary means of chitin decomposition. Sediment core samples were collected in 6.1 m of water 30 mi north of Rattlesnake Island. Slides coated with chitin purchased from a supply house were buried in mud dredged from the same collection site. Enumeration studies of sediment indicated the presence of about one million heterotrophic bacteria/ml, of which 10% displayed chitinolytic ability. The chitin-coated slides immersed in a mud jar gave preliminary evidence of a succession of microorganisms active in chitin degradation in both the aerobic (cocci to curved rods) and anaerobic (vibrioids to spiral and vibrioids forms) zones of the sediment column. Enrichment studies of frozen core sections showed potential activity of microorganisms in the sediments to degrade chitin with ammonia release. Tests for release of the subunit of chitin, N-acetylglucosamine, from enriched sediments were not successful. (Lynch-Wisconsin)
W78-09152

1977 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
Ministry of Agriculture, Atrim (Northern Ireland). Freshwater Biological Investigation Unit.
Annual Report Research and Technical Work 1977, Department of Agriculture for Northern Ireland, Freshwater Biological Investigation Unit. 21 p, 13 fig, 3 tab.

Descriptors: *Northern Ireland, *Lough Neagh(Northern Ireland), *Eutrophication, *Phosphorus, *Limiting factors, *Phytoplankton, Zooplankton, Lakes, Algae, Fertilizers, Nitrates, Lough Erne(Northern Ireland), Antrim Bay(Northern Ireland), Orthophosphorus, Cyanophyta, Light, Darkness, Nutrients.

Research conducted in 1977 by the Freshwater Biological Investigation Unit of the Department of Agriculture, Northern Ireland, shows that in Lough Neagh a decline in phosphorus content of the algae is the only reliable index of phosphorus limitation. Observations of changes in soluble phosphorus fractions in the water column did not produce a good index. Established in 1968 to study causes of algal blooms in Lough Neagh, the unit has widened its scope to other water bodies in Northern Ireland with similar problems. Sampling of Lough Erne and its inflowing rivers was completed in 1976, but data is still being evaluated; export of soluble phosphorus fractions from different catchments correlates well with human population densities, a result also found in the Lough Neagh system. Algal distribution was mapped using a flow-through fluorometer system for measuring chlorophyll-a. Water depth appears to have a predominant influence on algal density. In Lough Neagh phosphorus loading consists of about 50% soluble orthophosphorus, 20% soluble organic phosphorus, and 30% particulate phosphorus. Bioassays show that only a small fraction of soluble organic phosphorus is available for organic growth, and the particulate fraction may be unimportant as a nutrient; soluble orthophosphorus is the important available phosphorus fraction for algal growth. (Lynch-Wisconsin)
W78-09153

AQUATIC PLANTS: MANAGEMENT AND CONTROL,
Pennsylvania State Univ., University Park. Agricultural Extension Service.
R. G. Wingard, T. D. Rader, W. K. Hock, and R. B. Hesser.
Natural Resource Series, Special Circular 222. 18 p. (1977).

Descriptors: *Aquatic weed control, *Chemcontrol, *Mechanical control, *Environmental control, *Herbicides, *Aquatic plants, Submerged plants, Algae, Phytoplankton, Food chains, Fishkill, Oxygen depletion, Fertilization, Pennsylvania, Management, Water management(Applied), Plant growth.

A description of methods for management and control of aquatic plants, especially in Pennsylvania, supplemented by an illustrated catalog of 31 problem plants. An insert entitled 'Aquatic Plant Herbicides' reproduces the plant illustrations and lists effective herbicides. The booklet discusses: growth of algae and flowering aquatic plants (submergents, emergents, and floaters); the role of plants in energy, the food chain, animal habitats, filling of ponds and lakes, and oxygen depletion. Control methods include mechanical, environmental, and chemical means. Physical removal is most effective for small quantities of plants near shorelines, and consists of cutting, mowing, raking, digging, or pulling. The treatment must usually be repeated. Thin sheets of black plastic help discourage plant growth in small ponds and around boat docks. An environmental method, which offers the most permanent weed control, involves deepening the lake or pond to over 10 feet; sunlight seldom penetrates sufficiently to this depth for plant growth. Drawdown can be effective but the danger of oxygen depletion increases when fish and organic debris are concentrated in a smaller volume of water. Fertilization may stimulate the growth of plankton, thus restricting light penetration and inhibiting photosynthesis, but fertilization may increase rather than reduce the weed problem. Herbicide dosage and application are discussed. (Lynch-Wisconsin)
W78-09154

DISTRIBUTION AND BIOTIC EFFECTS OF NUTRIENTS IN FLATHEAD LAKE, MONTANA,
Montana Univ., Flathead Lake. Biological Station.
A. R. Gaufin, J. A. Stanford, and J. F. Tibbs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 271, Price codes: A05 in paper copy, A01 in microfiche. January 1975. 96 p, 13 fig, 8 tab, 41 ref, 2 append.

Descriptors: *Flathead Lake(MT), *Phosphorus, *Phytoplankton, *Nutrients, *Metabolism, *Eutrophication, *Baseline studies, Nitrogen, Trophic level, Oligotrophy, Algae, Rivers, Watersheds(Basins), Lakes, Water pollution effects, Bioassay, Light penetration, Suspended solids, Primary productivity, Circulation, Limiting factors, Turbidity.

The absence of algal blooms in Flathead Lake, Montana, despite high inputs of phosphorus, seems due to high iron concentration, constantly oxygenated water, and high levels of suspended sediment. These three factors may cause phosphorus to be removed from the photic zone, and suspended sediment in addition decreases light penetration and may even precipitate algae. Phosphorus concentrations in water of the apparently oligotrophic lake were only about 10% of previously reported levels, but sensitivity limits (0.01 mg P/l) were not low enough for accurate determination. Inputs of phosphorus were 1400 lbs/day from the Flathead River and 100 lbs/day from the Swan River. Low phosphorus concentrations in the lake water controlled phytoplankton production, but nitrogen levels did not affect it. This baseline study was undertaken to describe seasonal dynamics of various physical and chemical parameters influencing plankton community metabolism, and to compare results with earlier data on nutrient-loading trends. Flathead Lake is located in northwestern Montana in the upper Flathead River drainage. Its eastern half averages about twice the depth of the western half; max-

imum depth is 110 m, while mean depth is 14 m. Physical parameters evaluated included light, turbidity, circulation, and temperature. Intensive exploitation of the lakeshore for land development has caused concern for water quality. (Lynch-Wisconsin)
W78-09155

PHOSPHORUS FERTILIZATION OF FISH-PONDS IN THE UPPER GALILEE,
Mekorot Water Co., Tiberias (Israel). Lake Kinneret Watershed Lab.
Y. Eren, T. Tsur, and Y. Avnimelech.
Bamidgeh, Bulletin of Fish Culture in Israel, Vol. 29, No. 3, p 87-93, September 1977. 4 fig, 4 tab, 5 ref.

Descriptors: *Galilee(Israel), *Phosphorus, *Ponds, *Fish farming, *Aquiculture, Eutrophication, Nutrients, Lake Kinneret(Israel), Lakes, Microcystis, Algae, Cycling nutrients, Chlorophyll, Cyanophyta, Phosphates, Superphosphate, Sediments, Nutrient flux, *Fertilization.

Fertilizing fish-farming ponds in upper Galilee (Israel) with superphosphate, and supplying additional phosphorus in feed, results in an oversupply of phosphorus which contaminates Lake Kinneret upon drainage of the ponds. Pond no. 6 with an area of five ha and an average depth of one m, was sampled May-December 1973. Inorganic phosphorus in the form of superphosphate was added weekly at 30 kg P/ha. Phosphorus equilibrium in the sediment-water system was studied in adjacent pond no. 2, which was drained and filled with fresh spring water. The constant level of soluble inorganic phosphorus even during peak algal bloom (July-September) indicates that algae have a steady supply of available phosphorus. Pond no. 2 contained the same algal population as pond no. 6, primarily cyanophytes of the genus Microcystis. Phosphorus concentration in algae demonstrates that the algae are growing in a non-phosphorus-limiting medium. It is recommended that fertilization be stopped in ponds in which adequate amounts of phosphorus have accumulated at the bottom. After fertilization of pond no. 6 the increase in soluble phosphorus was only about 10% of the phosphorus applied; the rest precipitated and settled to the bottom. Pond water attained equilibrium with sediment at soluble inorganic phosphorus levels of about 100 g/l. When water is deficient in phosphorus, the latter is released from the bottom until equilibrium is achieved. (Lynch-Wisconsin)
W78-09156

OBSERVATIONS ON THE USE OF ORGANIC FERTILIZERS IN INTENSIVE FISH FARMING AT THE GINOSAR STATION IN 1976,
Intensive Fish Culture Station Ginosar (Israel).
U. Rappaport, S. Sarig, and Y. Bejerano.
Bamidgeh, Bulletin of Fish Culture in Israel, Vol. 29, No. 2, p 57-70, June 1977. 1 fig, 7 ref.

Descriptors: *Fish farming, *Fertilizers, *Chicken droppings, *Manure, *Ginosar(Israel), Carp, Tilapia, Fertilization, Livestock wastes, Seasonal, Feeds, Superphosphate, Phytoplankton, Algae, Zooplankton.

Tests of four types of fertilizers in 0.02 ha fish farming ponds in Ginosar, Israel stocked with monocultures of carp and tilapia showed that a solution of chicken droppings at 5 kg dry matter/ha/day was the most effective in increasing yield (24%), lowering the feed conversion ratio (0.8 units), and reducing feed and fertilizer cost per kg fish (52%). Other organic fertilizers tested in the ponds were liquid cattle manure and corral cattle manure (same application rate as chicken droppings), and a chemical fertilizer containing a daily application of 300 g superphosphate and 400 g ammonium sulfate per pond (five days per week). Corral manure reduced yield by 3%. The experiments were carried out over three seasons with carp, and two seasons with tilapia. During the first season, with fish density at 45,000 fish/ha, fertilizers had little effect as fish growth was low; during subsequent seasons fish density was reduced to 20,000/ha. Tilapia were tested only with chicken droppings and liquid cattle manure. Fertilizer addition was effective in summer, less so in fall, and had no effect in spring when the ponds contain ample supplies of natural feed. Prior to the pond experiments, preliminary observations were made with tanks free of fish to study properties of the fertilizers and their effect on the oxygen regime and development of fish feed animals. Phytoplankton and zooplankton samples were also taken during the pond tests. (Lynch-Wisconsin)
W78-09157

OBSERVATIONS OF ALGAL ZONATION RESULTING FROM COMPETITION,
Washington Univ., Seattle. Dept. of Oceanography.
T. Hruby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 568, Price codes: A02 in paper copy, A01 in microfiche. Estuarine and Coastal Marine Science, Vol. 4, p 231-233, 1976. 1 tab, 8 ref.

Descriptors: *Idiadaea cordata, *Laminaria saccharina, *Distribution patterns, *Competition, *Pacific Northwest U.S., *Coasts, San Juan Island(WA), Algae, Phaeophyta, Rhodophyta, Zonation, Estuaries, Kelps, Spores, Aquiculture, Light.

The red alga Idiadaea cordata was excluded from areas below its normal distribution by competition with more rapidly growning kelps, especially Laminaria saccharina, in experiments conducted in Washington coastal waters. In areas cleared of kelps, I. cordata grew to cover 20% of the bottom from natural spores settlement. In protected coastal waters of Washington and British Columbia (Canada) beds of economically important I. cordata are not found lower than 1.0-1.5 m below Mean Lower Low Water (MLLW), though transplants are known to grow to five m below MLLW, with optimal growth at three m. In this study a square plot of about three sq m on the north side of Turn Point, San Juan Island, San Juan Archipelago, Washington was cleared of foliose brown algae (Phaeophyta) in April 1973, and weeded monthly. The plot, 1.3-1.5 m below MLLW, was in the previous year in the middle of an extensive L. saccharina bed; the I. cordata boundary was one m below MLLW. The five weeded 0.25-sq m quadrats in the plot showed a statistically significant ($P < or = 0.05$ for May, June, and September) increase in I. cordata growth compared with controls. Competition for light appeared to be the mechanism for competitive exclusion, as the larger kelps shaded I. cordata. Other species found in the weeded plot but not in controls included Polyneura latissima, Neoagardhiella baileyi, Rhodymenia palmata, and Desmarestia sp. (Lynch-Wisconsin)
W78-09159

LACK OF CORRELATION BETWEEN THE COMPOSITION OF SEDIMENTS AND THEIR TOXICITY TO ALGAE,
Naval Research Lab., Washington, DC. Ocean Sciences Div.
For primary bibliographic entry see Field 5A.
W78-09160

PREIMPOUNDMENT AND IMMEDIATE POST IMPOUNDMENT ADENOSINE TRIPHOSPHATE CONCENTRATIONS IN SOUTHERN INDIAN LAKE: 1975, 1976,
Fisheries and Marine Servie, Winnipeg (Manitoba).
For primary bibliographic entry see Field 5A.
W78-09161

PHYTOPLANKTON GROWTH AND CHLOROPHYLL LEVELS IN THE SACRAMENTO - SAN JOAQUIN DELTA THROUGH SAN PABLO BAY,
Bureau of Reclamation, Sacramento, CA. Mid-Pacific Region.
M. D. Ball.
U.S. Department of Interior, Bureau of Reclamation, May 1977. 96 p, 33 fig, 7 tab, 27 ref.

Descriptors: *Phytoplankton, *Chlorophyll, *San Pablo Bay(CA), *Sacramento-San Joaquin Delta(CA), *Diatoms, *San Francisco Bay, *Eutrophication, Suisun Bay(CA), Suisun Marsh(CA), Algae, Bays, Deltas, Rivers, Chlorophyta, Sacramento River(CA), San Joaquin River(CA), Seasonal, Waste water disposal, Nutrients, Water pollution effects.

Data on phytoplankton standing crop as measured by chlorophyll-a, collected between 1969-74 in the Sacramento-San Joaquin Delta, Suisun Marsh, Suisun Bay, and San Pablo Bay (California), are summarized and evaluated. Samples were collected at high slack tides three ft below surface with submersible pumps or Van Dorn samplers. Dominant phytoplankters throughout the delta and into San Pablo Bay were diatoms; green algae seldon exceeded 20% of the total. Planktonic chlorophyll-a concentrations in the Sacramento River, the major water source to the delta, were generally under six micrograms/l. During spring, summer, and fall the shallow San Joaquin River contained a very high percentage of wastewater; peak summer chlorophyll concentrations were 100-250 micrograms/l, inversely related to river-flow. Most of this highly productive water was drawn to the export pumps during the summer. In the eastern delts sloughs and channels, chlorophyll levels were often quite high and varied erratically. Spring blooms of 30-40 micrograms/l and summer blooms of 40-100 micrograms/l were observed in the Suisun Bay area. Chlorophyll-a concentrations in Suisan Marsh generally peaked in late spring at the 40-100 micrograms/l range. In the channel through San Pablo Bay chlorophyll levels seldom exceeded six micrograms/l. Of total chlorophyll-a plus pheo-pigments, chlorophyll-a near the water surface amounted to 50-80% during spring-fall throughout the study area. (Lynch-Wisconsin)
W78-09163

INORGANIC PHOSPHORUS FRACTIONATIONS IN BLACKSTRAP LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
C. P. Hwang.
Water Research, Vol. 11, No. 10, p 945-946, 1977. 1 fig, 7 ref.

Descriptors: *Lake sediments, *Blackstrap Lake(Saskatchewan Canada), *Phosphorus, *Inorganic compounds, *Sediments, *Particle size, Canada, Saskatchewan(Canada), Reservoirs, Water supply, Nutrients, Hydrogen ion concentration, Aluminum, Iron, Calcium.

Inorganic phosphorus fractions (aluminum-phosphorus, iron-phosphorus, calcium-phosphorus) and their distribution characteristics in various fractions of the sediments of Blackstrap Lake (Saskatchewan, Canada) were determined. The lake is the largest reservoir in the Saskatoon Southeast water supply system. Results show the inorganic fraction is not only in colloidal < 2 micrometer fractions, but also in coarse > 50 micrometer fractions. Sediments were collected with an Ekman dredge in July 1972 at six locations. Samples were mixed to make composite, dispersed in distilled water, and separated into $>$ 50, 50-20, 20-5, 5-2, 2-0.2, and < 0.2 micrometer fractions. The percentage of different size fractions were 27.4, 31.3, 11.3, 3.2, 12.4, and 14.4 respectively. Al-P, Fe-P, and Ca-P of various size fraction sediments were then fractionated. The Ca-P combination was the principle factor in the control of inorganic phosphorus in the sediments.

Enrichment of Ca-P, Fe-P, and Al-P occurred mostly in the sand (> 50 micrometer) fractions and clay (2-0.2 and < 0.2 micrometer) fractions. Calculation of the sum of the Al-P, Ca-P, and Fe-P fractionations in various sized fractions yielded 67.6%, 73.6%, and 136.5% respectively. The pH of the sediments was about 7.3. (Lynch-Wisconsin)
W78-09164

EFFECTS OF SOME UNICELLULAR ALGAE ON ESCHERICHIA COLI POPULATIONS IN SEA WATER AND OYSTERS,
Tasmania Univ., Hobart (Australia). Faculty of Agricultural Science.
R. K. Brown, T. A. McMeekin, and C. Balis.
Journal of Applied Bacteriology, Vol 43, No 1, p 129-136, August 1977. 4 fig, 3 tab, 10 ref.

Descriptors: *Dimethyl-beta-propiothetin, *Acrylic acid, *Phaeodactylum tricornutum, *Oysters, *Sea water, *E. coli, *Coliforms, *Public health, Algae, Pavlova lutheri, Australia, Tasmania(Australia), Filter feeders, Crassostrea gigas, Water pollution effects, Water pollution control, Toxins, Nutrients, Microorganisms.

Acrylic acid, liberated on the death of such unicellular algae as Phaeodactylum tricornutum containing dimethyl-beta-propiothetin (DMPT), exhibited anticoliform activity in tests with seawater and oysters. The alga caused a rapid decline of Escherichia coli populations in seawater in dialysis tube experiments, and when fed to stored oysters caused a lower but consistent decline of E. coli. Another alga, Pavlova lutheri, which does not contain DMPT, was ineffective against E. coli. Oysters are usually cultured commercially in estuarine waters often contaminated by sewage and industrial wastes. The filter-feeding oysters concentrate microorganisms from the surrounding waters, including Salmonella, Shigella, enteropathogenic E. coli, and enteric viruses. As oysters are often eaten raw, a health hazard may occur. Dimethyl sulfide and acrylic acid are liberated by cleavage of DMPT on death of algal cells, and acrylic acid will therefore be present when dimethyl sulfide and DMPT are detected together. E. coli strain M13 was used as the test organism. Pacific oysters, Crassostrea gigas, grown in southern Tasmania (Australia) in waters free of serious heavy metal contamination, were used in all experiments. E. coli survival was tested in oyster culture seawater, algal cultures and filtrates, acrylic acid solutions, and in oysters. (Lynhc-Wisconsin)
W78-09165

ANALYSIS OF LASER FLUOROSENSOR SYSTEMS FOR REMOTE ALGAE DETECTION AND QUALIFICATION,
National Aeronautics and Space Asministration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-09166

DETERMINATION OF THE RATE AND EFFICIENCY OF NITROGEN TRANSFER FROM PHYTOPLANKTON TO ZOOPLANKTON USING NITROGEN-15 AS A TRACER,
Columbia Univ., New York. Teachers Coll.
V. M. Harris.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-3222-04, Price codes: A02 in paper copy, A01 in microfiche. Report COO-3222-04, February 1976. 55 p, 5 fig, 16 tab, 13 ref, 1 append. Atomic Energy Commission E (11-1)3222.

Descriptors: *Nitrogen cycle, *Phytoplankton, *Zooplankton, *Tracers, *Trophic level, Efficiency, Nutrient flux, Age, Primary productivity, Nitrogen fixation, Nitrogen, Chlorophyll, Radioisotopes, New York, Coasts.

Rate and efficiency of assimilated nitrogen transfer from the first trophic level, or producer (phytoplankton), to the second, or primary consumer (zooplankton) in the natural marine environment was traced with nitrogen-15-labelled phytoplankton. A one-cu m Polytank was used to contain the community. Zooplankton were collected using a dipping barrel on the Continental Shelf 30 mi east of Ambrose Light, New York in 1972-73. Assimilated transfer rates were 0.334 (December 1972), 1.792 (April 1973), and 0.261 (September 1973) gram-atoms of phytoplankton nitrogen per gram-atom of zooplankton nitrogen per day. The variability of rates seems related to the age frequency distribution of the zooplankton population. The first and third collections were made when the zooplankton populations probably consisted mostly of adults in a metabolic state of balance, while the April collection was made when the population probably contained many juveniles which would incorporate greater quantities of nitrogen than adults. Assimilation efficiencies ranged from 25.4-66.1%. The range agrees with rates reported in the literature. Calculation of assimilation efficiency for the second experiment was based on direct measurements of phytoplankton nitrogen content using Kjeldahl analysis, and the figure of 66.1% is therefore considered the most accurate. (Lynch-Wisconsin)
W78-09167

DIFFERENCES IN CARRAGEENAN IN GAMETOPHYTES AND TETRASPOROPHYTES OF RED ALGAE,
Washington Univ., Seattle. Div. of Marine Resources.
R. J. Waaland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 015, Price codes: A02 in paper copy, A01 in microfiche. Phytochemistry, Vol 14, p 1359-1362, 1975. 4 tab, 15 ref.

Descriptors: *Carrageenan, *Gametophytes, *Tetrasporophytes, *Rhodophyta, *Iridaea cordata, *Food processing industry, Algae, *Washington, Pacific Ocean, Oceans, Aquiculture, Cytological studies, Iridaea heterocarpa, Iridaea lineare, Iridaea cornucopiae, Gigartina exasperata, Gigartina papillata.

Carrageenan yield in six species of marine red algae (rhodophytes) collected off the coast of Washington ranged from 52-66%; carrageenan in gametophytes was 93% kappa-carrageenan and in tetrasporophytes was 95% lambda-carrageenan. Carrageenan, commercially valuable in the food processing industry, has usually (in Gigartinales) been fractionated into a potassium chloride-insoluble fraction with high gel strength and low viscosity (kapp-carrageenan) and a KCl-soluble fraction with low gel strength and high viscosity (lambda-carrageenan). Species examined were Iridaea cordata, I. heterocarpa, I. lineare, I. cornucopiae, Gigartina exasperata, and G. papillata. In all species carrageenan accounted for over 50% of plant dry matter; I. cordata averaged 61% of dry weight, while all others together averaged 55%. In I. cordata and I. heterocarpa the gametophytes are known to be haploid and the tetrasporophytes to be diploid; these are the only species for which cytological observations of ploidy levels are available. Except for G. papillata, all species in this study have isomorphic gametophytic and tetrasporophytic phases. That kappa-carrageenan is characteristic of gametophytes (haploids) and lambda-carrageenan of tetrasporophytes (diploids) offers a relatively simple and reliable means of assessing gametophyte/sporophyte ratios and ploidy levels of populations of carrageenan-producing algae. (Lynch-Wisconsin)
W78-09168

PHYTOPLANKTON SPECIES, BIOMASS, AND DIVERSITY IN LAKE LA CALDERA (SIERRA NEVADA, GRANADA, SPAIN),
Granada Univ. (Spain). Dept. of Ecology.
R. Martinez.
Acta Hydrobiologica, Vol 19, No 2, p 95-107, 1977. 8 fig, 3 tab, 16 ref.

Descriptors: *Lake La Caldera(Spain), *Phytoplankton, *Mountains, *Chrysophyta, *Species diversity, *Species composition, Biomass, Lakes, Diversity indices, Sierra Nevada(Spain), Penibetic Mountains(Spain), Basic data collections, Algae, Chromulina microplancton, Alpine, Cyanarcus hamiformis, Floral lists.

Phytoplankton of the high mountain lake, La Caldera, in the Sierra Nevada (Penibetic Mountains, Granada, Spain) were dominated by Chrysophyta, mainly chrysomonads of the genus Chromulina. Diatoms, poorly represented, were found mostly in bottom or littoral communities. Unusual was the presence in important numbers of the cyanophyte Cyanarcus hamiformis (now Gomontiella hamiformis). Cell number, biomass, and Shannon's diversity index were similar to other alpine ecosystems. Lake La Caldera is situated 3050 m above sea level on metamorphic rocks of siliceous origin. This is the first study of phytoplankton in a lake of the Penibetic Mountains, one of the two highest mountain systems in Spain. Sampling was carried out during the ice-free period June-September 1973. Twenty-three species were found, mainly in the nannoplankton and micro-algae range. Larger algae found in the littoral included the desmids Euastrum and Cosmarium, naviculaceae diatoms, and some zygnemales. Highest biomass of the dominant Chrysophyceae was found at the end of July near the bottom; Chromulina microplancton reached 2747 cells/ml at 8 m on 26 July. Chrysophyta are usually found in more acid waters; the pH of Lake La Caldera was 7.2-7.5 during the summer. By the end of the study period C. hamiformis was dominant, with the highest concentration on 12 September at a depth of 1 m (932 cells/ml). Maximum diversity was 2.9 bits/cell (21 August), and the minimum was about 1 bit/cell in July. (Lynch-Wisconsin)
W78-09169

AN INVESTIGATION ON THE MACROFAUNA OF THE RIVER WARTA WITHIN THE CITY OF POZAN,
Polish Academy of Sciences, Poznan. Zaklad Biologii Rolnej.
E. Biesiadka, and K. Kasprzak.
Acta Hydrobiologica, Vol 19, No 2, p 109-122, 1977. 2 fig, 2 tab, 22 ref.

Descriptors: *Warta River(Poland), *Macrofauna, *Poznan(Poland), *Oligochaetes, *Water pollution effects, Sewage disposal, Industrial wastes, Species composition, Species diversity, Faunal lists, Hirudinea, Turbellaria, Mollusks, Crustaceans, Ephemeroptera, Heteroptera, Trichoptera, Coleoptera, Chironomidae.

Although water quality of the River Warta in Poznan, Poland, has been severely degraded by sewage and industrial pollution, no extreme qualitative impoverishment of the macrofauna has resulted. The number of species and abundance has decreased, however, especially in Chironomidae, Ephemeroptera, Trichoptera, Coleoptera, Heteroptera, and Crustacea. Eurytopic species are dominant, and increasing pollution has produced an increase in species and numbers of Oligochaeta. A study in 1974-75 at three stations indicates great adaptive ability of many of the fauna. Of left bank sewage (60% industrial), only about 50,000 cu meters/day is purified before discharge into the river, while about 100,000 cu m/day enter the river without purification. Of 3062 specimens collected, 1750 were identified among 87 species. Oligochaeta dominated quantitatively (31.4%), followed by Chironomidae (19.6%), Mollusca (14.5%), and Hirudinea (12.5%). Chironomids had the greatest number of species, followed by Oligochaeta and Mollusca. Greatest numbers of specimens were collected upstream at

least-polluted Station One; fauna decreased markedly at the other two stations. Nineteen species of Oligochaeta were found at the most polluted station Three, and 16 at Station One. Lowest number of specimens and species were found at Station Two, due to concrete bank reinforcements which destroyed many littoral environments. (Lynch-Wisconsin)
W78-09170

PERIPHYTON OF THE RIVER VISTULA IN THE REGION OF HEATED WATER DISCHARGED FROM THE POWER PLANT AT SKAWINA,
Institute of Meteorology and Water Management, Krakow (Poland).
J. Pudo.
Acta Hydrobiologica, Vol 19, No 2, p 123-144, 1977. 6 fig, 3 tab, 57 ref.

Descriptors: *Periphyton, *Powerplants, *Thermal pollution, *Water pollution effects, *Vistula River(Poland), Skawina(Poland), Rivers, Algae, *Skawinka River(Poland), Heated water, Cooling water, Floral lists, Dissolved oxygen, Water temperature, Eutrophication.

Inflow of heated water to the Vistula and Skawinka Rivers from the Skawina, Poland, power plant caused no periphyton species to be eliminated, but resulted in inhibition or intensification of the growth of several species. Results of the investigation indicate that, in general, an artificial increase in temperature in unpolluted waters stimulates algal development, while in polluted waters such as the upper Vistula specific species are affected selectively. Water temperature in the Vistula below the plant was 6-7.5 C higher than above the plant. Dissolved oxygen at the maximum water temperature (32C) did not fall below 2 mg/l. Species which decreased in abundance due to the thermal increase were Sphaerotilus natans, Diatoma elongatum var. tenue, and Surirella ovata. Those increasing in numbers were Siderocapsa maior, Lagynion subglobosum, Navicula nutica, and N. viridula var. avenacea. Upper Vistula water quality undergoes progressive deterioration due to industrial waste discharges; water quality undergoes progressive deterioration due to industrial waste discharges; this study deals with a polluted 17-km stretch of the river. Seven stations were sampled June 1964 to June 1965. In the study area 224 taxa were identified; diatoms were most numerous with 198 taxa (88.3%), followed by Chlorophyceae (5.9%), Bacteriophyta (2.1%), Cyanophyceae (2.1%), Euglenophyceae (1.2%), and Chrysophyceae (0.4%). Twenty-nine genera of diatoms were identified. (Lynch-Wisconsin)
W78-09171

FURTHER STUDIES UPON HOLOCENE HISTORY OF LAKE JEZIORAK, PART II. COMPARISON OF THE HISTORY OF PARTICULAR BASINS,
Nicolas Copernicus Univ. of Torun (Poland). Dept. of Hydrobiology.
J. S. Mikulski.
Acta Universitatis Nicolai Copenici, Limnological Papers, No 10, p 107-118, 1977. 5 fig, 15 ref.

Descriptors: *Lake Jeziorak(Poland), *Holocene, *Paleolimnology, *Cladocera, *Geologic history, *Basins, *Eutrophication, Lakes, History, Geologic time, Sediments, Biocenosis, Palynology, Zooplankton.

The Holocene history of the various basins of eutrophic Lake Jeziorak, Poland was studied, using in particular remnants of ecological groups of Cladocera found in lake sediments. An attempt was made to trace the sequence of basin formation, as well as biocenotic evolution. Moty Bay behaved during the entire period as a typical, average-sized lake; emergent, reed-type macrophytes were dominant, as evidenced by the preponderance of Cladocera of Group 1, associated with reed-belt periphyton. During the time that Moty Bay was connected with the main channel area, the number of pelagic species dropped significantly, suggesting extensive exchange of water masses. Very thick sediments in the channel appear to have resulted from the inflow of allochthonous matter. A core sample for the northern section of the lake revealed many remains of cladocerans associated with sandy and muddy bottoms. Again during connection with the channel reductions in numbers of pelagic species occurred, but they never disappeared as happened in Moty Bay. Differentiation of the littoral of Moty Bay was very stable. The channel differentiated mostly after Connection I with the northern complex. The northern section was most differentiated during Separation Periods I and II, with considerable mud formation. (Lynch-Wisconsin)
W78-09172

THE INTENSITY OF MULTIPLICATION OF BACTERIA AND BIOMASS PRODUCTION IN THE WATER OF TWO LAKES,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
W. Donderski.
Acta Universitatis Nicolai Copernici, Limnological Papers, No 10, p 3-14, 1977. 3 fig, 2 tab, 34 ref.

Descriptors: *Lake Goplo(Poland), *Lake Jasne(Poland), *Eutrophication, *Mesotrophy, *Bacteria, Biomass, Generation time, Trophic level, Species composition, Seasonal, Cocci, Lakes, Primary productivity.

Bacterial number, generation time, and biomass production were studied in eutrophic Lake Goplo and mesotrophic Lake Jasne, Poland during 1972-73. Greatest numbers in Lake Goplo were found in summer, and in Lake Jasne in spring and autumn. Generation time in Lake Goplo in 1972 was shortest in July (4.2 hrs) and longest in March (51.7 hrs). In 1973 the shortest time was in May (3.6 hrs) and longest in July (23.9 hrs). Bacterial biomass was greatest in Lake Goplo in summer (7.82 mg/l) and least in autumn (0.055 mg/l). Cocci produced the largest biomass (6.29 mg/l) and bacilli the smallest (0.001 mg/l); biomass produced by rods ranged from 0.006-1.18 mg/l. In the Lake Jasne littoral, maximum biomass was in summer (0.54 mg/l) and minimum in spring (0.108 mg/l), while in pelagic water the maximum was in autumn (0.756 mg/l at 3-m depth and 0.708 mg/l at 9 m), and minimum in summer at depths of 3 and 12 m. In Lake Goplo dominant bacteria were cocci (68-98%), followed by rods (27% in spring, 0.8% in autumn); bacilli did not exceed 5%. Lake Jasne bacteria were dominated by nonsporulating rods (59-88%); cocci were most numerous in spring (40%). Bacilli again were the least numerous group (about 4%). These results agree in large part with previous studies. Lake Goplo, with a maximum depth of 16.6 m and a mean depth of 3.6 m, is located in northwestern Poland. Lake Jasne, in the Ilawa Lakeland, has a maximum depth of 20 m and a mean depth of 8.1 m. (Lynch-Wisconsin)
W78-09173

EFFECT OF CADMIUM OF ALKALINE PHOSPHATASE ACTIVITY IN DIFFERENT TISSUE OF LEPOMIS GIBBOSUS L. (PISCES; CENTRARCHIDAE) (IN FRENCH),
Lab. Invest. Endocrinol., Kain (Belgium).
A. Piavaux.
Hydrobiologia 55(3), p 251-256, 1977.

Descriptors: *Enzymes, Metabolism, *Cadmium, *Zinc-metallo-enzymes, Water pollution effects, *Sunfishes, Alkaline phosphatase.

To clarify if the interference of the Zn metabolism by Cd could be correlated to a modification of the activity of Zn-metallo-enzymes, sunfish (L. gibbosus L.) were exposed to different concentrations of Cd. The activity of alkaline phosphatase was determined in various organs of control and Cd-treated fish, together with Cd and Zn concentrations. While Cd accumulation is evident in all organs (particularly in liver and kidney), Zn concentration in treated fish is increased for liver and intestine and decreased for brain. The activity of the enzyme does not follow any systematic trend (increase in liver, decrease in intestine, brain and gills). It does not seem therefore that any competition for the active metabolic sites of alkaline-phosphatase take place in favor of Cd in the principal organs of heavy metal accumulation and/or excretion.--Copyright 1978, Biological Abstracts, Inc.
W78-09175

SANITARY PROTECTION OF WATER BODIES IN CONNECTION WITH EXTRACTION AND ENRICHMENT OF RARE METALS (IN RUSSIAN),
Novosibirsk Sanitary Research Inst. (USSR).
For primary bibliographic entry see Field 5G.
W78-09235

WASTE OIL STUDY, REPORT TO THE CONGRESS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5E.
W78-09240

SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF ABATE IN BODIES OF WATER (IN RUSSIAN),
Azerbaijan Research Inst. of Virology, Microbiology and Hygiene, Baku (USSR).
For primary bibliographic entry see Field 5G.
W78-09242

DATA ANALYSIS AND MODEL DEVELOPMENT FOR ECOSYSTEM MANAGEMENT AT LAKE GEORGE, N.Y.,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Electrical and Systems Engineering.
G. Roberts, and F. DiCesare.
Fresh Water Institute Report 77-11, Reprinted from: 1977 Proceedings of the International Conference of Cybernetics and Society, I.E.E.E., New York, N.Y. 6 p, 4 fig, 1 tab, 14 ref. NSF DEB-76-12294.

Descriptors: *Lake George(NY), *Ecosystems, *Water management(Applied), *Methodology, *Model studies, *Data analysis, New York, Data processing, Oligotrophy, Water pollution effects, Lakes, Data collections, Decision-making, Planning, Forecasting.

A construction method for data-based analysis models of lake ecosystems uses modelling research being conducted at Lake George, New York as a case study. It is argued that two other approaches--coupling of complex processing models, and simulation of mass flows among compartments--are research-oriented and not suitable for predictive purposes in environmental management, as they generally are not validated and rely heavily on theory. A six-stem modelling process is envisioned which keeps specific policy issues in mind: (1) The system is analyzed to determine problems, and models of system behavior are examined. (2) Research goals are identified, and desired model capabilities and restrictions determined. (3) Model structure is specified, based on objectives, theories, and data analysis. (4) The model is calibrated; parameter values are determined which best reproduce observed system behavior. (5) The model structure is examined and revised to meet goals. (6) The model is applied to the problem defined in step 1 and evaluated. Data have been collected over the past nine years at Lake George, a large, oligotrophic lake located in the Adirondack Mountains. Current land development could significantly alter the lake's water quality. (Lynch-Wisconsin)
W78-09243

TWO OIL SPILLS - INTERRELATEDNESS OF SOCIOECONOMIC STRUCTURE AND IMPACT ON SEAFOOD MARKETING SYSTEM,
Swedish Water and Air Pollution Research Inst., Stockholm.
I. Rosenblum.
Report No. B 411, January 1978. 14 p, 2 fig, 12 ref.

Descriptors: *Oil spills, *Marketing, *Economic impact, *La Coruna(Spain), *Tumaco(Colombia), *Seafood, M/V Urquiola, M/V Saint Peter, Food processing industry, Fisheries, Shellfish, Water pollution effects, Social aspects, Commercial fishing, Pacific Ocean, Harbors, Economics.

Investigations of the impact of major oil spills on the seafood marketing systems in Tumaco, Colombia and La Coruna, Spain demonstrated the interrelations of socioeconomic factors, both in terms of effects on the industry and degree of success of corrective measures. The M/V Saint Peter sank off the coast of Ecuador and Colombia in February 1976, releasing 243,442 barrels of crude oil. In May 1976 the tanker Urquiola foundered and spilled 80,000 tons of crude oil at La Coruna harbor. The Tumaco marketing system, characterized by many fishermen and intermediary buyers conducting numerous small, free transactions, is typical of a subsistence economy. This horizontal market was vulnerable to the spill at both the producer and intermediary buyer levels. The major effect of the spill was a decline in consumer demand due to feared health hazards; no administrative measures were taken. In La Coruna, integration of the sector and government regulation has resulted in a large number of producers required to sell through a single, centralized agency to a small number of large-scale buyers, mostly canneries. Due to the vertical structure and the fact that the buyers are largely canneries and therefore less susceptible to adverse effects than small dealers, the gatherers bore the brunt of the damage, which took the form of a massive shellfish kill. Compensation by authorities covered only a fraction of real losses. (Lynch-Wisconsin)
W78-09244

NO. 2 FUEL OIL SPILL IN BOURNE, MASSACHUSETTS: IMMEDIATE ASSESSMENT OF THE EFFECTS ON MARINE INVERTEBRATES AND A 3-YEAR STUDY OF GROWTH AND RECOVERY OF A SALT MARSH,
Woods Hole Oceanographic Institution, Woods Hole, MA.
G. R. Hampson, and E. T. Moul.
Journal of the Fisheries Research Board of Canada, Vol 35, p 731-744, 1978. 10 fig, 1 tab, 18 ref, append.

Descriptors: Oil, *Oil pollution, *Oil spills, Fuels, *Toxicity, Mortality, Biological communities, Aquatic populations, *Marine animals, *Invertebrates, *Littoral, *Salt marshes, Beaches, Plant populations, *Rhizomes, Intertidal areas, Aquatic algae, Barges, Organic compounds, Water pollution effects, Path of pollutants, Massachusetts, *Buzzards Bay(Mass), Cape Cod Canal, No. 2 Fuel oil.

On October 9, 1974 the oil barge Bouchard 65 loaded with 73,000 barrels of oil spilled an undetermined amount of No. 2 fuel oil off the west entrance of the Cape Cod Canal in Buzzards Bay Massachusetts. Qualitative samples of dead and moribund marine invertebrates were collected in tide pools and slight depressions along the beaches. A collection consisting of 4360 invertebrates comprising 105 species, plus 2 species of fish were found in 8 samples. Noticeable effects of the oil on the salt-marsh plant comminity were also observed. A detailed quantitative examination was begun to determine the effects of the oil on various components of the affected salt-marsh community in Winsor Cove compared to a selected control site. Examination of the interstitial fauna found in the study area in the summer of 1977 showed an extremely reduced number of individuals and species. (EIS-Deal)
W78-09274

LONG-TERM EFFECTS OF AN OIL SPILL ON FUCUS MACROFAUNA IN A SMALL BALTIC BAY,
Swedish Water and Air Pollution Research Lab., Nykoping. Baltic Sea Lab.
M. Notini.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 745-753, 1978. 7 fig, 1 tab, 21 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, Biological communities, Fuels, *Littoral, *Amphipoda, *Mollusks, *Gastropods, Aquatic populations, *Isopods, *Toxicity, Mortality, Organic compounds, Water pollution effects, Seasonal, Crustaceans, Oil tanker, Fucus, Sweden, *Stockholm archipelago.

On October 6, 1970, the small tanker, Irini ran aground in the southern part of the Stockholm archipelago, releasing about 1000 t of medium and heavy fuel oil. Approximately 400 t drifted into a small bay wiping out nearly the entire littoral fauna. Most of the oil was collected mechanically during the winter, and by May 1971 cleanup operations were completed. The recruitment of the bladder wreck (Fucus vesiculosus) community in the bay was observed at intervals over a 5-year period. Significantly increased macrofauna population densities were found for a number of species in the 1974 and 1976 samples compared to those of 1971 and 1972. Larvae of Chironomidae were the only group found with a decreased density between the first and sixth summers after the spill. The data are discussed in relation to conditions in a nearby unpolluted bay and to normally occurring cyclic variations. (EIS-Deal)
W78-09275

OBSERVATION OF A COLD-WATER INTERTIDAL COMMUNITY AFTER 5 YEARS OF A LOW-LEVEL, PERSISTENT OIL SPILL FROM THE GENERAL M.C. MEIGS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
R. C. Clark, Jr., B. G. Patten, and E. E. DeNike.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 754-765, 1978. 9 fig, 2 tab, 18 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, Fuels, Intertidal areas, Biological communities, Animal populations, Plant populations, *Aquatic populations, *Toxicity, Mortality, *Algae, *Absorption, Beaches, Organic compounds, *Ecology, Ecosystems, Water pollution effects, Tar, Urchins, Paraffinic hydrocarbons.

A rich and productive intertidal community was exposed continually for over 5 yr to small quantities of a Navy Special fuel oil from the unmanned troopship General M.C. Meigs that came aground on the Washington coast in January 1972. Observations of animal and plant populations and their petroleum hydrocarbon uptake patterns showed early evidence of contamination and the persistence of the oil spill throughout the study period. Abnormal and dead urchins, and loss of algal fronds and pigment were observed in localized areas near the wreck for at least 1 yr. Within 2 mo of the accident, paraffinic hydrocarbons had been taken up by prominent members of the community and continued to appear in certain species even after 5 yr. Although changes were seen in certain species during the early days of this persistent low-level pollution incident, the community balance in the rocky, intertidal ecosystem does not appear to have been markedly altered. (EIS-Deal)
W78-09276

RECOVERY OF BENTHIC MACROFAUNA FROM CHRONIC POLLUTION IN THE SEA AREA OFF A REFINERY PLANT, SOUTHWEST FINLAND,
Abo Akademi, Turku (Finland). Inst. of Biology.
E. J. Leppakoski, and L. S. Lindstrom.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 766-775, 1978. 10 fig. 3 tab, 40 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, Industrial wastes, Waste water(Pollution), Oil industry, *Oil wastes, *Benthic fauna, Waste water treatment, *Larval growth stage, *Sediments, *Oligochaetes, *Toxicity, Mortality, Path of pollutants, Water pollution effects, Shannon Diversity Index, Recolonization, Polychaetes, Bivalves.

Quantitative field studies (density, wet weight biomass, Shannon diversity, species richness, evenness of distribution) on benthic sublittoral macrofauna were made in the vicinity of an oil refinery in southwest Finland before and after the installation of a new wastewater treatment plant that reduced the amount of oil and liquid effluents by ca. 90-95%. The number of species and species diversity increased during the 1st and 2nd yr after pollution abatement at the stations close to the former outflows. Details of postabatement succession are discussed. The results demonstrate not only the recovery from chronic oil pollution but also the degree of ecological damage caused by previous continuous discharge of oil. (EIS-Deal)
W78-09277

RECRUITMENT OF BENTHIC ANIMALS AS A FUNCTION OF PETROLEUM HYDROCARBON CONCENTRATIONS IN THE SEDIMENT,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
J. W. Anderson, R. G. Riley, and R. M. Bean.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 776-790, 1978. 11 fig, 4 tab, 21 ref.

Descriptors: *Oil, *Oil pollution, *Oil spills, Sediments, *Bottom sediments, Intertidal areas, *Benthic fauna, *Gas chromatography, *Biodegradation, *Annelids, *Mollusks, *Crustaceans, Organic compounds, Chemical analysis, Path of pollutants, Depuration, *Crude oil.

Three separate field installations, consisting of clean and oiled sediment in fiberglass trays, were placed in the intertidal zone to determine rates of hydrocarbon depuration and recruitment of benthic organisms. Detailed chemical analysis, with glass capillary gas chromatography and gas-chromatography-mass spectroscopy, were conducted such that individual compounds and hydrocarbon classes associated with the sediment after varying periods of field depuration could be quantitated. Depuration rates of hydrocarbon types in sediment receiving oil on the surface (installations I and II) decreased in the order of saturates, methylnaphthalenes, and methylphenanthrenes. Rates of specific compound and hydrocarbon class depuration followed the general pattern exhibited by total hydrocarbons. These results are discussed in relation to physical and chemical processes acting on the oil-contaminated sediments. (EIS-Deal)
W78-09278

BENTHIC HYDROCARBONS OF RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-09279

PERSISTENCE OF POLYCHLORINATED BIPHENYLS IN MARINE BIVALVES,
London Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-09280

THE MARINE ALGAE OF THE POLLUTED INNER PART OF THE OSLOFJORD,
N. Klavestad.
Botanica Marina, Vol. 21, p 71-97, 1978. 7 fig, 9 tab, 44 ref.

Descriptors: *Benthic flora, *Aquatic algae, *Vegetation, *Surveys, *Algae, Seasonal, Annual, *Salinity, *Water temperature, Currents(Water), *Distribution patterns, Spatial distribution, Ecological distribution, Dominant organisms, Biological communities, On-site data collections, Ecology, Ecosystems, Population.

The benthic algal vegetation of the inner, polluted part of the Oslofjord was investigated during the period 1962-66. Observations were made at 101 localities. The area was divided into four sub-areas, each with its characteristics floristic features. A brief general description of the vegetation of the different sub-areas is given. The Oslofjord has previously been subjected to algological investigations, and the results of the preent survey are compared with their results. The survey contains decriptions of seasonal and annual variations in the vegetation throughout the whole area. On the basis of the available data on salinity, temperature, currents, pollution, and other ecological factors, the distribution of the various algae are discussed. Finally, there is a floristic list with information on life cycles stages of the various species. (EIS-Deal)
W78-09281

DISEASES, PARASITES, AND TOXIC RESPONSES OF COMMERCIAL PENAEID SHRIMPS OF THE GULF OF MEXICO AND SOUTH ATLANTIC COASTS OF NORTH AMERICA,
Environmental Research Lab., Gulf Breeze, FL.
J. A. Couch.
Fishery Bulletin, Vol. 76, No. 1, p 1-44, 1978. 46 fig, 4 tab, 85 ref.

Descriptors: *Shrimp, Commercial shellfish, Diseases, Animal pathology, Infection, *Parasitism, *Viruses, *Pathogenic fungi, *Bacteria, *Nematodes, *Heavy metals, *Pesticides, *Cadmium, *Mercury, Water pollution effects, Path of pollutants, *Helminthes, *Tumors, Gas bubble disease.

A reference work and review of both infectious and noninfectious diseases of commercial penaeid shrimps of the Gulf of South Atlantic region of the United States is presented. Disease is second only to predation and periodic physical catastrophes in limiting numbers of penaeid shrimps in nature and second only to nutritional and reproductive requirements in limiting aquacultural successes with penaeid shrimps. Noninfectious disease agents in penaeid shrimps are chemical pollutants, heavy metals, and environmental stresses. Organochlorine, organophosphate, and carbamate peasticides all have adverse effects in penaeids. Fractions of petroleum, particularly the naphthalenes, are very toxic to shrimp. Little other work has been done on the effects of petroleum on penaeid shrimps. Cadmium causes black gills in shrimp by killing gill cells. Mercury is accumulated by penaeids and may interfere with their osmoregulatory abilities. Many chemotherapeutic chemicals used routinely in treatment of fish diseases are toxic to shrimp at certain determined concentrations. Spontaneous pathoses found are a benign tumor, muscle necrosis, and gas bubble disease. 'Shell disease' is discussed from points of view of possible causes. A syndrome of 'broken backs' is reported in penaeid shrimps for the first time. An overview is presented for general needs in penaeid shrimp health research. (EIS-Deal)
W78-09282

UPPER TEMPERATURE TOLERANCES OF TELLINA TENUIS AND T. FABULA,
Glasgow Univ. (England). Dept. of Zoology.
J. G. Wilson.
Marine Biology, Vol. 45, p 123-128, 1978. 4 fig, 4 tab, 30 ref.

Descriptors: Temperature, *Water temperature, *Thermal properties, *Heat resistance, Mortality, *Mollusks, *Larval growth stage, *Lethal limit, Animal metabolism, Animal physiology, *Ecological distribution, Life cycles, Littoral, Acclimation, *Tellina.

The upper lethal tolerances of these two species were studied under a variety of temperature regimes in which both short-term and long-term mortality were noted. These included steady temperatures, acclimation at a steady temperature then exposure to a steady temperature, and acclimation at gradually increasing temperatures. T. tenuis was also tested for variation in mortality rate according to the date of collection or to the size (i.e, age) of the mollusc. The results suggested that T. tenuis was consistently more tolerant than T. fabula, and that the difference in tolerance was around 5C. Both species readily acclimated to higher temperatures after steady temperature acclimation, but not under a regime of gradually increasing temperature. There was no significant variation in the mortality rate of T. tenuis with season or age. It is suggested that, since the difference in temperature tolerance is not reflected in their respective geographical distributions, there may be some other stage in their life cycle, e.g. the larvae, which is equally susceptible to temperature extremes. The difference in tolerance, is, however, reflected in their respective littoral and sublittoral distributions. (EIS-Deal)
W78-09283

EFFECT OF PENTACHLOROPHENOL (PCP) ON MEIOBENTHIC COMMUNITIES ESTABLISHED IN AN EXPERIMENTAL SYSTEM,
University of West Florida, Pensacola. Faculty of Biology.
F. R. Cantelmo, and K. R. Rao.
Marine Biology, Vol. 46, p 17-22, 1978. 2 fig, 3 tab, 34 ref.

Descriptors: *Nematodes, Soil microorganisms, *Pest control, *Biomass, Food habits, Animal behavior, *Sediments, Biological communities, Estuarine environment, Predation, *Pesticides, Water pollution effects, Aquaria, Algicides, Microorganisms, Estuaries, *Phenols, Biocide, Epistrate feeders, *Pentachlorophenol.

Aquaria containing clean sand received a continuous supply of seawater from Santa Rosa Sound, Florida, USA, mixed with known concentrations (7, 76, 622 micrograms l-1) of pentachlorophenol (PCP). After 9 weeks, nematodes accounted for 87% of the total meiofauna. Nematode biomass and densities were greatest in aquaria exposed to 76 micrograms PCP l-1 and were least in aquaria exposed to 622 micrograms PCP l-1. Epistrate feeders were abundant in control aquaria and aquaria exposed to 7 and 76 micrograms PCP l-1, but not in aquaria exposed to 622 micrograms PCP l-1. Selective deposit feeders were not abundant in the control aquaria and aquaria exposed to 7 micrograms PCP l-1, but comprised 19% of the nematodes in aquaria exposed to 76 micrograms PCP l-1 and 61% in aquaria exposed to 622 micrograms PCP l-1. The marked reduction in benthic algae in high PCP aquaria probably was responsible for the decrease in epistrate feeders due to diminished food supply. (EIS-Deal)
W78-09284

EFFECTS OF THE ORGANOPHOSPHORUS INSECTICIDES TEMEPHOS (ABATE) AND CHLORPYRIFOS (DURSBAN) ON POPULATIONS OF THE SALT-MARSHES MELAMPUS BIDENTATUS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
G. Fitzpatrick, and D. J. Sutherland.
Marine Biology, Vol. 46, p 23-28, 1978. 4 fig, 3 tab, 18 ref.

Descriptors: *Insecticides, *Organophosphorus pesticides, *Pesticide toxicity, Pest control, Spraying, *Insect control, *Larvicides, Growth stages, Snails, *Biological communities, Mosquitoes, Population, New Jersey, Salt marshes, *Temephos, Chlorpyrifos, *Melampus.

The two toxicants were aerially applied to mosquito breeding areas in New Jersey salt marshes in the manner normally used in biting-fly control operations. No significant change in the population density of M. bidentatus was observed in response to multiple treatments of granular formulations of either temephos or chlorpyrifos. However, there was a highly significant (P less than 0.01) depression in population density observed in the plot exposed to multiple treatments of a temephos emulsion. This depression was followed by a resurgence in density levels, beginning 3 weeks after the last treatment. The specific mechanism for this perturbation is not known. However, it is hypothesized that it might involve some combination of indirect insecticide effects coupled with age-specific effects. Tests of age structure of the affected population using the chisquare distribution supported this hypothesis. (EIS-Deal)
W78-09285

MODIFICATIONS OF CONTINUOUS-FLOW TOXICITY TEST METHODS FOR SMALL AQUATIC ORGANISMS,
Proctor and Gamble Co., Cincinnati, Ohio. Ivorydale Technical Center.
For primary bibliographic entry see Field 5A.
W78-09286

RATIONAL DESIGN OF HATCHERIES FOR INTENSIVE SALMONID CULTURE, BASED ON METABOLIC CHARACTERISTICS,
Michigan Dept. of Natural Resources, Lansing.
H. Westers, and K. M. Pratt.
The Progressive Fish Culturist, Vol. 39, No. 4, p 157-165, October 1977. 2 tab, 7 fig, 21 ref.

Descriptors: Fish physiology, *Aquiculture, *Salmonids, *Fish management, *Metabolism, Design, Environmental effects, Water quality, *Design criteria, *Ammonia, *Carrying capacity, Fish farming, Commercial fish, Aquatic productivity, Fish hatcheries, Productivity, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Salmonid culture, Water exchange rate, Rearing ponds.

Design criteria for a new hatcheries for the intensive culture of fish should be based on a correlation of water quality characteristics with data on fish metabolism. This paper presents much of the available information on water quality (pH, temperature, dissolved oxygen, and un-ionized ammonia), water exchange rates, and fish metabolism, and suggests appropriate management practices and design criteria that take these factors into account. Specific recommendations include a water exchange rate of four per hour, dissolved oxygen saturation of 90% in incoming water and not less than 5 mg/l in effluent water, and a maximum allowable concentration of 0.0125 mg/l of un-ionized ammonia. (EIS-Katz)
W78-09287

DINOFLAGELLATE TOXINS AS PROBABLE CAUSE OF AN ATLANTIC HERRING (CLUPEA HARENGUS HARENGUS) KILL, AND PTEROPODS AS APPARENT VECTOR,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5B.
W78-09288

POPULATION DYNAMICS OF DAPHNIA GALEATA MENDOTAE AS MODIFIED BY CHRONIC CADMIUM STRESS,
J. S. Marshall.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 461-469, 1978. 4 fig, 4 tab, 31 ref.

Descriptors: *Cadmium, *Daphnia, Biological communities, *Population, *Zooplankton, *Toxicity, Mortality, *Reproduction, *Fertility, *Growth stages, *Growth rates, *Biomass, *Embryological growth stage, *Great Lakes, *Lake Michigan, *Carrying capacity, *Path of pollutants, Water pollution effects, Heavy metals, Extinction.

Forty populations of Daphnia galeata mendotae were maintained for 22 wk (or until they became extinct) in a medium consisting of filtered Lake Michigan water to which Chlamydomonas reinhardi and different concentrations of a mixture labelled (109Cd) plus stable CdCl2 were added 24 h before use. Weekly determinations were made of total numbers, average individual dry weight, mean brood size, egg-female ration aborted eggs and embryos, and average whole-body 109Cd content. Chronic cadmium stress reduced the populations' average numbers and biomass, while it increased the populations' turnover rates, temporal variability, probability of extinction, and proportion of ovigerous females. For individuals there was increased brood size. Due to compensatory increases in the proportion of ovigerous females and brood size mean, the cadmium sensitivity of population attributes was considerably less than that of the most sensitive individual attribute, prenatal mortality. A linear relationship between population carrying capacity (relative mean numbers) and added cadmium concentration indicated that the effective concentration for a 50% reduction of carrying capacity (EC50) is 7.7 micrograms Cd/l and that for a 1% reduction (EC1) is 0.15 micrograms Cd/l. (EIS-Deal)
W78-09289

EFFECTS OF THERMAL EFFLUENT ON STANDING CROP AND NET PRODUCTION OF ELODEA CANADENSIS AND OTHER SUBMERGED MACROPHYTES IN LAKE WABAMUN, ALBERTA,
Alberta Univ., Edmonton. Dept. of Botany.
R. W. Haag, and P. R. Gorham.
Journal of Applied Ecology, Vol 14, p 835-851, 1977. 7 fig, 1 tab, 31 ref.

Descriptors: *Thermal pollution, *Heated water, Water temperature, Thermal stratification, Cooling water, *Productivity, Seasonal, Standing crops, *Plant populations, Aquatic populations, Dominant organisms, Water pollution effect, Effluents, Population, *Macrophytes, *Elodea, Diversity.

The dry matter production of aquatic macrophytes was measured over 2 years, at three depths, in Lake Wabamun, Alberta, Canada. Production was measured in an area receiving thermal effluent and at a control site, unaffected by thermal effluent. A greater standing crop existed in winter in the thermal mixing zone. Elodea canadensis, which had no marked dormancy mechanism, was dominant in this zone in winter. Higher light levels, due to the absence of ice over, resulted in earlier spring growth in the effluent zone, but early spring productivity was limited by low water temperatures, caused by strong thermal stratification. Elodea dominated early spring production because of the large standing crop overwinter. Changes in the species composition of submerged macrophytes in heated areas of Lake Wabamun do not seem to have spread to unheated acres of the lake. (EIS-Deal)
W78-09290

BIOCIDES IN RELATION TO WATER POLLUTION PART I: BIOASSAY STUDIES ON THE EFFECTS OF A FEW BIOCIDES ON FRESH WATER FISH, CHANNA GACHUA,
D. A. V. Coll., Muzaffarnagar (India). Dept. of Zoology.
R. C. Dalela, S. R. Verma, and M. C. Bhatnagar.
Acta Hydrochimica et hydrobiologica, Vol 6, No 1, p 15-25, 1978. 3 tab, 35 ref.

Descriptors: *Toxicity, *Lethal limit, *Pesticides, *Bioassay, *Endrin, *Water temperature, *Hydrogen ion concentration, Fish behavior, Laboratory tests, Freshwater fish, Chlorinated hydrocarbon pesticides, Environmental effects, Size, Mortality, Organophosphorus pesticides, *Channa, *Malathion, *Phosvel, *Thiodon.

In static tests, the LC50 for Channa gachua is determined for 24, 48, 72 and 96 hours for the following insecticides (results in mg/l): Endrin (0.007), Thiodon (0.01), Malathion (8), Phosvel (32). The toxicity of the four insecticides decreases with dropping temperature (35 and 24C), increasing pH value (pH 7.5 and 8.4) and increasing fish size (110 and 140 mm length). The safe concentration of the four insecticides in water is determined as follows: 0.002 mg/l Endrin, 0.003 mg/l Thiodon, 1.9 mg/l Malathion, and 9.2 mg/l Phosvel. (EIS-Katz)
W78-09293

THE EFFECTS OF CRUDE EKOFISK OIL AND OIL PRODUCTS ON MARINE FISH LARVAE,
Tromsoe Univ. (Norway). Inst. of Biology and Geology.
S. Lonning.
Astarte, Vol 10, p 37-47, 1977. 7 fig, 2 tab, 23 ref.

Descriptors: *Oil, *Larvae, Larval growth stage, Water pollution effects, *Bioassay, Commercial fish, Fish reproduction, *Toxicity, Mortality, *Fish eggs, *Embryonic growth stage, Pathology, Water pollution sources, Oil wastes, Oil pollution, Pollutants, Environmental effects, Microscopy, Morbidity, Fish physiology, Pleuronectes, Gadus, Platichthys, Ekofisk Oil.

Larvae of three species of marine teleosts were used in a study of the effects of crude Ekofisk oil, Ekofisk fractions, and some low boiling aromatics. Crude Ekofisk oil suspensions or extracts of oil had a moderate effect during early development, but during organogenesis the following effects were observed: Poor differentiation of the head region, protruding eye lenses, abnormally bent notochord, various levels of inhibition of hatching and breakdown of yolk. Similar effects were observed after treatment with the high boiling point samples, wheras the low boiling point samples caused a high incidence of rapid cytolysis and often delay and irregularities in cleavage and development. (EIS-Katz)
W78-09294

COMPARATIVE METABOLISM OF PCB ISOMERS BY THREE SPECIES OF FISH AND THE RAT,
Wisconsin Univ., Madison. Dept. of Entomology.
R. Hinz, and F. Matsumura.
Bulletin of Environmental Contamination and Toxicology Vol 18 No 5, p 631-639, 1977. 3 fig, 3 tab, 8 ref.

Descriptors: Fish physiology, *Metabolism, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *Halogenated pesticides, *Rainbow trout, Chemical reactions, *Bullheads, *Catfishes, Tracers, *Radioactivity techniques, *Chromatography, Animal physiology, Metabolism, Path of pollutants, Chemical analysis, Aroclor, Rat, Goldfish.

The ability to metabolize radioactively-labeled trichlorobiphenyl was analyzed in the goldfish, bullhead, rainbow trout, and the rat. Polar metabolities were observed in the livers of all species, but there was considerable inter- and intraspecific variation in quantity of metabolites present. Thin-layer chromatography suggested a similarity in the pattern of PCB metabolisms in the goldfish and rat. The authors regarded the goldfish as a good species for studying fish metabolism. (EIS-Deal)
W78-09295

SUBLETHAL EFFECTS OF INSECT GROWTH REGULATORS UPON CRAB LARVAL BEHAVIOR,
Duke Univ., Beaufort, NC. Marine Lab.
R. B. Forward, Jr., and J. D. Costlow, Jr.
Water, Air, and Soil Pollution, Vol 9, p 227-238, 1978. 6 tab, 32 ref.

Descriptors: *Toxicity, *Crabs, Animal behavior, Animal physiology, Animal metabolism, *Growth rates, *Growth stages, *Larval growth stage, *Insecticides, *Insect control, *Enzymes, Crustaceans, Water pollution effects, Mosquitoes, Salinity, Water temperature, Phototaxis, Zoeae, *Growth regulators(Insects), Methroprene, Hydroprene, Dimiline.

Both swimming speeds and phototaxis by the four larval stages of the crab Rhithropanopeus harrisii were monitored upon chronic exposure to sublethal concentrations of the insect growth regulators methroprene, hydroprene, and dimiline. Larvae were reared under conditions of salinity (20 o/oo) and temperature (25C) which produce the greatest developmental success. Sublethal concentrations of methroprene had no effect on swimming rates or phototaxis as compared to the acetone control larvae. For hydroprene, swimming rates by stage I, II, and III zoeae were unaffected while a significant increase in swimming speeds occurred in stage IV zoeae exposed to concentrations of 0.05 and 0.1 ppm. Only stage III zoeae exposed to 0.1 ppm showed a significant decrease in the level of positive phototaxis. Dimilin was much more potent, as significant increases in swimming speeds occurred in Stage I, II, and III zoeae, with 0.3 ppb being the lowest effective concentration. Although swimming by Stage IV zoeae was unaffected, phototaxis was altered at concentrations as low as 0.1 ppb. Concentrations normally used to control mosquito larvae were found to alter behavior. (EIS-Deal)
W78-09296

PHOTOSYNTHESIS/RESPIRATION RATIOS IN AQUATIC MICROCOSMS UNDER ARSENIC STRESS,
Oak Ridge National Lab., TN.
J. Giddings, and G. K. Eddlemon.
Water, Air, and Soil Pollution, Vol 9, p 207-212, 1978. 2 fig, 17 ref.

Descriptors: *Arsenic, *Toxicity, *Photosynthesis, *Photosynthetic oxygen, Biological communities, *Dissolved oxygen, *Primary productivity, *Respiration, *Arsenic compounds, *Sodium compounds, *Mathematical studies, Ecosystems, Water pollution effects, Monitoring, Microorganisms, *Photosynthesis/Respiration ratios.

The ratio of net photosynthesis (P) to total ecosystem respiration (R) usually declines when an aquatic ecosystem is subjected to various types of stress. P/R ratios were measured in 12 80-l microcosms containing water, sediment, and entire biotic communities from a shallow pond. P and R were estimated from changes in dissolved 02 concentrations during the day and night, respectively. After 10 weeks, the microcosms were stressed by the addition of sodium arsenate at concentrations of 0, 0.066, 11.5, and 143 ppm (as As). P/R ranged from 1.0 to 1.4 in all microcosms before arsenate was added. Under stress, both P and R declined in the 11.5 and 143 ppm microcosms, with negative net photosynthesis (i.e., decreases in

dissolved 02 during the day) observed on several occasions. P/R in these microcosms fell to zero or below, returning to 1.0 after three weeks. P/R remained above 1.0 in the 0.066 ppm and control microcosms. The P/R response could be used for screening suspected hazardous substances in microcosms, as well as for monitoring natural ecosystems. (EIS-Deal)
W78-09297

EFFECTS OF NO. 2 FUEL OIL WATER-SOLUBLE-FRACTIONS ON GROWTH AND REPRODUCTION IN NEANTHES ARENACEODENTATA (POLYCHAETA: ANNELIDA),
Texas A and M Univ., College Station. Dept. of Biology.
S. S. Rossi, and J. W. Anderson.
Water, Air, and Soil Pollution, Vol 9, p 155-170, 1978. 7 fig, 2 tab, 46 ref.

Descriptors: *Reproduction, *Growth rates, Growth stages, *Oil spills, *Oil pollution, *Aromatic compounds, Animal growth, *Larval growth stage, *Fecundity, *Fertility, *Toxicity, Mortality, *Juvenile growth stage, *Annelids, Organic compounds, Oil, Fuels, Water pollution effects, *Water soluble fractions, *Polychaetes, *Neanthes, Tissue analysis.

Effects of water-soluble-fractions (WSFs) from No. 2 Fuel Oil on growth and reproduction were studied in experiments simulating conditions of acute and chronic sublethal exposure. Effects were defined relative to concentrations of diaromatic hydrocarbons (naphthalenes) and total dissolved hydrocarbons. Hatching of metatrochophore larvae was inversely related to WSF concentration and to the length of time larvae were exposed prior to hatching. Growth of larvae into juveniles was unaffected by low concentrations. Inhibition of larval growth by higher WSF concentrations was reversible upon return of larvae to hydrocarbon-free sea water. Growth of juveniles into adult polychaetes was inversely related to concentration. All concentrations suppressed fecundity in each generation. (EIS-Deal)
W78-09298

ACUTE EFFECTS OF WOOD-PULP ON SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
A. E. Werner, and J. Robinson.
Water, Air, and Soil Pollution, Vol 9, p 69-81, 1978. 3 fig, 4 tab, 22 ref.

Descriptors: *Toxicity, Mortality, Fish physiology, Animal metabolism, Industrial wastes, *Pulp wastes, Pulp and paper industry, *Chemical wastes, *Cellulose, *Sockeye salmon, *Wood wastes, *Bioassay, Fish behavior, Water pollution effects, Water quality standards, Effluents, *Sublethal effects, Cellulose fiber, Wood fiber.

Freshwater suspensions of pulp fiber in concentrations exceeding 1000 ppm at 15C are acutely lethal to sockeye salmon fingerlings. Limited adaptation of such fish to fiber is possible but injury, at least in the short term, is irreversible. The acute lethality of various toxicants associated with industrial pulps is synergistically enhanced by the presence of fiber. Pulp storage up to 158 days at 15C had no significant effect on the acute lethality. Highly purified fibers are less toxic in freshwater than in sea water. The sensitivity to fiber of fish from two sources did not differ significantly. (EIS-Deal)
W78-09299

CONCENTRATION OF THREE METALS IN OYSTERS (CRASSOSTREA VIRGINICA) OF BILOXI AND PASCAGOULA, MISSISSIPPI ESTUARIES,
Jackson State Coll., MS. Dept. of Biology.
E. J. Harvey, Sr., and L. A. Knight, Jr.
Water, Air, and Soil Pollution, Vol. 9, p 255-261, 1978. 1 fig, 3 tab, 12 ref.

Descriptors: *Heavy metals, *Mercury, *Lead, *Cadmium, Commercial shellfish, *Oysters, *Poisons, *Spectrophotometry, *Trace elements, *Food chains, Metals, Path of pollutants, Chemical analysis, Chelation, *Mississippi, Tissue analysis, Bioaccumulation.

Concentrations of three toxic trace metals, Hg, Pb, and Cd in the commercial oyster Crassostrea virginica were measured by atomic absorption spectrophotometry. Mercury concentrations were low and appeared to be natural background levels. Lead content of the Mississippi oysters compared favorably with levels in Atlantic Coast oysters, but Cd in Atlantic Coast oysters was approximately 6.7 times greater than in the local specimens. There was no definite relation between oyster size and Pb, Hg, or Ce content. (EIS-Deal)
W78-09300

5D. Waste Treatment Processes

ULLSWATER INSTALLATION.
Effluent and Water Treatment Journal, Vol. 18, No. 3, p 105, March, 1978.

Descriptors: *Treatment facilities, *Biological treatment, *Resins, *Construction materials, *Rural areas, Design data, Septic tanks, Sewage treatment, Recreational facilities, Sewage disposal, Waste water treatment, Domestic wastes.

A Klargester BioDisc waste water treatment plant with a daily capacity of 10.8 cu m has been installed at the Helvellyn youth hostel in Ullswater, England. The 5.4 by 2.7 m BioDisc has a height of 3.2 m, of which 0.5 m is visible above ground. The Cellobond glass-reinforced polyester resin unit weighs 2.8 tons and is suitable for remote locations, such as the youth hostel which is 1,100 ft up the Helvellyn mountain. The BioDisc sewage treatment plant was installed within 30 min and tripled the sewage treatment capacity of the hostel. The sewage treatment plant can handle waste water with organic loads up to 4.08 kg/day BOD. (Lisk-FIRL)
W78-08838

PACKAGED SEWAGE TREATMENT PLANT.
Surveyor, Vol 151 No 4447, p 27, March, 1978.

Descriptors: *Biological treatment, *Filtration, *Domestic wastes, *Nutrient removal, *Porous media, Tertiary treatment, Fabrics, Sewage sludge, Equipment, Biochemical oxygen demand, Suspended solids, Waste water treatment, Municipal wastes.

G. F. Dickson Environmental Engineering Ltd. of Guilford, Surrey, England, has developed the Biospiral immersed rotating disc biological filtration system suitable for populations of 10-800. The compact unit contains an archimedian screw biological filter and a drum filter for suspended solids removal. The Biospiral system continuously recycles sludge and liquor to produce an effluent with 20/30 BOD and suspended solids concentrations. The patented tertiary treatment system employing a cloth filter is automatically cleaned when solids accumulate, eliminating the need for clarification of the effluent. Filter cleaning pumps transport the solids removed from the filter effluent. Filter cleaning pumps transport the solids removed from the filter cloth surfaces to the system inlet or sludge storage tanks. The Biospiral units may be installed in series as part of a larger treatment system. The unit can accomodate fluctuating loads and has low operating and maintenance requirements. (Lisk-FIRL)
W78-08860

LIQUID ALUM IS SUCCESSFUL IN ORLANDO, FLA.
Water and Wastes Engineering, Vol. 15, No. 4, p 54, April, 1978.

Descriptors: *Coagulation, *Polymers, *Flocculation, *Chemical precipitation, *Trickling filters, Biochemical oxygen demand, Suspended solids, Nutrient removal, Porous media, Waste water treatment, Municipal wastes.

Orlando, Florida's, Bennett Road waste treatment plant removes 90% of the BOD and suspended solids from 10 mgd of waste water with liquid alum treatment. The trickling filter facility has a design capacity of 8 mgd; an average of 150-200 ppm of liquid alum is added to the waste water just prior to secondary clarification. The plant stores the 2.5-3 weekly truckloads of alum delivered in two 7,000 gal tanks; one tank holds a three-day reserve. During daly periods of high waste water flow, alum is added to the splitter box effluent after trickling filtration to provide additional flocculation time. Polymers are added before the secondary clarifier to assist in coagulation. The effluent BOD and suspended solids concentrations, after alum treatment, are 13 and 20 ppm, respectively. Effluent samples are analyzed every 2 hrs. At 24 mgd advanced treatment facility planned for Orlando will also be disigned to incorporate the liquid alum treatment. (Lisk-FIRL)
W78-08877

CANADIAN GOVERNMENT APPROVES $66 MILLION LOANS TO MONTREAL FOR SEWAGE TREATMENT PROJECT.
Water and Pollution Control, Vol 116, No 1, p 17, January, 1978.

Descriptors: *Treatment facilities, *Legislation, *Construction, *Tunnels, *Sewerage, Collector sewers, Tunnel construction, Transport, Waste water treatment, Municipal wastes.

The Canadian government, through the Central Mortgage and Housing Corp., has loaned the Montreal Urban Community $66,660,400 for improvement of its municipal sewage collection and treatment system. Twenty-five percent of this loan, or $16,665,100, does not have to be repaid by Montreal. The loan is part of the $1.2 billion required for the upgrading of Montreal's sewerage system. Two-thirds of the total funding will be furnished by the Central Mortgage and Housing Corp. Loans totalling more than $231 million have been awarded to the Montreal Urban Community since 1974. The most recent loan will be used to purchase the land for a waste water treatment plant and for awarding contracts for its construction. Of the total cost of the project, $22 million was for the construction of an 11-ft diameter sewage collector tunnel. The Canadian government has awarded more than $1.5 billion to over 3,700 projects; 700 projects in Quebec have received $356 million, of which $67 million does not have to be repaid. (Lisk-FIRL)
W78-08883

MEDIATION OF ACID STRIP MINE POLLUTION BY THE ATTEMPTED INHIBITION OF THE IRON-OXIDIZING AUTOTROPH, THIOBACILLUS FERROOXIDANS,
Pennsylvania State Univ., University Park.
M. A. Kugatow.
Available from University Microfilms International, Ann Arbor, MI 48106; Order No. 7803339. PhD Thesis, 1977. 68 p.

Descriptors: *Thiobacillus ferrooxidans, *Acidic soils, *Acid mine water, *Iron bacteria, *Sulfur bacteria, Strip mines, Neutralization, Acid bacteria, Soil bacteria, Detergents, Mine wastes, Inhibitors, Inhibition, On-site investigations, Laboratory tests, Industrial wastes.

The growth of autotrophic Thiobacillus ferrooxidans, sulfur-oxidizing bacteria, and heterotrophic microorganisms in strip-mined acid soils and in laboratory test soil was studied under varying conditions of pH, chemical treatment, and detergent inhibitors. Soils with low pH values contained high concentrations of the iron-oxidizing bacteria; partial neutralization of the acid solids reduced the iron-oxidizing bacterial population. Sulfur oxidizing bacterial growth was not related to pH, although partial neutralization of the soils with Ca(OH)2 stimulated microogranism growth in some instances. Dodecylbenzenesulfonate detergent applied to the soils decreased the population of iron-oxidizing bacteria for 2-6 weeks except in highly acidic soils; sulfur-oxidizing bacterial numbers fluctuated but were not significantly affected by the detergent. Laboratory soil tests verified the data from on-site investigations; detergent hindered the growth of Thiobacillus ferrooxidans and prevented the reacidification of some partically neutralized mine soils. The inhibitors utilized in these tests did not change pH or total acidity of the acid mine soils. (Lisk-FIRL)
W78-08885

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME III. PROCESSING SYSTEMS TECHNICAL ANALYSES.
Dames and Moore, Salt Lake City, UT; and EIC Corp., Newton, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 915, Price codes: A24 in paper copy, A01 in microfiche. Report to NOAA, Office of Marine Minerals, August 1977. 559 p, 134 ref. Contract 6-35331.

Descriptors: Water pollution effects, *Manganese, Resources development, *Waste disposal, Mining, Environmental effects, *Waste treatment, *Outer Continental Shelf, *Underwater mining, *Nodules(Manganese).

This report brings together technological information pertinent to the processing of manganese nodules mined from the sea floor and to help access the effects of manganese nodule processing activities on land and marine environments. It treats potential methods, operations, and requirements for processing and handling manganese nodules on land and at sea, including recovery of value metals, transport of manganese-nodule ore and process wastes, treatment and disposal of wastes, material and energy balances and resource requirements. This volume contains description of alternatives for an on-shore processing of manganese nodules; economics of nodule mining and processing; specific leach processes; at-sea processing; waste treatment; and noise assessment. (See also W78-08956)
W78-08957

STATISTICAL SUMMARY, 1956 INVENTORY OF MUNICIPAL WATER FACILITIES IN CITIES OVER 25,000 POPULATION.
Public Health Service, Rockville, MD.
For primary bibliographic entry see Field 5F.
W78-09061

\FT ENVIRONMENTAL IMPACT STATEMENT, ASPEN METRO SANITATION DISTRICT, SNOWMASS WATER AND SANITATION DISTRICT--201 WASTEWATER FACILITIES PLANS.
Weiner and Associates, Denver, CO.
For primary bibliographic entry see Field 6G.
W78-09066

SUMMARY: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR UTAH LAKE--JORDAN RIVER WATER QUALITY MANAGEMENT PLANNING STUDY.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 6G.
W78-09067

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR MARION, NORTH CAROLINA.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 6G.
W78-09068

FINAL ENVIRONMENTAL IMPACT STATEMENT - NORTH FREMONT COUNTY WASTEWATER FACILITIES.
Environmental Protection Agency, Seattle, WA. Region X.
For primary bibliographic entry see Field 6G.
W78-09073

PRODUCTION AND DYNAMICS OF SALT MARSH VEGETATION AND THE EFFECTS OF EXPERIMENTAL TREATMENT WITH SEWAGE SLUDGE: BIOMASS, PRODUCTION, AND SPECIES COMPOSITION,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W78-09099

ENGINEERING AND MANAGEMENT ASPECTS OF DREDGE DISPOSAL AND TREATMENT,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical and Environmental Engineering.
For primary bibliographic entry see Field 5E.
W78-09176

A REVIEW OF CONFLICT RESOLUTION MODELS IN WATER RESOURCES MANAGEMENT,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09192

5E. Ultimate Disposal Of Wastes

GEOHYDROLOGIC EVALUATION OF A LANDFILL IN A COASTAL AREA, ST. PETERSBURG, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08849

WATER-QUALITY CONDITIONS IN SOUTHERN ROCKINGHAM COUNTY, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.; and Southern Rockingham Regional Planning District Commission, Salem, NH.
For primary bibliographic entry see Field 5B.
W78-08858

DISPOSAL IN THE MARINE ENVIRONMENT: AN OCEANOGRAPHIC ASSESSMENT.
National Research Council, Washington, DC. Ocean Disposal Study Steering Committee.
For primary bibliographic entry see Field 5G.
W78-08886

MERCURY IN SOUTHERN CALIFORNIA WATERS: INPUTS, DISTRIBUTION, AND FATE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-08888

SPREADING SLUDGE.
Surveyor, Vol. 151, No. 4469, p 22, February, 1978.

Descriptors: *Sludge disposal, *Design data, *Construction materials, *Drying, *Return flow, Sewage disposal, Baffles, Valves, Sludge treatment, Waste water treatment, Waste water disposal, Municipal wastes.

A sludge spreading tanker with a 10-ft sludge outfall capability has been ordered by the Thames Water Authority in England for the application of wastes to land. The tanker is manufactured by Fergussons (Tankers) Ltd. of Portsmouth, Hampshire, England, and equipped with an engine mounted on an M-type Bedford chassis. The spreader utilizes fan-shaped plates for even sludge application. A Metalastic bush on the front of the truck and heavy duty outriggers on the back support the 1,300 g mild-steel tank which contains dished and flanged internal anti-surge baffles to distribute the strain on the knuckled radius. The tank webs have returned edges for extra strength. Two Reis 4-inch discharge slide valves at the rear of the tanker have stainless steel blades and are air operated. (Lisk-FIRL)
W78-08951

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME II: TRANSPORTATION AND WASTE DISPOSAL SYSTEMS.
Dames and Moore, Salt Lake City, UT; and EIC Corp., Newton, MA.
For primary bibliographic entry see Field 5G.
W78-08956

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME III. PROCESSING SYSTEMS TECHNICAL ANALYSES.
Dames and Moore, Salt Lake City, UT; and EIC Corp., Newton, MA.
For primary bibliographic entry see Field 5D.
W78-08957

DISPOSAL OF VEGETATION WATER FROM OLIVE-OIL EXTRACTION PLANTS. NOTE II: INCINERATION OF VEGETATION WATER (LO SMALTIMENTO DELLE ACQUE DI VEGETAZIONE PROVENIENTI DAGEI IMPIANTI DI ESTRAZIONE DELL'OLIO. NOTA II: L'INCENERIMENTO DELLE ACQUE DI VEGETAZIONE),
Stazione Sperimentale degli Olii e dei Grassi, Milan (Italy).
A. Arpino, and C. Carola.
La Rivista Italiana Delle Sostanze Grasse, Vol. 55, p 24-28, January, 1978. 2 fig, 5 tab, 2 ref.

Descriptors: *Food processing industry, *Oily water, *Oilseed crops, *Incineration, *Fuels, Oil, Natural gas, Methane, Effluent streams, Vegetable crops, Waste water treatment, Waste water disposal, Industrial wastes.

A cost comparison of gasoil-fuel incineration with other incinerator fuel sources was conducted for the combustion-disposal of waste water from an Italian olive oil processing plant. Cost factors associated with waste water treatment and disposal in olive oil plant were reviewed for a two-year period. The plant has incinerated the waste streams with gasoil fuel since 1975. Alternative supplementary fuels investigated for incineration of the olive-crushing wastes included exhausted olive husks, methane gas, and oil. The alternative fuel sources were evaluated according to the quantity of combustion material required to provide the appropriate incineration temperature and the elec-

trical energy consumption by each fuel. A 90% fuel savings was estimated for the use of spent olive husks as incinerator fuel. The utilization of olive crushing waste water was considered as an alternative to disposal. (Lisk-FIRL)
W78-08958

DILUTION IN A VERTICAL ROUND BUOYANT JET,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
For primary bibliographic entry see Field 8B.
W78-09033

WATER QUALITY PROGRESS IN HOLSTON RIVER BASIN,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
For primary bibliographic entry see Field 5G.
W78-09043

ENGINEERING AND MANAGEMENT ASPECTS OF DREDGE DISPOSAL AND TREATMENT,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical and Environmental Engineering.
L. K. Wang, P. M. Terlecky, and R. P. Leonard.
Journal of Environmental Management, Vol. 5, No. 2, p181-203, April 1977. 2 fig, 4 tab, 45 ref.

Descriptors: *Water resources, *Water pollution, *Environmental control, *Waste treatment, *Dredging, *Waste disposal, Environmental engineering, Economic efficiency, Costs, Wildlife, Dikes.

Various dredge collection, treatment, containment, disposal and treatment alternatives are introduced and assessed. The dredge disposal techniques discussed herein include: open water disposal and diked disposal for creating recreational areas, wildlife enhancement areas, industrial construction sites, reinforced flood control dikes, deepwater refuge ecosystems, and restored strip-mine areas. The capabilities and cost data of various applicable processes for dredge treatment are also briefly summarized. The processes reviewed here encompass the entire spectrum of preliminary, primary, secondary and advanced waste treatment techniques. Advanced waste treatment methods are included in consideration of spoil as a manageable material. (Bell-Cornell)
W78-09176

WASTE OIL STUDY, REPORT TO THE CONGRESS,
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 693, Price codes: A18 in paper copy, A01 in microfiche. April 1974. 402 p, 11 fig, 52 tab, 68 ref, 7 append.

Descriptors: *Oil wastes, *Waste disposal, *Environmental effects, *Oil pollution, *Solid wastes, *Lubricants, *Ultimate disposal, Oil, Recycling, Re-refining, Fuel oil, Land disposal, Industrial wastes, Automotive lubricants, Economics, Lead, Pollutants, Water pollution, Soil contamination, Toxicity, Waste treatment, Water pollution effects.

This comprehensive report on waste oil disposal techniques and environmental effects shows that of 2.2 billion gallons of lubricating oil sold in 1972 in the United States, half was consumed in use, discarded, or lost, and half required disposal in an environmentally acceptable manner. Some 600 million gallons of automotive crankcase oil and 400 million gallons of industrial lubricating oil made up the bulk of the waste. Such oils contain many contaminants, including oxidation products, sediment, water, and metallic particles resulting from machine wear. Automotive lubricants also contain organic and inorganic chemicals from additives and from gasoline. Lead, the principal metallic contaminant in waste automotive oils, sometimes exceeds 1% by weight. In waste oil recycling/disposal, collection of the oil is the weakest link. Current disposal methods include: (1) re-refining, (2) use as a fuel for industries and utilities, (3) road oil, (4) asphalt and as a dust palliative, (5) sanitary landfills, and (6) surreptitious dumping on land or in water. The small re-refining industry relies on a costly and antiquated technology, is very susceptible to economic fluctuations, experiences feedstock shortages, and has problems of residual waste disposal. An estimated 40% of waste oil currently collected is used as fuel. Biological studies show variable toxicity according to species, method of introducing the oil, and whether marine or freshwater. (Lynch-Wisconsin)
W78-09240

5F. Water Treatment and Quality Alteration

STATISTICAL SUMMARY, 1956 INVENTORY OF MUNICIPAL WATER FACILITIES IN CITIES OVER 25,000 POPULATION.
Public Health Service, Rockville, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 750, Price codes: A05 in paper copy, A01 in microfiche. March 1958. 103 p, 17 tab.

Descriptors: *Water supply, *Water sources, *Water treatment, *Municipal water, Water softening, Water chemistry, Water demand, Water purification, Sedimentation, Coagulation, Disinfection, Water treatment plants, Water source ownership.

This publication is a statistical summary of the 1956 inventory of municipal water facilities in cities over 25,000 population. Tables include a general summary of communities, population served and ownership; water sources; general types of water treatment used and population served for both surface and groundwater supplies; more specific tables summarizing number of plants and population served by such treatment processes as disinfection, coagulation and softening, corrosion correction, taste and odor control, sedimentation, and various mixing devices, and a summary of plants and population served in regard to laboratories at plants. Two types of tables are used: 'A' tables present the totals for the U.S., Alaska and Hawaii arranged according to the city's size as shown by the 1950 census; 'B' tables present the same information in a total per state. Two mutually exclusive concepts have been introduced for purposes of this and future reports--the 'community' and the 'facility'. The former is defined as a political or geographic entity with a water supply to which a census population may be assigned; the latter is a water-producing entity serving one or a group of communities. (Zayac-NC)
W78-09061

THE HYGIENIC CHARACTERISTICS OF SEVERAL POLYMERIC COATINGS PROPOSED FOR USE IN DRINKING WATER SYSTEMS (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
V. N. Kupyrov, V. I. Vorobets, R. K. Gakal, and S. N. Starchenko.
Gig Sanit (3), p 96-97, 1977.

Descriptors: USSR, Water pollution, *Public health, Potable water, *Polymers coatings, Toxicity, Water quality.

A hygienic study was made of new Soviet (USSR) manufactured anticorrosion and water-insulating polymeric coatings for painting submerged electric pumps in wells of the public water system. Chronic experiments were conducted on albino rats to determine the toxic properties of the putty EP-00-10, the enamel EP-2100 and the paint KHS-720. The putty produced chemical substances on contact with water which negatively affected its quality, while water extracts from it had a toxic effect on the rats, resulting in a recommendation that the given polymeric material not be used in human water supply. The enamel and paint were cleared for use on submerged pumps.--Copyright 1978, Biological Abstracts, Inc.
W78-09196

5G. Water Quality Control

REAERATION CAPACITY OF THE ROCK RIVER BETWEEN LAKE KOSHKONONG, WISCONSIN AND ROCKTON, ILLINOIS,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08840

CHEMICAL QUALITY OF GROUND WATER IN THE CENTRAL SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
R. P. Fogelman.
Water-Resources Investigations 77-133, February 1978. 49 p, 13 fig, 14 tab, 25 ref.

Descriptors: *Water quality, *Groundwater, *Baseline studies, *Irrigable land, *California, Water wells, Water analysis, Chemical analysis, Water table, Hydrogeology, Aquifers, Central Sacramento Valley.

The study area includes about 1,200 square miles in the central Sacramento Valley adjacent to the Sacramento River from Knights Landing to Los Molinos, Calif. With recent agricultural development in the area, additional land has been brought under irrigation from land which had been used primarily for dry farming and grazing. This report documents the chemical character of the ground water prior to water-level declines resulting from extensive pumping for irrigation or to changes caused by extensive use of imported surface water. Chemical analyses of samples from 209 wells show that most of the area is underlain by ground water of a quality suitable for most agricultural and domestic purposes. Most of the water sampled in the area has dissolved-solids concentrations ranging from 100 to 700 milligrams per liter. The general water types for the area are a calcium magnesium bicarbonate or magnesium calcium bicarbonate and there are negligible amounts of toxic trace elements. (Woodard-USGS)
W78-08841

CHEMISTRY AND BIOLOGICAL HAZARD OF A COAL ASH SEEPAGE STREAM,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W78-08862

EFFICACY OF COPPER SULPHATE IN THE SUPPRESSION OF APHANIZOMENON FLOS-AQUAE BLOOMS IN PRAIRIE LAKES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Whitaker, J. Barica, H. Kling, and M. Buckley.
Environmental Pollution, Vol 15, p 185-194, 1978. 4 fig, 2 tab, 12 ref.

Descriptors: *Lakes, *Primary productivity, *Fish kill, *Eutrophication, *Sulfates, *Algal control, *Copper sulfate, Chlorophyll, Algae, Algicides, Population, Diatoms, Cyanophyta, Biomass, Mortality, Metals, Water Pollution effects, Prairie Lakes(Manitoba).

Five shallow eutrophic prairie lakes in the Erickson-Elphinstone area of Manitoba were treated with copper sulphate in order to control Aphanizomenon flos-aquae blooms and prevent summer fish kills. Copper sulphate was added at concentrations of 25 to 360 micrograms/liter Cu to lakes and 100 to 3000 micrograms/liter Cu to experimental tubes in early July when A. flow-aquae filaments were about 10 mm in length. Pretreatment chlorophyll a concentrations were 48 to 55 micrograms/liter and bloom species compositions were 90 to 98% of A. flos-aquae. Excellent algal control was achieved at all treatment concentrations. Typically chlorophyl a declined to 2 to 4 micrograms/liter after 4 days and A. flos-aquae completely disappeared. Algal biomass remained low for 2 to 3 weeks and then gradually increased. Often Chlorophyta, diatoms and chrysophytes dominated the algal community for the rest of the ice-free season, although in two lakes other species of cyanophyta (Microcystis sp.) were predominant. Low concentration ranging between 25 and 40 micrograms/liter Cu proved to be effective enough in these lakes. Copper concentration in the water returned to background levels after 8 to 10 days. (EIS-Klein)
W78-08864

TOXICITY OF A MIXTURE OF METALS ON FRESHWATER ALGAE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-08868

MECHANICAL CUTTING OF SUBMERSED MACROPHYTES: IMMEDIATE EFFECTS ON LITTORAL WATER CHEMISTRY AND METABOLISM,
Wisconsin Univ.-Madison. Dept. of Botany.
S. R. Carpenter, and A. Gasith.
Water Research, Vol. 12, p 55-57, 1978. 2 fig, 1 tab, 14 ref.

Descriptors: *Pest control, *Water quality, *Metabolism, *Water chemistry, Lakes, Eutrophication, Sediments, Environmental effects, Equipment, Aquatic life, Aquatic weed control, Mechanical control, Marine plants, Littoral, *Mechanical cutting, *Macrophytes.

Immediate consequences of mechanical cutting of submersed macrophytes were found to include suspension of sediments and Aufwuchs and exudation from damaged tissues which can potentially alter water chemistry and metabolism. In the densely vegetated littoral of a shallow hardwater eutrophic lake, effects of cutting on concentration of seston, dissolved organic carbon, biological oxygen demand of dissolved organic carbon, and particulate, dissolved unreactive, and dissolved reactive phosphorus were short lived or insignificant. In shallow areas, community photosynthesis and respiration were decreased by macrophyte removal. Use of this management approach on the limited basis tested does not appear to cause substantial detriment to the littoral environment. (EIS-Klein)
W78-08875

EFFECTS OF LABORATORY PROCEDURE ON FUEL OIL TOXICITY,
Massachusetts Univ., Gloucester. Marine Station.
For primary bibliographic entry see Field 5C.
W78-08880

MARINE ECOLOGY AND OIL POLLUTION,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
For primary bibliographic entry see Field 5C.
W78-08881

USE OF HYDROPONICS TO MAINTAIN QUALITY OF RECIRCULATED WATER IN A FISH CULTURE SYSTEM,
Southern Illinois Univ., Carbondale. Fisheries Research Lab.
W. M. Lewis, J. H. Yopp, H. L. Schramm, Jr., and A. M. Bradenburg.
Transactions of the American Fisheries Society, Vol 107, No 1, p 92-99, 1978. 2 fig, 3 tab, 13 ref.

Descriptors: *Hydroponics, *Aquiculture, *Catfishes, *Channel catfish, Recirculated water, *Filters, *Tomatoes, *Nutrients, *Water reuse, *Dissolved oxygen, *Growth rates, *Water circulation, *Plant growth, Waste water disposal, *Biofiltration.

Fish production, biofiltration, and hydroponics were linked in a closet of recirculating water. Fish tanks were stocked with channel catfish (Ictalurus punctatus) and the fish were fed daily. A revolving plate-type biofilter was used. Three field varieties of tomatoes were planted in outdoor hydroponic tanks. Three production units were operated during the 1976 growing season. All significant water quality variables were monitored. Performance was evaluated in terms of water quality, vegetative and fruit production of the tomatoes, and growth of the fish. Fish survival was high, but growth was below maximum because the temperature in the system was below optimum. The average loading rate of fish for the three units at harvest was 31.5 kg/unit, 489 g/tomato plant, 1.9 kg/m2 of hydroponic area, and 691 g/m2 of biofilter surface. Excellent water quality was maintained. The biofilter satisfactorily converted the waste to nitrate-N and phosphate-P and the hydroponic system removed these end products from the water. Nutrients were periodically added to supplement the nutrients from fish waste. Tomato yield was approximately twice that either demonstrated or expected in field production of the same varieties, and the hydroponically produced tomatoes were of better quality than the same varieties grown under field conditions. (EIS-Deal)
W78-08884

MEDIATION OF ACID STRIP MINE POLLUTION BY THE ATTEMPTED INHIBITION OF THE IRON-OXIDIZING AUTOTROPH, THIOBACILLUS FERROOXIDANS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W78-08885

DISPOSAL IN THE MARINE ENVIRONMENT: AN OCEANOGRAPHIC ASSESSMENT.
National Research Council, Washington, DC. Ocean Disposal Study Steering Committee.
Available from the National Technical Information Services, Springfield, VA 22161 as PB-274 056, Price codes: A05 in paper copy, A01 in microfiche. Report to Environmental Protection Agency, 1976. 86 p, 2 fig, 2 tab, 129 ref, 2 append. 68-01-2430.

Descriptors: *Water pollution control, *Waste disposal, Monitoring, Legislation, *Outer Continental Shelf, *Ocean dumping.

This study reviews and integrates scientific and technical information on ocean disposal to develop concepts for monitoring and regulating this practice. The objective is to provide, as a basis for EPA's future regulatory decisions, a rationale that considers ocean disposal in terms both of the need for ocean disposal, and of the capacity of the marine ecosystem to receive wastes. This objective, agreed upon by the Environmental Protection Agency and the study group, involves the discharge of waste into one medium only--the ocean. The report first describes the current legislation and regulations that form the background of the waste disposal problem. Next, it discusses the amount and properties of waste materials and the processes that affect their distribution and fate in the marine environment; these properties and processes form the general scientific constraints on alternatives for management. The system under which the Environmental Protection Agency currently operates is next evaluated through examination of desirable practices for site selection and site monitoring. The final section offers recommendations for further development of solutions to the problem of incorporating existing scientific information in the management of ocean disposal. (Sinha-OEIS)
W78-08886

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 1.
Bureau of Land Management, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 700, Price codes: E15 in paper copy, E15 in microfiche. Department of Interior, Bureau of Land Management, Final Environmental Impact Statement, Proposed Increase in Oil and Gas Leasing on the Outer Continental Shelf, Volume 1, July 1975. 82 fig, 108 tab.

Descriptors: *Environmental effects, *Resources development, *Leases, Baseline studies, Oil pollution, Coasts, Continental margin, Water pollution effects, *Outer Continental Shelf, *Environmental Impact Statement, Marine environments, Coastal environments, Oil and gas, Gulf Coast, Alaska coast.

It is proposed to accelerate Outer Continental Shelf oil and gas leasing in the years 1975 through 1978. This acceleration would occur nation-wide according to a revised proposed OCS planning schedule of six proposed lease sales for 1975 and six possible lease sales per year for the period 1976-1978, including some or all frontier areas by the end of 1978. This definition of the proposed action is a modification of the definition given in the draft environmental statement on accelerated OCS leasing. A tentative planning schedule was published in November 1974. An updated planning schedule was published in June 1975 and the regions used in the schedule, both geographic and geologic are depicted. This schedule incorporates the sales to be considered in 1975. Comments received from the public, as well as further internal review, have persuaded the Department to drop specific acreage figures as planning targets. It now appears more feasible to plan the program in terms of possible areas to be open for leasing and a certain number of sales per year. Hence the target figure of 'ten million acres' to be leased in 1975 has been dropped as an element of this proposal. Volume 1 contains a description of the proposed action and a description of the environment which includes the offshore environment, the nearshore and coastal zone environment, and significant and potential vulnerable resources. (See also W78-08892 and W78-08893) (Sinha-OEIS)
W78-08891

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 2.
Bureau of Land Management, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 701, Price codes: A17 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management, Final Environmental Impact Statement, Proposed Increase in Oil and Gas Leasing on the Outer Continental Shelf, Volume 2, July 1975, 1045 p.

Descriptors: *Environmental effects, *Resources development, *Leases, Baseline studies, Oil pollution, Coasts, Continental margin, Water pollution effects, *Outer Continental Shelf, *Environmental Impact Statement, Marine environments, Coastal environment, Oil and gas, U.S. Gulf Coast.

It is proposed to accelerate Outer Continental Shelf oil and gas leasing in the years 1975 through 1978. This acceleration would occur nation-wide according to a revised proposed OCS planning schedule of six proposed lease sales for 1975 and six possible lease sales per year for the period 1976-1978, including some or all frontier areas by the end of 1978. Volume 2 contains the environmental impact of the proposed action, mitigating measures, and unavoidable adverse environmental effects. (See also W78-08891 and W78-08893) (Sinha-OEIS)
W78-08892

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 3.
Bureau of Land Management, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 702, Price codes: E16 in paper copy, E16 in microfiche. Department of Interior, Bureau of Land Management, Final Environmental Impact Statement, Proposed Increase in Oil and Gas Leasing on the Outer Continental Shelf, Volume 3, July 1975, 936 p.

Descriptors: *Environmental effects, *Resources development, *Leases, Baseline studies, Oil pollution, Coasts, Continental margin, Water pollution effects, Alaska, California, *Outer Continental Shelf, *Environmental Impact Statement, Marine environments, Coastal environments, Oil and gas, Gulf Coast.

It is proposed to accelerate Outer Continental Shelf oil and gad leasing in the years 1975 through 1978. This acceleration would occur nation-wide according to a revised proposed OCS planning schedule of six proposed lease sales for 1975 and six possible lease sales per year for the period 1976-1978, including some or all frontier areas by the end of 1978. Volume 3 contains the attachments which include OCS regulations; operating orders - Gulf of Mexico and Pacific; proposed operating orders - Gulf of Alaska; OCS Research Management Advisory Board Charter; geological survey response to Energy Under the Oceans; report on the responses received in reply to the request for comments on potential future OCS oil and gas leasing; full text comments on proposal from State of Alaska; full text of comments on proposal by Southern California Council of Local Governments; proposed regulations regarding conduct of geological and geophysical explorations of the OCS; list of references; and glossary. (See also W78-08891 and W78-08892) (Sinha-OEIS)
W78-08893

BIODEGRADATION OF OIL IN SEAWATER FOR NAVAL POLLUTION CONTROL,
Naval Civil Engineering Lab., Port Hueneme, CA.
T. B. O'Neill.
Final Report to Office of Naval Research, June 1, 1977. 12 p, 4 ref. N00014-76-WR60021.

Descriptors: *Oil pollution, *Biodegradation, *Water pollution control, Oil spills, Microbial degradation, *Outer Continental Shelf, Hydrocarbonoclastic activity.

The isolation and utilization of pure and mixed microbial cultures for experiments on the biodegradation of crude oil Bunker C fuel and marine diesel is described. Many microbial species were found that had hydrocarbonoclastic activity. When pure cultures were combined in mixtures the activity was much greater, 91% oxidation in seven days, than the activity of any one of the component species when used in a pure culture. (Sinha-OEIS)
W78-08898

ECOLOGICAL EVALUATION OF PROPOSED DISCHARGE OF DREDGED MATERIAL INTO OCEAN WATERS.
California Univ., Bodega Bay. Bodega Marine Lab.; and Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W78-08899

CONTINUING DEVELOPMENT OF THE VULNERABILITY MODEL,
Enviro Control, Inc., Rockville, MD.
For primary bibliographic entry see Field 5B.
W78-08904

PROCEEDINGS OF A WORKSHOP ON PATTERN RECOGNITION APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs; and Coast Guard Research and Development Center, Groton, CT.; And TEEE Computer Society, Long Island, CA.
For primary bibliographic entry see Field 5A.
W78-08934

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME II: TRANSPORTATION AND WASTE DISPOSAL SYSTEMS.
Dames and Moore, Salt Lake City, UT; and EIC Corp., Newton, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 914, Price codes: A06 in paper copy, A01 in microfiche. Report to NOAA, Office of Marine Minerals, August 1977. 126 p, 34 ref. Contract 7-35169.

Descriptors: *Metals, *Manganese, *Resources development, *Environmental effects, Transportation, Waste disposal, Water pollution control, *Outer Continental Shelf, Underwater mining, Nodules.

This report brings together technological information pertinent to the processing of manganese nodules mined from the sea floor and to help access the effects of manganese nodule processing activities on land and marine environments. It treats potential methods, operations, and requirements for processing and handling manganese nodules on land and at sea, including recovery of value metals, transport of manganese-nodule ore and process wastes, treatment and disposal of wastes, material and energy balances and resource requirements. This volume describes the most likely systems for transporting manganese nodules from the mining ship to port and from the port to the process plant. It also describes waste transport and disposal methods most likely to be used by the industry. (See also W78-08957)
W78-08956

FEDERAL PROTECTION OF INSTREAM VALUES,
For primary bibliographic entry see Field 6E.
W78-08969

OIL SPILL IN BERMUDA: A CASE STUDY OF EFFECTIVE LITIGATION,
Harvard Univ., Cambridge, Div. of Applied Sciences. MA.
T. D. Sleeter, and J. N. Butler.
Environmental Conservation, Vol. 5, No. 1, p 21-24, (Spring, 1978). 2 fig.

Descriptors: *Penalties(Legal), *Oil spills, *Foreign countries, Judicial decisions, Oil pollution, Gas chromatography, Water pollution sources, Analytical techniques, Pollution taxes(Charges), Law enforcement.

The problem of identifying the source of spilled oil has prompted much recent research and controversial discussion. Only one case has resulted in a criminal charge being made against the pollution vessel's captain. However, this case was dismissed because of lack of jurisdiction based on the vessel's location at the time of discharge. The author outlines the proof and precedents involved in a Bermuda case which did result in the captain's liability for the clean-up costs of the oil spill. Swift action in obtaining a sample of the spilled oil and subsequent analysis by gas chromatography showed that the ship's fuel oil matched the spilled oil. This chemical evidence, together with a witness' statement, led to the captain being charged with violating the Bermuda Oil Pollution Act (BOPA) of 1973. Such strong evidence led the captain to retract his original denial of connection with the spilled oil. Most importantly, this case on appeal led to a valuable precedent. The Bermuda Supreme Court imposed absolute liability under the BOPA on the master of a vessel for pollution discharges, irregardless of his knowledge of their nature. (Baumbach-Florida)
W78-08970

CORPS CONFIRMS POLICY AGAINST 'UNNECESSARY' DEVELOPMENT IN WETLANDS.
For primary bibliographic entry see Field 6E.
W78-08972

OUR SALTY RIVERS: LEGAL AND INSTITUTIONAL APPROACHES TO SALINITY MANAGEMENT,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W78-08973

THE EPA'S POWER TO ESTABLISH NATIONAL EFFLUENT LIMITATIONS FOR EXISTING WATER POLLUTION SOURCES.
University of Pennsylvania Law Review, Vol. 125, No. 1, p 120-166 (November, 1976).

Descriptors: *Water pollution control, *Administrative agencies, *Federal Water Pollution Control Act, *Legal aspects, Industrial wastes, Regulation, Sanitary engineering, Effluents, Waste water treatment, Sewage effluents, Waste disposal, Waste water(Pollution), Water law, Water pollution, Water quality standards, Water pollution sources, Water quality control, Federal government, Federal jurisdiction, Administration, Judicial decisions.

The Environmental Protection Agency (EPA) provides definitions of levels of technology, which must be applied by distinct categories of industrial point sources of effluent discharge, by promulgating guidelines for effluent limitations. The amendments of the Federal Water Pollution Control Act (FWPCA) authorize the EPA to promulgate 'standards of performance' for new point source polluters. But neither the language nor the legislative history of the FWPCA provide clear authority for direct EPA control, as opposed to state control through the permit process, over existing sources. At issue is the distribution of authority between state and national governments. However, when the two conflicting interpretations of FWPCA section 301 (6) are compared, it becomes clear that little significant difference exists between them concerning the balance of state and national power. The EPA has the power to effectively establish actual minimum effluent limitations through the use of FWPCA section 304 (6) guidelines even if it lacks the power to issue section 301 (6) effluent limitations. Therefore, it cannot be said that recognition of the EPA's authority to issue national effluent limitatons would disturb the FWPCA's intended allocation of power between state and national governments. (Jordan-Florida)
W78-08977

. PROCEDURAL FRAMEWORK FOR IMPLE-IENTING NONPOINT SOURCE WATER POL-UTION CONTROL IN IOWA.
owa Law Review, Vol 63, No 1, p 184-229 October, 1977).

escriptors: *Iowa, *Water pollution control, Water quality, *Agricultural runoff, *Soil conser-ation, Water pollution, Pollution abatement, ischarge(Water), Runoff, Administration, Land se, Pollutants, Lakes, Groundwater, Sediments, rosion, Surface runoff, Turbidity, Federal Water ollution Control Act.

Ionpoint source water pollution is a major en-ironmental problem in Iowa and much of the nited States. Precipitation runoff causes large mounts of sediment to wash into waterways. In owa, agricultural runoff and soil erosion have esulted in turbid, bacteria-laden streams. hroughout the country, nonpoint source water ollution has been ignored in pollution abatement lans, due to difficulties in administering vast but ecessary programs and past emphasis upon point ource water pollution. However, Section 208 of he Federal Water Pollution Control Act (FWPCA) uthorizes a program of waste treatment manage-ent planning to aid the control of nonpoint ource water pollution. The implementation of this rogram is years behind schedule. The author valuates alternative administrative structures and rocedural devices that could be incorporated into he FWPCA Section 208 control system. In addi-ion, the author presents technical background in-ormation relating to nonpoint source water pollu-ion, and discusses substantive control techniques, xisting environmental regulatory agencies and ad-inistrative procedural requirements within Iowa. he author concludes that the Iowa plan should se the discretionary FWPCA Section 208 Best anagement Practices system applied by manda-ory control requirements, supplemented with ublic participation, and managed by intermediate evel river basin authorities. (Quarles-Florida)
W78-08984

LORIDA REGIONAL COASTAL ZONE EN-IRONMENTAL QUALITY ASSESSMENT, RE-ION 3, NORTH COASTAL FLORIDA.
orth Central Florida Regional Planning Council, ainesville.
eptember, 1976. 8 tab, 62 p.

escriptors: *Florida, *Coasts, *Planning, *Water uality, *Environmental effects, Air pollution, eaches, Climate, Coastal plains, Cur-ents(Water), Drainage, Environment, Estuaries, isheries, Geology, Groundwater resources, Gulf oastal Plain, Gulf of Mexico, Seashores, Sedi-ent control, Shores, Management.

he environmental quality of the Gulf coasts of ixie and Taylor counties in north central Florida s generally excellent with few problems of re-ional significance. Major concerns at present are he potential reduction of species diversity and umbers due to forestry harvesting practices and orest drainage. The most significant problem in his region appears to be the effect of the industrial ischarge of treated effluent from paper mills. nother major problem in development of the re-ion is due to storm events, which have the capa-ility of raising water levels by 14 feet during the 00 year storm. Such an event would flood the en-ire coastline up to ten miles inland. The region oes have potential problems including: (1) con-truction and dredge and fill operations in the oastal marsh and estuary systems, (2) utilization f groundwater resources, (3) improvement of ublic wastewater and disposal systems, (4) oil pill potential, (5) development in flood plains, and 6) damage to seagrass beds from modern shrimp rawling practices. Nevertheless, the problems as-ociated with coastal development in the more ensely developed areas of Florida have not yet ccurred in these counties. (Jordan-Florida)
W78-08986

FLORIDA ENVIRONMENTALLY ENDAN-GERED LANDS PLAN.
Florida Dept. of Natural Resources, Tallahassee. Div. of Recreation and Parks.
For primary bibliographic entry see Field 6G.
W78-08988

EXECUTIVE SUMMARY OF SECTION 208 PROGRAM FOR DESIGNATED AREAS. FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1974,
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 163, Price codes: A12 in paper copy, A01 in microfiche. October, 1974. 13 p.

Descriptors: *Water pollution control, *Water quality control, *Sewage treatment, *Legislation, *Federal Water Pollution Control Act, Legal aspects, Water law, Water pollution, Water quality, Aquatic life, Conservation, Local governments, Federal government, Management, Recreation facilities, Regional development, Regulation, Surveys, Planning, Administrative agencies, Governmental interrelations.

This summary provides a brief review of major elements of the section 208 water pollution control program for designated areas administered by the Environmental Protection Agency (EPA) under the Federal Water Pollution Control Act Amendments of 1972 (FWPCA). A primary goal of the FWPCA is to achieve by 1983 a level of water quality that supports aquatic life and recreation in and on the nation's waters. Application of the FWPCA Section 208 program to specific problems and areas is discussed, as well as the program's major features. The major issues which have arisen concerning various aspects of this program involve institutional arrangements, land use, development policy, relationship of areawide and facilities planning, and planning in undesignated areas. Also discussed are major features of the EPA Draft Guidelines for Areawide Waste Treatment Management Planning. These guidelines are intended to assist designated local planning agencies in the development of an areawide waste treatment implementation program. (Quarles-Florida)
W78-08990

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR SELECTED NEW SOURCE INDUSTRIES,
Environmental Protection Agency, Washington, DC. Office of Federal Activities.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 527, Price codes: A07 in paper copy, A01 in microfiche. October, 1975. 121 p.

Descriptors: *Environmental effects, *Federal Water Pollution Control Act, *Air pollution, *Industrial wastes, *Water pollution control, Federal government, Environment, Permits, Pollutants, Industries, Water pollution, Environmental control, Evaluation, Regulation, Classification, Rubber, Oil industry, Organic compounds, Chemical industry, Steam, Administrative agencies.

The Environmental Protection Agency (EPA) requires all applicants for permits to discharge pollutants to submit an environmental questionaire provided by the agency. This requirement conforms with the mandate of the National Environmental Policy Act of 1969 and the amended Federal Water Pollution Control Act. These guidelines are intended to aid permit applicants in the preparation of environment assessments. The guidelines include sections on the description of the proposed new source of pollution, the effect on the environment without the proposed action, environmental effects of the proposed new source, and alternatives to the proposed new source. Assements guidance is provided for all industrial categories and appendices provide more detailed guidance for specific industrial categories. However, appendices are not available for all industrial categories, but guidance will be provided on a case by case basis by the EPA regional administrator. Specific appendices are provided for the following industries: rubber processing; petroleum refining; organic chemicals; and the steam supply and non-contact cooling water industries. (Quarles-Florida)
W78-08992

REPORT FOR THE SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES AND THE ENVIRONMENT, OF THE SENATE COMMERCE COMMITTEE HEARING ON MERCURY CONTAMINATION UNDER THE DIRECTION OF SENATOR PHILLIP A. HART, AT MT. CLEMENS.
Federal Water Quality Administration, Chicago, IL. Great Lakes Region.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 147, Price codes: A07 in paper copy, A01 in microfiche. May 1, 1970. 146 p.

Descriptors: *Great Lakes, *Mercury, *Federal government, *Pollution abatement, *Water quality control, Lake Erie, Toxicity, Public health, Industrial wastes, Water pollution sources, Michigan, Fish, Sediment-water interfaces, Pollutants, Water pollution, Water quality, Canada, Aquatic life.

The use of large quantities of mercury in industrial processes has resulted in significant mercury pollution of the Great Lakes and connecting tributaries. Mercury is used as a chemical catalyst, in electrical apparatus, in agricultural and pharmaceutical products, and in many other industrial processes. Mercury's high toxicity and biological magnification cause concern for its introduction into ground or surface waters. Mercury pollution in the Great Lakes became apparent in 1970 when the Canadian government suspended fishing in certain areas and impounded fish shipments. The information collected now supports a ban on commercial fishing due to significant mercury concentrations in the fish in Lake St. Clair and Lake Erie. The mercury concentrations of various water samples were all below the detectable testing levels. Extremely high concentrations of mercury were bound in sediments, especially downstream from certain chemical plants. Actions initiated to clear up Lake Erie include enforcement workshops in various cities, formation of a special investigative task force on Lake Erie water pollution, and increased monitoring of the effects of mercury on fish and other aquatic life in the lake. (Molloy-Florida)
W78-08993

THE RIGHT OF INTERVENTION OF COASTAL STATES ON THE HIGH SEAS IN CASES OF POLLUTION CASUALITIES,
New Brunswick Univ., Fredericton. Law School.
C. C. Emanuelli.
University of New Brunswick Law Journal, Vol 25, p. 79-96, June 1976.

Descriptors: *Oceans, *Oil pollution, *Transportation, *Coasts, Remedies, Law enforcement, Penalties(Legal), Governmental interrelation, Pollution abatement, Ships, International law, Water pollution.

The oil tanker Torrey Canyon ran aground 12 miles off the British coast in 1967 causing major pollution damage to the British and French coasts. To abate the damage, the British government decided to fire the ship, contrary to international legal principles. The right of intervention was clearly expressed under the 1969 International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties and may

be exercised when there is actual or threatened pollution. There are limitations on when intervention may be exercised under the Convention. The Convention also provided for settlement of disputes and compensation for damages where applicable. Three principles explain the right of intervention by coastal states: self-defense, self-protection, and necessity, which was applicable in the Torrey Canyon incident. Although the convention has limited the right of intervention to oil pollution incidents, it is not intended to prohibit a nation from protecting itself from other pollutants as well. Canada has joined the Convention because it feels the Concention is incomplete in that it fails to acount for pollution resulting from seabed exploration. (Maass-Florida)
W78-08996

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol. 43, No. 4, p. 1256-1258, (January 6, 1978).

Descriptors: *Administrative agencies, *Federal Water Pollution Control Act, *Permits, *Water pollution sources, Adjudication procedure, Administration, Administrative decisions, Legal aspects, Judicial decisions, Legislation, Pollution abatement, Regulation, Water law, Water pollution, Water pollution control, Water pollution treatment, Environment, Effluents, Standards, Discharge(Water).

Herein the Environmental Protection Agency (EPA) has proposed amendments to its regulations governing state National Pollutant Discharge Elimination System (NPDES) programs. These amendments have two purposes: (1) to conform the regulations to the requirements of the settlement agreement approved by the district court for the District of Columbia in National Resources Defense Council, Inc. V. Train; and (2) to clarify the procedures under which EPA will exercise its power to object to the issuance of state NPDES permits. The settlement agreement requires a new program for the establishement by EPA of effluent limitations guidelines, new source performance standards, and pretreatment standards. To assure national uniformity in water pollution control, the proposed regulations will implement the requirements of the agreement with reference to all the states. Under the proposed regulations, states must modify, or alternatively, revoke and reissue permits when new guidelines for best available technology economically achievable are issued. Permits issued by EPA are subject, under the settlement agreement, to similar requirements. Under these proposed regulations, the EPA Regional Administrator and the state would work together in formulating the NPDES permits and ensuring that the supporting record is complete. (Jordan-Florida)
W78-08997

REQUIREMENTS FOR APPROVAL OF DISCHARGES TO AQUACULTURE PROJECT.
Title 40, Code of Federal Regulations, Part 115, sections 115.1-115.17 (July 1, 1977).

Descriptors: *Federal Water Pollution Control Act, *Aquaculture, *Water permits, *Water pollution control, Permits, Legislation, Administrative agencies, Water pollution sources, Water pollution treatment, Regulation, Aquatic environment, Crop production.

An aquaculture project is a defined managed water area which uses pollutants discharged into a designated project area for the maintenance, propagation and production of harvestable freshwater, estuarine, or marine plant or animal species. These Environmental Protection Agency (EPA) regulations provide procedures and guidelines for the approval of an aquaculture project and any discharges of pollutants associated with the project. The regulations control discharges otherwise unlawful under the Federal Water Pollution Control Act in order to determine the feasibility of using pollutants to grow beneficial aquatic organisms. These regulations do not apply to aquaculture facilities which do not utilize discharges of wastes from a separate industrial or municipal point source. The EPA Regional Administrator will issue a permit authorizing a discharge if it is determined the intended aquaculture crop will not have a significant potential for human health hazards, that the intended crop has commercial value or will be used as a food source, and that there will be minimal deleterious effect on the flora and fauna which are indigenous to the area. (Curtis-Florida)
W78-09000

UNITED STATES STEEL CORPORATION V. ILLINOIS POLLUTION CONTROL BOARD (VALIDITY OF STATE WATER POLLUTION CONTROL REGULATIONS; CONSISTENCY WITH FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W78-09010

COMPLAINT OF STEUART TRANSPORTATION COMPANY (LIMITED LIABILITY FOR OIL SPILL CLEAN-UP COSTS).
For primary bibliographic entry see Field 6E.
W78-09013

WYOMING ENVIRONMENTAL QUALITY ACT.
For primary bibliographic entry see Field 6E.
W78-09014

CONTAMINANT TRANSPORT TO DEEP WELLS,
Weston (Roy F.), Inc., Roslyn, NY.
K. J. Phillips, and L. W. Gelhar.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY6, Proceedings Paper 13824, p 807-819, June 1978. 9 fig, 2 tab, 12 ref.

Descriptors: *Pollutants, *Water wells, *Groundwater, *Water pollution, *Groundwater movement, Wastes, Wells, Base flow, Model studies, Soil water movement, Analytical techniques, Mathematical models, Theoretical analysis, Water quality, Nitrates, Soil contamination, *Groundwater quality, Well contamination.

Described herein by analytical and numerical techniques was the process of convective transport of a conservative contaminant to a deep, partially screened pumping well overlain by a zone of contaminated water. The three-dimensional flow to the well was treated as a point sink in an anisotropic medium. The effects of a regional downward flow, a phreatic surface above the well, and an impervious lower boundary were evaluated. The theoretical results were compared with the observed nitrate contamination of wells in Long Island, New York. It was shown that the local convective transport produced due to pumping greatly accelerates the process of contamination and decontamination of the wells. (Henley-ISWS)
W78-09034

WATER QUALITY PROGRESS IN HOLSTON RIVER BASIN,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
J. M. Higgins.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE3, Proceedings Paper 13813, p 515-524, June 1978. 7 fig, 4 tab, 5 ref.

Descriptors: *Water quality, *Pollution abatement, *Tennessee, *Water pollution, *Waste disposal, *Environmental engineering, Environmental sanitation, Public health, Water supply, Sanitary engineering, Sewage disposal, Planning, Domestic wastes, Industrial wastes, Pollutants, Water chemistry, Regional analysis, Waste water(Pollution), *Holston River Basin, *Cherokee Reservoir.

Wastewater discharges of oxygen-demanding wastes, suspended solids, ammonia, and total dissolved solids in the Holston River Basin of northeastern Tennessee have been reduced significantly since 1968. As a result, the quality of downstream rivers and reservoirs has improved. These changes were quantified using available historical data on waste discharges, river quality, and reservoir conditions. Additional improvements are needed, but careful studies will be required to ensure efficient abatement actions. Furthermore, the development of effective national policies will require similar trend assessments of representative basins, as a measure of the benefits received for abatement expenditures. (Henley-ISWS)
W78-09043

TOWARD ENVIRONMENTAL DEMAND MANAGEMENT,
Illinois Univ., Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6G.
W78-09064

SUMMARY: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR UTAH LAKE--JORDAN RIVER WATER QUALITY MANAGEMENT PLANNING STUDY.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 6G.
W78-09067

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR MARION, NORTH CAROLINA.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 6G.
W78-09068

A PRE-IMPOUNDMENT WATER QUALITY INVESTIGATION FOR THE PROPOSED GATHRIGHT RESERVOIR.
Environmental Protection Agency, Philadelphia, PA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-09072

FINAL ENVIRONMENTAL IMPACT STATEMENT - NORTH FREMONT COUNTY WASTEWATER FACILITIES.
Environmental Protection Agency, Seattle, WA. Region X.
For primary bibliographic entry see Field 6G.
W78-09073

ACCUMULATION OF DRY MATTER, NITROGEN AND PHOSPHORUS BY CULTIVATED WATER, HYACINTHS,
Alabama Agricultural Experiment Station, Auburn.
C. E. Boyd.
Economic Botany, Vol 30, No 1, p 51-56, January-March, 1976. 4 tab, 18 ref.

Descriptors: *Nutrient removal, *Nitrogen, *Alabama, *Water hyacinths, *Phosphorus, *Primary production, *Dry matter production.

On May 1, 1973, fifty water hyacinths were stocked in a 3.2 X 6.4 m enclosure in each of three

ponds in Auburn, Alabama. Triple superphosphate and ammonium nitrate were broadcast over the surface of the ponds between February 5 and September 9, 1973 at 2-week intervals. Water hyacinths were sampled on June 20, July 9, September 5, and September 28, 1973. Average rates of nitrogen and phosphorus removal over the entire growth period were 3.4 and 0.43 kg/ha/day, respectively, or an estimated accrual of 1.20 metric tons of nitrogen and 0.14 metric tons of phosphorus in climates conductive to year round growth. Upper and lower limits for dry matter production and nutrient uptake over a 12-month growing season, based on highest and lowest growth and nutrient absorption rates, were 39 to 142 metric tons/ha, 0.8 to 1.8 metric tons N, and 0.1 to 0.3 metric tons P. Average percentages of nitrogen in harvested plants decreased from June to September. Average phosphorus concentrations in plants were similar on June 20 and September 28, but were slightly lower on the other two dates. (Stihler-Mass)
W78-09089

DEICING SALT MOVEMENT AND ITS EFFECTS ON SOIL PARAMETERS AND VEGETATION,
Maryland Univ., College Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-09122

MANAGEMENT OF IRRIGATION STREAM SIZE FOR IMPROVED RUNOFF WATER QUALITY,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
R. G. Allen, J. R. Busch, G. C. Lewis, and D. W. Fitzsimmons.
Paper No 77-2570 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December, 13-16, 1977, Chicago, Illinois, 9 p, 6 fig, 1 tab, 8 ref.

Descriptors: Irrigation, *Runoff, *Water quality, *Irrigation water, *Furrow irrigation, Erosion, Sediments, Nutrients, *Irrigation efficiency.

A study of water quality changes between applied irrigation water and runoff for two furrow irrigated 0.89 ha plots is reported. Furrow streams on one plot were cutback to minimize runoff and erosion, and the second plot was used as a control. Losses of sediment and nutrients from the cutback-irrigated plot were much less than lost from the control, and the water-use efficiency was 73 percent versus 41 percent for the control. (Skogerboe-Colorado State)
W78-09128

RESOURCE ADEQUACY IN LIMITING SUSPENDED SEDIMENT DISCHARGES FROM AGRICULTURE,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 2J.
W78-09141

TILLAGE SYSTEM EFFECTS ON RUNOFF WATER QUALITY: PESTICIDES,
Iowa State Div., Ames. Dept. of Agricultural Engineering.
J. L. Baker, and H. P. Johnson.
Paper No. 77-2504B presented at the 1977 Winter Meeting, American Society of Agricultural Engineers. December 13016, 1977, Chicago, Illinois, 14 p, 2 fig, 4 tab, 17 ref.

Descriptors: *Pesticides, Runoff, Sedimentation, Corn(Field), Erosion, Soil erosion, Sediments, Water quality, *Agricultural runoff, *Cultivation, Pollutant identification, Path of pollutants.

Pesticide runoff losses in sediment and water were measured for six small watersheds planted to continuous corn by three tillage systems, conventional, till-plant, and ridge-plant. Decreased runoff and erosion for the till-plant and ridge-plant systems resulted in decreased pesticide losses; however pesticide concentrations insediment and/or water were sometimes higher (relative to conventional). (See also W78-09146) (Skogerboe-Colorado State).
W78-09145

IRRIGATION RETURN FLOW MODELING--A STATE OF THE ART,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
W. R. Walker.
Paper No. 77-2503 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 18 p, 4 tab, 54 ref.

Descriptors: *Return flow, *Model studies, *Simulation analysis, Computer programs, Groundwater, Nitrogen, Irrigation, Irrigation effects, *Reviews.

Forty-three models which have been developed and tested for simulation of irrigation return flow systems have been collected and evaluated. This paper discusses what seems to be some of the more critical problems in using these models, the relative strengths of those existing models, and important research and development needs for maximizing their utilization in the future. (Skogerboe-Colorado State)
W78-09147

SIMULATION OF NUTRIENT LOSSES FROM CROPLAND,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-09148

GROUND WATER POLLUTION. PART 2. POLLUTION FROM IRRIGATION AND FERTILIZATION,
National Technical Information Service, Springfield, VA.
For primary bibliographic entry see Field 5B.
W78-09151

PHOSPHORUS FERTILIZATION OF FISHPONDS IN THE UPPER GALILEE,
Mekorot Water Co., Tiberias (Israel). Lake Kinneret Watershed Lab.
For primary bibliographic entry see Field 5C.
W78-09156

OBSERVATIONS ON THE USE OF ORGANIC FERTILIZERS IN INTENSIVE FISH FARMING AT THE GINOSAR STATION IN 1976,
Intensive Fish Culture Station Ginosar (Israel).
For primary bibliographic entry see Field 5C.
W78-09157

THE USE OF SYSTEMS DIAGRAMS FOR ENVIRONMENTAL IMPACT ASSESSMENT: PROCEDURES AND AN APPLICATION,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-09174

HYGIENIC SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF BASUDIN IN WATER BODIES (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Inst. Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
For primary bibliographic entry see Field 5A.
W78-09181

RECLAMATION OF OPEN-PIT QUARRIES FOR MULTIPLE USES,
Bissell and Karn, Inc., San Leandro, CA.
For primary bibliographic entry see Field 6F.
W78-09182

MAINTAINING WATER QUALITY IN VOYAGEURS NATIONAL PARK,
Minnesota Pollution Control Agency, Roseville.
W. H. Anderl.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. UP1, p 117-126, July 1977. 1 fig, 3 tab, 5 ref.

Descriptors: *Water quality control, *Recreation facilities, *Land use, *Planning, *Forecasting, *Methodology, *Data collections, Eutrophication, Parks, Public health, Water resources, Management, Hydrology, Assessment, Aesthetics, Natural resources.

Voyageurs National Park is a recreational area with a high degree of water-based and water-oriented recreation and requires water quality surveillance. Bench mark (baseline) water quality data collected from 20 bench mark stations in the park allow the definition of water quality in the 'natural' environment. The types of data required to assess potential water quality problems are identified. Water quality assessment is a necessary component of the overall recreational planning process. The goal of water quality assessment is to use predictive tools to provide decision makers with the best attainable insight to the impact of planning alternatives on delineated water quality problems. A procedural framework for organizing and executing a technically sound assessment of water quality problems is presented. The steps are: (1) delineation of water quality problems; (2) analysis of hydrology; (3) selection of assessment methods (herein, information matrices and descriptive assessment method); (4) identification, collection, and collation of required data; (5) data analysis, method formulation, and testing of predictive capability; (6) forecasting impacts of planning alternatives; and (7) communication of results. (Bell-Cornell)
W78-09183

A REVIEW OF CONFLICT RESOLUTION MODELS IN WATER RESOURCES MANAGEMENT,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09192

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, DC.
For primary bibliographic entry see Field 2G.
W78-09213

A FORMAT FOR PLANNING A COMMECIAL MODEL AQUACULTURE FACILITY,
Kramer, Chin and Mayo, Inc., Seattle, WA.
For primary bibliographic entry see Field 6B.
W78-09228

ANALYSIS OF COSTS OF POLLUTION CONTROL.
Organization for Economic Co-operation and Development, Paris (France).
Publication No. 89514, 1973. 9 p, 2 tab.

Descriptors: *Organization for Economic Cooperation and Development, *Cost analysis, *Pollution abatement, *International trade, Costs, Economics, Balance of payments, Industries, Governments, Resource allocation, Gross national product.

Estimates of pollution control costs of member nations of the Organization for Economic Cooperation and Development (OECD) were analyzed for economic significance. While the imperfect available data does not provide a solid basis for economic analysis, and there are practically no estimates of savings resulting from pollution control, some preliminary observations can be made. Present cost estimates, valid only for the next few years, are provisional and should be used with caution. In addition, Japan's pollution control costs are increasing faster--and problems will be more serious--than in the other member countries upon which these remarks are based. Pollution control costs will be much lower than other welfare-oriented expenditures and defense spending. The shift in resource use caused by pollution control measures will probably not be greater than many other changes. As pollution control will probably increase in all major industrial members of the OECD, effects of pollution control measures on international trade. Pollution control in individual plants and parts of an industry may affect their competitive position, both in international and internal trade. Some data for selected countries is included in this report. (Lynch-Wisconsin)
W78-09232

IMPLEMENTATION OF POLLUTION CHARGES.
Organization for Economic Co-operation and Development, Paris (France).
Publication No. 28182, 1976. 7 p.

Descriptors: *Organization for Economic Cooperation and Development, *Pollution taxes(Charges), *Pollution abatement, *Regulation, *Implementation, International organizations, Noise pollution, Water pollution control, Poisons, Solid wastes, Sulfur dioxide, Particulates, Water management(Applied), Pollutants, Cost-effectiveness, Economics, Incentives, Redistribution, Social participation, Amenity.

Pollution charges, usually used in conjunction with direct regulation, stimulate technical progress by inducing reduced pollution. A pollution charge is a payment to appropriate authorities for each unit of pollutant above a certain specified level (possibly zero), or on each unit of disamenity imposed on the community. Pollutant and disamenity are expressed in 'assessment units'; the charge is found by multiplying the unit charge rate by the number of assessment units discharged per unit of time. The basis for charge assessment must be representative, simple, and acceptable. Representativeness means selecting pollution parameters which are primary causes of environmental deterioration. Simplicity requires limiting parameters to those which are easy to measure. Public acceptability depends on the system's simplicity and on involvement by affected parties in decision-making. Whee charges are not sufficiently high to be incentives, they perform a redistribution function. In such cases, proceeds may be allocated in a way which minimizes total pollution control costs. These concepts are applied in this paper to five sectors: (1) water management, (2) control of particulate and sulfur dioxide emissions, (3) solid wastes, (4) noise pollution, and (5) toxic wastes. Care must be taken to avoid transferring pollution from one medium to another as a by-product of pollution charges. (Lynch-Wisconsin)
W78-09233

NOTE ON THE IMPLEMENTATION OF THE POLLUTER-PAYS PRINCIPLE.
Organization for Economic Co-operation and Development, Paris (France).
Publication No. 5839, May 1974. 3 p.

Descriptors: *Polluter-pays principle, *Economics, *Pollution abatement, *Pollution taxes(Charges), *Cost allocation, *International organizations, Organization for Economic Cooperation and Development, Regulation, International waters, Natural resources, Costs, Regional development, Implementation, Administration, Governments.

Guiding principles of the Organization for Economic Cooperation and Development (OECD) state that the polluter must bear such expenses 'to ensure that the environment is in an acceptable state.' 'Acceptable state' implies that the advantage of further reduction in residual social damage is smaller than the social cost of further prevention and control. The principle, covering costs of both control and prevention, constitutes a means of cost allocation, and does not involve reducing pollution to any specified optimum level. The principle also helps make private costs of goods and services reflect relative scarcity of resources used in their production. In terms of conformity to the PPP, it is irrelevant whether the polluter passes some or all environmental costs on to consumers or absorbs them. Implementation may take the form of: (1) process and product standards, (2) individual regulation, (3) pollution charges, or (4) a combination of instruments. Choice of method can only be made by central or regional public authorities in the light of such factors as data requirements and administrative costs. Pollution charges require a comprehensive policy to make explicit the relationship of the charges to environmental policy objectives. Aid to polluters or exceptions to the PPP are justified only during transitional periods in order to speed pollution abatement or economic development, or when implementation would jeopardize the social and economic policy objectives of a country or region. (Lynch-Wisconsin)
W78-09234

SANITARY PROTECTION OF WATER BODIES IN CONNECTION WITH EXTRACTION AND ENRICHMENT OF RARE METALS (IN RUSSIAN),
Novosibirsk Sanitary Research Inst. (USSR).
E. D. Savilov, and L. F. Yanygina.
Gig Sanit (3), p 99-101, 1977.

Descriptors: *Industrial wastes, Pollution, *Toxicity, *Metals, *Acids, *Hydroxamic acids, Ions, Metal ions, Iron, Antimony, Manganese, Copper.

A series of studies indicated that sewage from mines and enrichment factories for rare metals (Fe, As, Mn, Cu) was polluted with suspended substances and metal ions. The flotation agent IM-50 and its component C6-C10 hydroxamic acids give water a specific odor and are stable in water, causing a negative effect on the sanitary state of water bodies resulting from an increased biochemical oxygen demand. In experiments on rats, IM-50 and C6-C10 hydroxamic acids mainfest a toxic effect predominantly on the blood system and functional state of the liver.--Copyright 1978, Biological Abstracts, Inc.
W78-09235

SURVEY OF POLLUTION CONTROL COST ESTIMATES MADE IN MEMBER COUNTRIES.
Organization for Economic Co-operation and Development, Paris (France).
1972. 23 p.

Descriptors: *Organization for Economic Cooperation and Development, *Pollution abatement, *Costs, *Air pollution, *Water pollution control, Austria, West Germany, Denmark, Finland, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom, United States, Industries, Waste treatment, Governments, Gross National Product.

Estimates of total pollution control costs are given for member nations of the Organizations for Economic Cooperation and Development (OECD). Selected expenditures by country are: (1) Austria--in 1971 investment for wastewater treatment was 1.8 billion schillings (0.5% of GNP). (2) Denmark--for total solid waste control, 500 million kroners (0.4% of GNP). (3) Finland--about 1-2 billion Finnish marks for pollution control (0.2-0.4% of GNP) in the 1970s. (4) Germany--total expenditure for 1971-75, about DM 70.5 billion (1.8% of GNP) for air, water, noise, biocide, and chemical pollution control, the Environmental Policy Program, solid waste management, and nature preservation. (5) Italy--for 1971-75, 1.6 trillion lira for water and air pollution and solid waste management (0.6% of GNP). (6) Japan--for 1971-75, 10 trillion yen for pollution control (1.2-2.1% of GNP). (7) Netherlands--800 million guilders annually by 1975, half for water pollution control (the increase representing 0.5% GNP at 1971 prices). (8) Norway--totals are given only for selected industries. (9) Spain--42 billion pesetas for 1972-75 (78% for water pollution control). (10) Sweden--in 1970 5.7% of total investment in mining and manufacturing. (11) Switzerland--450 Swiss francs in 1969 for the public sector (0.75% of GNP). (12) United Kingdom--partial costs were 449 million pounds in 1968-69 (1% of GNP). (13) United States--annual capital investment will rise from 3.6 billion in 1970 to $9.5 billion in 1980. (Lynch-Wisconsin)
W78-09236

IDENTIFICATION AND SPECIFICATION OF INPUTS FOR BENEFIT-COST MODELING OF PESTICIDE USE,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 6A.
W78-09238

'VOGTIA MALLOI,' A NEWLY INTRODUCED PYRALID (LEPIDOPTERA) FOR THE CONTROL OF ALLIGATORWEED IN THE UNITED STATES,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 4A.
W78-09239

WASTE OIL STUDY, REPORT TO THE CONGRESS,
Environmental Protection Agency, Washington DC.
For primary bibliographic entry see Field 5E.
W78-09240

SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF ABATE IN BODIES OF WATER (IN RUSSIAN),
Azerbaijan Research Inst. of Virology Microbiology and Hygiene, Baku (USSR).
V. Yu. Akhundov, D. F. Akhundov, and A. P. Mamedova.
Gig Sanit (10), p 101-103, 1976.

Descriptors: Caralase, Cholin, Esterase, Peroxidase, *Pesticides, *Abate, Experimental animals, *Lethal limit, *Water quality standards, Water pollution effects.

Commercial-grade Abate (88% and 92%) was subjected to a series of tests: Stability in water, effect on the organoleptic indices and sanitary regime (biochemical O2 consumption, ammonification and nitrification processes of bodies of water and effect on rabbits, rats and mice (blood morphology, catalase activity, blood peroxidase, serum cholinesterase) in acute, subacute and chronic experiments. On the basis of results, the maximum permissible concentration of Abate in bodies of water was set at 1 mg/l.--Copyright 1978, Biological Abstracts, Inc.
W78-09242

TECHNOLOGICAL-FORCING AND FEDERAL ENVIRONMENTAL PROTECTION STATUTES,
Washington Univ., Seattle. School of Law.
D. B. La Pierre.

Iowa Law Review, Vol. 62, No. 3, p 771-838, February 1977.

Descriptors: *Water pollution control, *Air pollution, *Legislation, *Standards, *Judicial decisions, *Technology, Federal Water Pollution Control Act, Federal Water Pollution Control Act Amendments of 1972, Clean Air Act, Clear Air Act Amendments of 1970, Environmental Protection Agency, Legal aspects, Pollution abatement, Political aspects, Regulation, Governments, Public health.

Federal regulation of pollution reduction standards indicates that the Environmental Protection Agency and the courts have converted the mandated health-based standard into one based on technology in the case of existing stationary sources of air pollutants, hazardous air pollutants, motor vehicle air pollutants, and toxic water pollutants. The wisdom of the standards actually imposed can be questioned, as well as the propriety of EPA and court action in restriking the general congressional balancing of public health protection and technological and economic feasibility; however, the retreat appears inevitable. Technology-based standards have in practice provided no incentive for major technological innovation. The Clean Air Amendments of 1970 and the provisions on toxic pollutants in the Federal Water Pollution Control Act Amendments of 1972 reflected health-based standards, and explicitly rejected technological and economic considerations as constraints. By contrast, the Federal Water Pollution Control Act is geared more to protection of environmental quality, and provides that the pollution reduction level should be governed primarily by the technological and economic feasibility of equipment, techniques, and methods. In all other pollution-control statutes a middle ground was established between health-based and technology-based standards. In this article each standard is analyzed, and relevant judicial decisions discussed. (Lynch-Wisconsin)
W78-09245

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W78-09268

RECOVERY OF BENTHIC MACROFAUNA FROM CHRONIC POLLUTION IN THE SEA AREA OFF A REFINERY PLANT, SOUTHWEST FINLAND,
Abo Akademi, Turku (Finland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-09277

EFFECTS OF THE ORGANOPHOSPHORUS INSECTICIDES TEMEPHOS (ABATE) AND CHLORPYRIFOS (DURSBAN) ON POPULATIONS OF THE SALT-MARSHES MELAMPUS BIDENTATUS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
For primary bibliographic entry see Field 5C.
W78-09285

SUBLETHAL EFFECTS OF INSECT GROWTH REGULATORS UPON CRAB LARVAL BEHAVIOR,
Duke Univ., Beaufort, NC. Marine Lab.
For primary bibliographic entry see Field 5C.
W78-09296

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

TRANSFER OF SYSTEMS TECHNOLOGY TO URBAN WATER MANAGEMENT,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
A. O. Esogbue, and G. Willeke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 466, Price codes: A11 in paper copy, A01 in microfiche. Georgia Environmental Resource Center, Atlanta, Completion Report ERC-04-78, April 1978. 234 p, 125 ref. OWRT B-116-GA(1), 14-34-0001-6069.

Descriptors: *Operations research, *Systems analysis, *Management, Cities, Model studies, Reviews, Research priorities, *Literature reviews, *Evaluation, Planning, Water supply, Water treatment, Waste water treatment, Distribution systems, *Urban water management, *Technology transfer, Flood control, Reservoir design, Reservoir operation, Recreation, Water pricing, Water demand, Data collections.

The objective was to initiate the closure mechanism between research, implementation and further research. Out of over 1000 papers reviewed in the literature from 1965-1976, 125 papers were subjected to an extensive evaluation. Evaluation of papers was done with respect to technical internal validity (technical evaluation to check various aspects of the model such as data problems, theoretical accuracy of mathematical procedures, appropriateness of statistical and sensitivity analysis, computational problems, etc.); external validity (environmental evaluation to check validity of assumptions regarding water resources environment and systems, significance of end results of study, presentation of procedures and results, implementation aspects, etc.); and technique transferability (author evaluation with respect to problem origin, modelling difficulties and experience, availability of codes, implementation status and knowledge of state of the art since the paper was written).
W78-08952

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES, AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME 3, SELECTED TECHNICAL PAPERS.
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 6B.
W78-08955

THE USE OF SYSTEMS DIAGRAMS FOR ENVIRONMENTAL IMPACT ASSESSMENT: PROCEDURES AND AN APPLICATION,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-09174

WORKSHOP ON THE VISTULA AND TISZA RIVER BASINS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
CP-76-5, International Institute for Applied Systems Analysis Workshop Proceedings, February 11-13, 1975, Edited by Andras Szollosi-Nagy. International Institute for Applied Systems Analysis, Laxenburg, Austria, April, 1976. 136 p, 37 fig, 12 tab, 90 ref. Szollosi-Nagy, A., Ed.

Descriptors: *River basins, *Methodology, *Optimization, *Planning, *Water management(Applied), *Mathematical models, *Systems analysis, Simulation analysis, Dynamic programming, Linear programming, Reservoirs, Constraints, Stochastic processes, Equations, Algorithms, Cost minimization, *Vistula River(Poland), *Tisza River(Poland).

Presented are workshops papers prepared by IIASA scholars and by guest scientists from Hungarian and Polish research institutions. Addressed are particular universal methodological problems of water resources development and optimal operation: River basin management in the Tisza and Vistula River basins provide the framework for discussions of the practical significance of methodological developments. The specific papers consider: (1) the planning and management activities in the Vistula basin; (2) new and previously developed optimization techniques for water management in the Tisza River system; (3) computer simulation to solve a water distribution, flood damage minimization problem in the Hungarian part of the Tisza basin, under the condition of water deficit; (4) a review of conflict-resolution models, including application of the decision analytic model to derive efficient municipal wastewater treatment alternatives along a river; (5) an optimal adaptive prediction algorithm for real time forecasting of hydrological time series; and (6) algorithms for the stochastic inflow-nonlinear objective water reservoir control problem. (See W78-09189 thru W78-09194) (Bell-Cornell)
W78-09188

THE VISTULA RIVER PROJECT,
A. Laski, and J. Kindler.
In: Workshop on the Vistula and Tisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (ed.), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 1-20, April 1976. 6 fig, 10 ref.

Descriptors: *Vistual River basin(Poland), *Multiple-purpose projects, *Planning, *Management, *Methodology, *Water resources development, Water requirements, Investment, Cost minimization, Optimization, Simulation analysis, WRM model, Water supply, Water allocation(Policy), Systems analysis, Economic efficiency.

Post World War II has seen a shift toward multiple-purpose water projects in Poland. This paper discusses planning and management activities as part of the national planning process in the Vistula River basin. Considered is a project aimed at meeting water demands projected to the years 1985 and 2000. The Vistula basin, its rivers, and its water resources are described. Discussed next is Poland's planning strategy for the basin, including a spatial and problem-oriented decomposition of the system, directed mainly towards the water supply problem. Given are the list of water control objectives and the steps followed in the planning process. Described is the optimum investment strategy and the WRM simulation-optimization model procedure for deriving the least-cost allocation system. Continuous revision and verification of plans is unavoidable in a rapidly expanding economy; the value of an operational tool for quick evaluation of the consequences to water management of some new development concepts and alternatives cannot be exaggerated. (See also W78-99188) (Bell-Cornell)
W78-09189

SYSTEMS ANALYSIS BASIS OF WATER MANAGEMENT IN THE TISZA RIVER VALLEY,
National Water Authority, Budapest (Hungary). Water Resources Center.
I. Bogardi, C. Bela, and G. Hanko.
In: Workshop on the Vistula and Tisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (ed.), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 21-68, April 1976. 12 fig, 5 tab, 28 ref.

Descriptors: *Tisza River basin(Hungary), *Water management(Applied), *Systems analysis, *Model studies, *Optimization, *Economic efficiency, *Reservoirs, Natural conditions, Socio-economic conditions, Projects, Water distribution(Applied), Runoff, Dynamic programming, Linear programming, Long-term planning, Constraints, Flood control, Water demand, Cost minimization, Economic loss minimization, Reservoir storage, Operations research.

The methods of systems analysis appear suited for solving the fundamental problems of water management in the Tisza Valley, for providing econoimcally optimal control and delineating strategy for future development. Described are the prevailing natural, socio-economic and water management conditions in the Tisza River System; considered are flood damage control, water uses, and flow augmentation. Next, systems analysis techniques developed thus far for the Tisza in Hungary are reviewed. Major problems of the System are listed, and models are discussed, including: a comprehensive water distribution model; a multi-stage stochastic programming model for optimum design and control of multipurpose, series-connected storage reservoirs; a mixed linear and dynamic programming model for water distribution; and a dynamic model for planning long-term water resources development; and a flood control model. Finally, a number of models is suggested which meet the stated requirements of a sound system model. An optimum control model for the present system is detailed, including symbols and definitions, the objective function of minimization of economic losses, the constraints, and the necessary data, parameters, and functions. Lastly, a cost minimization, development model of the water management system (excluding flood damage control) is considered. The computerized solution to the problem described can be performed by stochastic dynamic programming. (See also W78-09188) (Graf-Cornell)
W78-09190

RIVER BASIN NETWORK MODELLING AND ITS APPLICATION TO THE TISZA RIVER BASIN,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
P. Koryavov, and i. Belyaev.
In: Workshop on the Vistual and Tisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (ed.), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 69-93, April 1976. 7 fig, 5 tab, 3 ref.

Descriptors: *Simulation analysis, *Networks, *Computer models, *Overflow, *Water shortage, *Tisza River basin(Hungary), Decision making, Alternative planning, Water distribution(Applied), Optimization, Flood control, Reservoirs, Water demand, Cities, Constraints, Irrigation, Computer programs, Linear programming, Damage minimization, Water deficit, Model data, Equations, Systems analysis.

Computer simulation of complex dynamic systems combined with decision-making techniques becomes one of the principal methods for systems design and is a main goal of the IIASA Wate Resources Project. Herein, possible variants of regional development under the condition of a water deficit are analyzed. An essential part of a simulation system is that which represents the river basin and its development perspectives. Models of this 'block' should begin by selecting reasonable water use alternatives. By using the model presented in this paper, it is possible to consider the problem of regional water resources use in aggregated indexes. If the exogenous factors, i.e., weather prediction and runoff in a river basin, are given, then planning experts can study the consequences of different measures. The model can be used also to solve optimization problems. Considered is its application to the Hungarian part of the Tisza River Basin; two problems of water resources control which are dealt with are: water distribution among consumers at different time intervals (seasons) during a one-year period; and prevention or reduction of overflow during a flood period, where the objective function is flood damage minimization. The problem is solved using a Matrix Generator and Linear Programming Package. (See also W78-09188) (Bell-Cornell)
W78-09191

A REVIEW OF CONFLICT RESOLUTION MODELS IN WATER RESOURCES MANAGEMENT,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
A. R. Ostrom.
In: Workshop on the Vistula and Tisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (Ed), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 95-105, April 1976. 5 fig, 23 ref.

Descriptors: *Conflict-resolution models, *Decision analytical model, *Model studies, *Water quality control, *Waste water treatment, Cities, Optimization, Alternative planning, *Preferences, Reservoirs, River basins, Metagame analysis, Systems analysis.

Reviewed briefly are modeling techniques used to study problems of conflict resolution; these models ignore the underlying preferences of the decision maker(s) and the subjective information available from relevant interest groups. Metagame analysis, however, allows us to deal with relative preferences for outcomes of a single issue where there are competing interests; but this method, as well as those reviewed, does not handle uncertainty rigorously. The decision analytic approach, however, is an improvement over metagame analysis because it allows the modeler to consider a greater amount of subjective information: Preferences, risk aversion, and tradeoffs between objectives and uncertainty can all be treated in a rigorous fashion. Herein, metagame analysis and decision analysis are discussed and compared. Both methods are applied to a problem of finding efficient municipal wastewater treatment alternatives along a river. In addition, for the metagame approach, a problem of development on an international river basin where two countries have opposing interests is examined. (See also W78-09192
W78-09192

AN OPTIMAL ADAPTIVE PREDICTION ALGORITHM FOR REAL TIME FORECASTING OF HYDROLOGIC TIME SERIES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
A. Szolosi-Nagy.
In: Workshop on theVistula andTisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (ed), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 107-127, April 1976. 7 fig, 2 tab, 24 ref.

Descriptors: *Hydrology, *Time series analysis, *Forecasting, *Algorithms, *Real-time, Behavior, Water resources, Kalman filter, Estimating, Linear systems, Reservoirs, Equations, Loss minimization, Cost minimization, Optimization, Stochastic processes, Moving-average models, Autoregressive models, Uncertainty, Mathematical models, Systems analysis, Simulation analysis.

In order to achieve effective control of water resource systems, the future behavior of the inputs to theparticular system must be known. For real-time operation, small computers are preferable, and so prediction algorithms must be suited to these. This is possible using recursive prediction algorithms in which there is no need to store all the past measurements for the porpose of predicting future behavior. This paper outlines the basis of the Kalman filtering technique and proposes a simple state-space-based model for the recursive adaptive estimation of the impulse response of hydrologic system. Discrete time models are considered. The proposed algorithms can be applied to slightly nonlinear and time varying systems using a proper moving data window. having obtained the optimal time varying impulse response(s). Consedered are: state-space representation of hydrologic processes; adaptive sewuential prediction algorithms; and adaptive prediction the of linear hydrologic systems. The objective function is minimization of the chosen loss (cost) function. (See also W78-09188) (Bell-Cornell)
W78-09193

ALGORITHMS FOR THE STOCHASTIC INFLOW-NONLINEAR OBJECTIVE WATER RESERVOIR CONTROL PROBLEM,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. Casti.
In: Workshop on theVistula and Tisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (ed), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 129-136, April 1976. 2 ref.

Descriptors: *Reservoir operation, *Stochastic processes, *Dynamic programming, *Algorithms, Networks, Control, Computer programs, Optimization, Cost minimization, Constraints, Equations, Mathematical models, Operations research.

In an earlier IIASA internal paper (Casti, 1974) and in private communication to the author (Dantzig, 1975), algorithms to determine the least-cost control of a water reservoir network with stochastic inflows and nonlinear utilities were proposed. Both studies utilized a dynamic programming-type approach, coupled with approximations of one kind or another, in order to yield a computational algorithm in which the bulk of the calculation was carried out by efficient (and rapid) network flow algorithms. The purpose of this note is to present a synthesis of the work in these papers and to spell out the precise steps of an algorithm in sufficient detail to enable a computer program to be constructed. (See also W78-09188) (Bell-Cornell).
W78-09194

IDENTIFICATION AND SPECIFICATION OF INPUTS FOR BENEFIT-COST MODELING OF PESTICIDE USE,
Pennsylvania State Univ., University Park.
D. J. Epp, F. R. Tellefsen, G. A. Shute, R. M. Bear, and K. P. Wilkinson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 287, Price codes: A08 in paper copy, A01 in microfiche. EPA-600/5-77-012, Report August 1977. 143 p, 16 fig, 16 tab. 1HB617, R863247-01-1.

Descriptors: *Pesticides, *Pollutants, *Environmental effects, *Cost-benefit analysis, *Model studies, *Aldrin, Pesticide residues, Insecticides, Herbicides, Fungicides, Rodenticides, Corn(Field), Agriculture, Crop production, Economics, Aesthetics, Public health, Opportunity cost, Statistical models, Water pollution effects, Costs.

Data inputs to benefit-cost analysis of pesticide use are defined, delineated, and improved through: (1) classification of pesticide use effects; (2) establishment of valid methods of quantifying such effects; (3) identification of inadequate and erroneous methodology; and (4) illustration of benefit-cost analysis with aldrin used on corn. The report is divided into six sections: (1) Taxonomy of pesticide use effects. (2) establishment of valid methods of quantifying such effects; (3) identification of inadequate and erroneous methodology; and (4) illustration of benefit-cost analysis with aldrin used on corn. The report is divided into six sections: (1) Taxonomy of pesticide use effects. (2) Economic production, in which competing

means of evaluating production effects are evaluated and the opportunity cost approach is maintained to be the only conceptually valid technique and superior to alternative cost analysis. (3) Human health, with identification of statistical methods of measuring health costs of pesticide use; emphasis is placed on costs of chronic illness, which are shown to measurable in both dollar and utility values. (4) Environmental effects, though not generally quantifiable in a benefit-cost framework, are important in pesticide-use decision-making; effects on the terrestrial and aquatic environment are discussed. (5) Aesthetic effects, likewise not adequately quantifiable with present techniques, are evaluated using organism/effects matrices. (6) Distribution effects, which encompass pesticide effects when stratified by social, income, and international trade classifications. The output of opportunity cost analysis is consumer surplus, the proper measure of both economic and health effects associated with pesticide use. (Lynch-Wisconsin)
W78-09238

DATA ANALYSIS AND MODEL DEVELOPMENT FOR ECOSYSTEM MANAGEMENT AT LAKE GEORGE, N.Y.,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Electrical and Systems Engineering.
For primary bibliographic entry see Field 5C.
W78-09243

SOME PROBLEMS IN ANALYSING AND FORECASTING WATER DEMAND,
For primary bibliographic entry see Field 6D.
W78-09246

THE ANSWERS MODEL: A PLANNING TOOL FOR WATERSHED RESEARCH,
Arkansas Univ., Fayetteville. Dept. oof Agriculture Engineering.
For primary bibliographic entry see Field 2J.
W78-09257

6B. Evaluation Process

WATER--A CRISIS MORE SERIOUS THAN ENERGY,
United Nations Center for Economic and Social Information, New York.
L. U. Jauregui.
Magazine of the International Water Resources Association, Vol. 2, No. 1, p 25-26, March, 1977.

Descriptors: *Water conservation, *Water supply, *Water resources, Water supply development, *Water demand, Water quality.

The demand on the world's finite water supply is growing daily, because of the increased population, the concentration of people in certain areas and the industrialization process. At the same time, the quality of water has deteriorated because of these factors. We must take care of our water supply. And to do that, we have to change our attitudes towards it. (Skogerboe-Colorado State)
W78-08916

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 1 OF 2.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08931

TRANSFER OF SYSTEMS TECHNOLOGY TO URBAN WATER MANAGEMENT,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W78-08952

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME I,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08953

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME II,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08954

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES, AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME 3, SELECTED TECHNICAL PAPERS.
New England Council of Water Center Directors, Boston, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 516, Price codes: A16 in paper copy, A01 in microfiche. Completion Report, April 1978, 370 p. OWRT C-5342(4240)(6).

Descriptors: *Urbanization, *New England, *Lakes, *Regional analysis, *Regional development, Lake basins, Economic impact, Social impact, Lake watersheds, Coordination, Regions, Institutions, Multiple-purpose projects, Management, Planning, Research priorities, Political aspects.

The collection of papers included in this third volume represents the major individual contributions by research team members to the study and the results of specific research components. Each paper covered a number of particular relationships within the scope and conceptual framework of the study, but only a few of the numerous relationships implicit in the study framework could be the subject of individual research efforts. Nevertheless, those few, in addition to the cummulative expertise, provided the foundation for the interdisciplinary team analysis as presented in Volume I and the shorter summary version, Volume II. These individual research papers represent only a fraction of each scientist's contribution to the regional study. The remaining contributions are integrated in the study report presented in Volume I. The individual research papers together with the methodological appendix on conceptual methods are published as a complement to the overall study. (See also W78-08953 and W78-08954)
W78-08955

SYMPOSIUM ON COASTAL ZONE MANAGEMENT, THE UNIVERSITY OF WEST FLORIDA.
University of West Florida, Pensacola.
Proceedings of symposium, held August 8-9, 1976, Pensacola, Florida, by the University of West Florida, Pensacola, Florida, 1977. 80 p.

Descriptors: *Florida, *Coasts, Geology, *Management, Coastal plains, Conferences, Ecology, Economic impact, Environmental effects, Erosion, Estuaries, Legal aspects, Planning, Oil, Resources development, Resources, Shores, Social aspects, Water law.

The coastal areas have always been a source of sustenance for the human community. The magnitude of the mutual impact of the coastal zone and humanity, while great in the past, is increasing rapidly. The management of the coastal zone is becoming an activity of great human concern. Perhaps the most pronounced demand for such management is a result of the conflict between human requirements for stability in the coastal zone and the natural dynamics of coasts. Beaches move and hotels do not. Beaches are permanently eroded because they are not replenished as they would be naturally if the process of sand replacement had not been interrupted by the damning of rivers. Sand which would ordinarily replenish eroded beaches is trapped in inland reservoirs. Erosion and deposition are the two end effects of a single process; sediment transportation. Where a sand beach is marked by breaking waves sufficiently large to be of interest to tourists, one can be sure that the sand is geologically in motion. Onshore and offshore motion, at least at the present, represent losses to the system, and therefore, we can have serious erosion without compensating growth of land elsewhere. (Jordan-Florida)
W78-08985

FEDERAL EVALUATION OF RESOURCE INVESTMENTS: A CASE STUDY,
Cornell Univ., Ithaca, NY. Water Resources and Marine Sciences Research Center.
R. J. Kalter, L. W. Libby, R. C. Hinman, D. A. Schultz, and L. A. Shabman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 788, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Water Resources Council, Washington, D.C., February 1970. 89 p, 20 tab, append.

Descriptors: *Methodology, *Measurement, *Alternative planning, *Evaluation, *Cost-benefit analysis, Project planning, Project benefits, Cost analysis, Economic efficiency, Regional development, Environmental effects, Testing procedures, Land use, Decision making, Water resources development, Multiple purpose projects, *West Virginia, *Stonewall Jackson Reservoir(WV), West Fork River(WV).

The study is designed to test the evaluation procedures proposed by the 'Report to the Water Resources Council by the Special Task Force--Procedures for Evaluation of Water and Related Land Resource Projects' (June 1969). The test's project area involves Stonewall Jackson Reservoir on the West Fork River in West Virginia. The specific concerns of this test are benefit and cost measurement and the formulation of alternatives. It was found that empirical implementation of the four components of the multi-dimensional social welfare function required major additions to existing methodology. In most cases, existing sources of data and needed subsidiary studies were inadequate for accurate application of the appropriate methodology. Broadening the framework of project analysis beyond national economic efficiency to include the additional criteria of regional development, social well being and environmental enhancement did not reduce the need for careful and conceptually sound evaluation of the traditional efficiency impacts. With respect to the formation of alternatives for evaluation, it was found that the Special Task Force Report had not presented a means whereby alternatives can be limited, choices made, tradeoffs between each component highlighted, and proper options retained. Evaluative techniques that would eliminate these problems are recommended. (Nessa-NC)
W78-09062

TOWARD ENVIRONMENTAL DEMAND MANAGEMENT,
Illinois Univ., Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6G.
W78-09064

WATER ASSESSMENT (75) -- PLAN OF STUDY.
Water Resources Council, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-09065

MICROMANPOWER PLANNING IN THE PUBLIC SECTOR,
J. K. Davies, and C. Wright.
Available from the National Technical Information Service, Springfield, VA 22161 as HRP-0009009, Price codes: A99 in paper copy, A01 in microfiche. Prepared for Office of Water Programs Operations, Environmental Protection Agency, HRP-0009009, 1974. 68-01-2242.

Descriptors: *Planning, *Manpower, *Human resources, *Personnel management, Institutions, Labor unions, Theoretical analysis, Data collections, Data processing, Data storage and retrieval, Economics, Employment, *Micromanpower planning, *Public sector, *Labor market, Collective bargaining, Plan implementation.

The purpose of this report is to establish a systematic method for doing the type of manpower planning that is often required of organizations within the public sector of the economy. Both the institutional and technical aspects of manpower planning are developed, the level of development having been determined by presumed constraints. First presented is an overview of manpower planning, followed by a typology and history of the field. Next discussed is the institutional background with which the effective micromanpower planner must be familiar. Included here are an examination of the labor market; details of this country's human resource development system--specifically covering manpower training, personnel administration and human engineering; and a review of the expanding role of labor unions and collective bargaining in the public sector and their relationship to the manpower planner. As the report moves to its coverage of specifics of the micromanpower planning field, a review first of general planning theory and then, more narrowly, manpower planning theory, is provided. Next developed are the specifics of a system of manpower planning in the public sector. Included here is a data system outline, data use in the identification and analysis of manpower planning programs and quality control. Finally, several issues relating to the implementation of a manpower planning system within a public sector organization are discussed. (Zayac-NC)
W78-09071

MANAGEMENT OF FLOODING IN A FULLY-DEVELOPED LOW-COST HOUSING NEIGHBORHOOD,
Halff (Albert H.) Associates, Inc., Dallas, TX.
For primary bibliographic entry see Field 6F.
W78-09178

HYDROELECTRIC POWER AND SCENIC PROVISIONS OF THE 1950 NIAGARA TREATY,
Waterloo Univ., (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 6E.
W78-09180

AN UNUSUAL CHALLENGE--AMERICAN RIVER PARKWAY,
Sacramento County Dept. of Parks and Recreation, CA.
D. H. Nance, and W. S. Ueda.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. UP1, p 103-115, July 1977. 3 fig, 9 ref.

Descriptors: *Rivers, *Parkways, *Recreation facilities, *California, *Conservation, *Urban highways, Social needs, Planning, Conflicts, Land use.

A 23-mile (37-km) natural river with its flood plain meandering through the urban area of Sacramento County in California poses a challenge to the planning, design, and management concepts for recreational development. Balancing the conflicting recreational demands with conservation of natural values, preservation of wildlife, protection of property rights, ecological balance, and jurisdictional coordination is no small task. A description of the American River Parkway, its resources, and its uses shows why there are conflicts in utilizing the valuable resources. The attempts to resolve the many conflicts and the evolution of parkway development are discussed. (Bell-Cornell)
W78-09184

WORKSHOP ON THE VISTULA AND TISZA RIVER BASINS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09188

ECONOMIC BENEFITS OF CLIMATOLOGICAL SERVICES,
World Health Organization, Geneva (Switzerland).
R. Berggren.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-24847, Price codes: A04 in paper copy, A01 in microfiche. Technical Note No. 145, 1975. 43 p, 48 ref.

Descriptors: *Climatology, *Climatic data, *Economics, *Cost-benefit analysis, *Meteorology, *Planning, World Meteorological Organization, United Nations, Weather modification, Forecasting, Land use, Agriculture, Forestry, City planning, Transportation, Engineering, Water supply, Recreation, Insurance Architecture.

Economic benefits of climatological services are discussed for: (1) land-use planning, (2) agriculture and forestry, (3) city planning, (4) building design, (5) transportation, (6) engineering, (7) water supplies, (8) commerce, (9) insurance, (10) recreationa and sports, (11) medical and health services, and (12) weather modification. Climatological information usually affects capital investment, while synoptic forecast information often only pertains to operational costs. Studies of economic benefits must distinguish between highly developed and developing countries. In advanced countries meteorological progress keeps pace with industrial progress while agriculture has already assumed its main lines of development; meteorology thereby becomes a matter of protection against calamities. In developing countries meteorology often contributes to development by demonstrating the best use of natural resources, especially in the agricultural sector. Climatic forecasts are strongly dependent on the stability of observation records. Climatological data on water supplies are important to city planning, agriculture, and industry, and are needed not only on relative distribution of rainfall, but also on absolute values. Precipitation and evaporation data are important in computing irrigation need, planning dam construction and city water supply, and assessing the introduction of new crops. (Lynch-Wisconsin)
W78-09226

RAINBOW TROUT FARMING: AN ECONOMIC PERSPECTIVE,
Fisheries and Marine Service, Winnipeg (Manitoba). Western Region.
D. M. Cauvin, and P. C. Thompson.
Fisheries and Marine Service Industry Report No. 93, November 1977. 24 p, 7 fig, 12 tab, 9 ref.

Descriptors: *Rainbow trout, *Fish farming, *Aquiculture, *Economic feasibility, *Lake 106(Manitoba Canada), Alberta(Canada), Manitoba(Canada), Saskatchewan(Canada), Economics, Lakes, Pothole lakes, Oxygen depletion, Winterkilling, Risks, Cost analysis, Algae, Eutrophication, Fish stocking, Fish management, Fingerlings, Costs.

Analysis of the economic feasibility of rainbow trout farming in western Canada's pothole lakes shows that prospects are favorable in Lake 106, a low-risk algal summerkill lake, but in non-algal-collapse lakes investment as a commercial venture is not recommended. Extensive aquaculture in prairie pothole lakes in western Canada, a relatively new venture, is characterized by a high entrepreneur turnover rate, and risk of financial failure is high due to variability in recovery rates of stocked fingerlinds. This study, through detailed analysis of Lake 106 in 1974-75, examines: (1) annual income and expenditures, (2) the break-even point on annual production, (3) the break-even point on production per unit of fishing effort, (4) investment, and (5) prospects for a fish-farming industry. Lake 106, eight km south of Erickson, Manitoba, is a typical winterkill lake. Fingerlings of 6.4-7.6 cm are stocked soon after break-up in early spring and harvested in October and November. The pothole lakes are extremely productive due to abundance of natural food, primarily freshwater shrimp (Gammarus lacustris). Fish growth is remarkable, reaching 25.4-35.6 cm during the six-month period. During winter unharvested fish are killed by oxygen depletion following ice formation; potential predators are thus eliminated. In Lake 106 fish recovery was 79% in 1974 and 64% in 1975; the break-even points were 42% and 44%, respectively. (Lynch-Wisconsin)
W78-09227

A FORMAT FOR PLANNING A COMMECIAL MODEL AQUACULTURE FACILITY,
Kramer, Chin and Mayo, Inc., Seattle, WA.
R. D. Mayo.
Northeast Fish and Wildlife Conference, February 25-28, 1974, Great Gorge, New Jersey. Technical Reprint No. 30, February 1974. 15 p, 16 fig.

Descriptors: *Aquaculture, *Planning, *Model studies, *Fish hatcheries, Facilities, *Economic feasibility, Fish farming, Commercial fish, Economics, Thermal powerplants, Metabolites, Heated water, Costs.

A method for planning a hypothetical fish hatchery and evaluating its economic feasibility uses for illustration the fictitious 'omegafish.' The imaginery hatchery, located on a river next to a thermal power plant, has a capacity of two million lbs/yr, 20% of the total market of 10 million lbs/yr. Market price is $1/lb. Water is pumped from the thermal plant/s discharge canal, for which the hatchery must pay $50,000/yr. Power can be purchased at $0.2/KWH. Regulations specify that the aquacultural facility not return water to the river which would increase natural river BOD (in ppm) by more than 20% under any flow condition. Feed and growth requirements of the fish are discussed. Flow patterns are needed which keep feed pellets moving aong the bottom of the rearing tanks at 0.4-0.7 ft/sec. The units may be made of concrete or other durable, cleanable material. Oxygen and water requirements, metabolite production, diseases, temperature/development relationships, genetic selection, mobility, and mortality are analyzed. Typical water pretreatment, reconditioning, and posttreatment processes are listed. A schematic layout of a facility is illustrated, and costs of labor, equipment, building, pollution control, and operation are itemized. (Lynch-Wisconsin)
W78-09228

A SOCIAL AND ECONOMIC IMPACT STUDY OF OFFSHORE PETROLEUM AND NATURAL GAS DEVELOPMENT IN ALASKA, (PHASE I).
Mathematical Sciences Northwest, Inc., Bellevue, WA.; and Human Resources Planning Inst., Seattle, WA.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 705, Price codes: A19 in paper copy, A01 in microfiche. Report to Bureau of Land Management, Wash. DC., Final Report No. BLM-SE-77-02, Oct. 1976, 406 p, 55 fig, 112 tab, 63 ref. MSNW-HRPI-76-274, 08550-CT6-46.

Descriptors: *Alaska, *Natural gas, *Oil industry, *Kenai-Cook Inlet(AK), *Model studies, *Economic impact, *Social aspects, Offshore platforms, Oil, Economics, Cost-benefit analysis, Regional analysis, Land use, Demography, Kenai(Ak), Soldotna(AK), Forecasting, Simulation analysis, Employment, Economic development, Projections.

Phase I of this study centers on economic modelling of hydrocarbon development in Alaska's Kenai-Cook Inlet region, and Phase II concerns application of the modelling techniques to future development areas. In Phase I linkages of the petroleum sector to the rest of the Alaskan economy are examined. Kenai's proximity to Anchorage encourages the regions's economic integration with the rest of the state, and results in dispersion of the impact of development. The study includes: (1) a chronology of hydrocarbon development and employment from 1961-72; (2) economic analysis, with development and application of economic models; and (3) social analysis involving demographic trends 1961-72, community infrastructure and public services, social capital, and land use changes 1950-70. Emphasis is on the cities of Kenai and Soldotna as prime impact areas. Two Kenai-specific models, an economic base model and an input-output model, are used to forecast various economic and demographic variables. The economic base model is a modified version of a state base model developed for employment effects of pipeline construction. In test use the model successfully reproduced employment and population patterns reported for Kenai. For the social analysis, community interviews supplemented objective parameters. (See also W78-02517) (Lynch-Wisconsin)
W78-09229

MARITIME SUBSIDIES: PROBLEMS, ALTERNATIVES, AND TRADEOFFS,
New Mexico Univ., Alburquerque.
R. C. Moyer.
The Journal of Industrial Economics, Vol. 26, No. 1, p 53-68, September 1977. 1 fig, 5 tab, 11 ref.

Descriptors: *Merchant Marine Act, *Subsidies, *Trade-offs, *Shipping, *Maritime subsidies, Ships, Economics, Justification, Sealift Procurement and National Security study, Model studies, Simulation analysis, Financing.

Granting of operating subsidies to general cargo vessel operators are justified because military and strategic cargo-carrying capacity is essential for defense needs, but traditional economic-political justifications are rejected. In the case of construction differential subsidies, no such justification is found; a case is made for permitting U.S. flag operators to buy their vessels on the world market at the most competitive price. Suggestions are made for improving the foreign cost parity system of operating subsidies; the latter, based only on a proportion of total costs (excluding capital costs) and completely omitting revenues, leads to perverse results. A rate-of-return-based system of subsidy is proposed, and its advantages over the current system enumerated. A financial simulation model is used to compare the total financial value of U.S. subsidy, tax, and financing benefits with those for a similar vessel built and operated abroad, and it is shown that the U.S. package may be far more attractive than generally believed for certain bulk operators. Various mixes of financing and construction subsidies may shift the cost burden more toward the final consumer and away from the general body of taxpayers. A thorough reevaluation of the objectives and rationales of the new maritime program begun in 1970 is clearly needed. (Lynch-Wisconsin)
W78-09230

AN ECONOMIC APPRAISAL OF EASTERN SHORE SEAFOOD HARVESTING,
Virginia Inst. of Marine Science, Gloucester Point.
I. Strand.
Marine Resources Advisory, No. 11, June 1976. 6 p, 6 fig, 4 tab, 4 ref.

Descriptors: *Virginia, *Eastern Shore(VA), *Economics, *Commercial fishing, *Chesapeake Bay, *Fisheries, Seafood, Commercial fish, Clams, Oysters, Crabs, Flounder, Striped bass, Sea trout, Bluefish, Atlantic Ocean, Bays, Oceans.

Short- and long-term trends in the seafood harvesting industry of Virginia's Eastern Shore are analyzed using 1972-74 monthly data and 1949-72 annual data. Principal products are clams, hard and soft blue crabs, oysters, and several finfish, including fluke (flounder), striped bass, sea trout, and bluefish. In shellfish production there have been sharp long-term declines in soft crabs and oysters. Soft crab decline may be due to increased wages and disappearance of Chesapeake eel grass, while the decline in oyster production may be the result of MSX disease, increased salinity, and labor costs. Variation in finfish production has been dramatic. Croaker landings between 1949-62 peaked at 1.4 million lbs and never fell as low as 175,000 lbs, but between 1963-70 landings never exceeded 30,000 lbs and fell as low as 100 lbs. Puffers never exceeded 210,000 lbs from 1949-62, but rose to 1.5 million lbs in 1065. Causes have not been established. The value of 11 major commercial shellfish and finfish species on the Eastern Shore totalled $4.2 in 1972, $6.8 million in 1973, and $9.2 million in 1974. Various aspects of commercial fishing accounts for about 25% of Virginia employment. Recent federal government actions will probably cause a severe cost-price squeeze in the shellfish industry, and prices will continue to decline. Competition for labor should cause wage increases. Effects will be farless severe on the finfish industry. (Lynch-Wisconsin)
W78-09231

ECONOMIC AND SOCIAL PURPOSES RELATED TO WATER MANAGEMENT,
Organization for Economic Co-operation and Development, Paris (France).
W. Wright.
Publication No. 22.408, June 1977. 50 p, 90 ref.

Descriptors: *Water management(Applied), *Social aspects, *Economics, *Regional development, *Organization for Economic Cooperation and Development(OECD), *Planning, Legal aspects, Goals, Research priorities, Equity, Political aspects, Social values, Cost-benefit analysis, Governments, Recreation, Aesthetics, Water demand, Water supply.

Economic and social goals which govern water management in member nations of the Organization for Economic Cooperation and Development (OECD) were ascertained, and problems of implementation identified. Six objectives common to various countries are: (1) equity, (2) economic efficiency, (3) regional development, (4) environmental quality improvement, (5) cooperation with local administrations, and (6) cooperation with water authorities of other countries. Problems which have arisen during planning and implementation include: (1) equity problems regarding impact and financing of specific projects and current changes in laws; (2) economic efficiency is undercut by lack of economic information and mechanisms for motivating decision-makers to take social costs and benefits into account; (3) regional development programs have lead to resource misallocation by subsidizing such special uses as irrigation; (4) cost-benefit studies for measuring environmental quality improvements suffer from difficulties in evaluating intangible costs and benefits; and (5) national and international cooperation is needed to coordinate political and hydrological management units. Research is needed on effects of government subsidies, demand forecasts based on prices, recreational and aesthetic benefits of water projects, costs and benefits of research programs, and water utilization rights. (Lynch-Wisconsin)
W78-09237

TWO OIL SPILLS - INTERRELATEDNESS OF SOCIOECONOMIC STRUCTURE AND IMPACT ON SEAFOOD MARKETING SYSTEM,
Swedish Water and Air Pollution Research Inst., Stockholm.
For primary bibliographic entry see Field 5C.
W78-09244

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE - PROCEEDINGS.
Water Research Foundation of Australia, Sidney.
Report No. 37, Papers of a Symposoum Held in Melbourne, Victoria, August, 1972, December 1972.

Descriptors: *Watershed management, *Watersheds(Basins), *Recreation demand, *Reservoirs, *Australia, *Victoria(Australia), *Water management(Applied), *Melbourne(Australia), *Water resources development, Water supply, Land use, Administration, Water storage, Recreation facilities, Tourism, Water policy, Forest watersheds, Planning, Multiple purpose, Single purpose.

Five papers from a symposium on recreational aspects of watershed management held in August 1972 in Melbourne, Australia focus on problems of that part of the country: (1) 'Catchment Management and Use'--discusses the water cycle, water shed management objectives, responsible agencies in Australia, and effects of recreational activities. (2) 'Recreational Use of Inland Waters in Victoria'--describes the rapid growth of recreational development at irrigation storage reservoirs since 1950 in Victoria, administrative mechanisms devised, and planning strategy. (3) 'Water Supply Policies and Studies for Metropolitan Melbourne'--deals with the policy of single-purpose watershed use ('closed catchment') of the Melbourne and Metropolitan Board of Works, and describes the Board's programs of fire prevention and suppression, hydrology research, and recreation reserves. (4) 'Use of Catchment Areas as Flora and Fauna Reserves'--discusses factors which affect development of wildlife reserves in water supply catchments in Victoria, including the controlling agency's policies, forestry, grazing, snow sports, and motorized recreational vehicles. (5) 'Recreation Evaluation as a Guide of Policy Making in Water Catchments'--presents a method of evaluating economic benefits of recreational use, using data from the Grampians ranges in Victoria; an aggregate demand curve is derived. (See W78-09248 thru W78-09252) (Lynch-Wisconsin)
W78-09247

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE,
R. G. Downes.
Water Research Foundation of Australia, Report No. 37, Water Catchment Management and Recreational Use, p. 1.1-1.6, December 1972.

Descriptors: *Watersheds(Basins), *Watershed management, *Australia, *Water supply, *Water management(Applied), Land use, Hydrologic cycle, Permeability, Water pollution sources, Recreation, Governments, Water sources, Administration, Water storage, Sedimentation, Turbidity, Legislation, Agricultural runoff, Pollutants.

Various aspects of watershed management-especially in Australia--are discussed, including a brief

description of the water cycle, management objectives, agencies responsible, and effects of recreational activities. For ideal catchments with uniform flow and volume high enough to permit minimum storage, the primary management objective is to protect the regular flow. For catchments with irregular flow which require storage, an important management objective is prevention of soil erosion and consequent sediment deposition in reservoirs, thus maintaining the storage capacity. The main pollutants of water supply sources are generally sediment and turbidity from soil erosion (Particularly in the U.S.), and in Australia salinity, and leached fertilizers, pesticides, and organic matter from agriculture. Insustrial and toxic wastes and litter are not usually significant pollution sources in water supplies. The greatest potential pollution source is increased residence by people using the watershed for recreation; recreational access carries with it creation of less permeable surfaces and sewage effluent. The Land Conservation Council, created in 1970, makes recommendations to, and advises the Soil Conservation Authority on, catchment matters. The authority has followed a policy of enabling multiple-purpose use while maintaining catchment efficiency. (See also W78-09247) (Lynch-Wisconsin)
W78-09248

RECREATIONAL USE OF INLAND WATERS IN VICTORIA,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
G. W. Lewis, and R. Bird.
Water Research Foundation of Australia, Report No. 37, Water Catchment Management and Recreational Use, 2.1-2.11, December 1972. 2 append.

Descriptors: *Victoria(Australia), *Australia, *Recreation, *Reservoirs, *Water storage, *Planning, Water supply, Recreation demand, Recreation facilities, Irrigation, Administration, Water resources development, Water management(Applied), Sport fishing, Boating, Swimming, Tourism, Water policy.

Recreational development of irrigation storage reservoirs in Victoria, Australia, has largely taken place since 1950 as a result of affluence, rising boating popularity, and availability of an increasing number of reservoirs. Funds were first specifically budgeted for capital expenditures on recreational works in 1963-64 ($26,000) for use by the State Rivers and Water Supply Commission; in 1970-71 $117,300 was allotted. Additional grants from the Ministry of Tourism over the past eight years have amounted to 50% of the commission's own allocation, and total capital expenditures have exceeded $750,000. The rapid increase in recreational responsibilities has strained the commission because of problems of staff, funding, and experience. Problems included litter, policing, and provision of facilities. In the early 1960s the commission created a Reservoir Recreational Facilities Committee to plan for all storages, based on separate facilities for day picnickers and for boaters and campers. Though the program has been successful, separation of the two types of facilities has resulted in duplication of many services, such as roads, parking lots, and restrooms. A 1964 amendment to the Water Act allowed the commission to constitute its lands as recreational areas, with revenues generated retained for further development. (See also W78-09247) (Lynch-Wisconsin)
W78-09249

WATER SUPPLY CATCHMENT POLICIES AND STUDIES FOR METROPOLITAN MELBOURNE,
B. H. Fryer.
Water Research Foundation of Australia, Report No. 37, Water Catchment Management and Recreational Use, p 3.1-3.8, December 1972. 4 fig.

Descriptors: *Melbourne(Australia), *Water policy, *Watershed management, *Water supply, *Forest watersheds, *Watersheds(Basins), *Water management(Applied), City planning, Recreation demand, Hydrology, Research and development, Forest fires, Fire prevention, Planning, Closed catchment policy, Single purpose, Forest management, Melbourne and Metropolitan Board of Works.

The Melbourne and Metropolitan Board of Works (Australia), constituted in 1890 to orperate the city's water supply system, has consistently followed a 'closed catchment' or single-purpose water use policy for the catchment area. Present catchment areas total 230,000 acres of unalienated forested land. Despite frequent challenges to the policy by citizens, government agencies, and business associations, the board contends it should continue the policy, which has yielded acceptable results at minimal cost for almost a century. Public entry to the watershed areas is denied principally because Melbourne's system is based on an essentially untreated water supply. Nevertheless, the watersheds do carry significant quantities of commercial timber and are located near a rapidly expanding population seeking recreational opportunities. The board's watershed management program reflects these consideration in three broad aspects: (1) fire prevention and suppression, (2) applied research into forested catchment hydrology, and (3) development and maintenance of public recreation reserves outside the catchment. The board maintains a 200-man fire-fighting team, and operates four fire lookout towers and a communications system. In the hydrology research program, precipitation, throughfall, soil moisture, streamflow, and water quality are under study in three catchments--Picaninny, Blue Jacket, and Slip--to determine the feasibility of permitting commercial timbering. (See also W78-09247) (Lynch-Wisconsin)
W78-09250

THE USE OF CATCHMENT AREAS AS FLORA AND FAUNA RESERVES,
National Parks, Victoria (Australia).
For primary bibliographic entry see Field 6G.
W78-09251

RECREATION EVALUATION AS A GUIDE TO POLICY MAKING IN WATER CATCHMENT,
P. Greig.
Water Research Foundation of Australia, Report No. 37, Water Catchment Management and Recreational Use, p 5.11, December 1972. 5 fig, 6 tab, 2 ref.

Descriptors: *Grampians ranges(Australia), *Mountain forests, *Recreation demand, *Watershed management, *Economics, Victoria(Australia), Watersheds(Basins), Mountains, Water supply, Forestry, Tourism, Surveys, Social aspects, Pricing, Planning, Decision-making, Methodology, Cost-benefit analysis, Camping.

A method for evaluating economic benefits of recreational usage is described and demonstrated for Australia's Grampians ranges, a forested, mountainous water catchment area located between Melbourne and Adelaide in Victoria. Utilization of the results in management decision-making is illustrated. The method was initially developed by Clawson (1959). A survey was conducted over a 12-month period of visitors to the Grampians, and involved personal interviews, questionnaires, and vehicle cunts. Information was grouped according to post code into 132 zones of origin, and average round-trip travel costs were calculated for each zone from average road mileage and an average of $.04 cost permile of travel. Average non-travel costs (food, accommodations) were also calculated and added to travel costs to estimate average trip costs; the total was used as a proxy for average price paid per carload of visitors from each zone. Numbers of visitors per thousand of base population was also measured. The aggregate demand curve was plotted for the 'whole outdoor recreation experience.' Successive changes in demand brought about by application of different admission fees were estimated. Aggregate consumer surplus (the amount of money a consumer would pay over actual price) was derived from the demand curve. As there is currently no admission price, total annual consumer surplus is $323,450. Results are applied to planning for camping facilities in the Grampians. (See also W78-09247) (Lynch-Wisconsin)
W78-09252

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EFFECT OF PROCESS MODIFICATIONS ON THE REDUCTION OF WATER USE AND WASTE IN A CASE STUDY DAIRY PLANT,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 3E.
W78-08890

IRRIGATION COSTS, WHICH METHOD IS BEST FOR YOU.
For primary bibliographic entry see Field 3F.
W78-08917

ANALYSIS OF COSTS OF POLLUTION CONTROL.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-09232

IMPLEMENTATION OF POLLUTION CHARGES.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-09233

NOTE ON THE IMPLEMENTATION OF THE POLLUTER-PAYS PRINCIPLE.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-09234

SURVEY OF POLLUTION CONTROL COST ESTIMATES MADE IN MEMBER COUNTRIES.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-09236

6D. Water Demand

WATER--A CRISIS MORE SERIOUS THAN ENERGY,
United Nations Center for Economic and Social Information, New York.
For primary bibliographic entry see Field 6B.
W78-08916

PROCEEDINGS ON CONFERENCE ON GEOTHERMAL ENERGY AND THE LAW HELD IN SANTA BARBARA, CALIFORNIA ON FEBRUARY 3, 4 AND 5, 1975.
For primary bibliographic entry see Field 6E.
W78-08991

SOME PROBLEMS IN ANALYSING AND FORECASTING WATER DEMAND,
A. C. Twort.
Water Services, Vol. 80, No. 970, p 751-752, December 1976. 1 tab, 4 ref.

Descriptors: *Water demand, *Forecasting, *Water management(Applied), *Water consumption(Except consumptive use), *Domestic water, Water supply, Water users, United Kingdom, Classification, Planning, Data collections.

Although all water demand forecasting is based on past consumption records, most such records are unreliable because of nonuniform consumption classifications and because parameters used in defining types of consumption are not generally described. A practical classification system for water consumption is presented with three broad categories: (1) Household--domestic purposes (including car washing), gardening, wasteful use, and leakage. (2) Commercial/industrial/agricultural--shops and offices, large industrial, other industrial, institutional and public gardens, and agricultural and horticultural. (3) Unaccounted-for--leaks on service pipe connections to mains and at distribution mains, overflows and leaks from reservoirs, and three types of meter errors. In Britain hotels and licensed premises have sometimes been included under domestic consumption, while in other countries they would be placed under commercial. 'Household consumption' is therefore preferable to 'domestic consumption.' Reliable measurements of household consumption are rare, and are usually given only for relatively small sample populations. Such measurements must exclude distribution mains leakage and leakage from service pipe connections to mains, the resident population served must be known with at least + or - 5% accuracy, and households in the survey must comprise a definable class. Random sampling must not be used where there is more than one class of property. Better information on losses is also needed to accurately determine achievable targets. (Lynch-Wisconsin)
W78-09246

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE - PROCEEDINGS.
Water Research Foundation of Australia, Sidney.
For primary bibliographic entry see Field 6B.
W78-09247

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE,
For primary bibliographic entry see Field 6B.
W78-09248

RECREATIONAL USE OF INLAND WATERS IN VICTORIA,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
For primary bibliographic entry see Field 6B.
W78-09249

RECREATION EVALUATION AS A GUIDE TO POLICY MAKING IN WATER CATCHMENT,
For primary bibliographic entry see Field 6B.
W78-09252

6E. Water Law and Institutions

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME I,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08953

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME II,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08954

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES, AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME 3, SELECTED TECHNICAL PAPERS.
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 6B.
W78-08955

LAND ACCRETION AND AVULSION: THE BATTLE OF BLACKBIRD BEND,
L. S. Camp.
Nebraska Law Review, Vol. 56, No. 4, p 814-835 (1977).

Descriptors: *Nebraska, *Iowa, *Accretion(Legal aspects), *River flow, Missouri River, Boundaries(Property), Boundary disputes, Indian reservations, Judicial decisions, Riparian land, Avulsion, Rivers.

The Missouri River has washed away a peninsula on the Nebraska side that was part of a reservation given to the Omaha Indian Tribe by an 1854 treaty with the United States. This resulted in a spate of litigation in 1975 over 11,000 acres of land in Iowa which the Indian Tribe claimed for itself. The author focuses on various legal principles related to river movement. There is particular emphasis upon Nebraska and Iowa law. The above situation is used to illustrate these legal principles. The United States District Courts' resolution of this specific case is analyzed in detail. The author concludes with an exploration of the policies underlying the ruler of accretion and avulsion. Also included is a proposal for the recognition of an effective form of adverse possession against the government. Althugh the rechanneling of the Missouri and Mississippi Rivers tends to preclude further land disputes, the great number of rivers, streams and creeks coupled with the increasing value of farmland promises future disputes over smaller portions of land. The author notes that there are remaining issues not considered by the court in the present case which need to be resolved. (Quarles-Florida)
W78-08968

FEDERAL PROTECTION OF INSTREAM VALUES,
L. Holdeman.
Nebraska Law Review, Vol. 57, No. 2, p 368-402 (1978).

Descriptors: *Federal government, *Water policy, *Water utilization, *Federal Water Pollution Control Act, Recreation, Water quality, Planning, Water rights, Legislation, Permits, Water resources, Regulation.

The federal goverment has expressed strong concern for environmental and recreational values. These concerns encompass preservation of water quantity and quality, as well as fish and wildlife resources. Increasingly the federal government has become more involved in instream use, planning and preservation. Although state governments have traditionally controlled the acquisition and retention of water use rights, the federal government has intervened where states have failed to protect resources and where the interest to be protected is federal in nature. State inaction remains a serious obstacle to the protection and preservation of instream values. This obstacle is explored in detail. The diversion requirement for valid appropriation is cited as being totally inconsistent with conservation. Other methods employed by states in the regulation and adjudication of water rights are also examined. The primary focus of the author is on the federal prerogative in protecting instream values. Underlying principles are explored as well as the exercise of present and future federal control. The author notes an increasing awareness of environmental values by the federal government. (Quarles-Florida)
W78-08969

OIL SPILL IN BERMUDA: A CASE STUDY OF EFFECTIVE LITIGATION,
Harvard Univ., Cambridge, Div. of Applied Sciences. MA.
For primary bibliographic entry see Field 5G.
W78-08970

CORPS' WETLANDS CONTROL SURVIVES TRIP THROUGH A LEGISLATIVE SWAMP,
J. D. Kirschten.
National Journal, No. 43, p 1506-1512 (October 23, 1976).

Descriptors: *Dredging, *Interagency cooperation, *Permits, *Wetlands, Federal Water Pollution Control Act, Administrative agencies, Agriculture, Construction, Legislation, Marshes, Water policy, Political aspects.

A far-reaching and surprisingly resilient Army Corps of Engineers program to protect the nations' diminishing wetlands emerged unscathed at the close of the 94th Congress despite a withering election-year attack by powerful and varied groups of opponents. Environmentalists are generally satisfied with the turn of events that has left the Corps with broad authority to require permits for the disposal of dredge or fill materials in waters and wetland areas. Decisions on the issuance of permits must be made in accordance with Environmental Protection Agency (EPA) guidelines, and EPA has the authority to veto disposal sites it deems environmentally unsuitable. While the current program serves as an effective stopgap solution, providing a procedural basis for examining activities that might endanger wetlands resources, it has many pitfalls as a long-term program. It fails to accomodate the interests of states and localities and it is not coordinated with other federal efforts concerning coastal zone management or other programs. There remains an influential constituency of farm, forestry, construction, and land development interests working hard to dismantle the program. (Jordan-Florida)
W78-08971

CORPS CONFIRMS POLICY AGAINST 'UNNECESSARY' DEVELOPMENT IN WETLANDS.
Environmental Law Reporter, Vol. 6, No. 6, p 10117-10119 (June, 1976).

Descriptors: *Wetlands, *Florida, *Permits, *Dredging, Mangrove swamps, Federal Water Pollution Control Act, Water resources, Administrative agencies, Administrative decisions, Legal aspects, Water resources, Water law, Competing uses, Legislation, Water policy, State governments, Decision making, Cost-benefit analysis.

In accordance with the Federal Water Pollution Control Act Amendment of 1972, the Army Corps of Engineers has denied two applications from a large land and housing construction developer for dredging and filling more than 2000 acres of mangrove swamps in Florida. Section 404 of the Act extended the Corps' jurisdiction over dredge and fill activities to all waters of the United States. The application of this section has signalled the Corps' willingness to implement its newfound policy of protecting the nation's wetlands from unnecessary destruction. The Corps, noting that mangroves perform a number of important functions, including ocean food chain production and acting as wave and erosion buffers, applied a two-pronged

test. Since the benefits of the dredging and filling did not outweigh the damage to the wetlands resource and since the proposed alteration of the wetlands was not proven to be necessary to realize these benefits, the applications were denied. The denial of the proposed fill projects serve as notice to other developers that a strong presumption exists against the granting of further dredge and fill permits for the construction of housing in productive wetland areas. (Curtis-Florida)
W78-08972

OUR SALTY RIVERS: LEGAL AND INSTITUTIONAL APPROACHES TO SALINITY MANAGEMENT,
Washington Univ., Seattle. School of Law.
R. W. Johnson.
Land and Water Law Review, Vol. 13, No. 2, p 441-464 (1978).

Descriptors: *Water pollution control, *Salinity, *Management, *River basins, *Systems analysis, Pollution abatement, Groundwater, Surface water, Water law, Rivers, River regulation, Water rights, Federal Water Pollution Control Act, Colorado River, Agriculture, Industries, Saline water, Planning, Local governments, Federal government.

The salinity problem in United States rivers and elsewhere worsens annually and no water law system developed to date adequately addresses salinity management. The author discusses the salinity problem, its scope and remedial and preventative measures taken to date. Because the sources of salinity are so widely scattered and diffused, impacting both interstate and international rivers, effective solutions must be regional, national or even international in scope. The federal government must necessarily be involved in their design. There are no simple legal or institutional solutions to salinity problems. Noting that current pollution control programs are generally aimed at controlling point-sources and nonpoint salinity pollution sources, the author concludes that the specific relationship of the land, water, population, crop distribution and legal systems that exist in each basin will require uniquely tailored systems-analysis type solutions. The most efficient approach appears to call for an area's central government, or one of its agencies, to analyze the salinity problem, consider and select among the alternative solutions, and implement those selected by direct and authoritative governmental action. (Easterbrook-Florida)
W78-08973

PUBLIC RIGHTS TO PRIVATE BEACHES, LAKES, AND STREAMS IN WASHINGTON,
Washington Univ., Seattle. School of Law.
R. W. Johnson.
In: Shorelines Management 1977 Performance and Prospects, Conference Proceedings, September 22-23, 1977, University of Washington, Seattle, Washington Sea Grant Program, Division of Marine Resources, University of Washington, Seattle, 98195, p 133-141.

Descriptors: *Washington, *Public rights, *Public access, *Water rights, *Riparian rights, Beaches, Lakes, Streams, Fishing, Zoning, Permits, Navigation, Oceans, Legislation, Recreation, Navigable waters, Non-navigable waters, Prescriptive rights, Legal aspects, Judicial decisions.

The trend of the law in Washington State has been toward recognition of a broader range of public rights in adjacent lands of both navigable and non-navigable waters. Various court doctrines along with legislation have brought about significant changes in this area. Washington law now provides that the public has the right to use navigable and non-navigable waters. No impediments to such use can be placed on those waters without approval of local, state, and national governments. Impeding structures that have been built in these waters may be removed without compensation if necessary to aid navigation. The public probably has the right to use all privately owned tidelands and dry sands areas on beaches for recreational purposes. This right may also apply to privately owned tidelands of the Straits of Juan de Fuca, Hood Canal and Puget Sound. This right of access extends to privately owned beds, gravel and sand bars of rivers. Riparians on non-navigable lakes and streams have a right to use the entire water surface, whether publicly or privately owned. No filling or building of non-water-dependant structures on these waters is permitted without obtaining permission from all other riparian owners. (Quarles-Florida)
W78-08974

GEOTHERMAL RESOURCES: WATER AND OTHER CONFLICTS ENCOUNTERED BY THE DEVELOPER,
Vranesh, Raisch, and Schroeder, Boulder, CO.
G. Vranesh, and J. D. Musick, Jr.
Land and Water Law Review, Vol. 13, No. 1, p 109-49, 1977.

Descriptors: *Thermal power, *Geothermal studies, Energy, *Natural resource, Prior appropriation, Thermal properties, Hydrologic systems, Thermal water, Geysers, Natural recharge, Subsurface water, Oil-water interfaces.

Geothermal resources described as an alternative energy source with the potential of helping the United States reach a goal of energy self-sufficiency, have not yet been fully exploited in this country. In this article, the authors explain the need for a legal definition of geothermal resouces as well as a clarification of the body of law that should be applied to its development. After a brief discussion of the basic nature of the resource, the authors describe the types of potential pollution that can result from geothermal development. Through analysis of recent federal and state legislation and case law, the article examines the current conflict over whether to classify geothermal energy as a mineral or as a water resource. A discussion of the current Colorado treatment of geothermal development further illustrates the disparity in regulation and ownership rights that results from this difference in classification. The authors conclude that since geothermal resources are interrelated with groundwater supplies, geothermal resources should be classified as 'water' and should be subjected to the appropriation doctrine now used by the Western states. (Anderson-Florida)
W78-08975

WATER THAT IS NOT WATER.
Utah Univ., Salt Lake City. Coll. of Law.
O. Olpin, and A. D. Tarlock.
Land and Water Law Review, Vol. 13, No. 2, p 391-440, 1978.

Descriptors: *Geothermal studies, *Thermal water, *Energy, *Water rights, Groundwater, Resources, Oil-water interfaces, Federal-state water rights conflicts, Reservation doctrine, Subsurface waters, Surface-groundwater relationships, Geysers, Mineral industry.

This article describes the relationship between geothermal resources and conventional sources of water in order to analyze the proper relationship between the law of geothermal development and western water law. The authors argue that a geothermal reservoir is simply a natural resource whose exploitation should be regulated so that the developer is forced to bear all of the environmental costs of exploitation. A survey of the current federal and state legislation and case law illustrates the existing conflict over which body of law-mineral or water-should govern the recognition of property rights in geothermal reservoirs. The authors then present an argument against the blanket application of western water law and instead propose a system whereby a government agency after determining the degree of interconnection between geothermal areas and freshwater sources, would impose conditions and limitations on geothermal development designed to prevent substantial harm to freshwater sources. Under the proposed system, any geothermal operator who complies with the prescribed conditions would have the benefit of a presumption that his operations cause no injury to or interference with freshwater sources in the absence of convincing evidence to the contrary. (Anderson-Florida)
W78-08976

THE EPA'S POWER TO ESTABLISH NATIONAL EFFLUENT LIMITATIONS FOR EXISTING WATER POLLUTION SOURCES.
For primary bibliographic entry see Field 5G.
W78-08977

ENVIRONMENTAL IMPACT ASSESSMENT FOR WATER RESOURCE PROJECTS: THE ARMY CORPS OF ENGINEERS,
For primary bibliographic entry see Field 6G.
W78-08978

REAL PROPERTY--STATE HAS TITLE TO FORESHORES OF GEORGIA'S NAVIGABLE WATERS,
D. Bergh.
Mercer Law Review, Vol. 27, No. 4, p 1229-1236 (Summer, 1976).

Descriptors: *Tidal waters, *Navigable waters, *Non-navigable waters, *Georgia, *Public lands, Tidal marshes, Recreation, Oysters, State governments, Coastal marshes, High water mark, Low water mark, Land tenure, Real property, Shores, Beaches, Legal aspects, Judicial decisions, Legal review, Water rights, Riparian rights.

The state of Georgia has fee simple title to the foreshores of all navigable tidewaters in the state. Although a minority of states extend private ownership down to the low water mark, Georgia, along with the majority of states, holds that ownership of the foreshore up to the high water mark is in the state. In the 1976 State v. Ashmore case, the Georgia supreme court held that it was not the intent of an early state constitutional commission or the state legislature to extend the titles of landowners adjacent to tidewaters to the low water mark. The court also held that the state had title to the foreshore of all navigable tidewaters, but noted the difference between navigable and non-navigable tidewaters. Although it declined to define non-navigable tidewaters, the court did caution that its ruling applied only to navigable tidewaters. The court also failed to address several other key issues: whether or not coastal marshlands are 'navigable' or 'non-navigable' tidewaters; and if the marshlands are considered non-navigable, whether their title, which is vested in the abutting landowners, applies to oyster beds, bottoms, or land. (Easterbrook-Florida)
W78-08979

OCS DEVELOPMENT AND THE CONSISTENCY PROVISIONS OF THE COASTAL ZONE MANAGEMENT ACT--A LEGAL AND POLICY ANALYSIS,
Department of the Interior, Washington, DC. Office of the Solicitor.
K. A. Shaffer.
Ohio Northern University Law Review, Vol. 4, No. 3, p. 595-623 (July, 1977).

Descriptors: *Continental shelf, *Permits, *Federal-state water rights conflicts, *Land management, *Coast, Leases, Federal government, California, Oil, State governments, Legislation, State jurisdiction, Energy, Water management(Applied), Federal jurisdiction, Governmen-

tal interrelations, Legal aspects, Judicial decisions, Environmental effects, Beds under water.

A conflict has arisen between outer continental shelf development and protection of the coastal zone environment. Exploitation of outer continental shelf oil and gas is considered to be the only realistic short-term source of energy pending development of alternative energy sources, such as solar energy. The author notes that clear policy guidance from Congress is needed to ensure a balance of developmental and environmental considerations. The author discusses why the Coastal Zone Management Act and amendments tend to hinder a balanced decision making process. The implications and ramifications of a lawsuit brought by Exxon involving development off California's coast are examined. The author remarks that since the courts have failed to resolve the policy conflicts, Congressional action is necessary. The author calls for a unitary policy that: (1) clearly sets forth policy directives which reflect a conscious choice of values implicit in those policy directives; (2) assures development of balanced decision-making; and (3) promotes federal-state cooperation. This last goal may be accomplished by delineating jurisdictional authority over outer continental shelf development and coastal zne management between federal and state agencies, and by centralizing development administration in one capable agency. (Quarles-Florida)
W78-08980

THE NEWFOUNDLAND OFFSHORE CLAIMS: INTERFACE OF CONSTITUTIONAL FEDERALISM AND INTERNATIONAL LAW,
Toronto Univ. (Ontario). Faculty of Law.
G. S. Swan.
McGill Law Journal, Vol 22, No 4, p 541-573 (Winter, 1976).

Descriptors: *Canada, *Federal-state water rights conflicts, *Continental Shelf, *International law, Territorial seas, Legal aspects, Judicial decisions, Legal review, Jurisdiction, Federal government, Water law, State jurisdiction, Federal jurisdiction, Governmental interrelations, Water policy, Ownership of beds, Beds under water, Constitutional law, Oceans, Oil fields, Foreign countries, History.

Soon after the discovery of petroleum beneath the Labrador Sea, conflict arose between Newfoundland and the Canadian Federal Government concerning jurisdiction over the continental shelf and the territorial sea. Both governments claim the offshore oil and gas. The Canadian problem is compared with Germany's, Mexico's, and other nations' treatment of federal-state offshore controversies. Australian legal developments are detailed for analogy. The possible impact of the 1958 Geneva Convention on the Continental Shelf is also considered. A case concerning British Columbia presents the Canadian Supreme Court's test for continental shelf jurisdiction; a province must show exercise of valid jurisdiction conferred prior to entry into the Confederation. To support an argument that Newfoundland meets the test, the author examines: (1) the 1949 Terms of Union uniting Newfoundland and Canada; (2) the British North American Acts of 1867 to 1946; (3) Newfoundland statutes and case law showing exercise of jurisdiction; and (4) Newfoundland's assertions of jurisdiction in the World Court. After distinguishing Canadian Supreme Court treatment of other coastal state's claims, the author concludes that as a matter of Canadian constitutional and international law, Newfoundland should prevail. (Hoofman-Florida)
W78-08981

AN ANALYSIS OF DEEP SEABED MINING LEGISLATION,
D. B. Ott.
Natural Resources Lawyer, Vol 10, No 3, p 591-604 (1977).

Descriptors: *Legislation, *Mining, *Law of the Sea, *Beds under water, Continental shelf, Mineral industry, Manganese, International water, United Nations, United States, Technology, Environment, Federal government, Treaties, Oceans, Federal jurisdiction, Regulation, Natural resources, Exploitation, Water law.

Deep seabed mining refers to the gathering of manganese nodules on the ocean floor beyond the continental shelf. These nodules contain exploitable amounts of nickel, copper, cobalt and manganese. The author discusses pending legislation intended to protect future investments of American mining companies who have developed the basic technology for deep seabed mining from the capriciousness of mining beyond the jurisdiction of any nation. The author analyzes pro and con arguments concerning two proposed bills, and contrasts the operation of each of the laws in relation to United States and international law. The Deep Seabed Hard Minerals Act would establish a licensing and regulatory system for American nationals interested in mining the seabed. The Ocean Mining Incentive Act is a compromise bill which would protect American mining companies without jeopardizing a Law of the Sea treaty. The mining industry fears the effect that a Law of the Sea treaty may have on their rights to mine the seabed. Presently no law expressly prohibits unilateral exploitation, although the United Nations has declared the resources of the deep seabed to be the common heritage of mankind. Congress must balance American and industry self-interest against the international considerations. (Quarles-Florida)
W78-08982

THAT GULF OF MAINE DISPUTE: CANADA AND THE UNITED STATES DELIMIT THE ATLANTIC CONTINENTAL SHELF,
G. S. Swan.
Natural Resources Lawyer, Vol 10, No 2, p 405-457 (1977).

Descriptors: *Boundaries(Surfaces), *Canada, *United States, *International law, *Boundary disputes, Gulfs, Continental shelf, Atlantic Ocean, Economics, International waters, Permits, Geologic control, United Nations, Exploration, Exploitation, Territorial seas, Judicial decisions, Jurisdiction, Ownership of beds, Oil.

The United States government holds the stronger position in the Atlantic continental shelf delimitation dispute with Canada. The dispute flared when Canada issued exploration permits in the Gulf of Maine. The author discusses the geographic and early 1976 diplomatic ambit of the problem. The contentions of both governments are set forth and their strong economic motives are revealed. There is a detailed discussion of the International Court of Justice's opinion in the North Sea Continental Shelf Cases. These cases are viewed to be instructive precedent for the analysis of the instant dispute. The concepts of equidistance and of special circumstances in North Sea continental shelf delimitation are considered important. These ideas as debated prior to the Geneva Convention on the Continental Shelf are reviewed. However, neither concept influenced the International Court of Justice in the North Sea controversy. The reasons for this as well as the actual basis of the case holding are examined. The author concludes that the North Sea Continental Shelf Cases, when read in the perspective of past debate, will give the United States a decided edge in any further adjudication. (Quarles-Florida)
W78-08983

A PROCEDURAL FRAMEWORK FOR IMPLEMENTING NONPOINT SOURCE WATER POLLUTION CONTROL IN IOWA.
For primary bibliographic entry see Field 5G.
W78-08984

SYMPOSIUM ON COASTAL ZONE MANAGEMENT, THE UNIVERSITY OF WEST FLORIDA.
University of West Florida, Pensacola.
For primary bibliographic entry see Field 6B.
W78-08985

FLORIDA REGIONAL COASTAL ZONE ENVIRONMENTAL QUALITY ASSESSMENT, REGION 3, NORTH COASTAL FLORIDA.
North Central Florida Regional Planning Council, Gainesville.
For primary bibliographic entry see Field 5G.
W78-08986

GUIDELINES FOR EVALUATING PROPOSED WETLANDS ALTERATIONS IN SOUTH CAROLINA,
South Carolina Wildlife and Marine Resources Dept., Columbia.
M. O. Bara, R. W. Tiner, Jr., and D. C. Newkirk.
July, 1977. 28 p.

Descriptors: *South Carolina, *Wetlands, *Land management, *Environmental effects, Local governments, Permits, Bocks, Bulkheads, Sea walls, Groins(Structures), Jetties, Transmission lines, Marinas, Dredging, Impoundments, Sewage lagoons, Drainage, Barrier islands, Beaches, Mud flats, Bays, Sounds, Salt marshes, Marshes.

This report contains guidelines to assist the South Carolina Wildlife and Marine Resources Department in evaluating proposed wetlands alterations. The guidelines may also prove helpful in stimulating more effective management of wetland resources by local governments and other state agencies. Marshes are an important component of the tidal wetlands system. They protect highlands from erosion and storm damage and are highly productive areas for wildlife. The guidelines call for planning processes and evaluation of probable effects of proposed land uses. The broad purpose of the guidelines is to encourage communications between the Department and those wishing to alter procedure for any alteration in navigable waters. Also included is an evaluation of wetland development proposals. Both general guidelines and specific guidelines are set forth. An appendix which describes proposed works is included. Also included are appendices on enforcement, public agencies, and references. (Quarles-Florida).
W78-08987

FLORIDA ENVIRONMENTALLY ENDANGERED LANDS PLAN.
Florida Dept. of Natural Resources, Tallahassee. Div. of Recreation and Parks.
For primary bibliographic entry see Field 6G.
W78-08988

WATER QUALITY OF THE OHIO RIVER, LOUISVILLE, KENTUCKY-EVANSVILLE, INDIANA.
National Field Investigations Center-Cincinnati, OH.
For primary bibliographic entry see Field 5B.
W78-08989

EXECUTIVE SUMMARY OF SECTION 208 PROGRAM FOR DESIGNATED AREAS. FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1974,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08990

PROCEEDINGS ON CONFERENCE ON GEOTHERMAL ENERGY AND THE LAW

HELD IN SANTA BARBARA, CALIFORNIA ON FEBRUARY 3, 4 AND 5, 1975.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 509, Price codes: A05 in paper copy, A01 in microfiche. 1975. 77 p.

Descriptors: *Geothermal studies, *State governments, *Federal government, *Energy, Water law, Legislation, Utilities, Water policy, Public utilities, Public rights, Administration, Local governments.

The Conference on Geothermal Energy and the Law was held in Santa Barbara, California on February 3, 4 and 5, 1975. The purpose of the conference was to: (1) identify the constraints the law imposes on geothermal development; and (2) establish the groundwork for recommending appropriate reforms in federal, state and local structures, both legal and institutional. Persons participating in the conference were deliberately selected from a wide cross-section of interests among federal and state agencies, large and small producers, and major and independent utilities. The reports of the six work groups are included in the document. The reports included are: (1) problems of pre-developmental and early developmental stages; (2) problems of promoting entry and investment; (3) problems of preserving government, public and private owner interests; (4) problems of coordinating development with state water laws; (5) problems of overlapping administration; and (6) problems involving utilities and dependent users. (Quarles-Florida)
W78-08991

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR SELECTED NEW SOURCE INDUSTRIES,
Environmental Protection Agency, Washington, DC. Office of Federal Activities.
For primary bibliographic entry see Field 5G.
W78-08992

REPORT FOR THE SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES AND THE ENVIRONMENT, OF THE SENATE COMMERCE COMMITTEE HEARING ON MERCURY CONTAMINATION UNDER THE DIRECTION OF SENATOR PHILLIP A. HART, AT MT. CLEMENS.
Federal Water Quality Administration, Chicago, IL. Great Lakes Region.
For primary bibliographic entry see Field 5G.
W78-08993

COASTAL ZONE ACT.
Louisiana Coastal Law, No. 27, p. 1-2, September, 1977.

Descriptors: *Louisiana, *Commercial fishing, *Management, *Coasts, Fisheries, Fish harvest, Fish management, Planning, Administration, Water quality standards, Gill nets, Natural gas.

In 1977, the Louisiana legislature passed important legislation effecting coastal zone management, gill nets and fishery resource management, and energy regulation. A coastal zone management program was headed by a Coastal Commission represented by varying and competing interests in the coastal zone. The Act has been criticized as containing deficiencies including: a three mile boundary; failure to provide for areas of unique biological or ecological importance; discretion in local governments on whether to adopt a management plan; and failure to provide for statewide review. A second issue was the regulation of monofilament gill net, which is cnsidered one of the most effective types for taking fish. Limitations on catches and restricted areas were designed to rectify the recent decreases in trout and red drum catch. A third area involved energy resources. Legislation was passed to regulate the minimum price of intrastate first sales of natural gas, to cause increased production and to make Louisiana purchaser's the most desirable customers. In addition, legislation was passed to allow the building of coal pipelines to comply with the President's energy plan to convert some Louisiana industries to the use of coal. (Kastner-Florida)
W78-08994

NATIONAL SECURITY INTERESTS IN OCEAN SPACE,
Department of Defense, Washington, DC. Advisory Group on Law of the Sea.
L. S. Ratiner.
Natural Resources Lawyer, Vol 4, No 3, p 582-96, 1971.

Descriptors: *Oceans, *International law, *Resources, *International waters, Continental shelf, Coasts, Continental slope, Planning, Treaties, Coordination, Management.

Under customary international law coastal states have sovereign rights to control seabed resources, exploration and exploitation. The seaward extent of this control is not settled since the meaning of adjacency or exploitability has not been agreed upon. The National Petroleum Council has adopted the view that the United States now has vested sovereign rights over seabed resources to the souter edge of the submerged continent. In contrast, the United States Government proposed an international treaty under which national jurisdiction over seabed resources should end at a point where the waters reach a depth of two hundred meters and that beyond that point a trusteeship zone should be creates which embraces the remainder of the continental margin. In that zone coastal states would, as trustees for the international community administer the mineral resources. Developing countries as well as landlocked and shelf-locked countries countries could thus share in the wealth of ocean development. The United States Government welcomed criticism of the proposal from National Petroleum Council. Refuting the criticism, the government concluded that it is only through a process of critical analysis that a satisfactory treaty can be produced. (Kastner-Florida)
W78-08995

THE RIGHT OF INTERVENTION OF COASTAL STATES ON THE HIGH SEAS IN CASES OF POLLUTION CASUALITIES,
New Brunswick Univ., Fredericton. Law School.
For primary bibliographic entry see Field 5G.
W78-08996

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08997

COASTAL ENERGY IMPACT PROGRAM.
National Oceanic and Atmospheric Administration, Washington, DC.
Federal Register, Vol. 43, No. 37, p. 7546-7566, (February 23, 1978).

Descriptors: *Administrative agencies, *Coasts, *Energy, *Local governments, *Regulation, Administrative decisions, Coastal engineering, Energy dissipation, Federal government, Governments, Governmental interrelations, Law enforcement, Legislation, Management, Oceans, Shores, Standards, State governments, Water law.

The National Oceanic and Atmospheric Administration has promulgated a rule describing administrative procedures to implement the Coastal Energy Impact Program (CEIP). The CEIP will provide grants and credit assistance to coastal states and communities to help them deal with the impacts of coastal energy development. The CEIP was created by the 1976 amendments to the Coastal Zone Management Act of 1972. The central objective of the CEIP is to provide coastal states and units of local governments with financial assistance to mitigate the adverse on-shore effects of new or expanded coastal energy activity. The goal of providing repayment assistance under CEIP is to shift to the federal government most of the risk of fiscal loss that might be borne by coastal states and local governments in whose jurisdictions new or expanded rational, timely, and thorough planning for and management of the consequences in the coastal zone of energy facility siting and energy resource development. (Jordan-Florida)
W78-08998

GEOTHERMAL RESOURCES OPERATIONS.
Geological Survey, Washington, DC.
Federal Register, Vol. 43, No. 22, p 4264-4267 (February 1, 1978).

Descriptors: *Geological surveys, *Geothermal studies, *Electric powerplants, *Regulation, *Energy, Administration, Administrative agencies, Administrative decisions, Electric power production, Federal reservations, Geology, Geophysics, Permits, Public lands, Thermal springs, Thermal water, Wells, Steam, Subsurface investigations, Heated water.

The United States Geological Survey has proposed a revision of its regulations concerning geothermal resources operations on public, acquired, and withdrawn lands to permit the construction and operation of geothermal steam power facilities on fedeal lands leased for geothermal resources. The proposed rule authorizes the Area Geothermal Supervisor to approve the construction of geothermal steam power facilities and to supervise their operation. The proposal also sets forth the information submission and application procedural requirements which the operator of a proposed facility must satisfy in order to obtain the Supervisor's approval of construction and operation. These requirements include: (1) a plan of utilization; (2) plans for all proposed structures; (3) a schematic flow diagram; (4) a startup data and schedule of construction; (5) a description of any tests, studies or surveys planned to assess the geologic suitability of the sites; (7) a map showing the existing and planned access roads; and (8) the methods for disposing of waste water, solid wastes, and noncondensible gases. One purpose of regulation of geothermal facilities is to assure the orderly and timely development of federal geothermal leases. (Jordan-Florida)
W78-08999

REQUIREMENTS FOR APPROVAL OF DISCHARGES TO AQUACULTURE PROJECT.
For primary bibliographic entry see Field 5G.
W78-09000

COOPER V. WISDOM (PUBLIC HEARINGS REQUIRED BEFORE ISSUING DREDGE AND FILL PERMITS).
440 F. Supp. 1027. (1977).

Descriptors: *Dredging, *Boat-launching ramps, Construction, *Permits, *Florida, Administrative agencies, Facilities, Federal government, Engineering structures, Landfills, Naval architechture, Navigable waters, Recreation facilities, Water law, Water pollution, Adjudication procedure, Regulation, Judicial decisions, Federal Water Pollution Control Act, Decision making.

The Army Corps of Engineers (Corps) issued a permit to allow dredge and fill operations in Biscayne Bay to construct a boat ramp. The Corps did not hold a public hearing concerning the merits of the permit nor make a written determination

that the issues were insubstantial or that there was otherwise no valid interest to be served by a public hearing. The plaintiff, who brought action in federal district court, argued that these omissions were violations of the Corps' own regulations and he asked that a restraining order be issued against the boat ramp builders. The defendant Corps contended that its duty under the administrative regulations was discretionary. The court held that the language of the Corps regulation was mandatory, and that the Corps had a duty to hold a public hearing or to inform the plaintiff in writing of the reasons for not holding one. Since the public has a strong interest in the presevation of marine ecology, and in the proper functioning of the Corps in granting a permit, the court issued a permanent injunction against the permit. The Corps was directed to comply with the regulations in processing any new permits. (Jordan-Florida)
W78-09001

RIVERSIDE IRRIGATION DISTRICT V. LAMONT (IRRIGATION DISTRICTS HAVE EMINENT DOMAIN AUTHORITY).
572 p. 2d 151-153 (Colo., 1977), modified, December 27, 1977.

Descriptors: *Colorado, *Condemnation, *Irrigation districts, *Groundwater mining, *Water source, Condemnation value, Easements, Eminent domain, Groundwater, Groundwater potential, Groundwater resources, Irrigation, Irrigation ditches, Irrigation practices, Irrigation systems, Land tenure, Legal aspects, Right-of-way, State governments, Water law, Water supply, Water table, Water wells.

The irrigation district owned a right-of-way for a canal that extended through the landowner's ranch. The district wanted to acquire a right-of-way two hundred feet wide along the southern margin of the canal for the purpose of drilling groundwater wells to augment its supply of irrigation water. Unable to agree with the land owners on a price, the district sued to condemn the property. The landowners contended that there was no express grant of authority to irrigation districts to condemn land for groundwater wells and that federal law prohibited this condemnation. The trial court held for the landowners and the district appealed. The Supreme Court of Colorado reversed the trial court's decision on the ground that irrigation districts do have the authority under Colorado statutes to condemn property. The court found that Colorado law gives municipal corporations such as irrigation districts the power to acquire easements necessary for the purposes of those corporations. The court also held that the federal law relied on by the landowners applied only to rights-of-way over public lands and was irrelevant to the land in question. (Jordan-Florida)
W78-09002

MOONEY V. KUIPER (EXTENSION OF WELL CONSTRUCTION PERMITS FOR GOOD CAUSE).
573 p. 2d 538-540 (Colo., 1978)

Descriptors: *Colorado, *Administrative agencies, *Water rights, *Well permits, Drilling, Groundwater, Irrigation wells, Legal aspects, Legislation, Permits, Prior appropriation, Regulation, Water sources, Water supply, Water supply development, Well regulations, Wells.

The plaintiffs, landowners, were awarded conditional water decrees by the water court based upon two well construction permits that had been issued by the state engineer. These one year will permits had been extended for an additional year because of the time needed to obtain the water decrees. The plaintiffs, needing additional time to complete their wells, requested a second extension. The state engineer, however, took the position that Colorado law limited his authority to granting a single, non-renewable one year extension. The water court agreed that the state engineer and the plaintiffs appealed. The plaintiffs contended that, in light of other provisions relating to water rights, the legislature must have intended to allow renewable one year extensions of well permits upon annual showings of good faith. The Supreme Court of Colorado reversed the water court and declared that it would be unreasonable and inconsistent to hold that a conditional water right could be granted on the basis of the amounts stated in a particular well permit, but that the permit could not then be extended to allow diligent pursuit of those rights awarded in the conditional decree. (Jordan-Florida)
W78-09003

ORR V. CITY AND COUNTY OF DENVER (ABANDONMENT OF WATER RIGHTS).
572 p. 2d 805-811 (Colo., 1977), rehearing denied October 24, 1977.

Descriptors: *Colorado, *Groundwater, *Irrigation water, *Preferences(Water rights), *Water wells, Appropriation, Aquifers, Diversion, Groundwater availability, Groundwater mining, Groundwater resources, Irrigation, Legal aspects, Prior appropriation, Underground streams, Water law, Water resources, Water yield, Water rights.

The water court granted the applicants' application for underground water rights and the use of water wells as alternate points of diversion for the applicants' decreed surface water. The City of Denver appealed on the grounds that the rights represented by the applicants' surface decrees had been abandoned, and that the change in points of diversion requested by the applicants would cause substantial harm to junior appropriators. The city alleged that for extended periods of time there was nonuse or only partial use of the upper portion of applicants' water ditch. Testimony was presented to the water court to the effect that through the years, the applicant had used seepage water and well water as alternate sources of supply. The Supreme Court of Colorado held for the applicant, and stated that the key issue was whether there was an instant on the part of the applicant to abandon any of the decreed water. The supreme court found that the evidence supported the water court's holding that there was no intent to abandon the water rights. (Jordan-Florida)
W78-09004

STATE OF WYOMING BY AND THROUGH CHRISTOPULOS V. HUSKY OIL COMPANY OF DELAWARE (ASSERTION OF MUNICIPAL WATER RIGHTS BY A PRIVATE USER).
575 P. 2d 262-284 (Wyo. 1978).

Descriptors: *Wyoming, *Municipal water, *Water reuse, *Water pollution sources, *Water storage, Adjudication procedure, Administrative agencies, Cities, Effluents, Impaired water use, Legal aspects, Oil industry, Appropriation, Reclaimed water, State governments, Water law, Water pollution, Water rights, Water works.

Administrative agencies of the state of Wyoming appealed a decision of the trial court in favor of defendant oil company. The trial court held that the company's plan to impound and recycle effluent water remaining after its refinery process was not subject to the jurisdiction and control of the agencies. The water was purchased by the company from the city of Cheyenne. The trail court also declared that the proposed use did not infringe upon the rights of downstream appropriators. The appealing administrative agencies contended that the company's plan to impound the water rather than return it to the stream was a change and expansion of use of a direct-flow water right under the jurisidiction of the agencies. The Supreme Court of Wyoming sent the case back to the trial court with instructions to bring in the city of Cheyenne as an indispensable party. The court held that the interests which the company asserted were inextricably tied into the city's ownership of the water right and could be asserted on the basis that the city as owner of the right could take the steps the company sought to take. (Jordan-Florida)
W78-09005

DANIELS IRRIGATION COMPANY V. DANIEL SUMMIT COMPANY (FINALITY OF STATE ENGINEER'S DECISION ON WATER RIGHTS QUESTIONED),
571 P. 2d 1323-1325 (Utah, 1977).

Descriptors: *Utah, *Adjudication procedure, *Remedies, *Preferences(Water rights), Administrative agencies, Beneficial use, Diversion, Domestic water, Irrigation, Irrigation ditch, Irrigation systems, Irrigation water, Legal aspects, Permits, Prior appropriation, Water law, Water rights, Water sources, Water utilization, Administrative decisions.

Plaintiff brought an action on two counts: (1) to appeal the state engineer's decision approving the defendant's change application which asserted an irrigation right, and (2) to quiet title to the waters of a creek. The trial court dismissed the first count as not being timely prosecuted, and it declined to determine the rights of use of the parties because it deemed the state engineer's decision to be final. The plaintiff appealed and asserted that the trial court erred in treating the state engineer's decision as a final judicial act foreclosing the court's right to decide the respective water rights of the parties. The Supreme Court of Utah reversed and sent the case back to the trial court for a decision on the rights of the parties. The supreme court declared that the state engineer was a part of the executive branch of government, his duties were limited to administrative matters, and the proceedings before him were not judicial in nature. The supreme court found that the state engineer acted in an administrative capacity only and had no authority to determine the water rights of the parties. (Jordan-Florida)
W78-09006

ENGLISH BAY ENTERPRISES, LTD. V. ISLAND COUNTY (CLAM HARVESTING IN WASHINGTON BY A CANADIAN CORPORATION SUBJECT TO THE SHORELINE MANAGEMENT ACT).
89 Wash. 2d 16, 568 P. 2d 783-787 (Wash., 1977).

Descriptors: *Washington, *Permits, *Administrative decisions, *Shellfish, *Shellfish farming, Clams, Bays, Leases, Planning, Fish, Jurisdiction, Navigable waters, Administrative agencies, Environmental effects, Silts, Beaches, Dredging, Tidal waters, Local governments.

Plaintiff, a Canadian corporation engaged in the business of clam harvesting on tidelands, filed a substantial development permit application with defendant, a Washington county, seeking approval of its operations. Upon denial of its application by the board of county commissioners, plaintiff appealed to the Shoreline Hearings Board which found that the operation was subject to the Shoreline Management Act and denied the appeal. Plaintiff contended that its operation was not subject to the Shoreline Management Act or, alternatively, that its operation was consistent with the Act. Plaintiffs harvested clams using mechanical methods which the Hearings Board found harmed the shoreline environment. The Board insisted that plaintiffs' operation involved dredging, dumping, filling and substantial development within the meaning of the Act. The Supreme Court of Washington held that there was substantial evidence to support the Board's findings of fact. The court concluded that the clam harvesting operation was subject to the Shoreline Management Act. (Quarles-Florida)
W78-09007

SISLEY V. SAN JUAN COUNTY (REQUIREMENT OF AN ENVIRONMENTAL IMPACT STATEMENT FOR CONSTRUCTION OF MARINA IN WASHINGTON).
89 Wash. 2d 78, 569 P. 2d 712-719 (Wash., 1977).

Descriptors: *Washington, Construction, *Marinas, *Environmental effects, *Administrative decisions, Local governments, Permits, Bays, Administrative agencies, Environment, Navigable waters, Leases, Legal review, Legal aspects, Piles(Foundations).

Plaintiffs, residents living near the bay at issue, brought a class action suit against defendant, a Washington county. Plaintiffs sought a declaration that a permit to build a marina was illegal and void until an environmental impact statement was prepared. The applicant builder intervened as an additional defendant. Defendant builder applied for a substantial development permit under the Shoreline Management Act to build a commercial marina and supporting facilities at the head of a small bay. The necessary permit was obtained from the Board of County Commissioners and defendant began construction. On the action brought by plaintiffs, the Superior Court ordered the Board to review the evidence to determine the need for an environmental impact assessment. At the close of a public hearing, the Board ruled that an assessment was unnecessary and the lower court concurred. The Supreme Court of Washington held that the permit approval constituted an action within the meaning of the Environmental Policy Act which requires an environmental impact statement. The Oregon Supreme Court found that the Superior Court applied the wrong standard of review in upholding the Board's decision that the marina would not have significant environmental impact was erroneous. (Quarles-Florida)
W78-09008

CITY OF NORTH ST. PAUL V. MINNESOTA WATER RESOURCES BOARD (AUTHORITY OF STATE WATER RESOURCES BOARD TO CREATE WATERSHED DISTRICTS).
260 N.W.2d 584-587 (Minn., 1977).

Descriptors: *Minnesota, *Watershed management, *Administrative decisions, *Watersheds(Basins), Water resources, State governments, Administrative agencies, Legal review, Legal aspects, Local governments, Legislation, Water management(Applied), Levees, Flood control, Hydrologic data, Conservation, Water districts.

Plaintiffs, cities of Minnesota, challenged the inclusion of a creek subwatershed within a newly created watershed established by the Minnesota Water Resources Board, defendant. The watershed district at issue was established pursuant to state statute. A petition was filed and public hearings were held before the creation of the watershed. At the public hearing, plaintiffs argued that the creek area constituted a separate watershed, that the waters did not physically mingle, and that the water management problems of the creek were different from the rest of the district. These arguments were rejected by the Board. On appeal, plaintiffs contented that the relevant statute required the Board to base its decision of inclusion on scientific evidence. Plaintiffs further insisted that the Board's order was not supported by substantial evidence. The Supreme Court of Minnesota held that although the Board was obliged to base its decision on scientific principles, the facts to which such principles apply need not be scientific. The court also found that the Board's decision was supported by substantial evidence. (Quarles-Florida)
W78-09009

UNITED STATES STEEL CORPORATION V. ILLINOIS POLLUTION CONTROL BOARD (VALIDITY OF STATE WATER POLLUTION CONTROL REGULATIONS; CONSISTENCY WITH FEDERAL WATER POLLUTION CONTROL ACT).
52 111. App. 3d 1, 367 N.E.2d 327-336 (1977).

Descriptors: *Governmental interrelations, *Illinois, *Federal Water Pollution Control Act, *Water pollution control, Permits, Regulation, Environmental control, Administration, Standards, Water quality, Water pollution, Water pollution sources, Navigable waters, Legal aspects, Water policy, Water law, Judicial decisions, Watercourses(Legal aspects), Legislation, Discharge(Water), Industrial wastes.

Plaintiff corporation petitioned for defendant state agency's regulations promulgated under the Illinois Environmental Protection Act. The regulations established standards for control of the discharge of pollutants from point sources into the navigable waters of Illinois. Plaintiff contended that the rule requiring a permit applicant to determine whether or not a pollutant was present in its discharge, to any extent whatsoever, exceeded the agency's delegated authority and contravened tha National Pollution Discharge Elimination System (NPDES) permit practices under the Federal Water Pollution Control Act (FWPCA). NPDES permits usually grant general authorization to discharge limited by specific conditions. Affirming the adoption of the rule, the appellate court held that the regulations were consistent with both Illinois law and the FWPCA. The court also held that plaintiff had failed to show that the regulations were arbitrary or capricious since the agency's hearings sufficiently considered technical feasibility and economic reasonableness. The court also rejected arguments that the regulations placed an undue burden upon the conduct of business beyond the state's police power, or that the regulations denied procedural due process. (Hoofman-Florida)
W78-09010

COUNTY OF TRINITY V. ANDRUS (FEDERAL AGENCY'S RIVER PROJECTATIONS HELD NOT IN VIOLATION OF FEDERAL OR STATE LAWS).
438 F.Supp. 1368-1391 (E.D. Cal., 1977).

Descriptors: *California, *Federal-state water rights conflicts, *Water distribution(Applied), *Legislation, Local governments, Federal government, United States, Droughts, Legal aspects, Judicial decisions, Administrative agencies, Administrative decisions, Environmental effects, Dams, Drawdown, Water levels, Fish conservation, Headwaters, Rivers, Governmental interrelations, Water rights.

Plaintiffs, a California county and Indian intervenors, sought injunctive relief to stop defendant, Department of Interior, from the planned operation of the Trinity River Division of the Central Valley Project in response to the 1976-1977 California drought. Within plaintiff county's borders lies the Trinity River, an excellent fish habitat. The Indian tribe lives along the river which is their principal source of food. Due to the California drought, defendant agency diverted some of the river flow to other areas, which in turn produced a decline in the fish population. Plaintiffs alleged that such operation would be in violation of the following federal and state laws: the Trinity Act; the Fish and Wildlife Coordination Act of 1964; the Andromous Fish Act; the Reclamation Act of 1902; and California water law. Plaintiffs also argued that an environmental impact statement as required by the National Environmental Policy Act (NEPA) should be filed before any further diversion occurred. The federal district court analyzed the statutes in controversy and held that plaintiffs' contentions lacked merit. However, the court stated that defendants were obligated to reassess their actions in light of environmental impacts to satisfy the policy of NEPA. (Quarles-Florida)
W78-09011

JUPITER INLET CORPORATION V. TEQUESTA (MUNICIPALITY'S DEPLETION OF CONDOMINIUM COMPLEX'S AQUIFER IS A COMPENSATORY TAKING).
349 So. 2d 216-218 (Fla. Ct. App., 1977).

Descriptors: *Eminent domain, *Florida, *Groundwater, *Aquifers, *Saline water intrusion, Adjacent land owners, Condemnation, Wells, Groundwater movement, Discharge(Water), Damages, Legal review, Public rights, Water rights, Groundwater flow, Municipal water, Water supply.

Plaintiff condominium corporation sought recovery from municipality for the taking of water from a shallow aquifer underneath the owner's land, to the extent that it deprived the owner of the beneficial use of the shallow aquifer. Defendant operated a wellfield in close proximity to plaintiff's land, and resulting saltwater intrusion made the aquifer useless as a source of water. Plaintiff then had to obtain water from the deeper Floridan aquifer, at greater expense. The court held that the municipality's right to take property is limited to public purposes and with full compensation paid to the owner. Without the formal exercise of eminent domain, the owner had a cause of action for inverse condemnation. Removal of water was a taking, and full compensation must be paid whether government agents entered the property to take the water or pumped the water out from adjacent lands. The trial court was bound to have erred in granting a summary judgement to the municipality, since sufficient facts existed for an inverse condemnation cause of action. (Molloy-Florida)
W78-09012

COMPLAINT OF STEUART TRANSPORTATION COMPANY (LIMITED LIABILITY FOR OIL SPILL CLEAN-UP COSTS).
435 F. Supp. 798-808 (E.D.Va., 1977).

Descriptors: *Oil spills, *Chesapeake Bay, *Federal Water Pollution Control Act, *Costs, Oil pollution, Water pollution, Virginia, Federal government, Damages, Negligence, Weather forecasting, Cost repayment.

Plaintiff sought exoneration of a limitation of liability for oil spill damage caused when plaintiff's barge sank in Chesapeake Bay. The sinking was caused by the badly worn equipment on the barge and the failure to remove scupper plugs from the spill rail, permitting water to build up. The deterioration was evident on inspection, which was not done by the plaintiff. The court found this failure to inspect to be ordinary negligence on the part of the plaintiff owner, and discounted any negligence on the part of the United States government for possible errors in forecasting the weather. The court also found that the lack of wilful negligent action on the part of the barge owner entitled him to limited liability under the Federal Water Pollution Control Act for federal claims for oil spill clean-up costs, assessed under Virginia oil cleap-up statutes. The federal statute limits only federal clean-up costs. (Molloy-Florida)
W78-09013

WYOMING ENVIRONMENTAL QUALITY ACT.
Wyo. Sess. Laws, Ch. 250, secs 35-487.1 through 35-487.56 (1973).

Descriptors: *Wyoming, *Water pollution control, *Water quality, *Environmental control, *Air pollution, Water permits, Water pollution, Permits, Federal government, Administration, Legal aspects, Water law, State governments, Legislation, Solid wastes, Land management, Land reclamation, Regulation, Pollution abatement, Water quality control.

Wyoming's Environmental Quality Act (WEQA) has as its purpose to prevent air and water pollu-

tion and to reclaim land. The state seeks to coordinate the efforts of the federal government, state agencies, and other states in the development and preservation of air, land, and water resources. The act creates within the executive branch the State Department of Environmental Quality (DEQ). The DEQ is divided into the air quality division, water quality division, and land quality division. The DEQ director administers and enforces all the provisions of the WEQA. Each division has an administrator who, under supervision of the director, administrates the provisions of the WEQA. The WEQA creates an independent environmental quality council which acts as the hearing examiner for the DEQ by conducting hearing and promulgating rules. An advisory board for each division is created to recommend to the council programs for the control of pollution. Separate articles in regard to water quality, air quality, and land quality. There is also a provision concerning solid waste management. (Quarles-Florida)
W78-09014

STATE WATER CONTROL BOARD V. TRAIN (FEDERAL EFFLUENT LIMITATIONS CHALLENGED BY PUBLICLY OWNED SEWAGE PLANT).
559 F. 2d 921-28 (4th Cir. 1977).

Descriptors: *Sewage treatment, *Water pollution, *Administrative agencies, *Federal Water Pollution Control Act, Waste water treatment, Waste water(Pollution), Water treatment, Regulation, Legislation, Sewage effluents, Discharge(Water), Grants, Municipal wastes, Waste treatment, Water pollution control, Water pollution sources, Sewage disposal, Sewage.

The State Water Control Board of the Commonwealth of Virginia brought action against the Administrator of the United States Environmental Protection Agency, seeking a declaration that the effluent limitations of Section 301(b)(1) of the Federal Water Pollution Control Act Amendments of 1972 did not apply to publicly owned sewage treatment plants which have not received federal grants under Title II of the Act. The district court denied the Board the relief sought. The Court of Appeals, Fourth Circuit, affirmed. In seeking elimination of discharge of pollutants into the nation's navigable waters by 1985, Section 301(b)1) requires publicly owned treatment plants to reach certain effluent reduction standards by July 1, 1977. The Board argued that a federal grant under Title II of the Act was a condition precedent to the duty to comply with the 1977 effluent standards. The court rejected that argument, finding the 'plain meaning' of the statute to be unconditional compliance. Legislative history clearly showed the July 1, 1977 target to be inflexible. The court added that their holding does not mean, absent Congressional action, severe sanctions will be imposed on municipalities failing to meet the 1977 deadline. (Thomas-Florida)
W78-09015

PEOPLE V. SWEETSER (PUBLIC ENTITLED TO USE NAVIGABLE RIVERS FOR RECREATION EVEN IF RIVER BED PRIVATELY OWNED).
140 Cal. Rptr. 82-7 (App. 1977).

Descriptors: *California, *Riparian rights, *Public access, *Recreation, Public rights, Right-of-way, Boating, Embankments, River beds, Rivers, Trespass, Easements.

The defendant was convicted of criminal trespass for using a small unimproved portion of a highway easement, located within a ranch, to ingress to and egress from a river. The Fifth District Court of Appeals in California reversed the conviction. The court first held that is was clear that the defendant was not trespassing when he was kayaking on the river since 'the public has a right to use for boating,...and all other recreational purposes, any part of a river can be navigated by small recreational or pleasure boats, even though the river bed is privately owned'. In addition, it was clear that the defendant was walking within the perimeters of the county easement and complying with the purposes of a public highway easement which includes 'every kind of travel...which is not prohibited by law or by a restriction in the easement itself'. While the county may have placed restrictions on its easements, or make agreements with the landowners, no such agreement was proven in the case. In the absence of an agreement altering the easement, the defendant was properly using the easement. (Kastner-Florida)
W78-09016

MATTER OF ZITTEL'S MARINA, INC. (REVIEW OF LOCAL AGENCY GRANT OF PERMIT TO IMPROVE MARINA).
565 P. 2d 1196-1205 (Wash. App. 1977).

Descriptors: *Washington, *Marinas, *Permits, *Construction, Facilities, Recreation facilities, Docks, Water law, Administrative decisions, Erosion, Regulation, Shore protection, Boundaries(Property), Adjacent land owners, Navigable waters, Legal aspects, Dredging, Land development, Structures, State governments.

The defendant county approved a permit for an existing marina to construct facilities and make other improvements. Plaintiffs, adjacent landowners, filed suit and asserted that expansion of the marina will impair the aesthetic value of their property, restrict boat access, and have an adverse effect on the fish and shellfish in the area. Plaintiffs objected to the granting of the permit and claimed that the new facilities would increase the negative environmental impacts. The county's approval of the permit was affirmed by the Shorelines Hearing Board (SHB) and by the county superior court. Affirming the lower court decision; the appellate court held that the proceedings of the SHB, a quasi-judicial body, must be affirmed unless those proceedings are clearly erroneous or arbitrary and capricious. The court also held that the decision of the SHB was supported by the record. The court noted that SHB took into consideration the fact that approval of expansion of the existing marina would have less adverse impact on the environment than the creation of an additional totally new marina. The court found no mistake, or clearly erroneous, or arbitrary action by the SHB. (Jordan-Florida)
W78-09017

WATER ASSESSMENT (75) -- PLAN OF STUDY.
Water Resources Council, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 378, Price codes: A03 in paper copy, A01 in microfiche. August 1974. 27 p.

Descriptors: *Water resources, *Land resources, *Planning, *Water policy, Assessments, Budgeting, Scheduling, Water resources planning, Water management, Plan of study, *National priorities, Problem analysis.

The 1975 Assessment of Water and Related Land Resources, initiated by the U.S. Water Resources Council in 1974, was designed to identify and describe the country's most severe water problems, indicate priorities, and emphasize the need to resolve those problems. The first assessment was completed in 1968, and outlined a continuing assessment process. The current assessment is intended to describe the problems in more geographical detail and with more regional and public participation. The Plan of Study had four functions. The first was to overview the 1975 Assessment, describing its major products and its activities schedule, budget and operations. The second function was to inventory the nationwide analysis activities that were then being conducted by cooperating Federal agencies. Third and fourth, a specific problem analysis and a national purpose analysis were discussed, with each analysis' purpose, objectives, expected product and study schedule described. The Water Resources Council will make four recommendations: the extent of the national interest and the Federal role in helping to provide the capability to meet needs and resolve problem issues; the geographical areas where Level B planning studies should be developed or updated, between both 1975-85 and 1985-2000; data-collection and information-development program modifications necessary for implementing a continuing assessment process and to provide for the collection of data to support planning studies; and changes that need to be considered in various institutional arrangements and policies to provide an improved basis for resolving high-priority problems. (Zayac-NC)
W78-09065

REGIONAL GOVERNMENTAL ARRANGEMENTS IN METROPOLITAN AREAS: NINE CASE STUDIES,
Institute for Community Studies, Kansas City, MO.
C. J. Hein, J. M. Keys, and G. M. Robbins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 350, Price codes: A11 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., January 1974. 240 p, 24 fig, 15 tab.

Descriptors: *Governmental interrelations, *Local governments, *Cities, *Urban areas, Administration, Municipalities, State jurisdiction, State governments, *Regional governments, Urban counties, Governmental reform, Special districts, Minneapolis-St. Paul(MN), Detroit(MI), St. Louis(MO), Seattle(WA), San Antonio(TX), Washington(DC), Miami(FL), Nashville(TN), Toronto(Canada).

The study's purpose is to review the experiences of metropolitan areas with the major forms of regional governments. Nine case studies were done of different types of regional governmental arrangements grouped under the categories of: regional councils, (Minneapolis-St. Paul and Detroit); multi-purpose special districts (St. Louis and Seattle); unified urban governments (San Antonio); urban counties (Washington, D.C.); urban counties with some second-tier cities (Miami); city-county consolidations (Nashville); and two-tier federation (Toronto). The general conclusion is that the county--usually with a modernized structure and urban powers--serves as the core of regional governmental structures in the U.S. No multi-county regional governments were found. The durability of county boundaries and the adaptability of the county to urban government appear to be the most practicable basis for metropolitan governmental reform in the near future. The multi-purpose multi-county special district has been offered as a model for metropolitan reform for many years, but it does not exist in the U.S. and no example was found of such a district successfully operating major programs in a multi-county area. All of the regional governmental arrangements studied were found to be suffering from inability to make their boundaries coincide with the boundaries of regional problems. But patterns of regional governmental arrangements based on the urban county were judged more effective in dealing with emerging environmental management problems than patterns based on special districts and regional councils of government; the two-tier federation was judged about equal to the best of the urban county arrangements. Further state action is recommended for every case in order to make the regional arrangements more effective. (Zayac-NC)
W78-09069

MICROMANPOWER PLANNING IN THE PUBLIC SECTOR,
For primary bibliographic entry see Field 6B.

W78-09071

HYDROELECTRIC POWER AND SCENIC PROVISIONS OF THE 1950 NIAGARA TREATY,
Waterloo Univ., (Ontario). Dept. of Geography.
B. F. Friesen, and J. C. Day.
Water Resources Bulletin, Vol. 13, No. 6, p 1175-1189, December 1977. 4 fig, 2 tab, 30 ref.

Descriptors: *Hydroelectric power, *Niagara Falls, Niagara River, Great Lakes, International, Water management(Applied), Scenic preservation, Treaties, Power diversion, Costs, Benefits.

An important international Niagara River management issue concerns allocation of the average 202,000 cubic feet per second river discharge for hydroelectric power and scenic purposes. Major water diversions from Niagara Falls are necessary for power production. Flow is allocated by the 1950 Niagara Treaty which is intended to maximize power benefits and preserve and enhance the scenic falls spectacle. Examined is the extent to which the Treaty objectives have been achieved. Based on analyses of government documents, engineering data, and falls-viewing patterns, it is concluded that the 1950 Treaty led to enhancement of the falls spectacle and increased power generation. But significant additional power diversions probably are attainable without adverse effect upon the existing falls spectacle. Reducing daytime summer Horeshoe Falls flow and scheduling spring and autumn flow according to viewing patterns are possible means of increasing power diversions. Existing generating facilities could use considerably more water and the value of additional Niagara hydroelectricity is very high in terms of generation-cost savings over alternative power sources. Because of the cultural importance of the falls, Treaty modifications to permit increased power diversions are not recommended without prior public opinion sampling and on-site viewing experiments. These findings highlight the need for more careful study before long-term international agreements are concluded and illustrate the need for more flexible treaty arrangements to permit periodic adjustments for changing conditions. (Graf-Cornell)
W78-09180

WORKSHOP ON THE VISTULA AND TISZA RIVER BASINS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09188

THE VISTULA RIVER PROJECT,
For primary bibliographic entry see Field 6A.
W78-09189

REGULATION OF HARBORS AND PONDS OF MARTHA'S VINEYARD,
Woods Hole Oceanographic Institution, MA. Marine Policy and Ocean Management Program.
J. M. Friedman, R. A. Donnellan, and G. H. Nickerson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 425, Price codes: A04 in paper copy, A01 in microfiche. Report WHOI-76-56, May 1976. 58 p. NOAA 04-6-158-44016.

Descriptors: *Civil law, *Harbors, *Ponds, *Shores, *Massachusetts, Wetlands, Public access, Shellfish, Fishing, Coasts, Tidal waters, Seashores, Structures, Legal aspects, Legislation, Water law, *Martha's Vineyard(Mass).

These papers provided a brief analysis of the statutory framework for regulation of activities in the harbors and great ponds of Massachusetts. Several issues were treated in more detail: the difficulty of providing public access to great ponds and certain beaches; local authority over shellfishing; and permits for structures and alterations in tidal waters. Constitutional questions also were discussed, including the problem of discrimination by towns against non-residents in the municipal administration of natural resources. (Sims-ISWS)
W78-09222

WATER RIGHTS IN THE COAL FIELDS OF THE YELLOWSTONE RIVER BASIN,
Bureau of Indian Affairs, Washington, DC.
W. H. Veeder.
Law and Contemporary Problems, Vol. 40, No. 1, p 77-96, 1977. 118 ref.

Descriptors: *Water rights, *Yellowstone River Basin(MT WY), *Coal mines, *Montana, *Wyoming, *Indian reservations, *Legal aspects, Political aspects, U.S. Bureau of Reclamation, Conflict, Judicial decisions, History, Governments, Energy, Winters v. United States, River basins, River basin development, Strip mines, Resource allocation, Water resources, Water supply.

A serious conflict over water rights has developed in and around the coal fields of the Yellowstone River basin of southeastern Montana and northeastern Wyoming, with Indians of two reservations most gravely threatened because of insufficient water supplies. Federal and state policies, agencies, and water rights are often in conflict with one another and with those claiming rights under state laws such as farmers and cattlemen. The Bureau of Reclamation has in addition entered into contracts with major energy companies for sale of water rights, sparking an interagency dispute. Indians of Montana's Crow and Northern Cheyenne Reservations and Wyoming's Arapahoe and Shoshone Tribes of the Wind River Reservation are directly affected by the conflicts. This paper traces the development and implications of the conflicting federal, state, and Indian claims under four headings: (1) development of federal and Western water law, (2) the clash of federal and state water rights, (3) nature and extent of Indian water rights, and (4) federal resource programs and Indian water rights. Several judicial decisions are reviewed, including the crucial Winters v. United States (1906) which enjoined the defendant against diverting water away from a Montana reservation. Underestimating water needs for coal-related industrial projects has been a major cause of the problems. (Lynch-Wisconsin)
W78-09241

TECHNOLOGICAL-FORCING AND FEDERAL ENVIRONMENTAL PROTECTION STATUTES,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 5G.
W78-09245

WATER SUPPLY CATCHMENT POLICIES AND STUDIES FOR METROPOLITAN MELBOURNE,
For primary bibliographic entry see Field 6B.
W78-09250

GROUNDWATER STORAGE RIGHTS IN THE WESTERN STATES,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
J. D. Aiken.
Paper No. 77-2043 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 17 p, 45 ref.

Descriptors: Groundwater, Groundwater recharge, *Groundwater basins, Groundwater resources, *Legal aspects, *Legislation, *Storage(Underground), *Water rights.

Statutes and related court cases from California and Washington relating to the artificial storage and recapture of groundwater are summarized. Also some legal considerations that states should consider in establishing regulations for the artificial storage of groundwater, are discussed. (Skogerboe-Colorado State)
W78-09269

ECONOMIC IMPACTS OF ADMINISTRATIVE WATER LAW SYSTEMS,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
C. Kiker, and G. D. Lynne.
Paper No. 77-2042, presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 22 p, 20 ref.

Descriptors: Legal aspects, Legislation, *Water law, Economics, *Economic impact, *Administration.

There is a move to administrative regulation of water in the eastern states. Economic efficiency is largely being ignored in allocation of private entitlements to water. Several allocation alternatives that include economic criteria are examined. (Skogerboe-Colorado State)
W78-09270

SOIL EROSION AND SEDIMENTATION: ANALYSIS OF APPLICABLE LAW,
Virginia Polytechnic Inst. and State Univ., Blacksburgh Virginia Water Resources Research Center.
W. R. Walker, and W. E. Cox.
Paper No. 77-2040, presented at the 1977 Annual Meeting, American Society of Agricultural Engineers. June 26-29, 1977, Raleigh, North Carolina, 12 p, 16 ref.

Descriptors: *Soil erosion, Erosion, *Sedimentation, *Legislation, Legal aspects, Water law.

Law applicable to activities that increase erosion and sedimentation exists in a variety of forms. The trend in the development of such law has been toward an expansion in scope of activities encompassed and an increase in the degree of legal accountability imposed for resulting injury. (Skogerboe-Colorado State)
W78-09273

6F. Nonstructural Alternatives

FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME II, MORGAN COUNTY - WASHINGTON COUNTY, COLORADO.
Army Engineer District, Omaha, NB.
For primary bibliographic entry see Field 4A.
W78-09074

FLOOD PLAIN INFORMATION: SACRAMENTO RIVER, REDDING, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-09075

FLOOD PLAIN INFORMATION: TRINITY RIVER, LEWISTON LAKE TO JUNCTION CITY, TRINITY COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 4A.
W78-09076

MANAGEMENT OF FLOODING IN A FULLY-DEVELOPED LOW-COST HOUSING NEIGHBORHOOD,
Halff (Albert H.) Associates, Inc., Dallas, TX.

J. I. Novoa, and A. H. Halff.
Water Resources Bulletin, Vol. 13, No. 6, p 1237-1252, December 1977. 4 fig, 3 tab, 6 ref.

Descriptors: *Floodplains, *Management, *Evaluation, *Alternative planning, *Non-structural alternatives, *Structural alternatives, *Peak Branch Watershed(Dallas TX), Trinity River(Texas), Flooding, Projects, Costs, Benefits, Streams, Parks, Greenways, Urban development, Low-cost housing.

Within the flood plain of the lower reach of Peaks Branch, a stream in east Dallas, Texas, 500 buildings would be partially inundated by the 100-year flood. The fully-developed watershed and flood plain mainly accomodate low-cost housing. Eight alternative flooding remedies, ranging from no action to stream channelization to complete redevelopment, are considered. The alternates are evaluated in terms of their relative safety, effects on neighborhoods, required relocations of families and businesses, initial costs, and maintenance costs. Creation of a stream-side greenway, offering lakes and parks, is recommended. This plan best balances costs and required relocations with community benefits, including flood protection. (Graf-Cornell)
W78-09178

RECLAMATION OF OPEN-PIT QUARRIES FOR MULTIPLE USES,
Bissell and Karn, Inc., San Leandro, CA.
R. W. Karn.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. UP1, p 127-135, July 1977.

Descriptors: *Planning, *Recreation facilities, *Zoning, *Reclamation, *Mining, *Quarries, *Gravel, Land use, Urban planning, Water resources, Water quality, Natural resources, Groundwater, Sands, Parks.

Reclamation plans for sand and gravel quarries are being required by many public agencies and are advantageous to the public and the quarry operator. Four projects in the San Francisco Bay Area are used to illustrate some problems that have been encountered in reclamation planning and in suggesting solutions. The projects considered herein are all open-pit quarries that contain impounded water and present excellent opportunities for reclamation for recreational uses. Discussed are government actions, existing projects, plan variables, recreation use problems, and the advantages of reclamation planning. A successful reclamation plant must be able to solve the existing problems and be capable of implementation; good engineering input will be required. (Bell-Cornell)
W78-09182

MAINTAINING WATER QUALITY IN VOYAGEURS NATIONAL PARK,
Minnesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5G.
W78-09183

AN UNUSUAL CHALLENGE--AMERICAN RIVER PARKWAY,
Sacramento County Dept. of Parks and Recreation, CA.
For primary bibliographic entry see Field 6B.
W78-09184

SELECTING RECONNAISSANCE STRATEGIES FOR FLOODPLAIN SURVEYS,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 7B.
W78-09207

6G. Ecologic Impact Of Water Development

MARINE ECOLOGY AND OIL POLLUTION,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
For primary bibliographic entry see Field 5C.
W78-08881

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 1.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08891

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 2.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08892

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 3.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08893

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 1 AND 2.
Winzler and Kelly Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08894

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08895

CONTINENTAL SHELF DEVELOPMENT: A BIBLIOGRAPHIC BACKGROUND FOR ALASKA. VOLUMES 1 AND 2.
Alaska Dept. of Education, Juneau. Div. of State Libraries and Museums.
For primary bibliographic entry see Field 2L.
W78-08896

ECOLOGICAL EVALUATION OF PROPOSED DISCHARGE OF DREDGED MATERIAL INTO OCEAN WATERS.
California Univ., Bodega Bay. Bodega Marine Lab.; and Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W78-08899

CONTINUING DEVELOPMENT OF THE VULNERABILITY MODEL,
Enviro Control, Inc., Rockville, MD.
For primary bibliographic entry see Field 5B.
W78-08904

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 1 OF 3.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08928

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 2 OF 3.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08929

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 3 OF 3,
Winzler and Kelly., Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08930

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 1 OF 2.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08931

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08932

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME IV: MASTER BIBLIOGRAPHY.
Winzler and Kelly. Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08933

ENVIRONMENTAL IMPACT ASSESSMENT FOR WATER RESOURCE PROJECTS: THE ARMY CORPS OF ENGINEERS,
J. R. Luke.
George Washington Law Review, Vol. 45, No. 5, p 1095-1122 (August, 1977).

Descriptors: *Water resources development, *Environmental effects, *Planning, *Engineers estimates, *Cost-benefit analysis, Water resources, Environment, U.S. Water Resources Council, Recreation, Assessments, Benefits, Legislation, Cost analysis, Project planning, Projects, Comprehensive planning.

This article discusses the role of benefit-cost assessment used by the U.S. Army Corps of Engineers in Corps-initiated water resource development projects and the procedures used to delineate and evaluate projects' environmental impacts. Three sets of requirements dictate the cost-benefit analysis presently used: The Flood Control Act of 1936 requires that all project benefits and costs expressible in monetary units be included in a single cost-benefit ratio: the National Environmental Policy Act of 1969 envisions a descriptive evaluation of the environmental impacts of a proposed project; and Water Resources Council 1973 standards require both a formal cost-benefit analysis and a more loosely structured environmental assessment. While the Corps' present environmental assessment procedures provide a good preliminary framework for evaluating impacts, the article concludes that they fall short of creating a sufficient basis for the decisionmaker to adequately consider

the environment in water resource planning. Impact quantification, a more definitive Congressional statement of a national environmental quality goal, a more comprehensive decision-reasoning requirement, and a de-emphasis on assigning monetary equivalents to anticipated recreational benefits are all recommended in part to improve the Corps' project assessment procedures. (Easterbrook-Florida)
W78-08978

OCS DEVELOPMENT AND THE CONSISTENCY PROVISIONS OF THE COASTAL ZONE MANAGEMENT ACT--A LEGAL AND POLICY ANALYSIS,
Department of the Interior, Washington, DC. Office of the Solicitor.
For primary bibliographic entry see Field 6E.
W78-08980

GUIDELINES FOR EVALUATING PROPOSED WETLANDS ALTERATIONS IN SOUTH CAROLINA,
South Carolina Wildlife and Marine Resources Dept., Columbia.
For primary bibliographic entry see Field 6E.
W78-08987

FLORIDA ENVIRONMENTALLY ENDANGERED LANDS PLAN.
Florida Dept. of Natural Resources, Tallahassee. Div. of Recreation and Parks.
February, 1975. 132 p, 5 fig, 2 tab.

Descriptors: *Florida, *Conservation, *Land management, *Protection, *Public lands, Ecology, Environment, Environmental effects, Environmental engineering, Land classification, Land development, Land reclamation, Land resources, Legal aspects, Legislation, Water resources, Water conservation, Natural resources, Wetlands, Land.

In 1972, the Florida legislature passed the Land Conservation Act (LCA). The purpose of the LCA was to conserve and protect environmentally unique and irreplaceable lands. In compliance with the LCA, Environmentally Endangered Lands (EEL) Plan was prepared. The EEL is based upon the following factors: an analysis of the ecological resources of the state; and an examination of the pressures that adversely affect those resources. The EEL is intended to be a planning tool that establishes policy in the form of criteria and guidelines to assist in achieving the goals of the LCA by means of land acquisition. The EEL establishes six priority categories of land: (1) lands of critical importance to supplies to fresh water for domestic and natural systems; (2) freshwater and saltwater wetlands; (3) unique and outstanding natural areas; (4) natural ocean and gulf beach systems; (5) areas that protect or enhance the environmental values of significant natural resources; and (6) wilderness areas. Because the program lacks the power of eminent domain the total lands acquired are likely to be small. Consequently, most environmental protection in Florida will be achieved through regulation rather than through acquisition. (Jordan-Florida)
W78-08988

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR SELECTED NEW SOURCE INDUSTRIES,
Environmental Protection Agency, Washington, DC. Office of Federal Activities.
For primary bibliographic entry see Field 5G.
W78-08992

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 6 - RESERVOIR INDUCED SEISMICITY,
Woodward-Clyde Consultants, San Francisco, CA.
D. R. Packer, J. R. Lovegreen, and J. L. Born.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 337 p, 14 fig, 4 tab, 312 ref, 6 append. USBR 6-07/DS/72090.

Descriptors: *Reservoir-induced earthquakes, Earthquakes, California, *Earthquake evaluation, Earthquake engineering, *Seimic studies, Pre-impoundment, Seismicity, *Auburn Dam(Calif), Central Valley Project(Calif).

That portion of the study described pertains to any apparent risks at the Auburn damsite for an earthquake induced by the proposed reservoir. The amount of available data and the level of understanding of reservoir-induced seismicity are limited. The estimation for the likelihood of reservoir-induced seismicity at the proposed dam can only be a professional judgement and is based on an understanding of seismicity in the vicinity of the damsite and probability for the August 1975 Oroville earthquake being reservoir-induced. An analysis of the 55 reported cases of reservoir-induced seismicity is presented. Of these, 16 were classified as cases for induced seismicity, 35 as questionable and 4 as not reservoir related. (See also W78-09021) (Bur Reclam)
W78-09026

TOWARD ENVIRONMENTAL DEMAND MANAGEMENT,
Illinois Univ., Urbana-Champaign. Inst. for Environmental Studies.
K. B. Rotzoll.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 272, Price codes: A03 in paper copy, A01 in microfiche. IES Report No. 2, (UILU-IES 76 0002), April 1976. 21 p, 15 ref.

Descriptors: *Pollution abatement, *Economics, *Management, *Institutional constraints, Marketing, Regulation, Pricing, Demand, *Demand management, *Environmental management, Corporate responsibility, Market system, Environmental quality.

The purpose is to develop alternative means of encouraging environmentally sound decisions. It is an attempt to elaborate the general social-economic-political environment in which such decisions are made. The report examines the market system and its relationship to the control of environmental quality. The development of the market system is traced from its beginnings to the present. Changes are noted in how our perceptions of human nature, truth, government, and the economy have accompanied a change from the atomistic system of free competition described by classical liberal economists to a market dominated by large concentrations of economic power. These concentrations of power are subject to both the external controls imposed by governments and the internal controls arising from a sense of corporate responsibility. Such a market system is shown to be frequently ineffective in dealing with the environmental problems to which it often contributes. Environmental demand management involves directing the self-interest of both producers and consumers toward environmentally sound choices. It is seen as more effective than direct governmental regulation because of the complexity of environmental problems. (Nessa-NC)
W78-09064

DRAFT ENVIRONMENTAL IMPACT STATEMENT, ASPEN METRO SANITATION DISTRICT, SNOWMASS WATER AND SANITATION DISTRICT--201 WASTEWATER FACILITIES PLANS.
Weiner and Associates, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 589, Price codes: A07 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Region VIII, Denver, CO, August 1976, 119 p, 3 append.

Descriptors: *Environmental effects, *Waste water treatment, *Domestic wastes, *Water management(Applied), Wastewater disposal, Water quality, Colorado, Non-structural alternatives, Regional analysis, Regional economics, Suspended solids, Ammonia, Tertiary treatment, Pollution, Water pollution control, *Section 201 Facilities Planning, Nonpoint sources, Policy, Resorts, Residual chlorine, Secondary treatment, *Environmental Impact Statement, Aspen(CO), Snowmass(CO), Roaring Fork(CO).

The proposed action will provide for regional wastewater treatment in the combined Aspen and Snowmass resort study areas in Colorado. The study areas' principal river drainage is the Roaring Fork River which is in good condition but is threatened by increased future discharges from point and nonpoint sources. Additionally, present point sources do not have the facilities to meet effluent standards for ammonia, residual chlorine and suspended solids. Specified alternatives have only been proposed for domestic sewage treatment. Nonpoint source control remains an unresolved issue of this draft EIS. Existing facilities are recommended for expanded secondary treatment. Tertiary alternatives are also reviewed. Summertime land treatment was also proposed for both study areas. The proposed facilities will protect the Roaring Fork and Brush Creek. In the Snowmass area this will be achieved by alleviation of pollution from point source discharges; in Aspen the older of two existing plants will be closed, conforming to citizen preference and cost-benefit analysis. The other plant will be correspondingly upgraded and since the net increase in capacity will be minimal, it is not expected that this expansion will be a growth stimulant. The Snowmass facility will also be expanded and this too is not expected to be an inducement for ill-advised growth. Unsolved issues for which remedial measures will be developed prior to the issuance of the final EIS include: development of structural and non-structural policy plans for the control of nonpoint sources; negotiation with land owners for summertime land treatment on designated sites; and an acceptable treatment approach for residual chlorine. (Zayac-NC)
W78-09066

SUMMARY: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR UTAH LAKE--JORDAN RIVER WATER QUALITY MANAGEMENT PLANNING STUDY.
Environmental Protection Agency, Denver, CO. Region VIII.
April 1976. 44 p, 8 tab, 7 fig.

Descriptors: *Environmental effects, *Utah, *Water quality, *Waste water treatment, *Water management(Applied), Waste water(Pollution), Air pollution, Population, Economics, Water rights, Ecology, Management, Water pollution control, *Health effects, *Utah Lake(UT), *Jordan River(UT), *Environmental Impact Statement.

The proposed action is a comprehensive plan for directing future water quality within the Utah Lake-Jordan River hydrologic basins. Alternative wastewater treatment schemes were evaluated in order to best meet water quality standards established by the State of Utah. The planning area includes all or parts of five counties in north-central Utah. The area is presently served by 30 big wastewater treatment plants. Population projections indicate an 80% rise from the 1970 population of 726,488 to 1,304,557 in 1995. About two-thirds of the study area is woodland and for the most part is expected to remain that way. However, agricultural land will be affected by the population increase. Water quality management in each of the five counties is reviewed. Existing facilities and water quality are inventoried, followed by alternative treatment schemes and their water quality effects. Land use effects in each county are then discussed since it is recognized

hat implementation of any of the alternatives will ffect land use patterns. These effects are clas-ified as direct or indirect. The report then reviews ir quality, present and future; economic con-iderations, both of the construction of facilities hemselves and the conversion of agricultural land o urban land over the next 20 years; water right onsiderations; and the mitigation of possible eleterious impacts. The report concludes with a iscussion of the alternative courses of action and dentifies two basic alternative policies regarding mplementation of the management plan. These olicies would reflect either EPA approval of the lan or EPA conditional approval. (Zayac-NC)
W78-09067

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR MARION, NORTH CAROLINA.
Environmental Protection Agency, Atlanta, GA. Region IV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 517, Price codes: A10 in paper copy, A01 in microfiche. 1974, 208 p, 2 fig, 3 tab, 8 ref, 2 append.

Descriptors: *Environmental effects, Water quality, *Water quality control, *Water pollution, *Waste water treatment, North Carolina, Land use, Zoning, Water supply, Waste water(Pollution), Waste water disposal, Dissolved oxygen, Pumping plants, *Marion(NC), *Interceptor sewers, *Force mains, McDowell County(NC), *Environmental impact statement, Traffic flows, Industrial pretreatment.

This environmental impact statement determines the environmental viability of a construction project including a wastewater pumping station, force mains, interceptor sewers and wastewater treatment plant (WWTP) in Marion, McDowell County, North Carolina. The document, after reviewing the social and environmental setting, discusses alternatives ranging among no action, upgrading of existing facilities, assimilative capacities of different reaches and land disposal by crop irrigation system. The proposed action includes the construction of a new 3-mgd WWTP capable of accommodating a 6-mgd expansion with discharge to Corpening Creek. Some pretreatment of industrial wastes will be required. Beneficial impacts include the elimination of the present discharge of inadequately treated wastes, the reduction of the nutrient load to Lake Rhodhiss and improved water quality of both Corpening and Muddy Creeks. Adverse impacts will include the disruption of traffic flows during interceptor and force main construction and erosion during ditching and other earth-moving activities (to be ameliorated by proper construction techniques). The proposed WWTP will have operational safeguards so as not to violate dissolved oxygen standards of the receiving stream. It is expected that judicious use of local land use controls and good zoning practices will contribute to the avoidance of adverse impacts of development that might result from the extension of interceptor sewers. (Zayac-NC)
W78-09068

THE CLYDE ESTUARY AND FIRTH: AN ASSESSMENT OF PRESENT KNOWLEDGE.
Natural Environment Research Council, London (England). Clyde Study Group.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 878, Price codes: A04 in paper copy, A01 in microfiche. Publication Series C, No. 11, May 1974. 62 p.

Descriptors: *Estuaries, *Environmental effects, *Water pollution, Geology, Biology, Chemistry, Sedimentation, Sludge disposal, Excavation, Tidal effects, Sediment transport, Deposition(Sediments), Dredging, Pollutant identification, Nitrogen cycle, Monitoring, Heavy metals, Phytoplankton, Fisheries, Benthos, Pollution(Water), *Clyde Estuary(Scotland), *Firth of Clyde(Scotland), Water movements, Seaweeds.

The Clyde Study was formed to undertake a background appraisal of scientific information available for the Clyde Estuary and Firth. This report aims to gather information to a single locus, to identify gaps in knowledge and to stimulate further research. There has been a long history of industrial development in the upper estuary and it is an area greatly moderated by both the receipt of effluents and wastes, and dredging practices. Generally, though, the Clyde Estuary is revealed to be fairly stable in nature with a bottom composed of fine sediments apparently little reworked. Four general areas are investigated in depth. Geological studies indicate that the basin's deeper waters have a slow sedimentation rate so that dumping of sludge or excavation material may drastically alter the sediment regime. Further study of sediment transport and deposition is recommended. Studies of water movements show a small tidal range with weak tidal currents, indicating a stable system and a need to determine whether this stability is likely to be endangered. The input of fresh water from the area as a whole is moderated by the storage capacity of nearby Loch Lomond; further moderation might be cause for concern. Chemical studies indicate that pollution in the Clyde has three main origins: domestic sewage and industrial effluent; sludge dumping; and the enrichment of areas of the basin through the discharge of nitrogenous effluents. Thus the major pollutants are organic, but heavy metals and other substances are included. The estuarine system has remained stable, but constant monitoring is recommended. Biological studies undertaken indicate a healthy system; constant monitoring practices are recommended to ensure continued biological health. (Zayac-NC)
W78-09070

A PRE-IMPOUNDMENT WATER QUALITY INVESTIGATION FOR THE PROPOSED GATHRIGHT RESERVOIR.
Environmental Protection Agency, Philadelphia, PA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-09072

FINAL ENVIRONMENTAL IMPACT STATEMENT - NORTH FREMONT COUNTY WASTEWATER FACILITIES.
Environmental Protection Agency, Seattle, WA. Region X.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 309, Price codes: A06 in paper copy, A01 in microfiche. Report EPA 910/9-75-013, January 1976, 103 p, append. C-160186-01.

Descriptors: *Environmental effects, *Water quality, *Waste water treatment, *Water management(Applied), Air pollution, Nutrients, Lagoons, Septic tanks, Waste water(Pollution), Aesthetics, Construction, Population, Pollution, Management, Water pollution control, Impacts, Sewage treatment, Noise, Secondary effects, Fecal contaminants, Assimilative capacities, Induced growth, Environmental Impact Statement.

This is an EIS for proposed wastewater facilities for Fremont County, Idaho. The study area includes the entire north half of Fremont County. Since background studies indicate that the waters in this area are being contaminated through the use of inadequate subsurface sewage disposal systems, the proposed sewage treatment systems generally are intended: (1) to provide facilities in those areas of significant existing or projected development to prevent further water contamination; (2) to allow waters to recover their former natural conditions through assimilative action; (3) to preserve the beneficial uses for which the waters have been designated. Existing facilities in the study area include one evaporative lagoon, with the rest of the treatment systems being individual home septic tanks. Conditions in the planning area without the project are inventoried; environmental impacts of the proposed action are then discussed. Water quality of the area is expected to be improved by the removal of human fecal contaminants and through the restoration of the area's streams' assimilative capacities; negative impacts include some loss of nutrients. Construction activities will produce some adverse impacts. Adverse aesthetic impacts and adverse operation impacts will be minimized by proper site design. Secondary impacts will include the increased likelihood of population growth and further development in the area. The relationship between local short term uses of man's environment and the maintenance and enhancement of long term productivity is studied by investigating tradeoffs between construction impacts vs. improved water quality; improved water quality vs. induced growth; and implementation vs. delay (including no action). Outside participation is summarized, followed by comments to the draft EIS and responses. (Zayac-NC)
W78-09073

PRODUCTIVITY RELATIONS IN A CAREX-DOMINATED ECOSYSTEM,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-09081

MAN'S INFLUENCE ON THE DEVELOPMENT OF THE ESTUARINE MARSH, FLAX POND, LOND ISLAND, NEW YORK,
New York Univ., NY. Dept. of Biology.
L. E. Heusser, C. J. Heusser, and D. Weiss.
Bulletin of the Torrey Botanical Club, Vol. 102, No. 2, p 61-66, March-April, 1975. 4 fig, 22 ref.

Descriptors: *Channeling, *Salt marshes, *Cores, Pollen, Peat, Marshes, Estuaries, Paleoecology, *Flax Pond(NY).

Paleoecological changes during the past 1,730 radiocarbon years at Flax Pond are interpreted from plant macrofossils, pollen, spores, dinoflagellates, and formaminifers contained in seven cores. Three pollen assemblage zones are recognized: (1) Gramineae-Chenopodiaceae-Ruppia spanning approximately the last century, (2) Polypodiaceae-Cyperaceae-Compositae-Typha of unknown duration, and (3) Compositae-Gramineae constituting the early record. During the interval of zone 3, Flax Pond originated as an estuary; in zone 2, sedge, fern, and sphagnous remains in the peat point toward conditions that varied between fresh water and oligohaline. Man's apparent opening of the baymouth bar (blocking Flax Pond from Long Island Sound) in the 19th century (zone 1) brought about a sudden change to mesohaline conditions causing deposition of Spartina alterniflora peat and a sharp increase in arenaceous foraminifers, Trochammina inflata and Ammobaculites sp. Since the 1800's, fossil evidence indicates that ditching and dredging of the marsh have maintained salinities ranging between 5 and 26 ppt. (Stihler-Mass)
W78-09091

CONSERVATION OF COASTAL HABITATS OF WADERS IN THE SOUTH-WESTERN CAPE, SOUTH AFRICA,
Cape Town Univ. (South Africa). Percy Fitz-Patrick Inst. of African Ornithology.
For primary bibliographic entry see Field 2L.
W78-09101

THE CRANESVILLE PINE SWAMP,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 2H.
W78-09107

ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE. VOLUME 1: TREND IDENTIFICATION AND EVALUATION,
Development Planning and Research Associates, Inc., Manhattan, KS.
For primary bibliographic entry see Field 2G.
W78-09149

THE USE OF SYSTEMS DIAGRAMS FOR ENVIRONMENTAL IMPACT ASSESSMENT: PROCEDURES AND AN APPLICATION,
Oklahoma Univ., Norman. Science and Public Policy Program.
M. W. Gilliland, and P. G. Risser.
Ecological Modelling, Vol 3, No 3, August 1977, p 183-199. 7 fig, 1 tab.

Descriptors: *Environmental effects, *Systems analysis, *Systems diagrams, *Energy, *White Sands Missile Range(NM), *Planning, New Mexico, Model studies, Mathematical models, Simulation analysis, Water pollution control, Aquifers, Saline water intrusion, Methodology, Analytical techniques, Aquifer management, Data processing.

The utility of systems diagrams and of energy flow per unit time as the measure for environmental impact assessment is illustrated using results from the environmental impact statement for White Sands Missile Range, New Mexico. Procedures for developing and evaluating the diagrams are given and applied to White Sands. Both large-scale and small-scale environmental effects of the missile range were evaluated: On a macro scale, environmental stresses represented 1% of the natural energy flow through the system. At a more detailed level, a hydrological model used to assess effects of missile range water consumption on the aquifer showed that salt water intrusion into the aquifer was imminent, and identified two management strategies to prevent the intrusion. Environmental impact analysis includes: (1) evaluating total impact; (2) comparing alternatives; (3) organizing, summarizing, and synthesizing voluminous data; and (4) communicating results to the public and to decision-makers. A procedural approach incorporating models to organize information greatly facilitates such analysis. The thesis of this paper is that macroscale models, required to put various effects into perspective, need not be simulated to be useful. Rather, their utility is in synthesizing ideas, organizing information, guiding data collection, comparing effects, directing microscale analysis (at a level where simulation is valuable), and communicating results. (Lynch-Wisconsin)
W78-09174

LAKE ERIE AIRPORT STUDY,
Howard, Needles, Tammen and Bergendoff, Cleveland, OH. Cleveland Aviation Office.
H. R. Crawford.
Transportation Engineering Journal of ASCE, Proceedings of the American Society of Civil Engineers, Vol. 103, No. TE3, p 321-335, March 1977. 9 fig, 14 ref.

Descriptors: *Great Lakes, *Offshore structures, *Underwater construction, *Airports, *Environmental impact statements, Coastal engineering, Shore protection, Dikes, Urban planning.

Completed investigations include weather studies, Lake Erie bottom soils surveys, and environmental surveys of Lake waters and sediments. Weather, noise levels, air and water quality impacts, airspace/air traffic control considerations, obstruction clearances, effects on Lake currents and Lake navigation routes, and aesthetic considerations have been evaluated. The feasibility of dividing airport functions between the offshore site and onshore facilities has been studied, facility requirements have been developed, and airport layout schematics formulated. Potential construction configurations have been analyzed. Construction materials availability and transport methods are being investigated, alternative construction methods are being studied, and cost-effectiveness evaluations have been initiated. Environmental impacts and legal questions are under intensive study. Future work includes function/selection, access planning, cost-benefit analyses, financial planning, further environmental impacts, and final feasibility analysis. Completion of the in-Lake portion of the study is scheduled for late 1976. (Bell-Cornell)
W78-09186

RECENT AND PLANNED MARSH ESTABLISHMENT WORK THROUGHOUT THE CONTIGUOUS UNTED STATES-A SURVEY AND BASIC GUIDELINES,
Environmental Concern, Inc., St. Michaels, MD.
For primary bibliographic entry see Field 2I.
W78-09217

TECHNOLOGICAL-FORCING AND FEDERAL ENVIRONMENTAL PROTECTION STATUTES,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 5G.
W78-09245

THE USE OF CATCHMENT AREAS AS FLORA AND FAUNA RESERVES,
National Parks, Victoria (Australia).
L. H. Smith.
Water Research Foundation of Australia, Report No. 37, Water Catchment Management and Recreational Use, p. 4.1-4.8, December 1972. 8 ref.

Descriptors: *Watershed management, *Victoria(Australia), *Wildlife management, *Watersheds(Basins), Melbourne(Australia), Land use, Wildlife habitats, Ecology, Forestry, Recreation demand, Water supply, Grazing, Environmental effects, Multiple purpose, Single purpose, Mountains.

Planning considerations for wildlife reserves within water supply catchments in the State of Victoria, Australia are discussed. Victoria has two types of catchments: (1) those controlled by the Melbourne and Metropolitan Board of Works for supplying water to the city, and (2) water resources outside the Melbourne area, controlled by the State Rivers and Water Supply Commission. A major differentiation is that the MMBW has statutory control of catchment lands, while the commission's reservoirs are supplied by catchments controlled by other agencies. Watersheds of Victoria provide exceptionally good bases for flora and fauna reserves because of their rich and diverse wildlife. Mere designation of reserves would achieve little and could create major problems; land management is required for reserves viewed in a development sense. Due to MMBW's policy of single-use catchments, such managed reserves are not possible in its jurisdiction. Major catchments in Victoria not controlled by MMBW and therefore subject to multiple use are Mount Bogong, Bogong High Plains, Mts. Hotham/Loch/Feather-top, Mount Howitt/Snowy Plains, and the Baw Baws. Factors which affect the future of these areas as wildlife reserves include: (1) forestry; (2) grazing, which causes more damage at higher elevations; (3) snow sports, especially ragarding ancillary services; and (4) motorized recreational vehicles. (See also W78-09247) (Lynch-Wisconsin)
W78-09251

7. RESOURCES DATA

7A. Network Design

RIVER BASIN NETWORK MODELLING AND ITS APPLICATION TO THE TISZA RIVER BASIN,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09191

7B. Data Acquisition

SOME METHODS AND INSTRUMENTS FOR AUTOMATED MONITORING OF THE CHEMICAL COMPOSITION OF SURFACE WATERS,
Hydrochemical Inst. Novocherkassk (USSR).
For primary bibliographic entry see Field 5A.
W78-08812

PROBLEM OF ESTIMATING THE RELIABILITY OF INFORMATION OBTAINED BY AN AUTOMATED WATER QUALITY MONITORING AND CONTROL SYSTEM,
Hydrochemical Inst. Novocherkassk (USSR).
For primary bibliographic entry see Field 5A.
W78-08813

LOW-SPEED CALIBRATION OF THE BENDIX Q15R CURRENT METER,
Argonne National Lab., IL. Energy and Environmental Systems Div.
K. D. Saunders.
Journal of Great Lakes Research, Vol 3, No 3-4, p 317-320, December 1977. 5 fig, 1 tab, 2 ref. ERDA W-31-109-ENG-38, suppl. 18.

Descriptors: *Current meters, *Calibrations, *Laboratory tests, *Flow measurement, Instrumentation, Velocity, Currents(Water), Measurement, Analysis, Analytical techniques, Quality control, Equipment, Rotating meters, Bendix Q15R current meter.

Recent calibrations of the Bendix Q15R ducted impeller current meter showed a strong non-linear relationship between the observed count rate conversion factor and the true water speed in the range 0.0-0.1 m/s. An empirical response curve was fitted (using least squares) to the data, and the fitted coefficients were presented for all current meters calibrated by Argonne National Laboratory. Separate calibrations of every current meter were recommended wherever possible. If this is not possible, use of the composite fitted curve was recommended in preference to the manufacturer's conversion factor. The use of the constant nominal conversion factor supplied by the manufacturer is justified only when the currents are greater than about 0.1-0.2 m/s. (Humphreys-ISWS)
W78-08824

MONITORING POLLUTION.
For primary bibliographic entry see Field 5B.
W78-08878

AN ON-LINE COMPUTERIZED INFRARED IDENTIFICATION SYSTEM,
Beckman Instruments, Inc., Irvine, CA. Scientific Instruments Div.
For primary bibliographic entry see Field 5A.
W78-08944

AMERICAN DEVELOPMENTS IN HYDRAULIC MEASUREMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W78-09036

MAPPING WETLANDS ON BEAVER FLOWAGES WITH 35 MM PHOTOGRAPHY,
Southern Illinois Univ., Carbondale. Cooperative Wildlife Research Lab.
For primary bibliographic entry see Field 7C.
W78-09087

LANDSAT APPLICATION OF REMOTE SENSING TO SHORELINE FORM ANALYSIS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, B. Hayden, J. Heywood, J. Michel, and K. Schroeder.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-19551, Price codes: A01 in paper copy. Quarterly Report for Period 1/1/77 to 3/1/77. Prepared for NASA/Goddard Space Flight Center, Greenbelt, Maryland. 1977. 8 p.

Descriptors: *Shores, *Aerial photography, Erosion, Beaches, Coasts, *LANDSAT, *Assateague Island(MD VA), Maryland, Virginia.

Data on beach-zone width, swash slope, and sand-grain size were collected at 89 locations along Assateague Island (MD/VA). Correlations were run among these data sets and for coastal orientation and historical shoreline erosion. The analysis indicates that there are organized relationships between physical beach features and shoreline form and erosion, but weak relationships between sand-grain size and shoreline form and erosion. (Stihler-Mass)
W78-09093

A METHOD OF MEASURING SALT MARSH INUNDATION,
Aarhus Univ. (Denmark). Botanical Inst.
A. Jensen.
Oikos, Vol. 25, No. 3, p 252-254, 1974. 4 fig, 5 ref.

Descriptors: *Tidal marshes, *Salt marshes, *Tides, Methodology, Wetlands, *Measurement, *Inundation, Marshes.

A system for measuring the period of inundation of permanent plots is described and some results from Skallingen salt marsh, SW Jutland reported. The basic component of the system is a 10-channel event recorder with a stabilized electrical part of advancing the paper. A sensor is placed in the ground in such a way that it is activated when the water reaches a certain level and will stay activated until the water falls below that level. Results indicate that it is necessary to measure inundation at each investigation site. (Stihler-Mass)
W78-09098

EVALUATION OF A WATER ANALYSIS KIT,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5A.
W78-09111

CLOVER N-FIXATION MEASUREMENT BY TOTAL-N DIFFERENCE AND 15N A-VALUES IN LYSIMETERS,
California Univ., Davis. Dept. of Agronomy and Range Science.
W. A. Williams, M. B. Jones, and C. C. Delwiche.

Descriptors: *Nitrogen fixation, *Legumes, Lysimeters, *Clovers, California, Crop production, Crop response, Nitrogen, Nitrogen-15, Measurement.

Assessment and improvement of N fixation by legumes on annual-type range is becoming increasingly important in light of the increasing need for energy conservation. A comparison was made of two methods of assessing N fixation: a simple but crude method by measuring the total-N difference in tops of an N-fixing legume and a non N-fixing grass, and a more expensive method using A-values determined from 15N applications to the same legume and grass species. Subterranean clover and soft chess grass were grown in field lysimeters (69 cm deep by 36 cm diam.) filled with Josephine loam (Typic Haplozerults, fine loamy, mixed mesic) for 3 years. Single (100 and 500 kg/ha) and repeated (100 kg/ha) applications of 15N were made and determinations were made of soil and fertilizer N in plants, soil, and leachate periodically. The relation between the two methods was strongly linear; fixation (kg/ha) by the A-value method = 50.1 + 0.852 N fixation by difference ($r = 0.98$, $n = 15$). Consequently, previous values cited for N fixation measured by the difference method for winter annual legumes in California may have been underestimated by about 40%. (Skogerboe-Colorado State)
W78-09121

DIGITAL ELECTRONIC MEASUREMENT AND RECORDING OF IRRIGATION FIELD WATER DEPTHS,
ICE Corp., Manhattan, KS.
For primary bibliographic entry see Field 3F.
W78-09125

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES.
American Society of Civil Engineer, New York. Hydraulics Div.
For primary bibliographic entry see Field 4A.
W78-09138

ANALYSIS OF LASER FLUOROSENSOR SYSTEMS FOR REMOTE ALGAE DETECTION AND QUALIFICATION,
National Aeronautics and Space Asministration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-09166

SELECTING RECONNAISSANCE STRATEGIES FOR FLOODPLAIN SURVEYS,
Army Engineer District, San Francisco, CA.
S. C. Sollers, A. Rango, and D. L. Henninger.
Water Resources Bulletin, Vol. 14, No. 2, p 359-373, April 1978. 2 fig, 2 tab, 34 ref. Army DACW 73-74-C-0036, NASA S-50960-G.

Descriptors: *Remote sensing, *Floodplains, *Surveys, *Pennsylvania, Satellites(Artificial), Aircraft, Planning, Rivers, Flood plain zoning, Flood plain insurance, Flood data, Costs, On-site investigations, Classification, Mapping, Hydrology, LANDSAT.

Multispectral aircraft and satellite data over the West Branch of the Susquehanna River were analyzed to evaluate potential contributions of remote sensing to floodplain surveys. Multispectral digital classifications of land cover features indicative of floodplain areas were used by interpreters to locate various floodprone area boundaries. The boundaries thus obtained were found to be more striking and continuous in the LANDSAT data than in the low altitude aircraft data. The digital approach permitted satellite results to be displayed at 1:24,000 scale and aircraft results at even larger scales. Results indicated that remote sensing techniques can delineate floodprone areas more easily in agricultural and limited development areas than in areas covered by a heavy forest canopy. At this time it appears that the remote sensing data would be used best as a form of preliminary planning information or as an internal check on previous or ongoing floodplain studies. In addition, the remote sensing techniques can assist in effectively monitoring floodplain activities after a community enters into the National Flood Insurance Program. (Sims-ISWS)
W78-09207

AERIAL PHOTO INTERPRETATION OF A SMALL ICE JAM,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-09215

RAINFALL SIMULATOR FOR EVALUATING EROSION RATES AND SEDIMENT FROM ROW SIDESLOPES,
Agricultural Research Service, oxford, MS. Sedimentation Lab.
L. D. Meyer, and W. C. Harmon.
Paper No. 77-2025, presented at the 1977 Annual Meeting, American Society of Agricultural Engineers, June 26-29, 1977. Raleigh, North Carolina, 12 p, 9 fig, 8 ref.

Descriptors: Rainfall, Simulation analysis, *Rainfall simulators, Runoff, Erosion rates, Sediments, Sedimentation, *Soil erosion, *Slopes.

A new rainfall simulator was developed for obtaining data on row-sideslope runoff, erosion, and sediment size. It can apply a wide range of intensities at impact energies comparable to those of natural rainfall. Design features, simulated-ranifall characteristics, and example data are reported. (Skogerboe-Colorado State).
W78-09253

SELF-CLEANING SCREEN FOR PROCESSING BENTHIC SAMPLES,
Fish and Wildlife Service, Jamestown, ND. Northern Prairies Wildlife Research Center.
G. A. Swanson.
The Progressive Fish Culturist, Vol 39, No 4, p 177-178, October 1977. 2 fig, 3 ref.

Descriptors: *On-site Data collections, Equipment, *Sampling, *Benthos, *Screens, Design, Filters, Sieves, On-site investigation, Methodology, Laboratory equipment.

A screen is described that allows the processing of large amounts of material in a relatively short period without clogging. The apparatus is constructed from two pieces of plywood that are rounded at one end and joined on three sides by screen of the desired mesh size. Flotation material maybe attached to provide bouyancy. The half-round design causes one side of the screen to be cleaned while the other side screens the sample. (EIS-Katz)
W78-09291

DURABLE ICHTHYOPLANKTON SAMPLER FOR SMALL BOATS,
Maryland Univ., Frostburg. Appalachian Environmental Lab.
J. E. Cooper.
The Progressive Fish Culturist, Vol 29, No 4, p 170-171, October 1977. 3 fig, 7 ref.

Descriptors: *Sampling, Equipment, *Design, *Specification, *Plankton nets, *On-site data collections, Plankton, Research equipment, Boats, Zooplankton, Freshwater fish, *Ichthyoplankton samplers.

Half-meter ichthyoplankton sampling gear for simultaneous two-level sampling is described and illustrated. The gear is designed for use with boats up to 8 m long, at speeds less than 2.5 m/s. The gear is light and durable, and can be easily transported without disassembly. (EIS-Katz)
W78-09292

7C. Evaluation, Processing and Publication

RECONSTRUCTION OF RIVER DISCHARGES IN THE CONGO BASIN,
Moscow State Univ. (USSR). Dept. of Hydrology.

For primary bibliographic entry see Field 2E.
W78-08814

A MODEL TO DESCRIBE THE INHERENT SPATIAL AND TEMPORAL VARIABILITY OF PARAMETERS IN LAKE ONTARIO 1974,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-08817

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1977.
Geological Survey, University, AL. Water Resources Div.
Water-Data Report AL-77-1, February 1978. 459 p, 7 fig.

Descriptors: *Alabama, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Alabama consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoir; and water levels in wells. This report contains discharge records for 92 gaging stations, stage only for 25 gaging stations, stage and contents for 12 lakes and reservoir, water quality for 61 gaging stations and water levels for 52 observation wells. Also included are 26 crest-stage partial-record stations, 10 flood hydrograph partial-record stations, and 33 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Alabama. (Woodard-USGS)
W78-08836

WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, MAY 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
P. D. Ryder, and L. R. Mills.
Open-file report 77-642, 1977. 15 p, 4 maps, 2 fig, 1 tab.

Descriptors: *Aquifers, *Water levels, *Mapping, *Potentiometric level, *Water table, Hydrographs, Florida, *Floridan aquifer, *Surficial aquifer, Pasco County, Pinellas County, Hillsborough County.

The coastal parts of Pasco, Pinellas and Hillsborough are undergoing extensive urban development. The Floridan aquifer is the area's principal water supply. Potentiometric and water-table maps were prepared in order to determine the effect of groundwater withdrawals in selected well fields in west-central Florida. These maps were prepared in May 1977 to capture the annual low-water-level period. Declines in the potentiometric surface ranged from 3 feet in the Starkey well field to 25 feet in the Sun City well field. (Woodard-USGS)
W78-08843

WATER RESOURCES DATA FOR KENTUCKY, WATER YEAR 1977.
Geological Survey, Louisville, KY. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 738, Price codes: A18 in paper copy, A01 in microfiche. Water-Data Report KY-77-1, March 1978. 390 p, 4 fig, 3 tab, 22 ref.

Descriptors: *Kentucky, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Kentucky consist of records of stage, discharge, and water quality of streams; stage and contents of lakes; and water levels and water quality of wells and springs. This report contains discharge records for 116 gaging stations; stage and contents for 14 lakes; water quality for 51 gaging stations, 13 water-quality stations, 26 miscellaneous stations, and 34 wells and springs; and water levels for 82 observation wells. Also included are data for 127 crest-stage partial-record stations and 131 low-flow partial record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous sites. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Kentucky. (Woodard-USGS)
W78-08844

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1977.
Geological Survey, Huron, SD. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 757, Price codes: A14 in paper copy, A01 in microfiche. Water-Data Report SD-77-1, March 1978. 291 p, 6 fig.

Descriptors: *South Dakota, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for South Dakota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 97 gaging stations; stage and contents for 10 lakes and reservoirs; water quality for 26 gaging stations and 148 wells; and water levels for 16 observation wells. Also included are 100 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in South Dakota. (Woodard-USGS)
W78-08845

LOW-FLOW CHARACTERISTICS OF PENNSYLVANIA STREAMS,
Geological Survey, Harrisburg, PA. Water Resources Div.
L. V. Page, and L. C. Shaw.
Pennsylvania Department of Environmental Resources, Harrisburg, Water Resources Bulletin No 12, October 1977. 441 p, 21 fig, 1 tab, 2 ref.

Descriptors: *Low flow, *Flow duration, *Streams, *Pennsylvania, *Low-flow frequency, Flow rates, Data collections, Gaging stations, Measurement, Sites, Maps, Continuous-record sites, Partial-record sites, Miscellaneous-record sites.

This report presents the frequency of low flow and duration of flow for 1,210 sites on streams in and adjacent to Pennsylvania. The amount of data collected varies from the complete daily discharge records of the continuous-record gaging stations, some of which have been in operation for many years, to the miscellaneous sites, where only a few discharge measurements have been made. Daily discharges for all the continuous-record stations with five or more years of record have been summarized by electronic computer. Through the use of these statistical summaries, low-flow tables for all unregulated streams with 10 or more years of record and flow-duration tables for all streams with 5 or more years of record have been compiled. The annual minimum mean discharges for 7 consecutive days having recurrence intervals of 2 and 10 years, are given where possible for continuous-record stations with less than 10 years of record, for partial-record stations, and for miscellaneous measurement sites. (Woodard-USGS)
W78-08846

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1977,
Geological Survey, Helena, MT. Water Resources Div.
R. J. Omang, and J. A. Hull.
Open-file report 78-219, March 1978. 202 p, 2 fig.

Descriptors: *Peak discharge, *Montana, *Streams, *Crest-stage gages, *Small watersheds, Streamflow, Flow rates, Flood peak, Flood frequency.

Annual peak stage and stream-discharge data have been collected and tabulated for crest-stage gaging sites in Montana. The crest-stage program was begun in July 1955 to investigate the magnitude and frequency of floods from small drainage areas. The program has expanded from 45 crest-stage gaging stations initially to 191 stations in 1977. Data are tabulated for 336 sites throughout the period of record. (Woodard-USGS)
W78-08847

ALTITUDE AND CONFIGURATION OF THE TOP OF THE FLORIDAN AQUIFER, DUVAL COUNTY, FLORIDA,
Geological Survey, Jacksonville, FL. Water Resources Div.
G. W. Leve.
Water-Resources Investigations 77-114 (open-file report), 1978. 1 sheet, 1 ref.

Descriptors: *Subsurface mapping, *Hydrogeology, *Aquifers, *Structural geology, *Florida, Faults(Geologic), Stratigraphy, Limestones, Water wells, Duval County(Fla), Jacksonville(Fla), *Floridan aquifer.

Structural contours on the top of the Floridan aquifer in Duval County, Florida, show that the top of the aquifer ranges from less than 300 feet below sea level to more than 600 feet below sea level. Two inferred concealed faults occur in the aquifer; one trending northeast-southwest in the eastern part of the county. The maximum vertical displacement of the top of the aquifer of both faults is about 150 feet. A geologic section included on the map shows the geologic formations of Eocene age that comprise the Floridan aquifer. These are, in ascending order: the Lake City Limestone, the Avon Park Limestone, and the Ocala Limestone. (Woodard-USGS)
W78-08855

THE WINONA-TALLAHATTA AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, MS. Water Resources Division.
G. A. Spiers.
Water Resources Investigations 77-125 (open-file report), 1977. 2 sheets, 11 fig, 2 tab, 19 ref.

Descriptors: *Groundwater resources, *Mississippi, *Aquifer characteristics, *Water wells, *Water quality, Groundwater recharge, Water yield, Water users, Water levels, Maps, *Tallahatta Formation, Eocene aquifers, Claiborne Group.

This aquifer atlas describing the Winona-Tallahatta aquifer is the seventh in a series prepared in cooperation with the Mississippi Board of Water Commissioners. The atlas summarizes the large amount of unpublished data available in the files of the U.S. Geological Survey and it describes the extent, character, and present utilization of the aquifer and its potential for additional development. The Winona-Tallahatta aquifer, which contains freshwater having less than 1,000 mg/liter of dissolved solids in about 25 percent of the State occurs in northwestern and central Mississippi. The water-bearing zones extend into Tennessee and become part of the Memphis aquifer. In Arkansas and Louisiana the aquifer is in the Cane River Formation. The Tallahatta Formation which is the basal unit of the Claiborne Group includes, in ascending order, the Meridian Sand, Basic City Shale, and Neshoba Sand Members. The Winona-Tallahatta aquifer is the source of water for only a few large water users, but is the source of water for hundreds of small-yield domestic and stock wells less than 200 feet deep. Total water use in the State in 1977 from the Winona-Tallahatta is estimated to be about 3 mdg. (Woodard-USGS)
W78-08856

EFFECT OF PROCESS MODIFICATIONS ON THE REDUCTION OF WATER USE AND WASTE IN A CASE STUDY DAIRY PLANT,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 3E.
W78-08890

FINITE ELEMENT MODELING OF UNSATURATED FLOW,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08915

INFRARED SPECTRA OF PETROLEUM - DATA BASE INFORMATION AND APPLICATION TO REAL SPILLS,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-08943

THE FUTURE OF MINI-COMPUTERS AND MICROPROCESSORS IN INFRARED ANALYSIS,
The Perkin-Elmer Corp., Norwalk, CT.
For primary bibliographic entry see Field 5A.
W78-08946

EVALUATION OF EVAPORATION FROM LAKE ONTARIO DURING IFYGL BY A MODIFIED MASS TRANSFER EQUATION,
Atmospheric Environment Service, Downsview (Ontario). Hydrometeorology and Marine Applications Div.
For primary bibliographic entry see Field 2D.
W78-09039

WATER CONDITIONS IN CALIFORNIA, SUMMARY OF CENTRAL VALLEY WATER CONDITIONS, JUNE 1, 1978.
Sacramento Dept. of Water Resources, CA.
For primary bibliographic entry see Field 4A.
W78-09050

COASTAL BARRIER CHANGES, 1770-1867, BISCAYNE BAY AREA, FLORIDA,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
For primary bibliographic entry see Field 2L.
W78-09053

ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1976,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W78-09060

FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME II, MORGAN COUNTY - WASHINGTON COUNTY, COLORADO.
Army Engineer District, Omaha, NB.
For primary bibliographic entry see Field 4A.
W78-09074

FLOOD PLAIN INFORMATION: SACRAMENTO RIVER, REDDING, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-09075

FLOOD PLAIN INFORMATION: TRINITY RIVER, LEWISTON LAKE TO JUNCTION CITY, TRINITY COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 4A.
W78-09076

MAPPING WETLANDS ON BEAVER FLOWAGES WITH 35 MM PHOTOGRAPHY,
Southern Illinois Univ., Carbondale. Cooperative Wildlife Research Lab.
R. E. Kirby.
Canadian Field-Naturalist, Vol 90, No 4, p 423-431, October-December, 1976. 3 fig, 3 tab, 24 ref.

Descriptors: *Mapping, *Photography, *Remote sensing, *Wetlands, *Beavers, Maps, Vegetation, Methodology, Cover types, *Minnesota, National forests, Chippewa National Forest(Minn).

Beaver flowages and associated wetlands on the Chippewa National Forest, north-central Minnesota, were photographed from the ground and from the open side window of a small high-wing monoplane. The 35-mm High Speed Ektachrome transparencies obtained were used to map cover-type association visible on the aerial photographs. Nearly vertical photographs were rectified by projecting the slides onto a base map consisting of control points located by plane-table survey. Maps were prepared by tracing recognizable stands of vegetation in the rectified projection at the desired map scale. Twenty-six cover-type associations were identified and mapped on 10 study flowages in 1971. Comparative data from 10 flowages were collected serially throughout the entire openwater season. This cover-mapping technique was economical and substituted for detailed ground surveys. (Stihler-Mass)
W78-09087

COMPUTERIZED DESIGN AND ANALYSIS OF SPRINKLER IRRIGATION SYSTEMS,
Maine Univ. at Orono. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-09127

RIVER BASIN NETWORK MODELLING AND ITS APPLICATION TO THE TISZA RIVER BASIN,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09191

CHARACTERIZING LOW FLOWS USING THRESHOLD LEVELS,
Lehigh Univ., Bethlehem, PA. Fritz Engineering Lab.
For primary bibliographic entry see Field 2E.
W78-09202

AUTOMATIC ANALYSIS OF PUMPING TEST DATA-APPLICATION TO THE BOULTON AND HANTUSH HYPOTHESES (ANALYSE AUTOMATIQUE DES DONNEES DE POMPAGE D'ESSAI-APPLICATION AUX HYPOTHESES DE BOULTON ET D'HANTUSH),
Lille-1 Univ., Villeneuve d'Ascq (France).
For primary bibliographic entry see Field 2F.
W78-09205

MODEL FOR SIMULATING SOIL-WATER CONTENT CONSIDERING EVAPOTRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources and California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-09206

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION. APPENDIX A: SAN FRANCISCO BAY SAMPLING DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects lab.
For primary bibliographic entry see Field 5B.
W78-09225

SOME PROBLEMS IN ANALYSING AND FORECASTING WATER DEMAND,
For primary bibliographic entry see Field 6D.
W78-09246

EVALUATION OF THE COMPONENTS OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Boise ID.
For primary bibliographic entry see Field 2A.
W78-09258

A CONTINUOUS WATER BUDGET MODEL FOR WESTERN KANSAS,
Agricultural Research Service, Lafayette, IN.
For primary bibliographic entry see Field 2G.
W78-09263

8. ENGINEERING WORKS

8B. Hydraulics

WAVE FORCES ON MULTIPLE VERTICAL CYLINDERS,
Chicago Bridge and Iron Co., Plainfield, IL. Marine Research and Development.
S. K. Chakrabarti.
Journal of the Waterway, Port, Coastal and Ocean, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13727, p 147-161, May 1978. 15 fig, 7 ref.

Descriptors: *Waves(Water), *Hydrodynamics, *Piles(Foundations), Numerical analysis, Offshore platforms, Potential flow, Hydraulics, Equations, Mathematical studies, *Linear systems, Cylinders, Complex variables, Wave pressure.

Interaction of waves with a group of vertical cylinders was investigated. The inter-scattering of the waves from various cylinders was taken into consideration in the analysis. A direct solution was obtained through a matrix inversion. The forces on a

cylinder due to linear waves in the presence of other cylinders were evaluated. This method may be applied to design large multi-legged offshore platforms where drag effects are negligible. The theory has received some experimental verification. Numerical results also were presented for various platform configurations to show the effect of the presence of the neighborhood cylinders on the wave forces on a vertical cylinder. The results were compared with the single cylinder solution. (Lee-ISWS)
W78-08801

HYDRODYNAMIC DRAG FORCES ON GROUPS OF FLAT PLATES,
Manchester Univ. (England). Simon Engineering Labs.
D. J. Ball, and N. J. Cox.
Journal of Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13736, p 163-173, May 1978. 8 fig, 1 tab, 10 ref, 2 append.

Descriptors: *Drag, *Piers, *Hydraulic models, Flumes, Model studies, Harbors, Hydrodynamics, Navigation, Ships, Estuaries, Laboratory tests, *Plates(Structural members).

The hydrodynamic drag on a rectangular group of 50 flat plates, with steady incident flow normal to the front of the group was shown to be a function of five factors: (1) the acceleration of flow between the plates of a row; (2) the shielding of plates in line with the incident flow; (3) the diversion of flow around the front of the group; (4) the rejection of flow through the sides of the group; and (5) the formation within the group of an oscillating wake for the whole group. The drag force on each element of the group was measured for longitudinal and lateral spacings covering the range occurring in existing pier head pile groups that the flat plates simulated. (Sims-ISWS)
W78-08802

FINITE ELEMENT MODELLING OF NEARSHORE CURRENTS,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
P. L-F. Liu, and G. P. Lennon.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13719, p 175-189, May 1978. 9 fig, 3 tab, 12 ref, 2 append.
NSF ENG75-09421,NOAA 44-SO43-C, 44-SO51-C.

Descriptors: *Waves(Water), *Shores, *Rip currents, *Model studies, Mathematical models, Finite element analysis, Ocean waves, Coasts, Currents(Water), Beaches, Topography, Beds, Roughness(Hydraulic), Oceanography, Coastal engineering, Shore-line cover, Littoral current.

A finite element model was developed to compute the nearshore currents induced by breaking waves in the surf zone. The normal incident wave system was employed so as to study the effects of beach topography on the current circulation patterns. The beach topography considered here was of linear plane beach shape with minor undulations in the longshore direction. Ignoring the lateral turbulent diffusion, the finite element representation of the governing equations of mean currents was obtained by the method of weighted residuals. It was shown that, due to the flexible grid discretization, this model can be used to study problems containing more complex beach topography within a large area of interest. Two types of alongshore beach undulations were investigated: rhythmic topography and localized irregular topography. The locations of rip currents depend on the surf zone width and the on-offshore variation of beach profile. (Sims-ISWS)
W78-08803

VIRTUAL MASS OF COARSE GRANULAR MEDIA,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
A. A. Hannoura, and J. A. McCorquodale.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13734, p 191-200, May 1978. 6 fig, 2 tab, 28 ref, 2 append.

Descriptors: *Breakwaters, *Rocks, *Hydrodynamics, *Laboratory tests, Porous media, Unsteady flow, Mass, Darcys law, Reynolds number, Flow, Hydraulics, Theoretical analysis, Coastal engineering, Granular media, Inertia.

An experimental study to determine the effect of unsteady flow in the hydraulic conductivity of coarse granular porous media was outlined. The acceleration effect was expressed in terms of two variables, i.e., acceleration coefficient, which is function of the well-known inertia coefficient, and the instantaneous flow acceleration. The inertia coefficient was found by comparing the resistance of both steady and unsteady flows through the same porous matrix. The results were given in two forms to show the effect of the unsteady flow on the hydraulic resistance and to show the variation of the inertia coefficient with Reynolds number. The experimental results showed that virtual mass effect does exist in coarse granular porous media, which is the usual construction material for rubble-mound breakwaters. Also, it was found that the acceleration effect becomes more important for large grain porous media, e.g., of particule sizes equal or larger than 40 mm. (Sims-ISWS)
W78-08804

MASS TRANSPORT IN SHALLOW WATER WAVES,
British Columbia Univ., Vancouver Dept. of Civil Engineering.
M.de St.Q. Isaacson.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13774, p 215-225, May 1978. 4 fig, 18 ref, 2 append.

Descriptors: *Mass transfer, *Waves(Water), *Shallow water, *Model studies, Mathematical models, Theoretical analysis, Laboratory tests, Sediment transport, Shores, Coasts, Flow, Unsteady flow, Velocity, Boundary layers, Hydrodynamics, Coastal engineering.

The mass transport velocity near the seabed has been calculated previously to first and second approximations for both Stokes and cnoidal waves. A set of curves based on these predictions was presented in a convenient form and permitted a ready estimate of the bottom mass transport for any given conditions. Experiments conducted to test the predictions were described. These, as well as previous experiments, indicated reasonable agreement with the theoretical predictions. Although the onset of turbulence limits the range of validity of the curves, they may still be used but with less reliability. The condition for transition to a turbulent boundary layer adopted by some authors was found to be questionable. (Sims-ISWS)
W78-08805

WAVE SETUP AND DESIGN WATER LEVEL,
Technische Univ., Brunswick (West Germany). Leichtweiss Inst. for Water Research.
U. A. Hansen.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineering, Vol. 104, No. WW2, Proceedings Paper 13776, p 227-240, May 1978. 16 fig, 2 tab, 22 ref, 2 append.

Descriptors: *Shore protection, *Dikes, *Waves(Water), *Water levels, Shores, Coasts, Beaches, Ocean waves, On-site investigations, Tides, Seashores, Design, Coastal structures, Coastal engineering, Wave heights.

During the winter of 1975-76, measurements were made by the Leichtweiss-Institut of the Technical University of Braunschweig at the west coast of the island of Sylt in the North Sea. The purpose of the field investigations was to determine the wave-induced setup in the surf zone and on the beach, defined as the height difference between the mean water level (MWL) and the still water level (SWL) and the influence of typical offshore parameters on this phenomenon. A new scheme was defined to determine the MWL as the mean value of the water surface variations measured at incremental time intervals over a certain time span. The maximum setup on the beach can reach values up to 30% of the incident significant wave height. The field investigations have shown that the rise of the mean water level due to wave setup is significant and should be taken in account in determining the design water level for coastal structures. (Sims-ISWS)
W78-08806

SOME CHARACTERISTICS OF UNSTABLE FLOW PAST SLOTS,
State Hydraulic Works, Ankara (Turkey). Research Center.
S. Ethembabaoglu.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13738, p 649-666, May 1978. 16 fig, 18 ref, 1 append.

Descriptors: *Flow, *Fluid mechanics, *Hydrodynamics, Flumes, Laboratory tests, Dynamics, Cavitation, Turbulent flow, Turbulence, Gates, Hydraulic gates, Pressure, Vibrations, Hydraulics, Slots, Fluid dynamics.

Analysis of flow instability revealed that, as a result of fluid-dynamic feedback, flow fluctuations in the vicinity of slots (or cavities) may occur within narrow-band dominant frequencies and at large amplitudes. An experimental study was made to determine the possible flow patterns and the characteristics of the fluctuating pressures in the neighborhood of slots having five different slot-boundary configurations. The results confirmed the existence of well-defined, predominantly periodic pressure fluctuations. The relationships among the oscillation frequencies, flow velocities, the oscillation amplitudes, and the slot ratios were determined. The deviations from the analytical results at smaller slot ratios were considered to be due to the nature of the velocity profile of the approach flow and its development in the streamwise direction. (Sims-ISWS)
W78-08807

DISPERSION IN RIVERS AS RELATED TO STORAGE ZONES,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
G. V. Sabol, and C. F. Nordin, Jr.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13758, p 695-708, May 1978. 4 fig, 3 tab, 26 ref, 2 append.

Descriptors: *Dispersion, *Rivers, *Reservoirs, *Model studies, Mathematical models, Storage, Mixing, Suspended solids, Sediments, Flow, River flow, Sediment transport, Markov processes, Mathematics, Theoretical analysis, Sedimentation.

Longitudinal dispersion was considered as a simple stochastic process in which a particle travels random time periods at constant velocity, with travel periods separated by random time periods during which the particle is trapped in storage zones. The average number per unit time of entries into storage was considered to be a function of time. The resulting model was a nonhomogeneous

compound Poisson process defined by three parameters. Methods for estimating the parameters were given, and predicted concentration distributions were shown to agree reasonably well with observed field data. (Sims-ISWS)
W78-08808

SECONDARY FLOW IN NONCIRCULAR CONDUITS,
Research Council of Alberta, Edmonton. Transportation and Surface Water Engineering Div.
R. Gerard.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13764, p 755-773, May 1978. 5 fig, 25 ref, 2 append.

Descriptors: *Pipe flow, *Closed conduit flow, *Conduits, *Model studies, Mathematical models, Hydraulic conduits, Turbulence, Velocity, Flow, Reynolds number, Stress, Shear, Fluid mechanics, Hydraulics, Secondary flow.

A requirement for calculating an accurate velocity distribution in noncircular conduits is a knowledge of the secondary flow distribution in these conduits. The cause of these secondary flows was considered in this paper, and a simple momentum transfer model for Reynolds stresses was used to effect a solution for the secondary flow in a square duct. The calculated secondary flows were similar in magnitude and direction to measurements reported in the literature. (Sims-ISWS)
W78-08809

MODIFIED PROPORTIONAL V-NOTCH WEIRS,
Indian Inst. of Science, Bangalore (India). Dept. of Civil Engineering.
K. K. Murthy, and P. K. Gopalakrishna.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13781, p 775-791, May 1978. 9 fig, 5 tab, 12 ref, 2 append.

Descriptors: *Weirs, *Design, *Laboratory tests, Flumes, Discharge(Water), Measurement, Flow, Streamflow, Equations, Structures, Hydraulic structures, Theoretical analysis, Data processing, Water resources, Hydrometry, Hydrology, Hydraulics, V-notch weirs.

Seven different-shaped modified proportional V-notches were designed, and pertinent data for their use were given. It was shown that the indication accuracies of these weirs are more than that of the conventional V-notch. For five of the designed weirs, the indication accuracies were more than that of the conventional rectangular weir at lower heads of flow. All these proportional weirs, except the parabolic based weir, have added advantages over the V-notch in regard to fixing and finding the crest level. Experiments with five weirs (four symmetrical and one unsymmetrical) having rectangular bases and one (symmetrical) with a parabolic base showed very good agreement with the theory and gave consistent values for the coefficient of discharge, C sub d, varying between 0.588 and 0.605, within the ranges of the experiments. (Sims-ISWS)
W78-08810

REVIEW OF OSCILLATORY BOUNDARY LAYER FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
D. W. Knight.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY6, Proceedings Paper 13796, p 839-855, June 1978. 9 fig, 1 tab, 64 ref.

Descriptors: *Boundary layers, *Reviews, *Flow, Estuaries, Hydraulics, Hydrodynamics, Oceanography, Unsteady flow, Velocity, Waves(Water), *Boundary shear, Oscillations, Velocity distribution.

Recent theoretical and experimental knowledge concerning oscillatory boundary layers was reviewed in this paper, and an assessment was made of the present state of understanding of this particular form of unsteady flow. Although agreement was found between theory and experiment for the case of laminar oscillatory flow over a smooth flat bed, theoretical knowledge concerning other types of oscillatory flow in both laminar and turbulent conditions was shown to be inadequate. Some attention was given to the problem of defining the transition between a truly laminar condition and a fully developed turbulent one for unsteady flow over beds of different roughness and form. Attention also was focused on the increase in boundary shear stress that arises from frequency effects. (Lee-ISWS)
W78-08811

NAVIGATION LOCK, THE DALLES DAM, COLUMBIA RIVER, OREGON AND WASHINGTON; HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div., North Pacific, Bonneville, OR. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 318, Price codes: A06 in paper copy, A01 in microfiche. Technical Report 56-1, May 1965. 99 p, 64 fig, 3 tab.

Descriptors: *Locks, *Oregon, *Washington, *Model studies, *Hydraulic models, *Columbia River, Dams, Navigation, Flow, Flow control, Gates, Structures, Concrete structures, Hydraulic structures, Engineering structures, Loads(Forces), Hydraulics.

Tests were conducted on a 1:25-scale model of the 86-ft-wide by 675-ft-long navigation lock chamber, hydraulic system, and approaches of The Dalles Dam on the Columbia River. Model tests on elements of the original design lock showed that improvements were needed. Vortex action extended through the intake and filling culverts and created an explosive discharge within the lock chamber. With an initial head of 90.5 ft, the lock filling time was 12.0 min, emptying time was 5.8 min, and maximum forces on barge tows moored within the lock chamber were 15.7 tons. The maximum forces, which occurred about 1 min after the filling valves began to open, indicated that the initial phase of valve motion was too rapid. Strong eddy action and maximum velocities greater than 10 fps showed that improved distribution of lock outflow into the downstream approach was required. (Sims-ISWS)
W78-08818

DEVELOPING ZONE CHARACTERISTICS IN AERATED FLOWS,
Indian Inst. of Tech. Madras. Dept. of Civil Engineering.
B. S. Thandaveswara, and N. S. Lakshmana Rao.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY3, Proceedings Paper 13605, p 385-396, March 1978. 12 fig, 1 tab, 15 ref, 2 append.

Descriptors: *Flow, *Aeration, *Air entrainment, Turbulence, Diffusion, Dispersion, Froude number, Model studies, Laboratory tests, Hydraulic models, Flumes, Channel flow, Correlation analysis, Hydraulics, Air concentration.

A knowledge of air concentration distribution is essential in the study of flow characteristics in the developing zone. The local mean air concentration along the flow was correlated with Froude number. The developing zone was classified into a dispersion zone and a diffusion zone based on the variation of wall concentration. (Sims-ISWS)
W78-09030

WAVE PROPAGATION IN STEEP ROUGH MOUNTAIN STREAMS,
Forests Commission of Victoria, Melbourne (Australia).
For primary bibliographic entry see Field 2E.
W78-09032

DILUTION IN A VERTICAL ROUND BUOYANT JET,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
N. E. Kotsovinos.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 104, No. HY5, Technical Note, p 795-798 , May 1978. 9 ref, 1 fig, 1 append.

Descriptors: *Jets, *Flow, *Buoyancy, Analytical techniques, Analysis, Mathematical models, Laboratory tests, Dimensional analysis, Froude number, Equations, Cooling water, Waste dilution, Dispersion, Flow characteristics, *Plumes, Bouyant jets, Dilution, Densimetric Froude number.

A round, vertical, turbulent buoyant jet was defined as a source of fluxes per unit mass of mass, momentum, and buoyancy, issued through an orifice of diameter D into a nonflowing fluid of uniform density. Such flows occur often in hydraulic engineering (waste disposal in ocean, cooling water from power plants, stacks, etc), and the time average mean concentration along the axis of the buoyant jet often needed. A semi-empirical formula for the center line dilution in a vertical round buoyant jet in a nonmoving environment was derived. A comparison with existing experimental results indicated that the formula can be applied for a wide range of the initial densimetric Froude number, i.e., from very large Froude numbers (jets) to small Froude numbers (plumes). (Humphreys-ISWS)
W78-09033

AMERICAN DEVELOPMENTS IN HYDRAULIC MEASUREMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
J. F. Ripken.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY6, Proceedings Paper 13821, p 857-868, June 1978. 1 ref, 1 append.

Descriptors: *Measurement, *Instrumentation, *Discharge(Water), *Flow measurement, *History, Equipment, Flow meters, Flow, River flow, Stream gages, Tracers, Weirs, Electronic equipment, Orifices, Orifice flow, Flumes, Channel flow, Rivers, Hydrometry, Hydraulics, Hydrology, Measurement history.

A historical summary is presented of American contributions to hydraulic measurement of streamflow for the period 1776-1976. The development and interrelation of conduit flow measuring devices, together with open channel measuring devices, was included in this update of previous historical summaries. The narrative style and historical sequencing is a useful complement to the more specific 'Bibliography on Discharge Measurement Techniques.' (Sims-ISWS)
W78-09036

DETERMINATE HYDRAULIC GEOMETRY OF RIVER CHANNELS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
R. D. Hey.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY6, Proceedings Paper 13830, p 869-885, June 1978. 2 fig, 56 ref, 2 append.

Descriptors: *Channel morphology, *Sediment transport, *Alluvial channels, *Erosion, *Bank stability, Hydraulics, Flow resistance, Meanders, Continuity equation, Channel flow, *Hydraulic geometry, Process equations, Bank competence.

Natural channels have the ability to adjust their flow and bankfull hydraulic geometry in response to flow conditions. Nine governing equations are necessary to define the complete adjustment process and to relate channel response to discharge, sediment load, bed, and bank sediment, and the valley slope. A preliminary analysis allowed the nature of this process-response model to be identified, although insufficient information is known about all the processes for it to be used for design purposes. The necessary dependent and independent variables for the development of empirical design equations are identified by the model, and it also confirms the determinate nature of alluvial channels. (Singh-ISWS)
W78-09037

HYDRODYNAMIC PERFORMANCE OF PIPE UNDERDRAINS,
Technion-Israel Inst. of Tech. Haifa (Israel). Dept. of Hydrodynamics and Hydraulic Engineering.
J. Mevorach, and K. Zanker.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR1, Proceedings Paper 13636, p 127-142, March 1978. 15 fig, 4 ref, 2 append.

Descriptors: *Valves, *Hydraulic valves, *Drainage, Channels, Flow, Drains, Pipes, Sediments, Groundwater, Floods, Mathematical models, Laboratory tests, Hydrodynamics, Drainage engineering, Hydraulics, Flap valves, Flexible-flap drain valves, Underdrains.

Theoretical analysis and laboratory investigations of flexible-flap drain valve in high-velocity open channel flow were presented. Main hydrodynamic characteristics of the valve are: (1) Radial diffuser action, which prevents the valve from opening at low pressures; and (2) uplift forces, caused by high-velocity flow in the channel, helping the valve to open. The most severe condition for the valve operation is when there is little or no flow in the channel, but there is still high groundwater table around the channel. Flap-valves are found suitable for use in high-velocity flows, provided that the ratio of radii, R sub 2/R sub 1, between the circular flap and the valve opening is kept as low as compatible with engineering considerations. (Sims-ISWS)
W78-09046

HYDRAULICS ELEMENTS OF A PARTIALLY SILTED ROUND SECTION,
Soil Conservation Service, Baton Rouge, LA.
W. Talbot, and H. J. Braud.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 2, p 288-292, March-April 1978. 10 fig, 4 ref.

Descriptors: *Hydraulic conduits, *Sediments, *Flow, *Mathematical models, Model studies, Flow, Drainage, Pipe flow, Silts, Water levels, Roughness(Hydraulic), Hydraulics.

An analysis was made of a round conduit section with sediment in the section. Culverts often are partially filled with sediment. Area, wetted perimeter, hydraulic radius, section factor, and weighted Manning roughness factors were given for the full range of sediment depth-to-diameter ratios and possible flow depths. (Sims-ISWS)
W78-09047

COASTAL BARRIER CHANGES, 1770-1867, BISCAYNE BAY AREA, FLORIDA,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
For primary bibliographic entry see Field 2L.
W78-09053

CHANNEL ENTRANCE RESPONSE TO JETTY CONSTRUCTION,
Army Engineer District, Galveston, TX.
J. M. Kieslich, and C. Mason.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 740, Price codes: A02 in paper copy, A01 in microfiche. American Society of Civil Engineers, Proceedings of the Specialty Conference on 'Civil Engineering in the Oceans/III' held at the University of Delaware, Newark, Delaware, p 689-705, June 9-12, 1975. 10 fig, 11 ref.

Descriptors: *Jetties, *Channels, *Tides, *Tidal waters, *Inlets(Waterways), Thalweg, Bays, Sediment transport, Littoral drift, Waves(Water), *Channel entrance, *Tidal inlets, Inlet structures, Longshore.

This paper presented the results of an investigation where documentation indicated that there is a trend in response of the tidal inlets as a result of the construction of single jetties. The results of the study are expected to help in the design of inlets and inlet structures. Preliminary results of an inlet study were presented, including a summary of the history of several improved inlets and qualitative explanations for their observed behavior. (Bhoemik-ISWS)
W78-09058

SHOALING RATE PREDICTION USING A SEDIMENTATION TANK,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-09059

COMPUTERIZED DESIGN AND ANALYSIS OF SPRINKLER IRRIGATION SYSTEMS,
Maine Univ. at Orono. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-09127

EFFECT OF DRAIN DIAMETER, OPENINGS AND ENVELOPS ON WATER TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs, and Y. K. Tang.
Paper No. 77-2578 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, Chicago, Illinois, 21 p, 10 fig, 4 tab, 15 ref.

Descriptors: *Drainage, Drainage effects, *Drainage engineering, Drainage practices, Drainage systems, Soil water movement, *Water table.

Numerical solutions to the Richards equation for flow to parallel drains were used to determine the effects of drain tube diameter, openings and envelopes on water table drawdown. (Skogerboe-Colorado State)
W78-09132

LAKE ERIE AIRPORT STUDY,
Howard, Needles, Tammen and Bergendoff, Cleveland, OH. Cleveland Aviation Office.
For primary bibliographic entry see Field 6G.
W78-09186

RESTRAINTS ON WATER TRANSMISSION MAIN CONSTRUCTION,
Partner, Black and Veatch, Denver, CO.
D. R. Sayles.
Transportation Engineering Journal of ASCE, Proceedings of the American Society of Civil Engineers, Vol. 103, No. TE2, p 269-277, March 1977. 1 ref.

Descriptors: *Water distribution(Applied), *Regulation, *Pipelines, *Constraints, Construction, Planning, Design, Water resources, Water transport, Colorado, Economics, Physical restraints.

The restraints on water transmission main construction are physical, economical, and regulatory. These basic restraints may be characterized as inflexible, flexible within limits, or flexible without limits. This paper considers these various restraints and how engineers have coped with them in constructing water transmission mains, especially in the mountainous regions of Colorado. Regulatory restraints are the latest, and at times, the most difficult for the engineer. These restraints, unlike the physical and economical, do not adjust readily to changing conditions. The engineer must become actively and positively involved in the political scene to assure that regulatory restraints are beneficial to the community as a whole. Long-range planning and design for a water utility, as well as for other utilities, should consider all possible restraints for maximum good to the total living system. The expertise within ASCE and other professional organizations should be made available for passage of needed legislation. (Bell-Cornell)
W78-09187

PREDICTIONS OF HEAT AND MASS TRANSFER IN OPEN CHANNELS,
Karlsruhe Univ. (West Germany).
For primary bibliographic entry see Field 5B.
W78-09203

A MODEL TO INVESTIGATE THE INFLUENCE OF SUSPENDED SEDIMENT ON THE MASS TRANSPORT OF A POLLUTANT IN OPEN CHANNEL FLOW,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-09219

FLOOD CONTROL CONDUITS FOR DETROIT DAM, NORTH SANTIAM RIVER, OREGON; HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific Bonneville, OR. Div. of Hydraulic Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 315, Price codes: A04 in paper copy, A01 in microfiche. Report No. 45-1, June 1955. 59 p, 42 fig, 10 tab.

Descriptors: *Dams, *Oregon, *Hydraulic conduits, *Flood control, *Model studies, Hydraulic models, Open channels, Flow, Structures, Hydraulic structures, Laboratory tests, Measurement, Pressure, Piezometers, Photography, Hydraulics, *Detroit Dam(Ore), *North Santiam River(Ore).

The model investigation of the flood control conduits for Detroit Dam on the North Santiam River, Oregon, was undertaken to study the hydraulic performance of the conduits under the operating criteria established by the Portland District and to recommend improvements in the basic design. The model was constructed of plastic to a scale of 1:20. Tests of the original design for the conduit (Plan A), which was 5.67 ft wide and varied in height from 14 ft near the valves to 24 ft at the outlet, revealed that an increase in height throughout the entire length of the conduit was required to obtain the desired hydraulic performance of open channel flow in the conduits for all conditions of operation. The requirements of open channel flow with the air vents closed for al valve openings and all reservoir levels to maximum pool Elev 1574, feet mean sea level, was not attained. With air vents closed, flow from a fully opened valve filled the conduit when the forebay pool was at or above Elev 1465. Model investigations showed that a 7-

ft-wide conduit having a height of 16 ft near the valve and 36 ft at the outlet (Plan B-2) met the established criteria in all respects. (Sims-ISWS)
W78-09223

8C. Hydraulic Machinery

HYDRODYNAMIC PERFORMANCE OF PIPE UNDERDRAINS,
Technion-Israel Inst. of Tech. Haifa (Israel). Dept. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W78-09046

8D. Soil Mechanics

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 4 - QUATERNARY GEOLOGY AND AGE DATING,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09025

DEVELOPMENT OF METHODS FOR CALCULATION OF THE THERMAL REGIME OF ROCK-FILL DAMS IN REGIONS OF SEVERE CLIMATE,
Vsesoyuznyi Nauchno-Issledovatelskii. Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 8G.
W78-09218

8E. Rock Mechanics and Geology

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME I,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
L. R. Frei, J. D. Gilbert, and D. Ostenna.
August 1977, 44 p.

Descriptors: *Seismic evaluation, Geology, Age dating, Mineralization, Structural geology, Maidu East Shear Zone, Site investigations, Damsites, *Faults(Geologic), *Earthquake engineering, *Auburn Dam(Calif), Central Valley Project(Calif), California.

This volume, 1 and 3 comprising the report, contains the narrative of the report and 24 geologic drawings referenced in the text. Additional drawings and appendices are included in Volumes 2 and 3. The investigations were conducted in the immediate area of the damsite by the USBR Auburn project Geology staff with input from independent consultants. They are concerned principally with the structural and stratigraphic relationships of features in the site area and influence determination of the potential for surface faulting in the dam foundation. It was concluded that a Mesozoic, regional fault system is present both upstream and downstream of the damsite. A shear zone located within 1/2-mi. from the site is inactive by USBR criteria. A fault zone known as F-1, believed to be part of a local fault system, has moved last, relative to other major structures, in the damsite and the possibility of movement along structures termed T-zones is not credible. (See W78-09019 and W78-09020) (Bur Reclam)
W78-09018

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME 2,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
L. R. Frei, J. D. Gilbert, D. Ostenna, and R. Throner.
June 1977, 52 p.

Descriptors: Geology, Age dating, Mineralization, Faulting, *Fault criteria, Arch dams, *Preconstruction investigation, *Earthquake evaluation, *Faults(Geologic), *Earthquake engineering, *Auburn Dam(Calif), Central Valley Project(Calif), California.

This volume contains four appendices to the narrative included in Volume 1 of the report, and 17 geologic drawings referred to in the text. Appendix 1 - Auburn Dam Foundation Investigation, Design and Construction by L. R. Frei, summarizes the preconstruction geologic investigation and design considerations at the damsite. Appendix 2 - Bureau of Reclamation, Fault Classification and Investigation Criteria for Auburn Damsite Evaluation presents the criteria by which fault activity assessments will be determined for the seismic evaluation at Auburn Damsite. Appendix 3 - Auburn Damsite - Certain Mineralogical and Structural Features, by R. Merriam, a private consultant for the Bureau of Reclamation, describes gouge and mineralization studies along the F-1 fault zone in the left abutment of the dam. Appendix 4 - is entitled 'Mineralization and Structural History of the F-1 Fault Zone - Auburn Damsite by P. Behrman and C. Meyer. This study is an investigation of the geology and structural history of the damsite to determine or bracket the age of faulting. (See also W78-09018) (Bur Reclam)
W78-09019

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME 3,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
L. R. Frei, J. D. Gilbert, R. Throner, and D. Ostenna.
June 1977, 84 p.

Descriptors: Soils, Mehrten formation, *Seismic investigation, Paleosols, *Age dating, Sierran Foothills, Foothills Fault System, Soil tounges, Maidu East Shear Zone, *Earthquake evaluation, Earthquake engineering, Damsites, *Faults(Geologic), *Auburn Dam(Calif), Central Valley Project(Calif), California.

This volume contains two appendices to the narrative included in Volume 1 of the report, and 14 geologic drawings and logs. Both appendices are reports by Roy J. Shlemon, a private consultant hired by the Bureau of Reclamation, to perform geomorphic investigations to augment those of Woodward-Clyde Consultants. Appendix 5 - Soil-Geomorphic Investigations - Auburn Dam, California - Preliminary Phase, is a report of field reconnaissance to determine the possible presence and time of last movement of faults located at or near the proposed damsite. Estimated ages of paleosols, the characteristics and distribution of clay-filled fractures in the Mehrten formation, and colluviation of the Mehrten formation are presented, both generally and specifically as they related to shearing in the dam vicinity. Appendix 6 - Soil- Geomorphic Investigations, Maidu East Shear and F-O Fault Zones, Auburn Dam area, California, addresses the dating of two shear zones in the damsite area. Shelmon concludes that the Maidu East Shear Zone is inactive and the age of last movement on fault zone F-O is indeterminate. (See Also W78-09018) (Bur Reclam)
W78-09020

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA, VOLUME 1 - SUMMARY REPORT,
Woodward-Clyde Consultants, San Francisco, CA.
L. Cluff, D. Packer, and D. Moorhouse.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 95 p, 16 fig, 22 ref. USBR 6-07-/DS/72090.

Descriptors: *Seismic studies, Geology, Regional studies, Sierran Foothill(Geology), *Seismicity, California, *Earthquake engineering, *Engineering geology, Faults(Geologic), *Earthquake evaluation, *Auburn Dam(Calif), Central Valley Project(Calif).

Part I of a 8-volume report presents a summary and the conclusions of an independent earthquake evaluation study for the proposed Auburn Dam in California. Included are sections pertaining to the approach of earthquake evaluation studies, the methods of the study, the scope of the study, background information, a summary of conclusions, and summaries and conclusions of other supporting volumes. It was concluded that the MCE for Auburn Dam should be a 6 to 6 1/2 m earthquake; there is an indeterminate (active) fault approximately 1/2-mile from the damsite, and the most likely locations for surface faulting are along certain structures that exhibit 'bedrock characteristics.' (See also W78-09022 thru W78-09028) (Bur Reclam)
W78-09021

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 2 - SURFACE FAULTING POTENTIAL,
Woodward-Clyde Consultants, San Francisco, CA.
D. P. Schwartz, F. H. Swan, R. E. Harpster, T. H. Rogers, and D. E. Hitchcock.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 379 p, 55 fig, 3 tab, 43 ref, 3 append. USBR 6-07/DS/72090.

Descriptors: *Lineaments, *Surface faulting, *Site exploration, Structural geology, California, Seimic studies, *Faults(Geologic), *Earthquake evaluation, Earthquake engineering, Reservoir sites, Engineering geology, *Auburn Dam(Calif), Central Valley Project(Calif).

Volume 2 presents the results of the investigation for the potential for surface fault rupture at the site of the proposed Auburn Dam. The potential for surface faulting was evaluated by the 'active fault concept', it is considered active if it has experienced displacement within a specified interval of time. To identify the most probable locations of active faults, an analysis of lineaments was conducted from Oroville to near Sonora. At 11 exploration localities for the study, two faults were classified as active, five were classified as indeterminate inactive and one locality was not fault related. The pattern of late Cenozoic faulting, bedrock geology at the damsite, the assessment of fault activity in the dam foundation and the potential for surface fault rupture are also presented. (See also W78-09021) (Bur Reclam)
W78-09022

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 3 - REGIONAL GEOLOGY AND TECTONICS,
Woodward-Clyde Consultants, San Francisco, CA.
J. N. Alt, D. P. Schwartz, and D. R. McCrumb.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 212 p, 28 fig, 2 tab, 143 ref, 4 append. USBR 6-07/DS/72090.

Descriptors: *Seismic studies, *Regional study, *Late Cenozoic faulting, *Cenozoic stratigraphy, *Tectonics, *Earthquake evaluation, Earthquake engineering, California, *Faults(Geologic), *Auburn Dam(Caif), Central Valley Project(Calif).

Volume 3 presents the resuls of the regional evaluation of late Cenozoic faulting for the earthquake evaluation studies conducted for the Auburn Dam. The areas investigated are along the western Sierra Foothills west of Auburn from the North Fork of the Feather River to the Cosumnes

River, also an area near Chico, California to the northwest of Oroville, and two smaller study areas, one north and one southwest of the damsite. The investigation concludes that late Cenozic faulting in the area of investigation is more extensive than previously recognized, and that displacements are greatest in the northeastern portion of the study area. Pre-existing zones of structural weakness are preferential locations for late Cenozoic faulting. Most of this faulting is high angle, normal, down-to-the-east, some of which either have short recurrence intervals or are associated with large displacements. (See also W78-09021) (Bur Reclam)
W78-09023

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 5 - SEISMOLOGY,
Woodward-Clyde Consultants, San Francisco, CA.
B. Foxall, T. Turcotte, K. McNally, and E. VonDollen.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 51 p, 19 fig, 8 tab, 15 ref. USBR 6-07/DS/72090.

Descriptors: *Seismic studies, *Historical seismicity, *Microseismicity(Sierran Foothills), California, *Earthquake evaluation, *Seismology, *Earthquake engineering, *Auburn Dam(Calif), Central Valley Project(Calif).

The evaluation studies presented in this volume are the results of two tasks. The findings of the first task, a review of a few, specific, historical earthquakes to evaluate sources of maximum intensities, and the intensity of each in the vicinity of Auburn Dam, are described in a 'historical seismicity study'. A summary of earthquake data, intensity and isoseismal maps, methods of search and a summary of data for events are presented. The second study was an instrumentally recorded survey of the micro-earthquake activity in the Sierran Foothills region between Oroville and Auburn. Hypocentral locations and focal mechanism of the earthquakes were estimated. (See also W78-09021) (Bur Reclam)
W78-09024

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 4 - QUATERNARY GEOLOGY AND AGE DATING,
Woodward-Clyde Consultants, San Francisco, CA.
F. H. Swan, and K. Hanson.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 224 p, 15 fig, 4 tab, 71 ref, 6 append. USBR 6-07/DS/72090.

Descriptors: *Quarternary geology, *Age dating, Paleodsols, *Earthquake evaluation, *Seismic studies, Earthquake engineering, *Soils, *Stratigraphy, Erosion, Alluviation, California, *Auburn Dam(Calif), Central Valley Project(Calif).

Included are the ages and methods for determining the ages of deposits and soils, and a brief Quaternary geologic history of the area incorporated in the regional study, for the Auburn Dam. Regional geologic and soil stratigraphic evidence indicates that climatic fluctuations resulted in episodes or erosion, colluviation and alluviation which can be dated to establish relative, if not specific ages, for stratigraphic markers to date known faults as active or inactive. Dates of these markers are derived for their application to assessments for fault activity. (See also W78-09021) (Bur Reclam)
W78-09025

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 7 - MAXIMUM CREDIBLE EARTHQUAKES,
Woodward-Clyde Consultants, San Francisco, CA.
D. R. Packer, J. N. Alt, and A. Patwardhan.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 49 p, 8 fig, 3 tab, 69 ref. USBR 6-07/DS/72090.

Descriptors: *Maximum credible earthquake, *Seismicity, *Damsites, California, *Earthquake evaluation, *Earthquake engineering, *Faults(Geologic), *Seismic studies, *Auburn Dam(Calif), Central Valley Project(Calif).

Conclusions presented pertain to the maximum credible earthquake (MCE) for the Auburn Dam project. (1) The damsite is located in a crustal block which has had minor and localized late Cenozoic faulting. (2) Faults judged indeterminate (active) occur within 0.5 miles of the Auburn damsite. (3) Geologic studies have shown that episodic slips have occurred along faults during the last 100,000 years, the maximum observed cumulative net slip is 2.4 feet, and the maximum net slip per event is judged to be 0.8 feet. (4) The MCE based on this evidence is judged to be a magnitude 6 to 6 1/2 earthquake at a focal depth of 6 miles, located within 0.5 miles of the damsite. (See also W78-09021) (Bur Reclam)
W78-09027

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 8 - EARTHQUAKE GROUND MOTIONS,
Woodward-Clyde Consultants, San Francisco, CA.
I. M. Idriss, M. S. Power, K. Sadigh, and R. Kulkarni.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 123 p, 13 fig, 3 tab, 53 ref, 3 append. USBR 6-07/DS/72090.

Descriptors: *Earthquake ground motions, Response spectra(Earthquakes), Oroville earthquake, *Maximum credible earthquakes, *Earthquake evaluation, Earthquake engineering, Seismic studies, *Auburn Dam(Calif), Central Valley Project(Calif), California.

The purpose of the studies described is to characterize for design purposes, the ground motions at the Auburn Dam site during maximum credible earthquakes (MCE). The MCE's addressed in the study include one nearby and two distant events. The development and assessment of response spectra, acceleration time histories and results of these motions are discussed for incorporation into design criteria for the proposed dam. (See also W78-09021) (Bur Reclam)
W78-09028

8F. Concrete

QUALITY CONTROL OF THERMOPLASTIC WATERSHOP JOINTS,
VTN Cnsolidated Inc., Irvine, CA.
For primary bibliographic entry see Field 8G.
W78-09185

A PROPOSED TECHNIQUE FOR TESTING AND EVALUATION OF HARDENED IRRIGATION DITCH CONCRETE,
Darco Engineering International, El Centro, CA.
For primary bibliographic entry see Field 8G.
W78-09265

8G. Materials

MARINE INPUTS OF POLYCHLORINATED BIPHENYLS AND COPPER FROM VESSEL ANTIFOULING PAINTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-08889

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME I,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
For primary bibliographic entry see Field 8E.
W78-09018

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME 2,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
For primary bibliographic entry see Field 8E.
W78-09019

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME 3,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
For primary bibliographic entry see Field 8E.
W78-09020

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA, VOLUME 1 - SUMMARY REPORT,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09021

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 2 - SURFACE FAULTING POTENTIAL,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09022

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 3 - REGIONAL GEOLOGY AND TECTONICS,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09023

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 5 - SEISMOLOGY,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09024

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 7 - MAXIMUM CREDIBLE EARTHQUAKES,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09027

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 8 - EARTHQUAKE GROUND MOTIONS,
Woodward-Clyde Consultants, San Francisco, CA.

For primary bibliographic entry see Field 8E.
W78-09028

QUALITY CONTROL OF THERMOPLASTIC WATERSHOP JOINTS,
VTN Cnsolidated Inc., Irvine, CA.
E. R. Fisk.
Journal of the Construction Division, Vol. 103, No. CO1, Proceedings of the American Society of Civil Engineers, p 39-55, March 1977. 25 fig.

Descriptors: *Water stops, *Specifications, *Inspection, *Field tests, *Plastics, *Quality control, *Construction proecdure, Reservoirs, Hydrostatic pressure, Hydraulic structures, Joints(Connect9ions), Concrete.

A method of selecting, specifying, and inspecting polyvinyl chloride waterstop joints in concrete hydraulic structures to assure quality control under a zero-defects welded-joint concept is presented. Emphasis is placed upon basing selection of waterstop section on construction as well as design criteria. A set of quality control criteria is specified, and a special 'pen-knife test' is described. Sample specification data are included as a means of providing the inspection on construction as well as design criteria. A set of quality control criteria is specified, and a special 'pen knife test' is described. Sample specification data are included as a means of providing the inspection with the proper tools for quality assurance. (Bell-Cornell).
W78-09185

DEVELOPMENT OF METHODS FOR CALCULATION OF THE THERMAL REGIME OF ROCK-FILL DAMS IN REGIONS OF SEVERE CLIMATE,
Vsesoyuznyi Nauchno-Issledovatelskii. Gidrotekhniki i Melioratsii, Moscow (USSR).
N. A. Mukhetdinov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 539, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 616, May 1977. 12 p, 4 ref. Translated from the abstract of a disseration, Lĕningrad, p 2-28, 1973.

Descriptors: *Rockfill dams, *Temperature, *Model studies, Mathematical models, Heat transfer, Moisture content, Dams, Earth dams, Rock fill, Air, Permafrost, Structures, Hydraulic structures, Civil engineering, Cold regions, Cold weather construction, *USSR, Thermal regime.

This work presented the theoretical and experimental investigations which revealed the processes of formation of the thermal regime of individual structural elements of a rockfill dam (downstream prism, foundations, and inclined impervious core). Only the abstract of a dissertation was contained in this translation. (Sims-ISWS)
W78-09218

A PROPOSED TECHNIQUE FOR TESTING AND EVALUATION OF HARDENED IRRIGATION DITCH CONCRETE,
Darco Engineering International, El Centro, CA.
J. D. Hess.
Paper No. 77-2015 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 10 p, 4 fig, 1 tab.

Descriptors: *Irrigation canals, Irrigation systems, *Concretes, Sampling, Canals, Canal linings, Testing procedures.

A new testing technique is presented for the strength evaluation of hardened irrigation ditch concrete. The test procedure eliminates the need for evaluating in-service strength characteristics based solely upon conventional 6 inch by 12 inch cylinder tests or tests on small cores or prisms. No L/D corrections are required. (Skogerboe-Colorado State)
W78-09265

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

EDUCATION IN HYDROLOGY AND WATER RESOURCES IN THE UNITED STATES--1965-1974--AN OVERVIEW WITH RECOMMENDATIONS.
National Committee for the Internationa Hydrological Decade, Washington, DC. Work Group on Education and Training.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 915, Price codes: A05 in paper copy, A01 in microfiche. Fina Report, 1976. 83 p, 21 ref, 2 append. NSF C-310.

Descriptors: *Education, *Hydrology, *United States, *International Hydrological Decade, Training, Colleges, Universities, Schools(Education), Water resources, Scientific personnel, Technology, Environmental engineering, Sanitary engineering, Engineering, Civil engineering.

The report discussed conditions of education in hydrology and water resources in the United States for the period 1965-1974 and suggested future directions for education in these fields at university, pre-university, and continuing education levels. It also suggested some specific activities to assist education abroad and recommended periodic educational and manpower assessments. The report also recommended an overview committee concerned with education in water-related fields, additional financial assistance for such education, a hydrology-centered office in the National Science Foundation and an independent water institute to act as a clearinghouse for hydrological and water resources education and information. (Sims-ISWS)
W78-09055

9D. Grants, Contracts, and Research Act Allotments

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, DC.
For primary bibliographic entry see Field 2G.
W78-09213

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

ICE ON RIVERS AND LAKES--A BIBLIOGRAPHIC ESSAY,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2C.
W78-08837

CONTINENTAL SHELF DEVELOPMENT: A BIBLIOGRAPHIC BACKGROUND FOR ALASKA. VOLUMES 1 AND 2.
Alaska Dept. of Education, Juneau. Div. of State Libraries and Museums.
For primary bibliographic entry see Field 2L.
W78-08896

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME IV: MASTER BIBLIOGRAPHY.
Winzler and Kelly. Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08933

TRANSFER OF SYSTEMS TECHNOLOGY TO URBAN WATER MANAGEMENT,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W78-08952

COASTAL MARSH PRODUCTIVITY: A BIBLIOGRAPHY.
Gulf South Research Inst. Baton Rouge, LA.
For primary bibliographic entry see Field 05C.
W78-09108

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES.
American Society of Civil Engineer, New York. Hydraulics Div.
For primary bibliographic entry see Field 04A.
W78-09138

AGRONOMY ABSTRACTS, 1977 ANNUAL MEETINGS.
American Society of Agronomy, Madison, WI.
For primary bibliographic entry see Field 03F.
W78-09150

GROUND WATER POLLUTION. PART 2. POLLUTION FROM IRRIGATION AND FERTILIZATION,
National Technical Information Service, Springfield, VA.
For primary bibliographic entry see Field 05B.
W78-09151

10F. Preparation Of Reviews

TRANSFER OF SYSTEMS TECHNOLOGY TO URBAN WATER MANAGEMENT,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 06A.
W78-08952

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 20
OCTOBER 15, 1978

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

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VOLUME 11, NUMBER 20
OCTOBER 15, 1978

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...e Secretary of the U.S. Department of the Interior has de-...rmined that the publication of the periodical is necessary in the ...nsaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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09 MANPOWER, GRANTS, AND FACILITIES
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

PREDICTING BASE FLOW USING HYDROGEOLOGIC PARAMETERS,
Agricultural Research Service, Chickasha, OK. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 4D.
W78-09334

SENSITIVITY OF OPTIMIZED PARAMETERS IN WATERSHED MODELS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. G. Mein, and B. M. Brown.
Water Resources Research, Vol. 14, No. 2, p 299-303, April 1978. 1 fig, 2 tab, 12 ref.

Descriptors: *Model studies, *Watersheds(Basins), *Simulation analysis, *Methodology, *Hydrologic data, Analytical techniques, Statistics, Optimization, Forecasting, Geomorphology, *Boughton model, Ungaged watersheds, Parameters.

Models which attempt to simulate specifically each of the important hydrologic components of the watershed response appear to have more potential than black box models for predicting the effect of land use change, for application to ungaged watersheds, and for general studies of the effects of each process on watershed runoff. It has been common practice to evaluate some or all parameters of watershed models by fitting procedures. A methodology was presented by which the variance of each fitted parameter of a watershed model can be determined. This information can be used to determine the degree to which the model parameters can be related to physical characteristics. The method was illustrated by applying the Boughton model to several watersheds and by examining the coefficient of variation of each optimized parameter. (Singh-ISWS)
W78-09345

THE IMPACT OF SEASONAL FLOW CHARACTERISTICS AND DEMAND PATTERNS ON REQUIRED RESERVOIR STORAGE,
Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-09350

A MOISTURE-ACCOUNTING WATERSHED MODEL FOR SINGLE-STORM EVENTS BASED ON TIME-AREA CONCEPT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
R. Krzysztofowicz, and M. H. Diskin.
Journal of Hydrology, Vol. 37, No. 3/4, p 261-294, May 1978. 12 fig, 7 tab, 15 ref, 1 append.

Descriptors: *Model studies, *Storm runoff, *Watersheds(Basins), *Runoff forecasting, Rainfall-runoff relationships, Mathematical models, Discharge(Water), Base flow, Hydrology, Rivers, Moisture content, Analytical techniques, Rainfall, Hydrologic cycle, Hydrograph analysis, Hydrographs, Floods, Flood discharge, Soil moisture, Surface runoff, Foreign countries, *Poland, *Raba River(Poland).

A watershed model for simulating a total runoff hydrograph due to a single storm was formulated. Two concepts form the basis of the model: (1) The rainfall variability over the area is accounted for by a multiple input resulting from the subdivision of the watershed into zones. (2) The division of the total rainfall input into various components is accomplished through a moisture-accounting procedure of the upper soil layer. The model was applied to the Raba River in southern Poland. An interactive process of identification of the model parameters was described, and the results of the calibration were presented. Both the results and sensitivity analysis indicated the robustness and usefulness of the model developed. The model as described appears to be very sensitive to initial moisture conditions in the upper soil layer of the various zones into which the watershed is divided. It appears that further research is needed for developing soil moisture indices based either on antecedent rainfall in each zone separately or on a combination of antecedent rainfall and rate of base flow for the few days preceding the day of the storm occurrence. (Humphreys-ISWS)
W78-09351

HYDROLOGIC RESPONSE MODEL OF THE NORTH AMERICAN GREAT LAKES,
National Oceanic and Atmospheric Administration, Ann Arbor. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W78-09352

AGRICULTURE RUNOFF MANAGEMENT (ARM) MODEL--VERSION II. REFINEMENT AND TESTING,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5B.
W78-09444

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-09477

PLAYER'S GUIDE. THE RIVER BASIN MODEL.
Washington Environmental Research Center, DC. Environmental Studies Div.
For primary bibliographic entry see Field 6A.
W78-09522

CALIBRATION OF A MATHEMATICAL MODEL OF THE ANTELOPE VALLEY GROUND-WATER BASIN, CALIFORNIA,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-09741

2B. Precipitation

OPERATIONAL HYDROMETEOROLOGICAL DATA COLLECTION SYSTEM FOR THE COLUMBIA RIVER,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09326

HYDROLOGICAL ASPECTS OF THE DROUGHT EVENT IN NIGERIA-1972/1973,
Lagos Univ. (Nigeria). Dept. of Civil Engineering.
J. O. Sonuga.
Hydrological Sciences Bulletin, Vol. 22, No. 4, p 487-502, December 1977. 8 fig, 5 tab, 16 ref.

Descriptors: *Droughts, *Rainfall, *Variability, *Africa, Precipitation(Atmospheric), Moisture deficit, Water shortage, Data processing, Time series analysis, Correlation analysis, Distribution patterns, Persistence, Weather data, Meteorological data, Gaging stations, Runoff, Water levels, Lakes, Groundwater, Climatic data, Climatology, *Nigeria, *Lake Chad(Nigeria).

The drought event which reached severe levels in 1972 and 1973 caused a major disaster in the Sahalian and sub-Sahalian zones in Africa. This disaster has drawn attention to the need for data surveys and detailed studies for meaningful long-term measures to combat the effects of future droughts. The study reported in this paper was an attempt to assess the hydrological aspects of the drought event in Nigeria in 1972 and 1973. There exist relatively long and reliable records of rainfall within the drought zone, while records for runoff, water level and groundwater are few and far between. Data available were analyzed to determine evidence of trend and persistence (short and long-term). An examination of the rainfall records showed that extreme dry years at all the stations tended to recur at about the same time. The time interval between these extreme dry years was about 30 years. It also was observed from the spectral analysis of the records that most of the spectra for all the stations showed a generally high level of variance at low frequency. The limited information on runoff and groundwater precluded a detailed statistical analysis from being carried out on the annual series of runoff. However, the runoff data at some stations showed that the magnitude of runoff in the drought year 1972/1973 was about 22-72% of the average value for the length of record available (about eight years). Moreover, the long-term water-level record of Lake Chad revealed a similar trend for the occurrence of extreme dry years to that observed in the rainfall record. (Sims-ISWS)
W78-09333

ANNUAL AMPLITUDE OF PRECIPITATION IN THE USSR,
Ts. A. Shver.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 276-280, 1976. 1 fig, 5 tab, 4 ref. Translated from Transactions of the Main Geophysical Observatory (Trudy GGO), No. 349, p 175-182, 1976.

Descriptors: *Precipitation(Atmospheric), *Distribution patterns, *Foreign countries, Annual, Foreign research, Analytical techniques, Areal, Maps, Rainfall disposition, Meteorology, *USSR.

To compile a background map of the absolute annual amplitudes of precipitation, detailed (1:7,500,000) monthly maps reflecting the macro- and mesoclimatic precipitation distribution patterns were used. From the maps, the total amounts of precipitation were taken at the nodes of the coordinate grid every 1 deg of latitude and longitude. Then for each node, the difference (in mm) between the monthly precipitation maxima and minima was computed. The annual precipitation amplitude over most of the European USSR somewhat exceeds 40 mm and 50 mm in some places (upper reaches of the Dnieper River). It is less than 40 mm in the northern and southern parts of this region. By comparison with the European USSR, the annual amplitude in Siberia north of 60 deg N increases by an average of 10 mm, reaching 50 mm or more in some places. The highest value of annual amplitude of precipitation, of about 100-125 mm, is observed in Transbaykalia and in the Maritime Territory and also in some places in the Caucasus and in the mountains of Soviet Central Asia. The lowest annual amplitude of precipitation, about 15-20 mm, is recorded in Kazakhstan. (Humphreys-ISWS)
W78-09337

TRANSFERS ACROSS AN AIR-WATER INTERFACE AT HIGH WIND SPEEDS: THE EFFECT OF SPRAY,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-09341

RAINFALL DEPTH-DURATION-FREQUENCY STUDIES FOR SRI LANKA,
Halcrow (William) and Partners, London (England).
V. R. Baghirathan, and E. M. Shaw.
Journal of Hydrology, Vol. 37, No. 3/4, p 223-239, May 1978. 2 fig, 6 tab, 7 ref.

Descriptors: *Rainfall, *Hydrologic data, *Duration curves, *Frequency curves, Analytical techniques, Data collections, Frequency, Foreign research, Foreign countries, Statistical methods, Mathematical models, Regional analysis, *Sri Lanka.

Rainfall depth-duration-frequency studies for Sri Lanka were carried out with data available from 19 stations spread over the country. The data are in the form of historic records of annual maximum rainfall depths with 3-, 6-, 12- and 24-h durations. The extreme-value type-1 distribution fitted with maximum likelihood estimates was utilized to derive the required relationships. The analyses for the individual stations were treated as a prelude to a regional study covering the whole country. The regions were defined, taking rainfall and topographical characteristics into consideration; and the regional data sets were formed using the station-year concept. Satisfactory results were obtained for both phases of the study. However, owing to the relatively short length of the individual station records, the regional results were recommended for use in engineering design. (Humphreys-ISWS)
W78-09349

ATMOSPHERIC SCAVENGING OF HYDROCHLORIC ACID,
Illinois Inst. of Tech. Research Inst. Chicago.
For primary bibliographic entry see Field 5A.
W78-09362

CLIMATOLOGICAL DATA FROM THE BERTHOUD PASS AREA OF COLORADO,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 7C.
W78-09526

A SYSTEM THAT MEASURES BLOWING SNOW,
Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.
For primary bibliographic entry see Field 2C.
W78-09527

ARID AND SEMI-ARID LANDS: PROBLEMS AND PROSPECTS,
Cairo Univ. Giza (Egypt).
For primary bibliographic entry see Field 6G.
W78-09655

CONTRIBUTION OF DEW IN THE HYDROLOGIC BALANCE OF A SEMI-ARID GRASSLAND,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Riverina Lab.
M. L. Sharma.
Agricultural Meteorology, Vol. 17, p 321-331, 1976. 1 fig, 4 tab, 25 ref.

Descriptors: *Dew, *Hydrologic balance, *Grasslands, *Evapotranspiration, Soil water, Seasonal, Variability, Lysimeters, Precipitation(Atmospheric), Radiation, Semiarid climates, Arid lands, Australia.

Dew has long been indentified, though not generally measured, as an additional and controversial source of water supply in arid and semiarid regions. The hydrologic balance of a semiarid grassland near Deniliquin, New South Wales, was measured with a precise weighing lysimeter (1.22 x 1.53 x 1.53 m) from January through December 1974. The area was surrounded by large areas of similar grassland. Daily precipitation and open pan evaporation (Class A pan) were recorded within 400 m of the instrument, and data analyzed for quantity and duration of dew and actual evapotranspiration (ET). Dew was negligible during summer (January and February, as well as December), but amounted to 1.2% of class A evaporation, 2.5% of precipitation, or 3.9% of acutal ET for the remainder of the year. Ninety percent of the dew fell between the winter months of May and September (maximum in May-June), coinciding with the active growing period of grasslands. In June, dew amounted to 6.1% of pan evaporation, 29.8% of precipitation, or 15.6% of ET. Average monthly maximum dew duration of 17.5 hours also occurred in June. During winter, dewfall of up to 0.56mm/day was recorded. The number of dewfall days was 37 in winter, 22 in autumn, and 21 in spring. The role of dew in reducing evaporative loss of soil water is emphasized. A detailed energy budget was established in May, demonstrating that approximately 80% of net radiation was used for ET. Of this, dew used over 22%, which would have been used largely in ET of soil water. Tables show monthly dew on the grassland, and dew expressed as a percentage of ET, pan evaporation, precipitation, long term average pan evaporation, and average precipitation; monthly duration of dew; daily dew for selective months; and energy budget for May. A figure shows the daily heat budget for May. (Popkin-Arizona)
W78-09712

THE EFFECT OF CLIMATE ON IRRIGATED COTTON YIELDS UNDER SEMI-ARID CONDITIONS: TEMPERATURE-YIELD RELATIONSHIPS,
Isreal Meteorological Service, Bet-Dagan. Div. of Agricultural Meteorology.
For primary bibliographic entry see Field 3F.
W78-09717

2C. Snow, Ice, and Frost

ON THERMAL STRATIFICATION IN RESERVOIRS DURING THE WINTER SEASON,
National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
For primary bibliographic entry see Field 2H.
W78-09347

CONSTRUCTION OF FROZEN FILL DAMS IN ARCTIC COASTAL REGIONS,
For primary bibliographic entry see Field 8D.
W78-09363

PERFORMANCE, DESIGN AND OPERATION OF NORTHERN EXTENDED AERATION PLANTS,
Department of the Environment, Edmonton (Alberta). Northern Technology Center.
For primary bibliographic entry see Field 5D.
W78-09386

A SYSTEM THAT MEASURES BLOWING SNOW,
Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.
R. A. Schmidt.
Department of Agriculture, Forest Service, Research Paper RM-194, 80 p, October, 1977. 34 fig, 4 illus, 2 append.

Descriptors: *Snow, *Particle size, *Instrumentation, *Highway icing, Snow transport, *Blowing snow, Drifting snow, Operation and maintenance, Visibility, Highways.

A snow particle counter based on a prototype design that originated at the University of Washington, was developed and tested for research in the fundamentals of snow transport by wind. Further work created an electronic system that monitors visual range in blowing snow. The system has been applied to interstate highway traffic control. All design and test data are included in this report, together with shop drawings for fabrication of the sensor, and an operating and service manual for the visual range monitor. (Witt-IPC)
W78-09527

SYMPOSIUM ON APPLIED GLACIOLOGY.
International Glaciological Society, Cambridge (England).
Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol 19, No 81, 1977. 668 p. Glen, J.W., Adie, R.J., Johnson, D.M., and Homer, D.R., editors. Published by the International Glaciological Society, Cambridge (England).

Descriptors: *Conferences, *Glaciology, *Ice, *Snow, *Avalanches, Reviews, Snowpacks, Lake ice, Sea ice, Physical properties, Ice loads, Snowpacks, Engineering, Movement, Temperature, Model studies, Hydrology, Loads(Forces), Piers, Snow cover, Glaciers, Runoff, Melt water, Glaciohydrology, Mechanical properties, Structures, Permafrost, On-site investigations, Isotope studies, Snow forces, Snow avalanches, Ice accretion, Isotope glaciology, Ice sheets, Glacier calving.

The symposium objectives were to provide a review of the present (1976) state of the art in various branches of applied glaciology and to report on recent and topical work. The invited and contributed papers covered the subject areas of snow engineering, ice engineering, avalanches, ice accretion, lake and sea ice, snow hydrology, glaciers, and ground ice. (See W76-05372 and W78-09604 thru A78-09650) (Humphreys-ISWS)
W78-09603

ENGINEERING PROPERTIES OF SNOW,
Cold Regions Research and Engineering Lab., Hanover, NH.
M. Mellor.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol 19, No 81, p 15-66, 1977. 41 fig, 2 tab, 88 ref.

Descriptors: *Snow properties, *Review, Physical properties, Mechanical properties, Thermal properties, Electrical properties, Optical properties, Density, Compressibility, Albedo, Stress, Specific heat, Diffusivity, Particle size, Temperature, Wavelengths, Heat transfer, Conductivity, Reflectance, Blowing snow, Fall velocity, Dielectric properties.

The general properties of snow were described with a view to engineering applications of data. Following an introduction and a short note on the origins of snow, data were given for fall velocities of snow particles, and for mass flux and particle concentrations in falling snow and blowing snow. Notes on the structural properties of deposited snow covered grain size, grain bonds, bulk density, overburden pressure, and permeability. A section on impurities dealt with stable and radioactive isotopes, chemical impurities, insoluble particles, living organisms, acidity, and gases. Mechanical properties were treated only selectively. The selective treatment dealt with stress waves and strain waves, compressibility, effects of volumetric strain on deviatoric strain, and specific energy for comminution. The section on thermal properties covered heat capacity, latent heat, conductivity, diffusivity, heat transfer by vapor diffusion, heat transfer and vapor transport with forced con-

vection, and thermal strain. The section on electrical properties opened with a brief discussion on dielectric properties of ice and proceeded to a summary of the dielectric loss, and d.c. conductivity. There also were notes on the thermoelectric effect on electrical charges in falling and blowing snow. The section on optical properties dealt with transmission and attenuation of visible radiation, with spectral reflectance, and with long-wave emissivity. The review concluded with some comments on engineering problems that involve snow and the requirements for research and development. (See also W78-09603) (Humphreys-ISWS)
W78-09604

SNOW FORCES,
Eidgenossisches Inst. fuer Schnee- und Lawinenforschung, Davos (Switzerland).
B. Salm.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 67-100, 1977. 19 fig, 43 ref.

Descriptors: *Snow, *Loads(Forces), *Theoretical analysis, *Model studies, Slopes, Snow cover, Movement, Creep, Stress, Mechanical properties, Compressive strength, Mathematical models, Analytical techniques, Foreign research, *Switzerland, Snow gliding, Newtonian behavior.

Snow forces are understood as forces originating from a very slow motion of the seasonal snow cover and acting on boundaries confining it. Snow forces depend on the total water-equivalent (a statistical magnitude with a certain probability of occurrence) and on mechanical characteristics of snow. The approximation of considering of snow as a Newtonian liquid fits the requirements for applications best. In this approximation, the only mechanical characteristics to be taken into account, besides density, are shear viscosity and Poisson's ratio--which depend strongly on the snow structure. Generalizations were shown in which the snow cover is subdivided into layers having constant (Newtonian) properties. Non-Newtonian behavior also was mentioned. (See also W78-09603) (Humphreys-ISWS)
W78-09605

DIRECT SIMPLE SHEAR TESTS ON SNOW AND THEIR RELATION TO SLAB AVALANCHE FORMATION,
Norwegian Geotechnical Inst., Oslo.
D. M. McClung.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 101-109, 1977. 6 fig, 1 tab, 14 ref.

Descriptors: *Snow, *Laboratory tests, *Shear stress, Testing procedures, Analysis, Movement, Avalanches, Foreign research, Deformation, Methodology, Density, *Norway, Slab avalanche.

Many slab avalanches can be attributed to shear failure in a weak, thin basal layer at the slab base. A reasonable starting point for evaluation of the conditions prior to fracture is, therefore, an investigation of shear failure in thin samples of snow. This paper gave the experimental procedure and data on measurements of shear stress versus displacement for thin samples of snow under plane strain and approximately simple shear conditions. The data were given under varying conditions of strain-rate, normal stress, density, and snow type. The results showed that the samples exhibited strain-softening provided they were sheared faster than they gained strength by settlement under the chosen conditons. If snow fails at the base of a slab in the way in which it fails in the laboratory, then a mechanism is provided whereby tensile stresses would be produced in the slab and whereby the corresponding maximum principal stresses would be rotated toward a direction parallel to the slope, thereby promoting avalanche release. (See also W78-09603) (Humphreys-ISWS)
W78-09606

A FRACTURE CRITERION FOR SNOW,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
R. L. Brown.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 111-121, 1977. 5 fig, 2 tab, 6 ref. DA-ARO-D-31-124-71-GS9, NSF GA-3943.

Descriptors: *Snow, *Failure(Mechanics), *Theoretical analysis, *Model studies, Stress, Deformation, Mathematical models, Forecasting, Tensile stress, Compressive stress, Shear stress, Analytical techniques, Laboratory tests, Analysis, Fine-grained granular snow.

A fracture criterion was developed for fine-grained granular snow and was shown to predict accurately the conditions required for fracture under multiaxial states of stress. The criterion was applied to two specific types of deformation histories. The first deformation path involves an initial high strain-rate to produce fracture from an unstressed rest configuration, and the second path involves multiple strain-rate paths. The criterion expresses the critical value of deviatoric free energy in terms of the volumetric free energy and internal energy dissipation, and it was found to predict fracture accurately for tension, compression, and shear. (See also W78-09603) (Humphreys-ISWS)
W78-09607

SNOW DRIFT,
Melbourne Univ., Parkville (Australia). Dept. of Meteorology.
U. Radok.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 123-139, 1977. 6 fig, 53 ref, 1 append.

Descriptors: *Snowpacks, *Snow management, *Glaciology, *Reviews, Theoretical analysis, Snow, Wind erosion, Aggradation, Erosion, Erosion control, Movement, Saltation, Buildings, Roads, Analytical techniques, Foreign research, Wind blown snow, Drift evaporation, Snow erosion, Drift accumulation.

Wind-blown snow represents an age-old problem in the applied glaciology of most higher-latitude regions, but its physical intricacies first received attention in esoteric discussions on the long-term mass balance of polar ice sheets. Measurements on the uniform unlimited surface of such ice sheets have shown good agreement, at least over a limited height range, with estimates for the concentration and flux of drift snow as a function of height and wind velocity based on turbulence theory. An alternative theory, developed concurrently from wind-tunnel results and field observations in Siberia, was discussed. Basic questions requiring further study include drift snow concentrations at considerable heights, drift evaporation, and electrical phenomena. The main practical aspects of snow drift relate to the prevention of excess accumulation on roads, railway lines, and avalanche slopes; and to the encouragement of accumulation in fields and forests, and other locations where frost protection and/or storage of water is desired. The methods used were reviewed; the methods are beginning to rely on physical concepts and theories rather than solely on empirical formulas derived from engineering experiments. In regions of positive surface mass balance, buildings and other structures tent to become obliterated by snow drift. An important factor of this process is the fall-out of snow in the retarded flow on the windward side of the structure. Some recent attempts to measure and calculate that fall-out were discussed. (See also W78-09603) (Humphreys-ISWS)
W78-09608

THE KINETIC FRICTION ON SNOW AND ICE,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
D. Kuroiwa.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England). September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 141-152, 1977. 10 fig. 1 tab, 13 ref.

Descriptors: *Snow, *Ice, *Friction, *Testing, Laboratory tests, On-site tests, Lake ice, Testing procedures, Movement, Velocity, Measurement, Analytical techniques, Analysis, Kinetics, Skiing, Ice skating, Foreign research, *Japan, Kinetic friction, Friction coefficient.

This paper presented many experimental data of friction between a slider and snow or ice in relation to skiing and skating. Measurements of the kinetic coefficient of friction, k, for a metallic or plastic-resin ring in contact with a snow surface were made using an oscillograph. The mechanism of this friction was analyzed through oscillograms showing frictional resistance between a slider and a snow surface together with observations of the real contact area between the surface of the slider and snow grains. It was shown that friction at low sliding speeds caused plastic deformation within snow, but, when sliding velocity was increased, a stick-slip friction occurred accompanying fractures and abrasions of snow grains. Since the laboratory experiment of friction on snow is limited to a range of low sliding speeds, the measurements of k for practical skis increased from 0.03 to 0.1 as the speed increased from velocities 5 to 22 m/s. The measurements of k for skates were made using a specially designed device on skating rinks prepared both on natural lake ice and artificial ice. The temperature dependence of k was studied for the blades of skates; k showed a minimum for both rinks around -1 to -2C, namely, 0.003 for the natural lake ice and 0.0078 for the artificial rink ice. (See also W78-09603) (Humphreys-ISWS)
W78-09609

THE MODELING AND MEASUREMENT OF THE DEFORMATION OF A SLOPING SNOWPACK,
Montana State Univ., Bozeman. Dept. of Engineering and Mechanics.
T. E. Lang, and R. A. Sommerfeld.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium of Glaciology, Cambridge (England), September 13-17, 1976. Journa of Glaciology, Vol. 19, No. 81, p 153-163, 1977. 5 fig, 2 tab, 10 ref.

Descriptors: *Snowpacks, *Deformation, *Model studies, *On-site tests, *Colorado, Analytical techniques, Stress, Mathematical models, Measurement, Slopes, Snow management, Snow, Testing procedures, Finite element analysis, Analysis, Deformation rates.

The modeling of deformation in snowpack of realistic geometry was reproted. Experimentally measured deformation rates were compared with corresponding rates predicted from a finite-element model developed using local stratigraphy in the experimental area. Specifically designed deformation gages placed on an avalanche-sensitive snow slope at Berthoud Pass, Colorado, during the winter of 1972-73 were used to measure the experimental values. The finite-element code, based upon a plane-strain idealization, was used to model the steady-state flow of the slope. The program incorporates visco-elastic of the snowpack, snow-layer stratigraphy, and the orthotropic pro-

perties of snow when both tension and compression components of stress act at a point. The degree of correlation between experimental and computed values of deformation rates was reported, and limitations of the analysis in conjunction with the type of experimental data taken were discussed. (See also W78-09603) (Humphreys-ISWS)
W78-09610

APPROXIMATE SOLUTIONS FOR THE INTERRUPTION OF CREEP AND GLIDE BY AVALANCHE DEFENSES,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. J. Evans, and J. A. Langdon.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 165-173, 1977. 7 fig, 7 ref, 1 append.

Descriptors: *Snowpacks, *Avalanches, *Theoretical analysis, *Model studies, Snow, Glaciology, Barriers, Finite element analysis, Deformation, Stress, Analysis, Velocity, Movement, Forces(Loads), Analytical techniques, Mathematical models, Avalanche defences.

A numerical calculation procedure is presented for the stress and deformation anaysis of a snow mass which is creeping and gliding on an inclined surface and which in addition, may be restrained by rigid obstacles. The analysis was based on the assumption that the velocity profile at any position in the snowpack is linear, that is, that sections initially plane remain plane during deformation. Such motion has been observed to occur in the neutral zne and is certainly true at a rigid barrier; accordingly, it appears to be reasonable to restrict the velocity field to be plane everywhere. A constitutive law for steady creep was used which is consistent with the observed neutral zone motion. The solution procedures was illustrated by its application to some problems of avalanche defense barriers. The cases investigated include: continuous barriers, cylindrical barriers, and barriers of finite width. Barrier forces and the extent of backpressure zone were given. (See also W78-09603) (Humphreys-ISWS)
W78-09611

PROGAGATION OF A PLASTIC WAVE IN SNOW,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
G. Wakahama, and A. Sato.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 175-183, 1977. 6 fig, 8 ref.

Descriptors: *Snow, *Deformation, *Laboratory tests, Movement, Plastic deformation, Celerity, Foreign research, Testing procedures, Analysis, Velocity, Evaluation, *Plastic wave.

In order to clarify the detailed processes of the deformation of snow at high rates, laboratory experiments were made by compressing snow at high speed. The propagation of a plastic wave through snow was observed by using a high-speed camera and a pressure-detecting device. Analyses of the data obtained gave the velocity of the plastic wave for various kinds of snow whose density ranged from 0.17 to 0.46 Mg/cu m and free-water content from 0 to 17%, whereby studies were made into the dependences on the density and free-water content of the velocity of the plastic wave. When the impact velocity was 4.3 + or - 0.2 m/s, the wave velocity ranged from 5 m/s for a new snow to 12 m/s for a fine-grained, well-settled snow. The plastic-wave velocity in wet snow was, in general, smaller than that in dry snow of the same density. Changes in density and structure of snow associated with the passage of a plastic wave were studied and discussed. The pressure at the wave front was measured; values of 0.1-0.3 bar were obtained, these are of the same order as the value estimated from theoretical formulas. The plastic-wave velocity also was observed for a confined snow, which showed a larger velocity and plastic strain than an unconfined snow. (See also W78-09603) (Humphreys-ISWS)
W78-09612

EXPECTED SNOW LOADS ON STRUCTURES FROM INCOMPLETE HYDROLOGICAL DATA,
Eidgenossisches Inst. fuer Schnee- und Lawinenforschung, Davos (Switzerland).
J. Martinec.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 185-195, 1977. 9 fig, 17 ref.

Descriptors: *Snow cover, *Water equivalent, *Loads(Forces), *Buildings, Snow, Building codes, Compaction, Frequency, Frequency curves, Estimating, Evaluation, Analytical techniques, Analysis, Altitude, Foreign research, *Switzerland, Snow loads, Densification.

An assessment of snow loads in Switzerland was required for a revision of the building code. Settling curves of snow were used to compute water equivalents of snow if direct measurements were not available. Based on a frequency analysis, relations between the snow load and the altitude were given for various return periods. Problems of regional effects and of converting the snow cover data to roof loads were outlined. (See also W78-09603) (Humphreys-ISWS)
W78-09613

ENGINEERING PROPERTIES OF FRESHWATER ICE,
National Research Council of Canada, Ottawa (Canada). Div. of Building Research.
L. W. Gold.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 197-212, 1977. 5 fig, 45 ref.

Descriptors: *Ice, *Mechanical properties, *Strength, *Reviews, Ice loads, Deformation, Freshwater, Ice cover, Stress, Ductility, Engineering, Shear stress, Youngs modulus, Yield strength, Tensile strength, Compressive strength, Rupturing, Strain, Freshwater ice, Crack propagation.

This review gave attention primarily to the deformation and strength behavior of ice. The principal engineering problems requiring knowledge concerning the properties of ice are prediction of the maximum force that ice might exert on a structure and determination of the load that can be placed safely on an ice cover. The properties of ice relevant to these problems were discussed. Particular attention was given to the dependence of Young's modulus on the frequency of the stress, strain-rate dependence of the yield and fracture strengths, and the ductile to brittle transition. It was shown that the strain-rate dependence of these properties is consistent with information on the stress dependence of dislocation velocity on the basal plane. The tensile and compressive strengths also were shown to be consistent with current theories of crack initiation and propagation. (See also W78-09603) (Humphreys-ISWS)
W78-09614

MEASURING THE UNIAXIAL COMPRESSIVE STRENGTH OF ICE,
Cold Regions Research and Engineering Lab., Hanover, NH.
F. D. Haynes, and M. Mellor.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 213-223, 1977. 6 fig, 3 tab, 7 ref, 1 append.

Descriptors: *Ice, *Compressive strength, *Laboratory equipment, *Testing procedures, Mechanical properties, Methodology, Laboratory tests, Equipment, Evaluation, Stress, Measurement, Youngs modulus, Strength of materials, Uniaxial compressive strength, Specimen preparation.

An attempt was made to develop a simple but accurate method for making compressive strength tests on right circular cylinders. Compliant loading platens were designed to apply uniform normal stress without introducing significant interface radial shear stresses. The compliant platens gave reproducible results that agreed well with results obtained by a precise conventional technique. Accurate results were obtained with simple specimen preparation, and with short specimens where the length-to-diameter ratio was less than unity. Platens were made from a rubber-like urethane which was molded in aluminum cylinders to provide lateral restraint. Uniaxial compression tests on cylindrical polycrystalline ice specimens were made to determine the characteristics of the platens. For 21 specimens with ends prepared on a lapping plate to obtain a mirror finish, the measured strength showed a variation of only 13% for length-to-diameter ratios from 0.74 to 2.5, with no systematic trend. Another 21 specimens with length-to-diameter ratios of about 2.35 were tested with various platens and various methods of specimen end preparation. The strength for specimens with saw-cut ends and for those with ends lapped showed very little difference when tested with the rubber platens. The main advantages gained from the use of these platens are: (1) simple procedures are adequate for specimen preparation, and (2) short lengths of core can be utilized. These advantages are of very great significance in field testing where precise technique is not always feasible and the traditional field technique gives highly inaccurate data. (See also W78-09603) (Humphreys-ISWS)
W78-09615

FRICTION OF A STEEL BALL ON A SINGLE CRYSTAL OF ICE,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
K. Tusima.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 225-235, 1977. 9 fig, 2 tab, 24 ref.

Descriptors: *Ice, *Friction, *Mechanical properties, *Laboratory tests, Kinetics, Measurement, Laboratory equipment, Testing procedures, Loads(Forces), Velocity, Steel, Temperature, Foreign research, *Friction coefficient, Kinetic friction, Brinell hardness.

Results are presented of a study carried out to explain the low friction on ice. Friction of a steel ball on a single crystal of ice was measured as a function of load, velocity, temperature, and diameter of slider. It was found that even when the velocity was very small (1.5 x 10 to the minus 7th power to 0.0018 m/s), the coefficient of friction was very small, ranging from 0.005 to 0.2, although friction on the prismatic plane was twice as large as that on the basal plane. The coefficient of friction increased with load, which means that Amonton's classical law of friction is not applicable to ice. The coefficient of friction increased with decreasing velocity, which may result from the creep of ice in the contact area. The friction strongly increased as the temperature became close to 0C. A minimum friction was observed for a definite tem-

perature. It was found that the explanation of the results obtained is given satisfactorily neither by the classic pressure-melting theory nor by the friction-melting theory, but only by adhesion theory. (See also W78-09603) (Humphreys-ISWS)
W78-09616

CONCENTRATED LOADS ON A FLOATING ICE SHEET,
Cold Regions Research and Engineering Lab., Hanover, NH.
D. E. Nevel.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 237-245, 1977. 5 fig, 1 tab, 8 ref.

Descriptors: *Ice loads, *Stress distribution, *Mathematical models, Load distribution, Loads(Forces), Floating, Elastic theory, Mathematical studies, Mechanical properties, Stress, Analytical techniques, Theoretical analysis, Ice sheets, Rectangular loads.

The safe bearing capacity of a floating ice sheet usually is determined by limiting the maximum tensile stress which occurs under the load at the bottom of the ice sheet. If the size of the load distribution is large compared to the ice thickness, the thin plate theory predicts these stresses correctly. However, if the size of the load distribution becomes small compared to the ice thickness, the plate theory overestimates the stresses. In this case, the ice sheet should be treated as a three-dimensional elastic layer. Previous investigators have solved the elastic-layer problem for loads distributed over a circular area and have limited the results to the stress at the bottom of the ice sheet directly under the center of the load. In this paper, the stresses were evaluated at any radial position, and it was shown how these stresses approach those for the plate theory as the radial position becomes large. The solutions for the stresses were presented in integral form, as well as graphs from the numerical integration. These new results were significant for the superposition of stresses when two concentrated loads act near each other. Similarly for loads distributed over a rectangular area, the plate theory will overestimate the stresses if the dimensions of the load becomes small compared to the ice thickness. For this case, integral solutions were presented for the stresses and were evaluated directly under the center of the load. (See also W78-09603) (Humphreys-ISWS)
W78-09617

FLEXURAL STRENGTH OF ICE ON TEMPERATE LAKES,
Cold Regions Research and Engineering Lab., Hanover, NH.
A. J. Gow.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 247-256, 1977. 6 fig, 8 tab, 7 ref.

Descriptors: *Lake ice, *Beams(Structural), *New Hampshire, *On-site tests, Strength of materials, Ice, Mechanical properties, Temperature, Lakes, Structural members, Cantilevers, Testing, Testing procedures, Stress, Equipment, On-site data collections, Strength, Flexural strength, Simply supported beam.

Tests of the flexural strength of temperate lake ice were performed at two test sites in New Hampshire. Large, simply supported beams of temperate lake ice generally yield significantly higher flexural strengths than the same beams tested in the cantilever mode. Data support the view that a significant stress concentration may exist at the fixed corners of the cantilever beams. Maximum effects are experienced with beams of cold, brittle ice substantially free of structural imperfections; the stress concentration factor may exceed 2.0 in this kind of ice. In ice that has undergone extensive thermal degradation, the stress concentration effect may be eliminated entirely. Simply supported beams generally test stronger when the top surface is placed in tension. This behavior is attributed to differences in ice type--the fine-grained, crack-free top layer of snow-ice usually reacting more strongly in tension than the coarse-grained bottom lake ice which is prone to cracking. (See also W78-09603) (Humphreys-ISWS)
W78-09618

ICE FORCES,
Technical Univ. of Denmark, Lyngby (Denmark). Inst. of Hydrodynamics and Hydraulic Engineering.
P. Tryde.
In: Symposium of Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 257-264, 1977. 7 fig, 10 ref.

Descriptors: *Ice loads, *Rupturing, *Theoretical analysis, *Mathematical models, Ice, Loads(Forces), Glaciers, Floating, Analytical techniques, Distribution patterns, Rupture patterns, Ice floes, Ice sheets.

The behavior of ice-floes are considered as floating plates which rupture against obstructions of various shapes. The velocity of contact is large enough to exclude plastic deformation, and the ice is assumed to behave as an elastic material until failure. The reported research dealt essentially with ice of a constant thickness, formed in water. When large masses of ice, for example in the form of glaciers or floating ice fields, are moving against an obstruction, either natural or man-made, huge forces will develop. The paper discussed the different types of rupture patterns that may develop in front of either vertical or inclined faces, and formulas were given for some typical cases. The basic formula, derived from elementary mechanics, used to estimate the forces was written as F = (a function of the geometrical and physical parameters of the system) times (the compression strength of the ice) times (the ice thickness) times (the width of the structure). (See also W78-9603) (Humphreys-ISWS)
W78-09619

ICE-STRUCTURE INTERACTION WITH ARTIFICIALLY GENERATED FORCE RECORDS,
Memorial Univ. of Newfoundland, St. John's. Faculty of Engineering and Applied Science.
A. S. J. Swamidas, D. V. Reddy, and G. Purcell.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 265-283, 1977. 14 fig, 6 tab, 45 ref.

Descriptors: *Ice loads, *Offshore platforms, *Model studies, *Cold regions, *Alaska, Towers, Structures, Ice, Hydraulics, Theoretical analysis, Dynamics, Fluctuations, Loads(Forces), Engineering structures, Mathematical models, Analytical techniques, Statistical methods, Computer programs, Stochastic processes.

The paper described the dynamic ice-structure interaction study of monopod platforms (fixed type) which are of considerable interest to the off-shore oil industry in cold regions. In view of the scantiness of continuous ice-force records, artificial-force records were generated from available small-scale field ice-force records using stochastic concepts. The method, based on the similarity between the fluctuating parts of randomly varying ice-force records and the seismic records, uses a non-stationary random process obtained from filtering a shot noise through a second-order filter. The dynamic response analysis of a monopod structure located at Cook Inlet, Alaska was carried out by hybridizing the relevant sub-routines of the computer programmes, SAP IV (Structural Analysis Programme) and EATSW (Earthquake response of Axisymmetric Tower Structures surrounded by Water). The work included a study of the influence of soil properties on the frequencies and responses, and a comparison between the responses of fixed and elastically supported (by the soil foundation) monopod platforms. (See also W78-09603) (Humphreys-ISWS)
W78-09620

MECHANISMS AND THEORY OF IDENTATION OF ICE PLATES,
Laval Univ., Quebec. Lab. of Ice Mechanics.
B. Michel, and N. Toussaint.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 285-300, 1977. 11 fig, 4 tab, 15 ref.

Descriptors: *Ice loads, *Penetration, *Laboratory tests, *Loads(Forces), Ice, Deformation, Rates of application, Mechanical properties, Stress, Strain, Rupturing, Rates, Testing procedures, Data collections, Analysis, Analytical techniques, Ice sheets, Indentation tests.

This study gave the results and interpretation of tests made in a cold room on ice plates held vertically in a press and indented at various speeds with a rectangular indentor. These plates, 81 cm sq, were held and frozen solid to a steel frame to represent semi-infinite ice sheets. The tests were carried out at -10C, with indentation speeds varying from 0.00006 cm/s to 3 cm/s. It was found that the nominal pressure of indentation varies as a function of loading rates in a manner similar to that of the strength of S sub 2 ice in uniaxial compression. The pressure increases rapidly with loading rates up to its maximum value at a strain-rate of 0.0005/s. From there on, the pressure decreases. In the ductile range and up to the point of maximum pressure, a theoretical model was proposed where the theory of indentation of an ideal plastic body can be applied to predict an identation pressure close to three times that of the uniaxial crushing strength. The test did not show any so-called 'ratio effect' caused by the ratio of the indentor width to the plane thickness. This effect could be explained by the influence of the geometry of the indentor on the strain-rate. (See also W78-09603) (Humphreys-ISWS)
W78-09621

INDENTATION TESTS TO INVESTIGATE ICE PRESSURES ON VERTICAL PIERS,
Imperial Oil Ltd., Calgary (Alberta).
K. R. Croasdale, N. R. Morgenstern, and J. B. Nuttall.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 301-312, 1977. 11 fig, 2 tab, 9 ref.

Descriptors: *Ice loads, *Lake ice, *Piers, *Testing, Ice, Structures, Loads(Forces), Laboratory tests, On-site tests, Strength, Strain, Rates, Compressive strength, Rupturing, Data collections, Theoretical analysis, Penetration, Engineering, Equipment, Testing procedures, Mechanical properties, Analysis, Analytical techniques, Indentation tests.

Controlled field and laboratory tests were performed to investigate the relationship between ice strength and the maximum ice pressures on vertical piers. The apparatus used in the field tests consisted of a flat indentor (75 cm wide) which was pushed through the ice by hydraulic rams. Twenty-seven tests were conducted on lake ice up to 1 m thick. Ice pressures in the range 2.5 to 5.0 MPa were obtained for ice in good initial contact with

the identor. The ice pressures exhibited little sensitivity to variations in temperature, ice thickness, and strain-rate for the range 0.000075 to 0.0044/s. The average unconfined compressive strengths obtained in the laboratory were about 20% higher than the average field ice pressures. In addition, the laboratory strengths were found to be sensitive to temperature and to strain-rate in the range 1 X 10 to the minus 7th power to 0.001/s. The confined compressive strength was 2 to 3 times the unconfined strength. The failure modes observed in the identation tests were similar to those predicted (before the tests) by an upper-bound plasticity model. The ability of the model to relate small-scale ice strength to field ice pressures was discussed. The results presented in this paper should not be used by the engineer to design piers for ice-infested areas without further qualification. It is obvious that the perfect contact which was striven for in these tests would not be appropriate to most actual structures. (See also W78-09603) (Humphreys-ISWS)
W78-09622

SNOW AVALANCHES: A REVIEW OF CURRENT RESEARCH AND APPLICATIONS,
Washington Univ., Seattle. Geophysics Program; and Washington Univ., Seattle. Dept. of Atmospheric Sciences.
E. R. LaChapelle.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 313-324, 1977. 51 ref.

Descriptors: *Avalanches, *Snow, *Reviews, *Glaciology, Forecasting, Statistical mods, Mapping, Snow management, Zoning, Hazards, Land use, *Snow avalanches, Avalanche release.

Snow avalanches have long been an active area of applied glaciology. Empirical and traditional methods of forecasting and controlling avalanches are gradually giving way to the application of modern science and engineering. There are four areas of this science where progress is being made through active interaction among scientists, engineers, and practical men. The artificial release of avalanches as a control measure has seen a large body of research regarding effects of explosives on snow but still is handicapped by inadequate basic knowledge about avalanche release mechanisms. There is currently a surge of interest in testing numerical methods of avalanche forecasting, and several sophisticated statistical techniques have been introduced; but operational forecasting still depends largely on empirical experience. The pressure of development on alpine lands has brought to the fore a number of problems associated with mapping avalanches, determining their return intervals, and deducing their behavior from both observations of terrain and vegetation and calculating their behavior from theory. The ability to predict the characteristics of moving avalanches is advancing through a combination of theoretical insights and field observations, but is inhibited by the difficulty of the latter. (See also W78-09603) (Humphreys-ISWS)
W78-09623

CONTINUOUS MONITORING OF METAMORPHIC CHANGES OF INTERNAL SNOW STRUCTURE AS A TOOL IN AVALANCHE STUDIES,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
R. L. Armstrong.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 325-334, 1977. 7 fig, 11 ref.

Descriptors: *Snow, *Monitoring, *Colorado, Avalanches, Mechanical properties, Shear, Stratigraphy, Density, Profiles, Meteorology, Physical properties, Density stratification, On-site investigations, Rupturing, Temperature, Water equivalent, Snowfall, Precipitation(Atmospheric), *Snow structure, *San Juan Mountains(Colo), Snow avalanches, Slab avalanches, Metamorphosis.

Relationships between snow structure, climatic factors, and the nature of avalanche events in the San Juan Mountains of Colorado were analyzed. Physical and mechanical properties of the snow cover have been monitored on a continuous basis by conventional methods as well as through the application of a profiling snow-density gauge. Temperature-gradient metamorphism is the dominant mechanism which determines the character of the local snow structure. Properties unique to well-developed temperature-gradient snow (depth hoar) were discussed. Three specific metamorphic processes were described which contribute to a highly varied and mechanically weak snow structure. Analysis of fracture-line profile data allowed general studies of the local snow climate to be compared with the stratigraphy of actual release zones. Fracture-line data support the conclusion that meteorological conditions prevailing at the time of new-snow deposition play a less significant role in the eventual release of slab avalanches than metamorphic processes which influence the snow cover between storm periods. Shear failure zones are consistently composed of weak layers metamorphosed weeks and even months prior to the precipitation event which triggers the release. (See also W78-09603) (Humphreys-ISWS)
W78-09624

GRADIENT METAMORPHISM, ZONAL WEAKENING OF THE SNOWPACK AND AVALANCHE INITIATION,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
C. C. Bradley, R. L. Brown, and T. R. Williams.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 335-342, 1977. 9 fig, 9 ref. DA-ARO-D-31-124-71-GS9, NSF GA-3943.

Descriptors: *Snowpacks, *Mechanical properties, *Avalanches, Snow, Laboratory tests, On-site tests, Analysis, Density stratification, Temperature, Profile, Snowfall, Youngs modulus, Testing procedures, *Snow structure, *Yellowstone National Park, Avalanche release, Metamorphosis.

A co-ordinated study involving both a field investigation in Yellowstone National Park and a laboratory investigation was undertaken to evaluate the process of temperature-gradient metamorphism on the mechanical properties of snow. Both parts of the investigation showed that, when subjected to a negative temperature gradient, low-to-medium density snow metamorphoses first into a fine-grained anhedral depth hoar before finally acquiring a fully developed, and stronger, euhedral crystal structure. Measurements indicated that the subhedral snow was the weakest stage in the metamorphic process and that, while strength may drop to as low as 10% of the original strength, the material stiffness decreased by less than 50%. Also, it was observed that the location of weakest snow was usually the point of a local maximum density and largest temperature gradient, thus suggesting a relationship between metamorphic state and thermal conductivity. (See also W78-09603) (Humphreys-ISWS)
W78-09625

A MODEL STUDY OF POWDER-SNOW AVALANCHES,
Grenoble Univ. (France). Inst. of Mechanics.
E. J. Hopfinger, and J. C. Tochon-Danguy.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 343-356, 1977. 10 fig, 10 ref.

Descriptors: *Avalanches, *Snow, *Model studies, Mathematical models, Theoretical analysis, Entrainment, Density currents, Laboratory tests, Hydraulic models, Testing procedures, Air entrainment, Density stratification, Flow, Analytical techniques, Velocity, Flow characteristics, Drag, Profiles, Flow separation, Powder snow avalanches, Snow entrainment.

A powder-snow avalanche is a particular type of turbulent gravity current which it is proposed to treat using methods developed in contexts where the Boussinesq approximation is valid. Hence, it is assumed that the air entrainment rate E primarily depends on the internal Froude number (Tochon-Danguy and Hopfinger, 1975) and that the large density variation in an avalanche reduces only the drag resulting from the air entrainment. In order for this drag to dominate over the wall stress, it is necessary that the slope angle be greater than a certain minimum value which depends on the density ratio of the flow. For a low-density flow, for example, a minimum slope angle of about 5 deg is necessary. The more unusual aspect is that an avalanche also may entrain snow along its path, which increases its mass and in certain cases can produce an accelerating flow. This aspect was included in the theoretical treatment. Experiments were carried out in an inclined water channel using brine as dense fluid. Visual observations as well as measurements of the velocity and density profiles were made. Various states of flow were proposed, depending on whether the avalanche is 'long' (having the structure of a usual gravity current), or 'short' (having the structure of a thermal), or whether snow is entrained. The practical consequences which can be drawn from these results were discussed, in particular in the context of the design of defence structures, and flow visualizations of a gravity current impinging on an obstacle give an idea of the protected region. (See also W78-04029 and W78-09603) (Humphreys-ISWS)
W78-09626

ON THE FLOW OF AVALANCHING SNOW,
Eidgenossisches Inst. fuer Schnee- und Lawinenforschung, Davos (Switzerland).
M. Heimgartner.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 357-363, 1977. 6 fig, 1 tab, 9 ref.

Descriptors: *Avalanches, *Snow, *Model studies, *Analytical techniques, Mathematical models, Theoretical analysis, Analysis, Flow, Energy equation, Hydraulics, Depth, On-site investigations, Laboratory tests, Foreign research, *Snow avalanches, Flowing avalanches.

Variation of flow depth of a flowing avalanche caused by a change in the slope angle was examined using Bernoulli's energy equation, used in hydraulics to determine a non-uniform steady flow. This equation was modified for a material with internal friction and a strongly curved track. The calculated flow depth were compared with those obtained by tests with a snow slide. In the flow model dry and turbulent friction were taken into account. Friction coefficients were estimated comparing calculated and measured flow depths. It appears that in wet snow they differ from those of dry snow. This model was used to calculate the runout distance of a natural avalanche. This distance agreed well with the measured runout. (See also W78-09603) (Humphreys-ISWS)
W78-09627

WAVE PATTERN OF FLOWING SNOW SLABS,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
T. E. Lang.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 365-373, 1977. 6 fig, 4 ref.

Descriptors: *Avalanches, *Snow, *Model studies, Wavelengths, Distribution patterns, Spatial distribution, Mathematical models, Mathematical studies, Analytical techniques, Theoretical analysis, Flow, *Snow slabs.

Equations were derived, using a total potential-energy formulation, which predict the wavelength of the dominant wave pattern of a flowing snow slab. Account was taken of the visco-elastic properties of an assumed surface layer of snow which overlays a distinct visco-elastic foundation layer of snow. The predicted wave pattern is recognized as a precursory mechanism which influences the characteristics of the sawtooth flank fracture pattern that may remain following a snow avalanche, particularly on broad, uniform slopes. The parameters that influence the wave pattern were determined by an order-of-magnitude reduction of the terms in the governing differential equation for visco-elastic slab response. The major deduction from this analysis is the physical condition that the visco-elastic flow of a snow slab supported on a visco-elastic foundation has a natural tendency to form a wave pattern of wavelength dependent upon specific material properties. (See also W78-09603) (Humphreys-ISWS)
W78-09628

EVALUATION AND COMPARISON OF STATISTICAL AND CONVENTIONAL METHODS OF FORECASTING AVALANCHE HAZARD,
Eidgenossisches Inst. fuer Schnee- und Lawinenforschung, Davos (Switzerland).
P. Fohn, W. Good, P. Bois, and C. Obled.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 375-387, 1977. 8 fig, 1 tab, 10 ref.

Descriptors: *Avalanches, *Forecasting, *Statistical methods, Snowpacks, Snow, Meteorology, Hazards, Evaluation, Statistical models, Mathematical models, Analysis, Analytical techniques, Multivariate analysis.

Principal problems concerning the raw data and methodological limitations of statistical and conventional avalanche forecasting methods were summarized. The concepts of four statistical models based on multivariate data analysis were outlined. In order to give an idea of the potential and quality of the different methods, test runs over two winters were discussed, and a tentative score was established. Statistical models I and IV, together with the conventional forecast, attain a score of 70-80%, whereas statistical models II and III show a slightly poorer performance. Problems with the basic data set such as wrong timing, temporal correlation of avalanche occurrances, lack of good indices for structural instability of the snow-cover (an 'avalanche-day' is a very rudimentary avalanche variable) are at present (1976) the most important problems. Statistical methods show definite potential in backing up the memory and the decision process of forecasters; however, not being explanatory, statistical methods replace neither the qualitative reasoning of the conventional method nor the quantitative-but still lacking-physically based approach of deterministic models. (See also W78-09603) (Humphreys-ISWS)
W78-09629

ALTERNATE METHODS FOR THE ARTIFICIAL RELEASE OF SNOW AVALANCHES,
Washington Univ., Seattle. Geophysics Program; and Washington Univ., Seattle. Dept. of Atmospheric Sciences.
E. R. LaChapelle.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 389-397, 1977. 4 fig. 3 ref. WSHD Research Agreement No. Y-1637.

Descriptors: *Avalanches, *Snow management, *On-site investigations, *Snow, Vibrations, Explosions, Equipment, On-site tests, Testing procedures, Methodology, *Avalanche release, Snow avalanches, Air bags.

A series of devices were developed and tested which are designed to initiate the release of snow avalanches by mechanically disturbing or altering the snow cover. These serve as substitutes for the conventional use of high explosives and artillery projectiles. Canisters charged with an explosive mixture of gases can be fired electrically by remote control and can be recycled to fire again as needed. Air bags placed underneath the snow cover can be inflated with reasonably low pressure to disrupt and dislodge the snow cover. Energetic vibrators powered by compressed air can dislodge unstable snow under favorable circumstances. A polyethylene membrane placed on the ground surface of a steep mountainside effectively inhibits the accumulation of snow by allowing new snow to slide off as fast as it accumulates. All of these methods have led to the practical release of avalanches, but none appears to offer a universal solution to avalanche release in all circumstances. The gas exploder system is the most promising to date and is currently being installed for operational use. (See also W77-05810 and W78-09603) (Humphreys-ISWS)
W78-09630

PRELIMINARY OBSERVATIONS OF ACOUSTIC EMISSIONS PRECEDING AVALANCHES,
Rocky Mountain Forest and Range Experiment Station, Fort Collins.
R. A. Sommerfeld.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 399-409, 1977. 5 fig, 3 ref.

Descriptors: *Avalanches, *Acoustics, *On-site investigations, *Snow, Sound waves, Slope stability, Stability, Exploration, Frequency, Instrumentation, Geophones.

Three geophones were used to monitor spontaneous emissions of noise in a snowpack on an avalanche track. For the whole avalanche season, 30 Hz noise was recorded on magnetic tape and 3 Hz noise was recorded for a short period of time. Periods before and during avalanches were associated with high noise, while periods of known stability were associated with low noise. While the results presented are extremely encouraging, they do not as yet resolve the problem of the development of a reliable short-term stability predictor. Not enough events have been recorded to establish reliability. Also, the marginal character of the records leaves a basic question unanswered. (See also W78-09603) (Humphreys-ISWS)
W78-09631

SPONTANEOUS FRACTURE INITIATION IN MOUNTAIN SNOW-PACKS,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
W. St. Lawrence, and C. Bradley.
In: Symposium on Applied Glaciology; Proceeding of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 411-417, 1977. 3 fig, 4 ref. NSF DES 73-00233AOI, DAAG29-76-G-0037, Co-op No. 12-11-204-12.

Descriptors: *Avalanches, *Snowpacks, *Seismic studies, *On-site investigations, Glaciers, Snow, Monitoring, Instrumentation, Seismic waves, Sound waves, Frequency, Slope stability, Cracks, Rupturing, Geophones.

Over the past few years an investigation has been conducted to determine the extent of seismic signals associated with avalanching snow slopes. A number of the signals recorded were examined and classified according to their origin. One of these signals, however, is not defined clearly in terms of an observable source mechanism. To obtain information regarding the origin of this signal, results were compared from several investigations conducted to study the seismic activity associated with glaciers. A comparative analysis of the snow and glacier signals indicated that the high-frequency signals observed in snow fields are due to internal fracture within the snow. (See also W78-09603) (Humphreys-ISWS)
W78-09632

ARTIFICIAL RELEASE OF AVALANCHES BY EXPLOSIVES,
Eidgenossisches Inst. fuer Schnee- und Lawinenforschung, Davos (Switzerland).
H. Gubler.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 419-429, 1977. 6 fig, 3 tab, 6 ref.

Descriptors: *Avalanches, *Snow management, *Snow, *On-site investigations, Instrumentation, Snow cover, Explosives, Stress, Acoustics, Slope stability, Testing procedures, Seismic waves, Rupturing, Cracks, Avalanche release.

The method of the artificial release of slab avalanches by explosives was investigated. The effect of a detonation on a seasonal snow cover was measured and discussed. The attenuation of the resulting stress waves as a function of the type of explosive used, the position of the charge relative to the snow surface, the charge mass, the snow-stratification profile, and the type of ground were determined in field experiments. The effective ranges of shots in potential fracture zones were established. (See also W78-09603) (Humphreys-ISWS)
W78-09633

THE DYNAMICS OF AVALANCHING IN THE KHIBINS,
Akademiya Nauk SSSR, Moscow. Inst. Geografii.
V. M. Kotlyakov, B. N. Rzhevskiy, and V. A. Samoylov.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 431-439, 1977. 6 fig, 12 ref.

Descriptors: *Avalanches, *On-site investigations, *Snow, *Loads(Forces), Dynamics, Measurement, Velocity, Structures, On-site tests, Analytical techniques, Analysis, Foreign research, Foreign countries, Surveys, Instrumentation, Barriers, *USSR, *Khibin(USSR), Avalanche impact.

Results of ten-year measurements of avalanche impact upon a large-size installation were shown. The installation is equipped with 20 pressure sensors using the principle of the intrusion of a steel cone into a duralumin plate. The impacts of 30 dry avalanches with volumes from 100 up to 50,000 cu m were analyzed. A maximum pressure at 'a point' of 100 kN/sq m and a pressure of 650 kN/sq m averaged over the area of the installation (24 sq m)

were recorded. It was found that 75% of the impact energy is concentrated in the lowest 2 m of the installation. Proceeding from these data, and also taking into account that the thickness of an avalanche body amounts to 10-20 m at the moment of impact, it was concluded that there is a 'dense core' and an upper 'high aerosol' part in an avalanche body. The use of stereo-photogrammetric surveys of moving avalanches revealed the 'velocity depression' effect in the Khibin avalanches: Avalanche velocity decreases abruptly (by a factor 1.5 to 2) at the end of transit channel and then grows rapidly up to a maximumk at the end of the avalanche cone. The greatest variations of velocity amount to 51 m/s. The data obtained prove the inefficiency of anti-avalanche filling dams, especially because of their negative role in the generation of disasterous air waves, whose pressure varies from 20 up to 150 kN/sq m. (See also W78-09603) (Humphreys-ISWS)
W78-09634

STRONG SNOW-STORMS, THEIR EFFECT ON SNOW COVER AND SNOW ACCUMULATION,
Institut Inzhenerov Zheleznodorozhnogo Transporta, Novosibirsk (USSR). Dept. of Railroad Construction.
A. K. Dyunin, B. A. Anfilofiyev, M. G. Istrapilovich, Ya. D. Kvon, and N. T. Mamoyeva.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 441-449, 1977. 4 fig, 10 ref.

Descriptors: *Snowfall, *Model studies, *Storms, *Snowpacks, Snow, Snow cover, Laboratory tests, Laboratory equipment, Theoretical analysis, Analysis, Mathematical models, Diffusion, Flow, Winds, Wind velocity, Foreign research, *USSR, Snowstorms, Wind tunnel.

Snowdrifts have been studied by many researchers, both in field and laboratory conditions; however, these investigations have been carried out mostly at wind speeds up to 20 m/s, whereas in many areas of our planet snowstorms occur at winds up to 40 m/s and more. During the winter seasons of 1972-76, a great number of experiments with an artificial snowstorm in a special wind tunnel 27 m long were carried out. The wind speeds reached 40 m/s (60-65 m/s at the 10 m anemometer height). The existing theories and hypotheses of snowdrifting, and in particular the 'diffusion' model, were tested in a series of experiments. These experiments have not confirmed the assumption of the Australian scientists on the decisive role of diffusion in drift mechanism at large wind speeds. The problem of strong snowstorm effect on snow accumulation on avalanche-danger slopes, in particular, wind redistribution of snow, is no less important. The results obtained may be used for the determination of snow accumulation in avalanche starting zones due to deflation. This is especially important for forecasting very dangerous and frequently-occurring avalanches due to snowstorms. The investigations performed enabled the authors to estimate the snow deposition produced by strong and superstrong snowstorms, to account for the peculiarities of such snowstorms and the means of protection, to forecast snow distribution in mountainous regions, and to define the role of snowstorms in glacier mass balance. (See also W78-09603) (Humphreys-ISWS)
W78-09635

ICE ACCRETIONS ON STRUCTURES,
Toronto Univ. (Ontario). Dept. of physics.
R. List.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 451-465, 1977. 12 fig, 1 tab, 20 ref.

Descriptors: *Ice, *Growth rates, *Laboratory tests, *Drops(Fluids), Heat balance, Evaporation, Mathematical models, Analysis, Foreign research, Structures, Freezing, Water loss, Icing, Ice accretion, Water content.

Three basic areas of ice accretion were discussed: (1) the motion of the (supercooled) droplets in air up to collision with the icing object, (2) the net growth rates, and (3) the heat balance of an icing cylinder. The weakness of presently used approaches to establish collision efficiency and possible improvements were outlined. Experimental evidence on the icing of cylinders was then reviewed. The evidence established that the growth rates by icing are far less than expected because up to 80% and more of the initially accreted water can bounce off or be lost by shedding at air temperatures of -20C. The reduced growth rates have a considerable effect on the heat balance of the icing object, whose temperature and water-phase mixture are controlled by the temperature and phase of the lost water-substance. These latter properties are completely unknown and require further studies. In conclusion, the scientific aspects of icing are far from being understood; empirical findings may have to provide guidance for applications. (See also W78-09603) (Humphreys-ISWS)
W78-09636

DE-ICING OF RADOMES AND LOCK WALLS USING PNEUMATIC DEVICES,
Cold Regions Research and Engineering Lab., Hanover, NH.
S. F. Ackley, K. Itagaki, and M. D. Frank.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, 1977. 10 fig, 1 tab, 1 ref.

Descriptors: *Ice, *Deicers, *Ice breakup, *Engineering structures, Locks, Hydraulic structures, Equipment, On-site tests, Analysis, Rupturing, Methodology, Locks, Mechanical equipment, Ice accretion, Deicing, Radomes, Pneumatic devices.

A rough comparison between thermal and mechanical methods of de-icing indicated that mechanical methods could potentially de-ice with an order-of-magnitude less energy than that required to melt an ice accretion. Two applications of mechanical de-icing using pneumatically driven inflatable de-icers were described. The first of these was the de-icing of a small cylindrical radome used for air navigational purposes. Two seasons of testing were conducted with a de-icer consisting of an inflatable-deflatable flexible plastic covering. The de-icer was driven by tanks with pressure and vacuum reservoirs that were recharged by an on-site air compressor in response to a pressure sensor. The de-icing cycle was activated by an ice detector, so the system responded to icing events on a demand basis driven by the ice detector. The system proved successful in keeping the radome free of ice without manned operation and with small energy consumption in a mountain icing environment. The second application was an attempt to de-ice the walls of locks used in river nagivational facilities. Ice usually formed at the high-water-mark by the freezing of the water exposed to low air temperatures or by the pressing of ice against the walls by ships using the locks. The de-icers consisted of air-driven hoses mounted on the wall covered by a thick flexible rubber mat and protected from ship damage by steel outer plates. This method was successful in removing ice accumulations up to 2 m long by 0.3 m thick over the area covered by the de-icer. Installation costs and the necessity for protection of the de-icer against abrasion by ships may make this de-icing method prohibitively expensive compared with methods which are not as susceptible to damage by ships (e.g., chemical coatings and electrical heating cables buried in the walls). (See also W78-09603) (Humphreys-ISWS)
W78-09637

SNOW ACCRETION ON ELECTRIC WIRES AND ITS PREVENTION,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
G. Wakahama, D. Kuroiwa, and K. Gota.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 479-487, 1977. 4 fig, 1 tab, 4 ref.

Descriptors: *Snow, *Engineering structures, *Snow management, Transmission lines, Snow removal, Growth rates, Laboratory tests, Freezing, On-site investigations, Transmission towers, Analysis, Physical properties, Wind velocity, Adhesion, Foreign research, *Japan, Snow accretion, Snow structure.

This paper presented a study on the accretion of wet snowflakes transported by a strong cyclone on electric wires by means of wind-tunnel experiments and field observations, with the aim of successfully preventing them from accreting on and causing damage to power lines and high-voltage power transmission towers in snow areas in such countries as Japan, Canada, and the U.S.A. Although extensive studies have been made on snow accretion in Japan since the 1930's by many workers, their studies have been restricted to the coastal regions of central Honshu facing the Sea of Japan, which are typified by heavy wet snowfalls on the monsoon type in a weak wind of less than 3 m/s at a temperature between -1 and +1.5C continuing throughout the day. However, it has long been known that a cyclone characterized by a strong wind exceeding 10 m/s that carries heavier and wetter snowflakes can cause snow accretion on electric wires to grow to 20-30 cm in diameter. Because its detailed snow accretion processes and mechanism had not been clarified, studies were done on the growth processes of snow accretion, the adhesive stress of snow to a wire, the structure and texture of the accreted snow, coefficients of collision and collection of snow on the wire, and trajectories of individual snow particles impinging on or passing by a wire at various wind speeds. It was confirmed that wet snow can accrete on wires at any wind speed between 0 and 20 m/s. Moreover, new techniques were developed to prevent wet snow from accreting on wires, and these have proved to be effective in situ for any type of snow accretion in Hokkaido. (See also W78-09603)(Humphreys-ISWS)
W78-09638

THE INTENSITY OF DIFFERENT KINDS OF RIME ON THE UPPER TREE LINE IN THE SUDETY MOUNTAINS,
Wroclaw Univ. (Poland). Dept. of Geography.
S. Baranowski, and J. Liebersbach.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 489-497, 1977. 7 fig, 1 tab, 15 ref.

Descriptors: *Rime, *Ice, *On-site investigations, Mountains, Weather, Wind velocity, Air temperature, Weather patterns, Air circulation, Foreign research, Climatology, *Poland, *Sudety Mountains(Poland), Ice accretion.

Based on many years of measurements and observations on the frequency and intensity of deposition of various types of rime which have been conducted by the Department of Meteorology and Climatology of Wroclaw University at the top of Szrenica, Sudety mountains, a hundred meters above the tree line, the essential factors influencing this feature were determined. The upper parts of the Sudety mountains belong to the regions with the most frequent and heaviest rime deposits in Europe, which often appears to be hazardous to

farming. It has been found that intensity of rime deposition depends clearly on air temperature and wind velocity, and it is related to certain types of weather situations characterized by types of atmospheric circulation. (See also W78-09603) (Humphreys-ISWS)
W78-09639

ENGINEERING PROPERTIES OF SEA ICE,
Hamburgische Schiffbau-Versuchsanstalt (West Germany).
J. Schwarz, and W. F. Weeks.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 499-531, 1977. 18 fig, 2 tab, 109 ref.

Descriptors: *Sea ice, *Mechanical properties, *Reviews, *Ice, Engineering, Strength, Structures, Offshore platforms, Salinity, Temperature, Elasticity(Mechanical), Poisson ratio, Friction, Adhesion, Tensile strength, Compressive strength, Shear strength, Thermal properties, Ice structures, Flexural strength, Electromagnetic properties.

As the continental shelves of the Arctic become important as source areas for the oil and minerals required by human society, sea ice becomes an increasing challenge to engineers. This paper started with a consideration of the different fields of engineering which require information on sea ice with the tasks ranging from the design of ice-breaking ships to Arctic drilling platforms and man-made ice islands. Then the structure of sea ice was described as it influences the observed variations in physical properties. Next, the status of knowledge of the physical properties important to engineering was reviewed. Properties discussed included mechanical properties (compressive, tensile, shear and flexural strengths; dynamic and static elastic moduli; Poisson's ratio), friction and adhesion, thermal properties (specific and latent heats, thermal conductivity and diffusivity, density) and finally electromagnetic properties (dielectric permittivity and loss, resistivity). Particular attention was given to parameters such as temperature, strain-rate, brine volume, and loading direction as they affect property variations. Gaps, contradictions in the data, and inadequacies in testing techniques were pointed out. Suggestions were made for future research, especially for more basic laboratory studies designed to provide the data base upon which further theoretical developments as well as field studies can be built. (See also W78-09603) (Humphreys-ISWS)
W78-09640

STUDIES OF THE MOVEMENT OF COASTAL SEA ICE NEAR PRUDHOE BAY, ALASKA, U.S.A.,
Cold Regions Research and Engineering Lab., Hanover, NH.
W. F. Weeks, A. Kovacs, S. J. Mock, W. D. Tucker, and W. D. Hibler.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 533-546, 1977. 8 fig, 2 tab, 5 ref.

Descriptors: *Sea ice, *Alaska, *Coasts, *Tracking techniques, Movement, On-site investigations, Measurements, Testing procedures, Equipment, On-site tests, Air temperature, Wind velocity, Radar, Analysis, Analytical techniques, *Prudhoe Bay(Alaska).

During March-May 1976, a combination of laser and radar ranging systems was used to study the motion of both the fast ice and the pack ice near Narwhal and Cross Islands, two barrie islands located 16 and 21 km offshore in the vicinity of Prudhoe Bay, Alaska. Laser measurements of targets on the fast ice near Narwhal Island indicated small net displacements of approximately 1 m over the period of study (71 d), with short-term displacements of up to 40 cm occurring over 3 d periods. The main motion was outward normal to the coast and was believed to be the result of thermal expansion of the ice. The radar records of fast-ice sites farther offshore showed a systematic increase in the standard deviation of the displacements as measured parallel to the coast, reaching a value of + or -6.6 m at 31 km. The farthest fast-ice sites show short-term displacements of up to 12 m. There are also trends in the records that are believed to be the result of the general warming of the fast ice with time. Radar targets located on the pack ice showed large short-term displacements (up to 2.7 km) but negligible net ice drift along the coast. There was no significant correlation between the movement of the pack and the local wind, suggesting that coastal ice prediction models can succeed only if handled as part of a regional model which incorporates stress transfer through the pack. The apparent fast-ice-pack-ice boundary in the study area was located in 30-35 m of water. (See also W78-09603) (Humphreys-ISWS)
W78-09641

HORIZONTAL MOVEMENT OF FAST ICE IN THE NORTH WATER AREA,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Geographisches Inst.
H. Ito, and F. Muller.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 547-554, 1977. 6 fig, 4 ref.

Descriptors: *Sea ice, *Surveys, *Cold regions, *Arctic, Ice, Movement, Measurement, On-site investigations, Methodology, Analysis, Evaluation, Sea water, *Ellesmere Island, *Greenland, Polynya.

The understanding of the horizontal movement of fast ice is important for applied sea-ice mechanics. A case study, carried out in conjunction with a polynya known as North Water, was presented. The displacements of the fast-ice arches which separate the polynya from the surrounding ice-covered sea, were measured and found to be small. Therefore, it is, confirmed that these arches prevent the influx of large quantities of sea ice into the polynya. The rate of displacement is determined by wind, current, and boundary conditions. Two zones with different stress situations producing different displacements were noticed. Large structural features, e.g., the ridged zone, may have to be considered as the boundary condition for the analysis instead of the coast line. Once cracks appear in the area, the displacement may contain both rigid-body movement and deformation. (See also W78-09603) (Humphreys-ISWS)
W78-09642

THE FLEXURAL MOTIONS OF A FLOATING ICE SHEET INDUCED BY MOVING VEHICLES,
Saskatchewan Research Council, Saskatoon.
D. Eyre.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 555-570, 1977. 10 fig, 9 ref.

Descriptors: *Lake ice, *Lakes, *Trafficability, *Canada, Iced lakes, On-site tests, Floating, Deflection, Instrumentation, Freshwater, Testing procedure, Fluctuations, Theoretical analysis, Analytical techniques, Frequency, Movement, Velocity, Waves(Water), Transportation, Acoustics, Sound waves, Rupturing, Analysis, Foreign research, Bridges, *Lake Diefanbaker(Canada), Ice crossing, Flexural motions, Vehicle speed, Ice waves.

An extensive series of tests were conducted on a floating ice sheet on a deep, freshwater lake. A variety of vehicles were driven along an instrumented test track at a wide range of speeds, producing several characteristic patterns of ice and water response that were recorded and analyzed in detail. Tests were repeated at different stages of ice growth to accommodate changes in physical conditions. The use of a vibration transducer and a new type of deflectometer has permitted the study of many primary and secondary effects. As vehicle speed is increased, the ice and water pass through four characteristic modes of response, culminating in a wave effect at the higher speeds. It has been shown that the ice and water waves travel consistently at the speed of the vehicle. This factor was used to modify a simple ice-wave theory, which then predicts a linear variation of wave frequency with vehicle speed that can be expressed in a universal form for deep-water conditions. The experimental measurements of frequency confirmed this universal variation. The observed secondary effects include air-coupled flexural oscillations, hydrodynamic fluctuations, and systematic variations in ice fracture intensity with vehicle speed. This last effect leads to the proposition of a new criterion of vehicle safety. (See also W78-09603) (Humphreys-ISWS)
W78-09643

EXPERIENCE WITH GLACIER CALVING AND AIR-BUBBLING IN HIGH ALPINE WATER RESERVOIRS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
W. Haeberli.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposiunm on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 10, No. 81, p 589-594, 1977. 2 fig, 18 ref.

Descriptors: *Lakes, *Glaciology, *Alpine, *Ice, Water resources, Waves(Water), Glaciers, Ice breakup, On-site investigations, Ice cover, Flood protection, Hydroelectric plants, Water temperature, Foreign research, *Switzerland, Glacier calving.

Some observations which pertain to the interaction of ice and lake water in a high alpine environment and which were made in recent years in connection with hydroelectric projects and flood protection work were presented. In 1966, when the thin flat snout of Griesgletscher (Walliser Alpen) became submerged during the first filling of a newly constructed reservoir, waves of only very small amplitude were generated by the calving of about 150,000 cu m of ice because most of the energy was dissipated by local turbulence. Far more spectacular waves have been experienced near steep ice cliffs in connection with work for flood control. For the design of an air bubbler system, air and water temperatures were measured in winter 1974-75 at Grimselsee, one of the largest reservoirs in the Bernese Alps. These measurements showed that the warmest water at the bottom of the lake was drained away during winter for the production of electricity. A strong temperature inversion forms in the air above the water behind the dam, as the lake level is lowered by several tens of metres. (See also W78-09603) (Humphreys-ISWS)
W78-09644

SHORT-TERM FORECASTING OF WATER RUN-OFF FROM SNOW AND ICE,
Cold Regions Research and Engineering Lab., Hanover, NH.
S. C. Colbeck.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 571-588, 1977. 6 fig, 61 ref. 4A161102 AT24/A1/001,1F161102B52A/02/009.

Descriptors: *Runoff forecasting, *Snow, *Ice, *Reviews, *Hydrologic aspects, Forecasting, Glaciers, Snow cover, Runoff, Hydrology, Hydrographs, Water sources, Hydrologic systems, Flow, Melt water, Mathematical models, Stochastic processes, Metamorphism, Wet snow.

Accurate forecasting of water run-off from snow covers and glaciers is increasingly important because of the increasing competition for scarce water resources. The trend toward conceptual computerized models of hydrologic systems requires extensive knowledge of the physical aspects of those systems. Unlike river and stream networks, the hydrological characteristics of snow covers and glaciers are highly variable with time and cannot be easily defined. After reviewing the physical aspects of water flow through snow covers and glaciers, it was concluded that snow covers and glaciers are predictable hydrological systems once the melt metamorphism of the snow is complete and the englacial conduits have been established. However, much additional information about snow and ice masses must be generated before general forecasting techniques can be established for all situations. (See also W78-09603) (Humphreys-ISWS)
W78-09645

MOVEMENT OF A LARGE ICE MASS BEFORE BREAKING OFF,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydeologie und Glaziologie.
A. Iken.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambride (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 595-605, 1977. 7 fig, 13 ref.

Descriptors: *Glaciers, *Lakes, *Ice breakup, *Failure(Mechanics), Glaciology, Ice, Rupturing, Flow, Model studies, Mathematical models, Theoretical analysis, Analytical techniques, Stress analysis, Cracks, On-site investigations, Movement, Foreign research, *Switzerland, Glacier calving.

In a two-dimensional model of an ice mass breaking off from a cliff, stresses and velocities were calculated numerically according to Glen's flow law. A tensile crack opens in the zone of maximum tensile principal stress sigma and propagates to a depth where sigma is zero. Ice flow then produces an overhang of the partly detached ice mass. Consequently, the stress sigma below the tip of the crack becomes tensile again and the crack propagates for another small distance. This process goes on until the center of gravity of the detaching ice mass has moved past the supporting edge of the bedrock. (See also W78-09603) (Humphreys-ISWS)
W78-09646

THE DISPOSAL OF RADIOACTIVE WASTE IN ICE SHEETS,
For primary bibliographic entry see Field 5E.
W78-09647

FRAZIL-ICE NUCLEATION BY MASS-EXCHANGE PROCESSES AT THE AIR-WATER INTERFACE,
Alaska Univ., College. Geophysical Inst.
T. E. Osterkamp.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Jounral of Glaciology, Vol. 19, No. 81, p 619-625, 1977. 34 ref. NSF GA-30748.

Descriptors: *Frazil ice, *Nucleation, *Reviews, Boundary processes, Mass transfer, Ice, Air-water interfaces, Streams, Rivers, Open channels, Slush, Freezing, Mass exchange.

The physical requirements for proposed frazil-ice nucleation theories were reviewed in the light of recent observations on frazil-ice formation. It was concluded that spontaneous heterogeneous nucleation in a thin supercooled surface layer of water is not a viable mechanism for frazil-ice nucleation. Efforts to observe crystal multiplication by border ice have not been successful. The mass-exchange mechanism proposed by Osterkamp and others (1974) was generalized to include splashing, wind spray, bubble bursting, evaporation, and material that originates at a distance from the stream (e.g., snow, frost, ice particles, cold organic material, and cold soil particles). It was shown that these mass-exchange processes can account for frazil-ice nucleation under a wide range of physical and meteorological conditions. It was suggested that secondary nucleation may be responsible for large frazil-ice concentrations in streams and rives. (See also W78-09603) (Humphrey-ISWS)
W78-09648

SUB-SEA PERMAFROST REGIME AT PRUDHOE BAY, ALASKA, U.S.A.,
Alaska Univ., College. Geophysical Inst.
T. E. Osterkamp, and W. D. Harrison.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 627-637, 1977. 7 fig, 3 tab, 14 ref.

Descriptors: *Permafrost, *Alaska, *Coasts, *Subsurface investigations, Drilling, Boreholes, Lithologic logs, Sampling, Moisture content, On-site investigations, Salts, Exploration, Conductivity, Electrical conductance, Temperature, Chemical analysis, On-site data collections, *Prudhoe Bay(Alaska).

A sub-sea permafrost drilling program was conducted near Prudhoe Bay, Alaska. Sub-sea permafrost was found at all offshore drill sites and was characterized as being ice bonded or unbonded. The unbonded sub-sea permafrost occurred in a thin layer at the sea bed; the near-shore thickness of this layer appears to be controlled by the bathymetry. The mean annual sea-bed temperatures were about -3.4C at 203 m offshore -1.1C at 481 m offshore and -0.7C at 3,370 m offshore. The thermal diffusivity was about 21 sq m/a for unbonded sandy gravel with silt. The sub-sea permafrost soils were sandy gravel with some silt overlain by a thin layer of silty sand which increased in thickness from a few meters near shore to about 14 m at 3,370 m offshore. A few small ice lenses were found in a hole 195 m offshore, but no massive ice was observed. Pore-water salt concentrations at the sea bed were 3-4 times that of normal seawater where ice was frozen to the sea bed and 1-2 times that of normal seawater otherwise. Preliminary laboratory experiments showed that the saturated hydraulic conductivity of the unbonded sub-sea permafrost was about 0.000001 to 10 to the minus 7th power m/s. The permeability of the subterranean permafrost was zero. (See also W78-09603) (Humphreys-ISWS)
W78-09649

TOURISM, SUMMER SKI-ING, HYDROELECTRICITY AND PROTECTION OF THE PUBLIC IN THE FRENCH ALPINE GLACIAL AREA: THE DEVELOPMENT OF AN APPLIED GLACIOLOGY,
Grenoble-1 Univ. (France). Inst. de Geographie Alpine.
R. Vivian.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 639-642, 1977.

Descriptors: *Glaciology, *Alpine, *Resources development, Water resources, Glaciers, Recreation, Skiing, Ice, Water supply, Drainage, Foreign countries, Structures, *France, Subglacial drainage.

A historical review is presented of applied glaciology problems in the French Alps since the last century (cog railway to the top of Mont Blanc, construction of mountain huts, preventive emptying of subglacial water pockets under Tete Rousse glacier, etc.). The second part was devoted to a brief review of modern projects concerned with construction of cableway stations or cableway pylons on or near the glaciers, with the preparation of ski runs on glaciers during summer, and with the different problems met during works to capture subglacial torrents for the needs of hydroelectric companies. (See also W78-09603) (Humphreys-ISWS)
W78-09650

2D. Evaporation and Transpiration

EVAPORATION AND RADIATION MEASUREMENTS AT SALTON SEA, CALIFORNIA,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
A. M. Sturrock, Jr.
Available from Supt. of Documents, GPO, Washington, DC 20402; Price, $1.30. Water-Supply Paper 2053, 1978. 26 p, 4 fig, 8 tab, 11 ref.

Descriptors: *Saline lakes, *Evaporation, *Solar radiation, *Energy budget, *Mass transfer, Hydrologic budget, Measurement, Analytical techniques, California, *Salton Sea(Calif).

Evaporation from Salton Sea, Calif. was computed for a 539-day period between July 14, 1967, and January 2, 1969, by use of energy-budget, mass-transfer, and water-budget methods. The total evaporation computed by the three methods agreed within 5 percent. For computing evaporation by the mass-transfer method, vapor pressure measured at raft stations on the sea was considered to be more representative of the conditions over the sea than vapor pressure measured at land stations. The values of heat transfer to and from the bed were used in energy-budget computations. The inclusion of these heat transfer values improved the correlation of evaporation computed by the energy-budget and water-budget methods. Monthly evaporation computed by the energy-budget method for 1968 showed that the Salton Sea exhibited a double-wave evaporation similar to that of oceans in the same latitude. The net incoming radiation was measured at three stations around the Salton Sea. The areal variaton was less than 1 percent on an annual basis and the largest weekly variation was less than 6 percent. (Woodard-USGS)
W78-09322

A MODEL FOR THE WATER REGIME OF CONIFEROUS FOREST AND GRASSLAND,
Swiss Forestry Research Inst., Birmensdorf (Switzerland).
H. Item.
Journal of Hydrology, Vol. 37, No. 3/4, p 323-332, May 1978. 7 fig, 1 tab, 8 ref.

Descriptors: *Water balance, *Model studies, *On-site tests, *Coniferous forests, *Grasslands, Hydrologic cycle, *Evaporanspiration, Soil water, Moisture content, Saturated soils, Transpiration, Vegetation, Forests, Mathematical models, Foreign research, *Switzerland.

In a previous investigation a functional model for the interrelations between evapotranspiration, weather conditions, and soil water content in the root zone was established and adapted to a deciduous forest. Based on results of field plot experiments by Germann, this model was adapted to a coniferous forest and a meadow. Estimation of the free model parameters for each plot leads to a

satisfactory approach to measured values of water consumption. The potential evapotranspiration of vegetation (on water saturated soil) amounts to about 1.5 times the evaporation of an open water surface under identical meteorological conditions. In both plots, transpiration reacts very sensitively to desiccation of the soil. On warm and dry summer days there is a remarkable reduction of transpiration as soon as average soil suctions in the root zone exceed previous investigation by the present author. Application of the model is still limited at the moment. It may be used only for areas where parameters are expected to be the same as for a site already investigated or where enough field measurements have been made to permit an estimation of the free parameters. (Humphreys-ISWS)
W78-09353

CLASS A PAN EVAPORATION AS AFFECTED BY SHELTER, AND A DAILY PREDICTION EQUATION,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
C. L. Hanson, and F. Rauzi.
Agricultural Meteorology, Vol. 18, p 27-35, 1977. 4 tab, 2 fig, 21 ref.

Descriptors: *Evaporation, *Evaporation pans, *Hydrologic data, *Hydrologic cycle, *Radiation, Shelterbelt, Great Plains, Air temperature, Wind velocity, Arid lands.

Evaporation, particularly in arid and semiarid lands, is an important factor in the hydrologic cycle and in ecohydrologic models. Class A pan evaporation is the standard method of evaporation measurement. Pan data at tree shelterbelt sites on the Northern Great Plains indicate that evaporation from pans protected from the wind was about 14 percent less than from unprotected pans. An empirical equation was developed for estimating daily Class A pan evaporation from either protected or unprotected areas. The equation is: $E=R(-0.06 + 0.036T) + 0.016W$, where E= daily Class A pan evaporation (mm/day), R = daily incident short-wave radiation in evaporation units, T = mean daily temperature (degree C), and W = total daily wind run (Km/day). It is recommended that the location of all published evaporation pan data should be investigated before using it as an index. (Popkin-Arizona)
W78-09716

WATER LOSS FROM CUT HERBAGE IN THE WINDROW AND FROM ISOLATED LEAVES AND STEMS,
Reading Univ. (England). Dept. of Agricultural Botany.
D. R. Firth, and Y. Leshem.
Agricultural Meteorology, Vol. 17, p 261-269, 1976. 4 fig, 1 tab, 6 ref.

Descriptors: *Water loss, *Leaves, *Stemflow, *Evapotranspiration, *Consumptive use, Model studies, Computer models, Flow resistance, Vetch, Grasses, Arid lands, Cut herbage, Water potential, Israel.

Pathways of water loss from cut grass are reviewed from a drying perspective, and related to atmospheric water potential. The loss of water from well ventilated single leaves and stems in laboratory tests declined exponentially, consistent with a simple biophysical and physiological model. Loss of water from vetch in the swath (or mowed strips) in an Israeli field was measured at three depths and two treatments, and was found to be more complicated. This indicates that the swath is nothing like a single uniform compartment. Total water loss was compared with pan evaporation in the field vetch experiment. Treatments which produced chopped and lacerated crop pieces, and mowed crops yielded similar water loss to pan evaporation relations. In both cases, water loss was initially somewhat greater than pan evaporation, though decreasing over time. The theoretical framework for water loss from cut herbage differs from that from a standing crop in two significant ways: the leaf water potential is far from that of a free water surface; and, the water lost is all stored water, which has a capacitance effect in the cleared swath. This study has implications to facilitate forage drying for high quality hay in barn or field conditions. Figures show drying curves, effects of segment length on drying, water loss of chopped and cut vetch, in relation to pan evaporation, and water loss in field vetch at three depths. Drying constants of treated isolated leaves and stems are tabulated. (Popkin-Arizona)
W78-09720

A MONTE-CARLO MODEL FOR THE RADIATION FIELD IN PLANT CANOPIES,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 2I.
W78-09721

IMPROVING WATER USE IN SPRINKLING FOR BLOOM DELAY,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-09778

2E. Streamflow and Runoff

FLOOD PROFILES OF THE ALAFIA RIVER, WEST-CENTRAL FLORIDA, COMPUTED BY STEP-BACKWATER METHOD,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-09308

ESTIMATING RECHARGE FOR EPHEMERAL STREAMS IN ARID REGIONS: A CASE STUDY AT KAIROUAN, TUNISIA,
Ecole Nationale Superieure Des Mines de Paris, Fontainebleau (France). Center for Geological Information.
For primary bibliographic entry see Field 2F.
W78-09344

SENSITIVITY OF OPTIMIZED PARAMETERS IN WATERSHED MODELS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-09345

UNBIASED PLOTTING POSITIONS-A REVIEW,
Ireland Office of Public Works, Dublin.
For primary bibliographic entry see Field 7C.
W78-09348

THE IMPACT OF SEASONAL FLOW CHARACTERISTICS AND DEMAND PATTERNS ON REQUIRED RESERVOIR STORAGE,
Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-09350

A MOISTURE-ACCOUNTING WATERSHED MODEL FOR SINGLE-STORM EVENTS BASED ON TIME-AREA CONCEPT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2A.
W78-09351

HYDROLOGIC EFFECTS OF THE TONKAWA CREEK FLOOD ABATEMENT PROGRAM,
Agricultural Research Service, Chickasha, OK. Southern Great Plains Water Research Center.
For primary bibliographic entry see Field 4A.
W78-09461

HYDROLOGIC DATA FOR LITTLE ELM CREEK, TRINITY RIVER BASIN, TEXAS, 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09736

TECHNIQUE FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
E. M. Miller.
Water-Resources Investigations 78-5, January 1978. 83 p, 2 fig, 2 plates, 5 tab, 23 ref.

Descriptors: *Floods, *Frequency analysis, *Analytical techniques, *Virginia, *Streams, Gaging stations, Peak discharge, Flow rates, Regression analysis, Drainage area, Channel morphology, Topography, Geomorphology, Flood recurrence interval, *Basin characteristics.

A technique is presented for estimating the magnitude and frequency of floods in Virginia. For 299 gaged sites, the magnitudes of floods having recurrence intervals of 2 to 100 years are provided in tables. For ungaged sites, regression relations are presented that allow the estimation of flood magnitudes based on upstream drainage area, average main-channel slope, and a factor of account for regional variations in basin terrain characteristics that would bias the results. A summary of maximum known peak discharges are presented for 363 sites together with the relationship of drainage-area size to flow in cubic feet per second per square mile. Also included is a table of 10 basin characteristics for 403 gaging stations. (Woodard-USGS)
W78-09737

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09751

2F. Groundwater

STRATIGRAPHIC AND HYDROGEOLOGIC FRAMEWORK OF PART OF THE COASTAL PLAIN OF TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
E. T. Baker, Jr.
Open-file report 77-712, March 1978. 32 p, 15 fig, 1 tab, 34 ref.

Descriptors: *Groundwater availability, *Water quality, *Aquifer characteristics, *Texas, *Gulf Coastal Plain, *Stratigraphy, Hydrogeology, Geologic mapping, Catahoula Sandstone, Jasper aquifer, Burkeville confining layer, Evangeline aquifer, Chicot aquifer.

The subsurface delineation of hydrogeologic units of Miocene and younger age and stratigraphic units of Paleocene to Holocene age establishes and interrelationship of these units statewide across much of the Coastal Plain of Texas. The 11 dip sections and 1 strike section, which extend from the land surface to 7,600 feet below sea level, provide continuity of correlation from the outcrop to the relatively deep subsurface. Sand containing water with less than 3,000 milligrams per liter of dissolved solids, which is shown on the sections,

serves as an index of water availability of this quality. (WoodardrUSGS)
W78-09310

PREDICTING BASE FLOW USING HYDROGEOLOGIC PARAMETERS,
Agricultural Research Service, Chickasha, OK. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 4D.
W78-09334

NON-STEADY SPHERICAL FLOW TO A CAVITY WELL IN AN INFINITE NON-LEAKY AQUIFER,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
R. S. Kanwar, and H. S. Chauhan.
Water Resources Bulletin, Vol. 14, No. 3, p 605-612, June 1978. 1 fig, 10 ref.

Descriptors: *Groundwater, *Groundwater movement, *Water wells, *Model studies, Mathematical models, Equations, Aquifers, Wells, Drawdown, Hydraulic conductivity, Confined water, Unsteady flow, Pumping, Hydraulics, Hydrology, Cavity wells.

The non-steady drawdown distribution near a cavity well discharging from an infinite non-leaky artesian aquifer was presented. The variation of drawdown with time and distance caused by a cavity well of constant discharge in a confined aquifer of uniform thickness and uniform permeability was obtained. The solution was expressed in a series form which converged rapidly so that only two terms of the series are needed to obtain an accuracy of more than 95%. A simplified approach was suggested to find the aquifer characteristics. (Sims-ISWS)
W78-09335

SOLUTIONS OF BOUSSINESQ'S EQUATION FOR SEEPAGE FLOW,
Argonne National Lab., IL. Div. of Environmental Impact Studies.
A. B. Gureghian.
Water Resources Research, Vol. 14, No. 2, p 231-236, April 1978. 6 fig, 2 tab, 19 ref.

Descriptors: *Seepage, *Equations, *Groundwater, Seepage control, Ditches, Finite element analysis, Hydrology, Soils, Channels, Mathematical studies, *Boussinesq's equation, Hele-Shaw analog, Finite difference method.

Solutions of Boussinesq's equation for groundwater seepage from a ditch with vertical sides extending in depth to a horizontal impermeable floor were obtained numerically by using the finite difference and finite element methods for the case when the seepage rate from the ditch into the soil is constant with time. Both solutions agreed satisfactorily with experimental results from a Hele-Shaw analog. It was found, however, that the execution time in the computer for the finite difference method was an order shorter than that for the finite element method, and thus the finite difference method is to be preferred. The finite difference method also was used to obtain a numerical solution for the reverse situation when water seeps out of the soil into the ditch at a constant rate. (Lee-ISWS)
W78-09343

ESTIMATING RECHARGE FOR EPHEMERAL STREAMS IN ARID REGIONS: A CASE STUDY AT KAIROUAN, TUNISIA,
Ecole Nationale Superieure Des Mines de Paris, Fontainebleau (France). Center for Geological Information.
M. Besbes, J. P. Delhomme, and G. De Marsily.
Water Resources Research, Vol. 14, No. 2, p 281-290, April 1978. 9 fig, 3 tab, 14 ref.

Descriptors: *Africa, *Recharge, *Ephemeral streams, *Arid lands, Aquifers, Runoff, Floods, Hydrology, Estimating, Foreign countries, Foreign research, Infiltration, *Tunisia, *Kairouan(Tunisia), Runoff-recharge relationship.

On the assumption that the behavior of an aquifer is linear, it was shown that recharge from an ephemeral streanm can be computed by deconvolution of the fluctuations of the piezometers in the vicinity of the stream. First, the 'impulse response' of the piezometer has to be determined, either from an exceptional flood event or with the help of a digital model of the aquifer. Application of this method to the plain of Kairouan (Tunisia) proved to give estimates of rechare during a 5-year period within the same order of magnitude as direct volume estimates obtained by an automatic contouring technique of the recovery of the aquifer after infiltration (kriging). An empirical runoff-recharge relationship then was determined to extend the estimation of recharge to a 23-year period. (Lee-ISWS)
W78-09344

HYDRAULIC CONDUCTIVITY OF UNSATURATED POROUS MEDIA: GENERALIZED MACROSCOPIC APPROACH,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2G.
W78-09346

CONCENTRATION-DEPENDENT DIFFUSION APPLIED TO GROUNDWATER CONTAMINATION PROBLEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-09354

FLOW THROUGH UNCONFINED AQUIFERS CONTAINING INTERCEPTOR DRAINS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
For primary bibliographic entry see Field 4B.
W78-09355

UNSTEADY FLOW TO A PUMPED WELL IN AN UNCONFINED FISSURED AQUIFER,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
N. S. Boulton, and T. D. Streltsova-Adams.
Journal of Hydrology, Vol. 37, No. 3/4, p 349-363, May 1978. 7 fig, 4 ref.

Descriptors: *Aquifers, *Drawdown, *Mathematical models, *Pumping, Groundwater movement, Unsteady flow, Fissures(Geologic), Fracture permeability, Flow, Water table aquifers, Model studies, Wells, Analytical techniques, Porous media, Mathematical studies, Theoretical analysis, Equations, Fissured aquifer.

A new equation was derived for the fissure drawdown in a fractured aquifer under water table conditions. The fractured aquifer was assumed to consist of block-and-fissure units. The compressibility of both the porous blocks and the adjoining fissures was taken into account. The differential equation for the flow to a well in confined and unconfined fissured formation was derived. The abstraction well, which is pumped at a constant rate, is of full penetration. Type curves for the fissure drawdown were computed and plotted in double logarithmic coordinates, has two inflection points: the first is associated with an apparent delayed elastic deformation of fractured media, and the second corresponds to the quasi-steady flow conditions of an unconfined aquifer. Two exponential integral curves (Theis curves) approximate the initial S-shaped form segment of the time-drawdown curve. The first curve is based on the storage coefficient for the porous block. The final segment of the time-drawdown curve is approaching the exponential integral based on the specific yield for water-table conditions. A critical discussion of the theory for the flow of groundwater in fissured rocks was given. (Humphreys-ISWS)
W78-09356

NUMERICAL STUDY OF INTERACTIONS BETWEEN BOUNDARY CONDITIONS AND SOLUTIONS OF THE LINEAR DISPERSION EQUATION (ETUDE NUMERIQUE DE L'INFLUENCE DES CONDITIONS AUX LIMITES SUR LES SOLUTIONS DE L'EQUATION DE LA DISPERSION POUR UN ECOULEMENT UNIDIMENSIONNEL),
Montpellier-2 Univ. (France). Lab. d'Hydrologie Mathematique.
F. Brissaud, F. Lambert, and P. Couchat.
Journal of Hydrology, Vol. 37, No. 3/4, p 365-377, May 1978. 7 fig, 8 ref.

Descriptors: *Porous media, *Flow, *Mathematical models, *Boundary processes, *Dispersion, Earth-water interfaces, Model studies, Analytical techniques, Analysis, Mathematical studies, Numerical analysis, Equations, Peclet number.

At low Peclet's numbers, solutions of the dispersion equation for a linear flow in porous columns are affected greatly by the boundary condition at the entrance of the column. Including an entrance chamber which precedes the porous bed in mathematical models yields a more realistic simulation of the physical processes involved. Hence, the concentration distributions are also depending upon the ratio of concentration gradients on both sides of the entrance section of the bed. Mathematical simulations showed that the standard flux-type boundary condition leads to better predictions as the porous medium is more dispersive and the entrance chamber shorter. (Humphreys-ISWS)
W78-09357

NONSTEADY DRAIN FUNCTION FOR PARALLEL FLOW IN LEAKY AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vandenberg.
Journal of Hydrology, Vol 37, No 3/4, p 379-385, May 1978. 1 fig, 5 ref.

Descriptors: *Aquifers, *Drainage, *Mathematical models, *Leakage, Unsteady flow, Steady flow, Canal seepage, Analytical techniques, Analysis, Model studies, Mathematical studies, Theoretical analysis, Equations, Drawdown, Excavation, Porous media, *Leaky aquifers.

Nonsteady state equations for the drainage of a leaky aquifer to a linear excavation were derived, and their relationship to a previously tabulated function, also occuring in the theory of leaky aquifers, was established. It was shown that derived expressions for hydraulic potential and flow contain the expressions for the steady-state, leaky case and the nonsteady, nonleaky case published previously by Edelman. (Humphreys-ISWS)
W78-09358

TRANSIENT WATER INFILTRATION WITH CONSTANT SURFACE FLUX,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemical Engineering.
S. H. Lin.
Journal of Hydrology, Vol. 37, No. 3/4, p 387-392, May 1978. 2 fig, 11 ref.

Descriptors: *Porous media, *Infiltration, *Unsaturated flow, *Mathematical models, Analytical techniques, Groundwater recharge, Flow, Numerical analysis, Model studies, Diffusion, Analysis, Moisture content, Profiles, Rehovot sand.

The water infiltration in vertical unsaturated porous media with constant water flux at the surface was investigated. The orthogonal collocation method was employed for solving the governing nonlinear partial differential equation. The numerical solutions for water infiltration in the Rehovot sand are in good agreement with the previous ones obtained by the finite-difference method. However, because of its high accuracy, computational stability, and easy application, the orthogonal collocation does provide a good alternative for solving the nonlinear water infiltration problems. (Humphreys-ISWS)
W78-09359

CALIBRATION OF A MATHEMATICAL MODEL OF THE ANTELOPE VALLEY GROUND-WATER BASIN, CALIFORNIA,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
T. J. Durbin.
Available from Supt. of Documents, GPO, Washington, DC 20402; price $7.25. Water-Supply Paper 2046, 1978. 51 p, 17 fig, 13 plates, 2 tab, 33 ref.

Descriptors: *Aquifer characteristics, *Model studies, *Mathematical models, *Groundwater basins, *California, Data collections, Finite element analysis, Analytical techniques, Hydrogeology, Groundwater movement, Water wells, Pumping, Drawdown, Groundwater recharge, Water level fluctuations, Potentiometric level, Transmissivity, Storage coefficient, Maps, *Antelope Valley(Calif), Los Angeles County, Kern County.

Antelope Valley is a closed topographic basin in the western part of the Mojave Desert in southern California. A ground-water basin with a surface area of 900 square miles and a thickness of as much as 5,000 feet underlies the valley floor. The ground-water system consists of two alluvial aquifers separated by fine-grained lacustrine deposits. During the last 50 years, pumpage of ground water in excess of natural recharge has resulted in the steady decline of the ground-water level in the basin. The change in water level has been as much as 200 feet. By 1972 the cumulative overdraft was about 9 million acre-feet. To help evaluate the possible impact of various water management alternatives, a mathematical model of the ground-water basin was constructed. The model was calibrated by comparing the computed hydraulic heads of the corresponding prototype water levels for both steady-state and transient-state conditions. For the steady-state model the area-weighted median deviation of the computed hydraulic heads from the prototype water levels was 12 feet. For the transient-state model the median deviation was 25 feet. The mathematical model is based on the governing equations of ground-water flow. The solution to the equations was approximated numerically by the Galerkin-finite element method. Thirteen maps depict aquifer characteristics in Antelope Valley. (Woodard-USGS)
W78-09741

GROUND-WATER BASIC DATA FOR DICKEY AND LA MOURE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09743

SUMMARY OF WATER RESOURCES FOR THE CAMPO, CUYAPAIPE, LA POSTA, AND MANZANITA INDIAN RESERVATIONS AND VICINITY, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09746

GEOCHEMICAL AND HYDROLOGIC DATA FOR WELLS AND SPRINGS IN THERMAL-SPRING AREA OF THE APPALACHIANS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09754

HYDROGEOLOGY OF THE OBSERVATION WELL SITE AT THE U.S. GEOLOGICAL SURVEY NATIONAL CENTER, RESTON, VIRGINIA,
Geological Survey, Reston, VA. Water Resources Div.
J. D. Larson.
Open-file report 78-144, 1978. 35 p, 9 fig, 4 tab, 8 ref. append.

Descriptors: *Observation wells, *Virginia, *Aquifer characteristics, *Hydrogeology, *Transmissivity, Water quality, Water yield, Lithologic logs, U.S. Geological Survey National Center, *Reston(Va), Triassic rocks.

The U.S. Geological Survey's National Center is on a 105-acre tract straddling rocks of two distinct types. These are pelitic schists of late Precambrian or early Paleozoic age; and sandstone, shale, siltstone, conglomerate, and diabase of Triassic age. Two observation wells and two core holes were drilled on the part of the property underlain by Triassic sedimentary rocks. The wells were drilled to monitor water levels, for equipment testing and to determine the hydraulic properties of the Triassic rocks. Geophysical logs were run and lithologic logs prepared from drill cuttings and cores. An aquifer test was conducted and indicated that the transmissivity is about 40 sq ft/day. Flowmeter surveys showed that the water comes from two thin zones, presumably bedding plane partings. The flowmeter surveys, core samples, and geophysical logs suggest that the Triassic sandstone is a fractured-rock aquifer. A water sample taken at the close of the aquifer test was low in dissolved solids, soft, and of excellent quality. (Woodard-USGS)
W78-09757

2G. Water In Soils

EXCHANGEABLE SODIUM AND SOIL WATER BEHAVIOR UNDER FIELD CONDITIONS,
Central Soil Salinity Research Inst., Karnal (India).
C. L. Acharya, and I. P. Abrol.
Soil Science, Vol. 125, No. 5, p 310-319, May 1978. 9 fig, 1 tab, 15 ref.

Descriptors: *Sodium, *Soil management, *Alkaline soils, *Irrigation water, *Soil chemical properties, Infiltration, Permeability, Soil analysis, Soil chemistry, Soil physical properties, Soil analysis, Soil water, Leaching, Land reclamation, Irrigation water, Irrigation effects, *Exchangeable sodium, *Sodic soils, *India.

The effect of exchangeable sodium on soil water behavior under field conditions was investigated in five differentially gypsum treated plots of a highly sodic soil. The soil is representative of the sodic soils of the Indo-gangetic plains in northern India. The soil texture is sandy loam in the surface 0-15 cm, and the clay fraction is dominantly illitic. Exchangeable sodium percentage (ESP) varied from 4 to 38 in 0-15 cm, and 28 to 88 in the 15-30-cm layer. Basic intake rate of the soil increased from 8.7 mm per day in soil of highest ESP to about 25 mm per day in soil of lowest ESP. Higher basic intake rate and increased retention at low suctions resulted in greater profile water storage. Soil water diffusivity values (D) calculated from the water distribution following evaporation showed that at a water content of 0.22 cu cm/cu while D (sq cm/day) decreased from 34 to 26 when ESP increased from 4 to 11, the D value sharply decreased to 8 with a further rise in ESP to 16. Improvement in transmission characteristics resulting from lowered ESP was reflected in the drying pattern of soils. The first stage of drying was delayed in low ESP treatments compared to the high ESP treatment because of regular movement of water from lower layers to the surface to meet the evaporation demand. The effect of treatments on water movement was noticeable to a depth of 90 cm studies in these experiments, although the improvement in layers below 15 cm was very small in treatments receiving lower doses of gypsum. (Henley-ISWS)
W78-09329

SOLUTIONS OF BOUSSINESQ'S EQUATION FOR SEEPAGE FLOW,
Argonne National Lab., IL. Div. of Environmental Impact Studies.
For primary bibliographic entry see Field 2F.
W78-09343

HYDRAULIC CONDUCTIVITY OF UNSATURATED POROUS MEDIA: GENERALIZED MACROSCOPIC APPROACH,
Colorado State Univ., Fort Collins. Engineering Research Center.
Y. Mualem.
Water Resources Research, Vol. 14, No. 2, p 325-334, April 1978. 2 fig, 5 tab, 41 ref. NSF ENG-7611542.

Descriptors: *Hydraulic conductivity, *Porous media, *Unsaturated flow, *Mathematical models, Equations, Theoretical analysis, Soil texture, Statistical models, Porosity, Specific yield, Curves, Soils, Permeability, Saturation, Wetting, Wilting point, Effective saturation, Unsaturated soils.

The macroscopic approach which yields the power function relationship between the relative permeability and the effective saturation, K sub r = S sub e to the n power, was generalized to allow n to vary with the soil type. Theoretical analysis shows that n may receive values lower than 3.0 for granular porous media and higher than 3.0 for soils of the fine texture. These findings were verified by using experimental data of 50 soils. The lower limit of n was found to be 2.5, while high values (up to n = 24.5) were found for the fine-textured soils. Statistical analysis of the measured data of the 50 soil samples showed a significant correlation between n and w, which indicates the amount of work per unit volume of soil required to drain a saturated soil to the wilting point. By using the soil characteristics psi-theta, an empirical formula was derived which relates n to w by n = 0.015w + 3.0. This proposed model was compared with the two previous versions of Averjanov and Irmay on the basis of the experimental data of the 50 soils. A very good agreement was found between the measured K sub r - theta curves and the theoretical ones, derived by the new model, for granular soils as well as for soils of fine texture where the other models very often fail. The accuracy of the new model is competitive with the best of the statistical models analyzed by Mualem. By this study, the power function model gains a high degree of accuracy, which, compounded by its simplicity, produces an efficient tool for prediction of the hydraulic conductivity of unsaturated soils. (Visocky-ISWS)
W78-09346

A MODEL FOR THE WATER REGIME OF CONIFEROUS FOREST AND GRASSLAND,
Swiss Forestry Research Inst., Birmensdorf (Switzerland).
For primary bibliographic entry see Field 2D.
W78-09353

NUMERICAL STUDY OF INTERACTIONS BETWEEN BOUNDARY CONDITIONS AND

SOLUTIONS OF THE LINEAR DISPERSION EQUATION (ETUDE NUMERIQUE DE L'INFLUENCE DES CONDITIONS AUX LIMITES SUR LES SOLUTIONS DE L'EQUATION DE LA DISPERSION POUR UN ECOULEMENT UNIDIMENSIONNEL),
Montpellier-2 Univ. (France). Lab. d'Hydrologie Mathematique.
For primary bibliographic entry see Field 2F.
W78-09357

TRANSIENT WATER INFILTRATION WITH CONSTANT SURFACE FLUX,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2F.
W78-09359

APPLICATION OF DIGESTED SLUDGE FOR IMPROVING ERODED SOIL CAUSED BY SO2,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5E.
W78-09420

ANION MOBILITY IN SOILS: RELEVANCE TO NUTRIENT TRANSPORT FROM TERRESTRIAL TO AQUATIC ECOSYSTEMS,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 5B.
W78-09442

INFLUENCE OF TRICKLE AND SURFACE IRRIGATION ON RETURN FLOW QUALITY,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-09443

SOIL WATER DEPLETION AFTER FOUR YEARS OF FOREST REGROWTH IN SOUTHWESTERN WISCONSIN,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 4C.
W78-09524

CHARACTERISTICS OF ARIZONA PONDEROSA PINE STANDS ON SANDSTONE SOILS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 3B.
W78-09528

HEAT AND WATER TRANSPORT PROPERTIES IN CONIFER DUFF AND HUMUS,
Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.
M. A. Fosberg
Department of Agriculture, Forest Service, Research Paper RM-195, 10 p, November, 1977. 4 fig, 27 ref, 1 tab, append.

Descriptors: *Fuels, *Soil water, *Moisture content, *Humus, *Infiltration, *Permeability, Bulk density, Forest soils, Lodgepole pine trees, Ponderosa pine trees, Pine trees, Douglas fir trees, Conifers, Coniferous forests, Water vapor, Heat transfer, Diffusion, Duff.

Permeability and bulk densities of duff and humus in stands of ponderosa pine, lodgepole pine, and Douglas-fir were measured to provide a data base for fuel moisture and soil infiltration models. Diffusion of heat and water vapor through a ponderosa pine duff layer was measured to calibrate a diffusion model. These results provide necessary data and relationships required by complex forest soil water balance and energy models. (Witt-IPC)
W78-09529

A SELF-PROPELLED HIGH-CLEARANCE SOIL CORING MACHINE,
Texas A and M Univ. Lubbock. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 7B.
W78-09654

MASSIVE ACCUMULATION OF CALCIUM CARBONATE AND ITS RELATION TO NITROGEN FIXATION OF SAINFOIN,
Wyoming Univ., Laramie. Div. of Plant Science.
W. D. Ross, and R. H. Delaney.
Agronomy Journal, Vol. 69, No. 2, p 242-246, March-April 1977. 2 fig, 3 tab, 25 ref.

Descriptors: Lagoons, *Calcium carbonate, *Nitrogen fixation, Soils, Soil investigations, *Sainfoin.

Sainfoin has many desirable qualtities as a legume forage, but it is not widely grown because of its lack of persistence and poor N-fixation on many sites. The effect of competition by non-N-fixing soil microorganisms on N-fixation was studied at 0, 50, 80, 95, and 100% levels of autoclaved soil sterilization. Plants were grown aseptically for 30 days, dipped in Rhizobium inoculum, and transplanted to the sterlized soil. After 47 and 87 days in the growth chamber at 24/18C, the plants were harvested. Nitrogen fixation was determined by the acetylene reduction capacity of the complete root system. Unexpectedly, root distortion accompanied by massive accumulation of $CaCO_3$ was stimulated in sainfoin roots that were grown in autoclaved soil to reduce the soil microoganisms. The accumulation of Ca and its affect on N-fixation in sainfoin are described. (Skogerboe-Colorado State)
W78-09656

SOIL CONSERVATION ON AGRICULTURAL LAND: THE CHALLENGE AHEAD,
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 3F.
W78-09659

THE SOLUBILITIES OF CARBONATES AND PHOSPHATES IN CALCAREOUS SOIL SUSPENSIONS,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2K.
W78-09711

HISTORY AND CHALLENGES IN SOIL AND WATER CONSERVATION AND MANAGEMENT,
Association of North Central State Agricultural Experiment Station, Ames, IA.
G. M. Browning.
Soil Science Society of America Journal, Vol. 41, No. 2, p 254-259, March-April, 1977.

Descriptors: *History, *Soil conservation, *Water conservation, *Soil management(Applied), Natural resources, Agricultural watersheds, Soil erosion, Soil surveys, Irrigation practices, Weather, Crop production, Agroclimatology, Land use, Planning, Environmental engineering, Foods, Strip mines, Research and development, Land, Water, Recreation, Evapotranspiration, Structural engineering, Irrigation efficiency, Energy, Reclamation.

Because soil management and water conservation is an important consideration in the irrigated arid lands of the Southwest U.S., this bicentennial address to th Soil Science Society of America, reviewing the history and challenges in soil and water conservation and management, show a major improvement in how natural resources are used. These challenges and opportunities remain, however, to refine and extend the universal soil loss equation, complete soil surveys, improve agricultural water use, develop relationships between weather and crop yields, improve information for land-use planning, improve the environment and meet future food requirements, improve tillage systems, and improve strip-mining operations without permanent damage to the environment and to soil productivity. Major areas of discussion are: Agricultural Research System, Soil and water conservation research, challenges ahead, land water, recreation, weather, evapotranspiration, structural measures, irrigation, land use, environment, energy, tillage, strip mine reclamation, and planning. (Popkin-Arizona)
W78-09714

FITTING SOLUTE BREAKTHROUGH EQUATIONS TO DATA USING TWO ADJUSTABLE PARAMETERS,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
A. M. Elprince, and P. R. Day.
Soil Science Society of America Journal, Vol. 41, No. 1, p 39-41, January-February, 1977. 1 tab, 2 fig, 20 ref.

Descriptors: *Soil water movements, *Ion transport, *Anion adsorption, *Dispersion, *Diffusion, Solutes, Equations, Calcium compounds, Mathematical models, Chlorides, Calcium chloride, Leaching, Anions, Regression analysis, Stagnant water, Convection, Columns, Soil chemical properties, Laboratory tests, Mathematical studies, Anion adsorption.

In this study, solute breakthrough curves are determined in many soil-water studies under irrigated, leached, landfills, sewage lagoons, or other possibly contaminated areas. The equations for such curves are reviewed, and an experiment with Hanford sandy loam is discussed. The experiment involved saturating the soil with calcium nitrate prior to leaching with calcium chloride, and fitting the chloride breakthrough curve with two adjustable parameters. The parameters account for two problems encountered in breakthrough phenomena: (1) negative adsorption of anions, which reduces the volume of liquid available for solute transport; (2) appreciable volumes of stagnant soil solution, which do not contribute to the convective flux. Calculations demonstrate that a least square procedure, applied simultaneously to the two parameters during curve fitting, resolves the discrepancy between the theoretical and experimental breakthrough. Soil volume data on the laboratory experiment, and chloride breakthrough curves using one and two adjustable parameters are given. (Popkin-Arizona)
W78-09715

DETERMINATION OF SOIL-MOISTURE REGIMES OF THE MAGHREB ACCORDING TO NEWHALL, (DETERMINATION DU REGIME HYDRIQUE DES SOLS DU MAGHREB D'APRES NEWHALL),
Ghent Rijksuniversiteit (Belgium) Geologisch Inst.
T. Travernier, and A. Van Wambeke.
Pedologie, Vol. 26, No. 2, p 168-178, 1976. 3 tab, 4 fig.

Descriptors: *Soil moisture, *Soil classification, *Water balance, *Energy budget, *Mathematical models, Soil chemical properties, Soil physical properties, Soil temperature, Soil types, Soil profile, Air temperature, Rainfall, Evapotranspiration, Computer models, Arid lands, Desertification, North Africa, Morocco, Algeria, Tunisia.

Soil-moisture regimes are important in classifying soils, and in changing soil characteristics over time, such as during desertification. A brief review of the mathematical model by Newhall is presented, simulating the water and heat budget of a soil profile, and accounting for monthly temperature, rainfall, and evapotranspiration. Examples are given which determine climatic and soil-moisture regime using the Newhall model applied

to the stations of the Maghreb, which includes Morocco, Algeria, and Tunisia in North Africa. Results of the FORTRAN model are given in tables, which indicate thermic temperatures for Xeric and Ustic moisture regimes, and mesic to hyperthermic temperatures for Aridic moisture regimes. (Popkin-Arizona)
W78-09718

CONTRIBUTION TO THE MICROMORPHOLOGY OF SOME SALINE SOILS OF THE NORTH NILE DELTA IN EGYPT,
National Research Centre, Cairo (Egypt). Soils Lab.
F. S. Hanna, and G. J. Stoops.
Pedologie, Vol. 26, No. 1, p 55-73, 1976. 6 fig, 1 tab, 9 ref.

Descriptors: *Saline soils, *Salts, *Irrigation water, *Soil formation, *Soil classification, Arid lands, Soil profiles, Calcium carbonate, Organic matter, Electrical conductance, Cations, Anions, Halides, Gypsum, Coastal plains, Stratification, Cultivated lands, Drainage, Clay minerals, Soil chemistry, Soil texture, Soil structure, Land reclamation, Nile Delta, Egypt.

Saline soils of the northern Nile Delta occupy more than 400,000 acres of land, uncultivated because of high salt content and shortage of good irrigation water. This study describes the micromorphology of seven representative saline soils. Soil profiles (pedon descriptions), profile photographs, and analytical data (grain size distribution, pH, $CaCO_3$, OM, EC, total soluble salts, cations and anions) for each horizon are provided. Four soils are Salorthids, or fluviomarine flats. Diffuse iron exihydrate gluebules in the G-horizon, halite cutans on most fissures and ped surfaces, lenticular gypsum crystals, and thin surface crusts are micromorphological characteristics of the Salorthids. Two soils are Halaquepts, and represent uncultivated sandy soils of the coastal plains. These are stratified, and generally free of halite cutans and gypsum crystals except in clayey or loamy bands. A final cultivated soil of the coastal plain is described for comparison. It is unstratified in the upper or cultivated layers, and exhibits a higher biological activity. Poor drainage is exhibited by clayey soils, and is caused in part by diffuse and irregular Fe-Mn-oxihydrate nodules, concretions or neoferrans. Calcite occurs dispersed or as diffuse layers. Lenticular gypsum crystals are found throughout the profiles. Halite cutans cover walls of most cavities, and are most striking. The mineralogy, texture, structure, and micromorphology of the saline soils explain their resistance to cultivation and reclamation. (Popkin-Arizona)
W78-09719

CLAY IN RELATION TO PEDALITY AND STABILITY OF MICROSTRUCTURE IN NILE ALLUVIAL SOILS,
Cairo Univ., Giza (Egypt). Dept. of Soils.
A. Fathi, I. A. Zein el Abedine, F. Labib, and A. A. Wahdan.
Egyptian Journal of Soil Science, Vol. 16, No. 1, p 93-112, 1976. 7 tab, 20 ref.

Descriptors: *Clays, *Soil stability, *Alluvium, *Soil texture, *Soil structure, Azonal, Soil management, Soil moisture, Soil water movement, Fine-textured soils, Soil profiles, Drainage, Air circulation, Particle size, Geomorphology, Soil chemistry, Arid lands, Pedality, Microstructure, Egypt.

Nile alluvial soils are young azonal soils, formed in recent times by sedimentation of suspended matter. The pedality of the non-saline and non-alkali alluvial soils of Egypt is affected by clay and management. The Ap horizons show apedal structures, which are subject to management. The Chorizona are dependent on clay content. The increase of clay changes soil structure for apedal to pedal, and reduces water movement and drainage. Air exchange and gas transfer is also inhibited by increased clay content in the soil profile. Tables show the impact of clay content on morphology, particle size (soil texture), soil chemistry, micromorphology, and soil structure on Nile alluvial soils. (Popkin-Arizona)
W78-09722

A SIMULATION MODEL APPROACH FOR RELATING EFFECTIVE CLIMATE TO WINTER WHEAT YIELDS ON THE GREAT PLAINS,
Barnard Coll., New York.
D. W. Bridge.
Agricultural Meteorology, Vol. 17, p 185-194, 1976. 5 tab, 22 ref.

Descriptors: *Hydrologic budget, *Model studies, *Wheat, *Crop production, *Great Plains, Semiarid climates, Plant growth, Root systems, Soil-water-plant relationships, Oil moisture, Seeds, Consumptive use, Air temperature, Precipitation(Atmospheric), Runoff coefficients, Evapotranspiration, Moisture availability, Seasonal, Period of growth, Regression analysis, Simulation Analysis.

A modified water budget model is discussed that simulates an increase in root depth as winter wheat progresses from seed to maturity and the soil moisture available to the plant as a result of root growth. The model uses the daily Thornthwaite water budget (which requires daily mean temperature and precipitation), soil moisture capacity, initial soil moisture, station latitude, and long-term monthly temperatures for all twelve months. The model also uses direct runoff coefficients, a linearly decreasing soil-moisture availability curve, and a 300-mm soil-moisture storage capacity. It predicts potential evapotranspirtion (PE), actual evapotranspiration, surplus water, soil moisture deficit, and soil moisture for each growing-season day for Kharkov winter wheat in four stations in Oklahoma, Nebraska, and Montana on the Great Plains. Selected variables were summed over time from planting to maturity by stepwise linear regression, which formed equations 'explaining' reasonable percentages of yield variations at the four sites. The simulation model uses the water budget and allows for changing root depth. The climatic parameters generated by the expanding root zone simulation model by regression, were regressed against wheat yield for comparison. Regression and correlation coefficients are tabulated. Correlations of wheat yield with precipitation and PE were low but correlation of wheat yields with all generated variables improved considerably. The study reinforces findings that there is a superior association between wheat yields and parameters derived with crop water budget models as opposed to simple energy and moisture variables. (Popkin-Arizona)
W78-09723

OBSERVATIONS OF SOIL WATER AND SALT MOVEMENT UNDER DRIP AND FLOOD IRRIGATION IN AN APPLE ORCHARD,
Commonwealth Scientific and Industrial Research Organization, Merbein (Australia). Div. of Horticultural Research.
For primary bibliographic entry see Field 3C.
W78-09762

PROCEDURES FOR EVALUATION OF DRAINAGE BENEFITS FOR AGRICULTURAL CROPS,
Soil Conservation Service, Lincoln, NE. Midwest Technical Service Center.
D. W. Manley.
Paper No. 77-2590 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 6 p, 6 tab.

Descriptors: *Economics, *Drainage, Agriculture, *Crop production, Drainage practices, Drainage systems, *Evaluation, Benefits.

The basic concepts and procedures used by the Soil Conservation Service for making an economic analysis of drainage for agricultural crops are described. (Skogerboe-Colorado State)
W78-09765

SOIL AND WATER CONSERVATION PRACTICES FOR POLLUTION CONTROL,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-09768

CAPILLARY POTENTIAL DISTRIBUTIONS IN ROOT ZONES USING SUBSURFACE IRRIGATION,
Department of Agriculture, Watkinsville, GA.
A. W. Thomas, H. R. Duke, and E. G. Kruse.
Transactions of the American Socity of Agricultural Engineers, Special Edition, Vol. 20SW, p 62-67, February 20, 1977. 11 fig, 8 ref.

Descriptors: Infiltration, *Root zones, *Subsurface irrigation, Corn(Field), Irrigation systems, Soils, Irrigation design, *Capillary water.

An experimental study was conducted of infiltration from buried sources which represented field irrigation laterals. Capillary potentials in the root zone of barley and corn were measured during the growing season and compared with measured and calculated steady-state values. Design evaluation of subsurface irrigation system was introduced and example calculations were presented. (Skogerboe-Colorado State)
W78-09770

SOIL-SALT INTERACTIONS IN RELATION TO SALT CONTROL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5G.
W78-09771

MANAGEMENT OF BED-FURROW IRRIGATED SOIL WITH LIMITED AND NO-TILLAGE SYSTEMS,
Southwestern Great Plains Research Center, Bushland, TX.
For primary bibliographic entry see Field 3F.
W78-09777

GYPSUM BLOCKS, TENSIOMETERS RELIABLE SOIL MOISTURE MONITORS.
For primary bibliographic entry see Field 3F.
W78-09781

TEMPERATURE GRADIENT EFFECTS ON IN SITU HYGROMETER MEASUREMENTS OF WATER POTENTIAL,
Utah State Univ., Logan.
H. H. Wiebe, R. W. Brown, and J. Baker.
Agronomy Journal, Vol. 69, No. 6, p 933-939, November-December, 1977. 6 fig, 1 tab, 17 ref.

Descriptors: Temperature, *Hygrometry, Soil water, Soil moisture, Soil properties, Soils, Measurement.

The effects of temperature gradients on water potential measurements with various commercial and laboratory soil hygrometers were tested in a soil column at -18 bars or in a sponge column wetted with a -18 bar sodium chloride solution. Temperature gradients were induced in the medium by warming or cooling either the base or the top of the column for several hours. Hygrometers in which the measuring (wet) junction was located

in the middle of the cylindrical sample surface gave small temperature gradient errors, less than 3 bars when the temperature gradient in th surrounding medium was 1 degree cm(-1). Locating the measuring thermocouple near the base of the cylindrical sample surface gave errors ranging from 10 to 18 bars per gradient of 1 degree cm(-1). Hygrometers with an 'end window' sample surface gave errors ranging from 23 to 62 bars. Water potential readings were consistently too low (dry) when the sample surface was cooler than the measuring junction, and too high (near zero) when the sample was warmer. Accurate water potentials were obtained with all models when medium temperature was uniform. (Skogerboe-Colorado State)
W78-09782

THE MINIMUM SIZE OF PERMEABLE FILL USED WITH MOLE DRAINAGE,
Ministry of Agriculture, Fisheries and Food, Cambridge (England). Field Drainage Experiment Unit.
C. W. Dennis, and S. G. Croote.
Agricultural Water Management, Vol. 1, No. 2, p 143-153, September, 1977. 7 fig, 1 tab, 6 ref.

Descriptors: *Mole drainage, Drainage engineering, *Drainage practices, Drainage systems, *Drains, Hydraulic conductivity.

Laboratory work involving the full scale simulation of flow from a mole drainage channel into a trench filled with permeable material and thence to the pipe drain at the bottom of the trench is described. Four sizes of permeable fill, two trench widths, two pipe types and a wide range of flow rates were used in the investigations. Provided that there was reasonable vertical separation between the mole channel and pipe the flow could be divided into three distinct phases: entry from the mole channel, near vertical flow within the permeable fill and entry into the pipe. The most limiting of these was the ability of the fill to accept water from the mole channel. Variation of hydraulic head with flow rate and permeable fill size at critical points of the system is presented in graphical form. It is suggested that permeable fill with a mean diameter of 5 mm is the minimum size acceptable under United Kingdom conditions and that this result will not be affected by the presence of a small quantity of fine material. The hydralic conductivity associated with such material, in the absence of fines, is approximately 2500 m/day. Application of the data to other design conditions is also possible. (Skogerboe-Colorado State)
W78-09786

A MODEL FOR THE TRANSPORT OF PESTICIDES IN SOIL WITH DIFFUSION-CONTROLLED RATES OF ADSORPTION AND DESORPTION,
Laboratorium voor Insekticide-nonderzoek TNO, Wageningen (Netherlands).
For primary bibliographic entry see Field 5B.
W78-09790

FIELD MEASUREMENTS OF AMMONIA VOLATILIZATION FROM SURFACE APPLICATIONS OF AMMONIUM SALTS TO A CALCAREOUS SOIL,
Agricultural Research Service, Temple, TX. Blackland Conservation Research Center.
For primary bibliographic entry see Field 5B.
W78-09794

2H. Lakes

PRIMER ON LAKES IN WASHINGTON,
Geological Survey, Tacoma, WA. Water Resouces Div.
N. P. Dion.
Washington Department of Ecology, Olympia Water-Supply Bulletin 49, 1978. 55 p, 21 fig, 96 ref.

Descriptors: *Limnology, *Washington, *Lakes, *Lake morphology, *Lake morphometry, Eutrophication, Ecosystems, Chemical properties, Biological properties, *Limnological terms.

This report was prepared to provide a nontechnical, 'layreader' introduction to the many physical, chemical, and biological characteristics of lakes. The report includes a glossary of lake and geologic terms related to lakes of Washington State--and to lakes generally-and discusses the many characteristics involved in evaluation of lake-water quality. The report is intended not only as an entity in itself but as a contribution to a better understanding by the general reader of more technical and more detailed reports on lakes in Washington. (Woodard-USGS)
W78-09307

LIMNOLOGY OF LAGUNA TORTUGUERO, PUERTO RICO,
Geological Survey, Fort Buchanan, PR. Water Resouces Div.
F. Quinones-Marquez, and L. A. Fuste.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 322, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 77-122, March 1978. 84 p, 34 fig, 15 tab, 42 ref.

Descriptors: *Limnology, *Lagoons, *Puerto Rico, Hydrology, Biological properties, Chemical properties, Physical properties, Eutrophication, Water chemistry, Data collections, Sampling, Saline water intrusion, *Laguna Tortuguero(PR).

The principal chemical, physical and biological characteristics, and the hydrology of Laguna Tortuguero, Puerto Rico, were studied from 1974-75. The lagoon, with an area of 2.24 square kilometers and a volume of about 2.68 million cubic meters, contains about 5 percent of seawater. Drainage through a canal on the north side averages 0.64 cubic meters per second per day, flushing the lagoon about 7.5 times per year. Chloride and sodium are the principal ions in the water, ranging from 300 to 700 mg/liter and 150 to 400 mg/liter, respectively. Among the nutrients, nitrogen averages about 1.7 mg/liter, exceeding phosphorus in a weight ratio of 170:1. About 10 percent of the nitrogen and 40 percent of the phosphorus entering the lagoon is retained. The bottom sediments, with a volume of about 4.5 million cubic meters, average 0.8 and 0.014 percent nitrogen and phosphorus, respectively. (Woodard-USGS)
W78-09314

EVAPORATION AND RADIATION MEASUREMENTS AT SALTON SEA, CALIFORNIA,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 2D.
W78-09322

CHARACTERISTICS OF THE HYDROLOGIC REGIME OF LARGE SIBERIAN RESERVOIRS,
For primary bibliographic entry see Field 4A.
W78-09336

SEDIMENTATION RATES AND A REVISED SEDIMENT BUDGET FOR LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-09339

ATMOSPHERIC LOADING OF PHOSPHORUS AND OTHER CHEMICALS TO LAKE MICHIGAN,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 5B
W78-09340

ON THERMAL STRATIFICATION IN RESERVOIRS DURING THE WINTER SEASON,
National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
M. Rahman.
Water Resources Research, Vol. 14, No. 2, p 377-380, April 1978. 2 figm, 5 ref.

Descriptors: *Thermal stratification, *Reservoirs, *Seasonal, *Diffusivity, *Boundary processes, Temperature, Distribution, Ice, Solar radiation, Numerical analysis, Hydraulics, Heat transfer, *Temperature profile, Heat flux, Initial temperature condition.

A one-dimensional mathematical model describing the thermal structure in stratified reservoirs during the winter season was considered. With the help of this model, an attempt was made to clarify some of the physical factors which strongly influence the temperature profiles in reservoirs. It has been observed that there are many factors which influence the shape of the vertical temperature distribution, namely, the profile at the time of ice formation, the heat exchange by diffusion in the water mass, the heat exchange due to inflow and outflow of water in reservoirs, etc. This model accounts for a qualitative assessment of the possible effects of diffusivity and the initial shape of the temperature profiles on the variation of the vertical temperature distribution. (Sinhg-ISWS)
W78-09347

HYDROLOGIC RESPONSE MODEL OF THE NORTH AMERICAN GREAT LAKES,
National Oceanic and Atmospheric Administration, Ann Arbor. Great Lakes Environmental Research Lab.
F. H. Quinn.
Journal of Hydrology, Vol. 37, No. 3/4, p 295-307, May 1978. 5 fig, 4 tab, 8 ref.

Descriptors: *Water balance, *Model studies, *Great Lakes, *Lake Michigan, *Lake Huron, *Lake St. Clair, *Lake Erie, Hydrologic cycle, Mathematical models, Analytical techniques, Precipitation(Atmospheric), Runoff, Lakes, Tributaries, Evaporation, Discharge(Water), Open channel flow, Water levels, Water resources, Water supply.

A hydrologic response model of the unregulated portion of the North American Great Lakes was presented for use in water resource and research studies. The hydrologic response model is a water quantity model encompassing Lakes Michigan, Huron, St. Clair, and Erie, and their connecting channels. The input parameters include overwater precipitation, tributary runoff, evaporation and diversion rates for each lake in the system, and ice retardation rates and discharge equations for the connecting channels. The model outputs are end-of-month and monthly mean water levels for each lake in the system and the monthly flow rates in the connecting channels. The equation set for the model is composed of the continuity equations for each lake in the system. Runge-Kutta and Newton-Raphson algorithms were investigated for use in the model solution as well as a second-order finite-difference technique designed by the author. The Newton-Raphson algorithm required approximately 40% less computer time than the other algorithms and was selected for inclusion in the solution. The model was calibrated by parameter optimization using an optimum gradient algorithm. The accuracy of the monthly simulated flows in the connecting channels showed that for approximately 95% of the time the errors in the monthly flows will be less than 4%. The net basin supply version of the model is desirable for use in developing countries where lake levels and river rating curves may constitute the only available historical data base. (Humphreys-ISWS)
W78-09352

MARYSVILLE LAKE HYDROTHERMAL STUDY; REPORT 2, 2250-MW PROJECT; HYDRAULIC AND MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-09466

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 10, NONTECHNICAL SUMMARY OF PROJECT,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 6G.
W78-09467

DILLON RESERVOIR - BLUE RIVER STUDY - COLORADO, JUNE, JULY, AUGUST - 1973.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5C.
W78-09533

CALCIUM AND CATION SORPTION BY CLADOPHORA FROM THE GREAT LAKES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5C.
W78-09535

MACROPHYTES OF THE DAM RESERVOIR AT GOCZALKOWICE,
Polish Academy of Sciences, Pszczyna. Hydrobiological Station; Polish Academy of Sciences, Pszcyna. Hydrobiological Station.
For primary bibliographic entry see Field 5C.
W78-09536

QUANTITATIVE AND QUALITATIVE COMPOSITION OF BOTTOM FAUNA IN POLLUTED PARTS OF LAKE VANERN AND SOME ASPECTS ON WATER QUALITY INDICES,
Statens Naturvardsverk, Stockholm (Sweden). Undersoknings Lab.
For primary bibliographic entry see Field 5C.
W78-09537

PHOSPHATE AND SILICATE KINETICS FOR THE LAKE MICHIGAN DIATOM DIATOMA ELONGATUM,
Michigan Univ., Ann Arbor. Div. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-09538

PHYSICO-CHEMICAL SURVEILLANCE DATA OBTAINED FOR LAKE ONTARIO, 1974 AND THEIR RELATIONSHIP TO CHLOROPHYLL A,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-09539

SHORELINE EROSION IN SOUTHEASTERN WISCONSIN,
Wisconsin Geological and Natural History Survey, Madison.
For primary bibliographic entry see Field 2J.
W78-09547

CARRYING CAPACITY CONTROLS FOR RECREATION WATER USES,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 6D.
W78-09551

REPORT OF THE DANE COUNTY ADVISORY COUNCIL FOR LAKE QUALITY IMPROVEMENT, A FRAMEWORK FOR LAKE MANAGEMENT.
Wisconsin Lake Quality Improvement Advisory Council, Madison.
For primary bibliographic entry see Field 5C.
W78-09552

INSECTICIDES, POLYCHLORINATED BIPHENYLS AND METALS IN AFRICAN LAKE ECOSYSTEMS. II. LAKE MCILWAINE, RHODESIA,
South Dakota State Univ., Brookings. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-09574

INSECTIDES, POLYCHLORINATED BIPHENYLS AND METALS IN AFRICAN LAKE ECOSYSTEMS. III. LAKE NAKURU, KENYA,
South Dakota State Univ., Brookings. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-09575

AN IN SITU DETERMINATION OF THE DISAPPEARANCE OF COLIFORMS IN LAKE MICHIGAN,
Marquette Univ., Milwaukee, WI.
For primary bibliographic entry see Field 5B.
W78-09599

U.S. RESERVOIR INVENTORY,
National Reservoir Research Program, Fayetteville, AR.
For primary bibliographic entry see Field 4A.
W78-09797

2I. Water In Plants

THE PHASED DIVISION OF THE FRESHWATER DINOFLAGELLATE CERATIUM HIRUNDINELLA: ITS USE AS A METHOD OF ASSESSING GROWTH IN NATURAL POPULATIONS,
Freshwater Biological Association, Windemere (England).
For primary bibliographic entry see Field 5C.
W78-09530

PHOTOSYNTHESIS OF SUGARBEETS UNDER N AND P STRESS: FIELD MEASUREMENTS AND CARBON BALANCE,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 3F.
W78-09653

ROLE OF CHANGES IN SOLUTE CONCENTRATION IN MAINTAINING FAVORABLE WATER BALANCE IN FIELD-GROWN COTTON,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 3F.
W78-09658

CONTRIBUTION OF DEW IN THE HYDROLOGIC BALANCE OF A SEMI-ARID GRASSLAND,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Riverina Lab.
For primary bibliographic entry see Field 2B.
W78-09712

WATER LOSS FROM CUT HERBAGE IN THE WINDROW AND FROM ISOLATED LEAVES AND STEMS,
Reading Univ. (England). Dept. of Agricultural Botany.
For primary bibliographic entry see Field 2D.
W78-09720

A MONTE-CARLO MODEL FOR THE RADIATION FIELD IN PLANT CANOPIES,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
I. Szwarcbaum, and G. Shaviv.
Agricultural Meteorology, Vol. 17, No. 5, p. 333-352, 1976. 11 fig, 1 tab, 5 ref.

Descriptors: *Monte Carlo method, *Statistical models, *Radiation, *Canopy, *Light, Agroclimatology, Plant growth, Photosynthesis, Crop production, Crop response, Evapotranspiration, Leaves, Reflectance, Distribution, Absorption, Analytical techniques, Numerical analysis, Albedo, Leaf reflection, Leaf distribution, Leaf orientation, Canopy geometry, Ground reflection, Light adsorption, Light scattering, Flow chart.

Radiation field in plant canopies has an important role in plant growth, photosynthesis, plant development, and evapotranspiration. A Monte-Carlo model is developed for evaluating the radiation field inside plant canopies. The model is based on tracing a parcel of light through the canopy leaves. It includes effects of leaf reflection, leaf distribution and orientation, canopy geometry, ground reflection, and other factors. The model can be expanded to include additional special features, such as light absorption and scattering, and important features of individual leaves. The Monte-Carlo model reproduces known analytical results under suitable assumptions. Numerical examples of the radiation field inside a hypothetical canopy and some albedo properties, are given. A flow-chart of the Monte-Carlo procedure is shown. (Popkin-Arizona)
W78-09721

A SIMULATION MODEL APPROACH FOR RELATING EFFECTIVE CLIMATE TO WINTER WHEAT YIELDS ON THE GREAT PLAINS,
Barnard Coll., New York.
For primary bibliographic entry see Field 2G.
W78-09723

IRRIGATION APPLICATION DEPTHS FOR OPTIMUM CROP PRODUCTION,
South Dakota State Univ., Brookings, Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-09779

ESTIMATING LEAF WATER POTENTIAL IN SAFFLOWER,
Pahlavi Univ., Shiraz (Iran). Dept. of Irrigation.
For primary bibliographic entry see Field 3F.
W78-09783

2J. Erosion and Sedimentation

SEDIMENT TRANSPORT IN THE TANANA RIVER IN THE VICINITY OF FAIRBANKS, ALASKA, 1977,
Geological Survey, Anchorage, AK. Water Resources Div.
W. W. Emmett, R. L. Burrows, and B. Parks.
Open-file report 78-290 (basic data), 1978. 28 p, 9 tab, 7 fig, 4 ref.

Descriptors: *Sediment transport, *Bed load, *Particle size, *Streamflow, *Alaska, Flow rates, Measurement, Hydrologic data, *Tanana River(Alas), *Fairbanks area(Alas).

Measurements during the period of principal runoff in 1977, of suspended- and bedload-sediment transport for the Tanana River in the vicinity of Fairbanks, Alaska, show that the median particle size of suspended sediment is generaly silt (<0.062 mm), but at some low-water discharges, the median particle size is very fine sand. The median particle size of bedload is generally gravel (>2.0 mm, and often in the range of 10 to 20 mm), but at some low transport rates, the median particle size is medium sand. At all water discharges and sediment-transport rates, the particles constituting the suspended load are significantly smaller than the particles constituting the bedload. Tables present data and computations. Most tables are followed by graphical presentation of the data. The majority of the text is devoted to explanation of tables and graphs. (Woodard-USGS)
W78-09318

EROSION PROCESSES ON STEEP GRANITIC ROAD FILLS IN CENTRAL IDAHO,
Forest Service (USDA) Boise, ID. Intermountain Forest and Range Experimental Station.
W. F. Megahan.
Soil Science Society of America Journal, Vol. 42, No. 2, p 350-357, March 1978. 8 fig, 1 tab, 10 ref.

Descriptors: *Erosion control, *Idaho, *Roadbanks, *Granites, Particle size, Sedimentation, Hydrology, Roads, Erosion, On-site investigations, *Erosion processes, Erosion plots, Road fills, Steep granitic roads, Dry creep.

A set of thirty 20.2-sq m (1/200-acre) erosion plots was used to study erosion occurring on steep road fills constructed with granitic soil materials in the Idaho Batholith. Erosion data were collected for a 3 1/2-year period from 1969 through 1972. Erosion on bare control plots averaged 3.4 metric tons/sq km per day for water years 1970 through 1972. Erosion was reduced an average of 44% and 95% by tree planting and straw mulching, respectively. Daily erosion rates were consistently higher during summer periods than during snowfree winter periods, presumably because of greater rainfall energy during the summer. Dry creep accounted for at least 15% of the total annual erosion for the years sampled and was as high as 40% in 1971. The erodibility index was a poor predictor of erosion for rain periods. Observations in the area suggest that wind was an important erosion factor on the steep slope studied. The median particle size of eroded materials D sub 50 tended to decrease throughout the summer and fall until mid-October when it abruptly increased. Soil crusting during the summer and soil freezing and thawing in the fall may have caused these seasonal trends. (Lee-ISWS)
W78-09330

SEDIMENTATION RATES AND A REVISED SEDIMENT BUDGET FOR LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
A. L. W. Kemp, G. A. MacInnis, and N. S. Harper.
Journal of Great Lakes Research, Vol. 3, No. 3-4, p 221-233, December 1977. 4 fig, 4 tab, 31 ref.

Descriptors: *Lake Erie, *Deposition(Sediments), *Lakes, *Sedimentation rates, *Great Lakes, On-site investigations, Surveys, Sediments, Erosion, Shores, Sediment loads, Rivers, Sampling, On-site data collections, Palynology, Dating, Pollen, Distribution patterns, Sediment distribution, Analysis, Methodology, *Sediment budget, Sediment sources, Shoreline bluff erosion, Pinus pollen, Ambrosia pollen.

Present-day sedimentation rates were determined at 50 offshore locations, representative of the depositional basins of Lake Erie. Sedimentation rates were calculated by averaging the weight of sediment above the Ambrosia and/or Pinus pollen horizons, dated at 1850. The rates are variable, ranging from a low of 0 g/sq m/yr to a maximum value of 6,450 g/sq m/yr. Sedimentation rates were highest in the western basin, near the mouths of the Detroit and Maumee Rivers, and in the deepest parts of the eastern basin, east of Long Point. The high rates in the western basin are due to the large inputs of suspended solids from the Detroit and Maumee Rivers. Erosion of shoreline bluffs between Rondeau and Long Point probably is responsible for the high rates in the eastern basin. Mean sedimentation rates of 2,160, 580, and 1,340 g/sq m/yr were calculated for the western, central, and eastern basins, respectively. A total of 14.3 million tons of fi[illegible]ained sediment is deposited annually in t[illegible]ake. Erosion of shoreline bluffs is the major source of the sediment that is accumulating in the offshore basins, accounting for 40% of all incoming materials. Rivers are the second largest source, contributing 28% of the external sediment load. (Humphreys-ISWS)
W78-09339

APPLICATION OF DIGESTED SLUDGE FOR IMPROVING ERODED SOIL CAUSED BY SO2,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5E.
W78-09420

CONTROL OF SEDIMENTS, NUTRIENTS, AND ADSORBED BIOCIDES IN SURFACE IRRIGATION RETURN FLOWS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 5G.
W78-09450

SHORELINE EROSION IN SOUTHEASTERN WISCONSIN,
Wisconsin Geological and Natural History Survey, Madison.
D. W. Hadley.
Special Report No. 5, February 1976. 33 p, 17 fig, 9 ref.

Descriptors: *Wisconsin, *Lake Michigan, *Shoreline erosion, *Erosion control, *Slope stabilization, *Coastal engineering, Lake shores, Shore protection, Beach erosion, Waves(Water), Littoral drift, Currents(Water), Coastal structures, Coasts, Groundwater, Water level fluctuations, Ice, Geologic history, Geology, Glacial sediments, Costs, Landslides.

The highly developed Lake Michigan shoreline in southeastern Wisconsin has experienced accelerated erosion in recent years, due in part to unusually high precipitation and near-record high-water levels. This report describes natural processes involved, geologic history, and possible remedial measures. Much of the shore is composed of high, steep bluffs developed in loose, unconsolidated silt, sand, gravel, and clay of glacial origin. Recent erosion at the foot of the bluffs from storm waves has resulted in numerous landslides and danger to homes and residents. The situation is further aggravated by groundwater seepage from the bluffs. Alternatives to relocation of dwellings or inaction are costly, and include: (1) slope stabilization, (2) construction of permanent protective structures, and (3) temporary protection. Several measures may be required on a single property. As very few attempts by individual owners to protect isolated property have been successful, community effort is almost essential. Before protective structures can be built where massive slumping is likely, regrading the slope is necessary. If spring sapping is significant, adequate drainage structures must be provided. To prevent gully erosion, devegetated areas must be replanted and surface runoff controlled. Slope stabilization measures include retaining structures at the base, drains to lower the water table, and regrading. (Lynch-Wisconsin)
W78-09547

TRACE METAL CONCENTRATIONS IN ESTUARINE SEDIMENTS: MOBILIZATION, MIXING OR PRECIPITATION,
Waterloopkundig Lab., Delft (Netherlands).
For primary bibliographic entry see Field 5B.
W78-09601

FLUVIAL SEDIMENT IN OHIO,
Geological Survey, Lansing, MI. Water Resources Div.; and Geological Suvey, Columbus, OH Water Resources Div.
P. W. Anttila, and R. L. Tobin.
Available from Supt. of Document, GPO, Washington, DC, 20402; price $2.30. Water-Supply Paper 2045, 1978. 57 p, 20 fig, 17 tab, 28 ref.

Descriptors: *Fluvial sediments, *Sediment transport, *Sediment yield, *Ohio, *Streams, Streamflow, Flow rates, Sediment discharge, Suspended load, Bed load, Particle size, Data collections, Stations, Regional analysis, Evaluation.

Characteristics of fluvial sediment in Ohio streams and estimates of sediment yield are based on data from several daily record stations and 5 years of intermittent record from a 38-station network. Most of the sediment transported by Ohio streams is in suspension. Mean annual bedload discharge, in percentage of mean annual suspended-sediment discharge, is estimated to be less than 10 percent at all but one of the sediment stations analyzed. Duration analysis shows that about 90 percent of the suspended sediment averages less than 100 mg/liter 75 percent of the time and less than 50 mg/liter 50 percent of the time. Suspended sediment in Ohio streams is composed mostly of silt and clay. Sand particle content ranges from 1 to 2 percent in northwestern Ohio to 15 percent in the east and southeast. Sediment yields range from less than 100 tons per square mile per year in the northwest corner of Ohio to over 500 tons per square mile per year in the southern part, in Todd Fork basin, lower Paint Creek basin, and the Kentucky Bluegrass area. Yield from about 63 percent of Ohio's land area ranges from 100 to 200 tons per square mile per year. (Woodard-USGS)
W78-09742

SEDIMENT DISCHARGE FROM HIGHWAY CONSTRUCTION NEAR PORT CARBON, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-09750

PREDICTION OF SEDIMENT TRANSPORT IN A GRASSED MEDIA,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-09764

COMPARATIVE ERODIBILITY OF LOESS SOILS IN POLAND AND THE UNITED STATES,
Agricultural Research Service, Columbia, MO. North Central Watershed Research Center.
For primary bibliographic entry see Field 4D.
W78-09766

EVALUATION OF WILD OAT STRAW AS A SOIL EROSION RETARDANT USING SIMULATED RAINFALL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 4D.
W78-09784

2K. Chemical Processes

EXCHANGEABLE SODIUM AND SOIL WATER BEHAVIOR UNDER FIELD CONDITIONS,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2G.
W78-09329

ANALYTICAL IMPLICATIONS OF HARMONIZED MONITORING SCHEMES,
Water Research Centre, Medmenham (England). Water Quality and Health Div.
For primary bibliographic entry see Field 5A.
W78-09331

COLLABORATIVE TESTING OF A MANUAL SODIUM ARSENITE METHOD FOR MEASUREMENT OF NITROGEN DIOXIDE IN AMBIENT AIR,
Environmental Monitoring and Support Lab., Research Triangle Park, NC.
For primary bibliographic entry see Field 5A.
W78-09332

ANALYZER FOR CONTINUOUS DETERMINATION OF DISSOLVED OXYGEN, PH, ELECTRICAL CONDUCTIVITY, TEMPERATURE, AND TRANSPARENCY IN NATURAL WATERS,
Akademiya Nauk SSSR, Moscow. Inst. Geokhimii i Analiticheskoi Khimii.
For primary bibliographic entry see Field 5A.
W78-09338

THE ROLE OF STANDARD REFERENCE MATERIALS IN ENVIRONMENTAL MEASUREMENTS,
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-09361

ATMOSPHERIC SCAVENGING OF HYDROCHLORIC ACID,
Illinois Inst. of Tech. Research Inst. Chicago.
For primary bibliographic entry see Field 5A.
W78-09362

ANION MOBILITY IN SOILS: RELEVANCE TO NUTRIENT TRANSPORT FROM TERRESTRIAL TO AQUATIC ECOSYSTEMS,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 5B.
W78-09442

FRAZIL-ICE NUCLEATION BY MASS-EXCHANGE PROCESSES AT THE AIR-WATER INTERFACE,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-09648

THE SOLUBILITIES OF CARBONATES AND PHOSPHATES IN CALCAREOUS SOIL SUSPENSIONS,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
G. M. Marion, and K. L. Babcock.
Soil Science Society of America Journal, Vol. 41, No. 4, p 724-728, July-August, 1977. 6 tab, 4 fig, 36 ref.

Descriptors: *Soil water, *Soil chemical properties, *Carbonates, *Phosphates, *Solubility, *Calcareous soil, Calcite, Calcium compounds, X-ray diffraction, Ions, Suspension.

Solubility of salts in irrigated soils is an extensively researched and important field in the arid lands agriculture of the Southwest U.S. This paper evaluates the significance of ion-pairs on carbonate and phosphate activity in calcareous soils, and identifies the solid phases governing their solubility in calcareous soils tested including Altamont, Clear Lake, and Panoche. Up to 50 percent of the soluble phosphate was found present as ion-pairs in calcite under-saturated and supersaturated experiments. Calcite was the only carbonate mineral identified by X-ray diffraction, with calcium phosphate minerals most likely present in the soils. Experimental data is tabulated and graphed. (Popkin-Arizona)
W78-09711

FITTING SOLUTE BREAKTHROUGH EQUATIONS TO DATA USING TWO ADJUSTABLE PARAMETERS,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W78-09715

GROUND-WATER BASIC DATA FOR DICKEY AND LA MOURE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09743

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09751

HYDROGEOLOGY OF THE OBSERVATION WELL SITE AT THE U.S. GEOLOGICAL SURVEY NATIONAL CENTER, RESTON, VIRGINIA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-09757

2L. Estuaries

APPLICATION OF AN OIL SPILL VULNERABILITY INDEX TO THE SHORELINE OF LOWER COOK INLET, ALASKA,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-09301

STRATIGRAPHIC AND HYDROGEOLOGIC FRAMEWORK OF PART OF THE COASTAL PLAIN OF TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-09310

LIMNOLOGY OF LAGUNA TORTUGUERO, PUERTO RICO,
Geological Survey, Fort Buchanan, PR. Water Resouces Div.
For primary bibliographic entry see Field 2H.
W78-09314

RELATION OF URBAN LAND-USE AND LAND-SURFACE CHARACTERISTICS TO QUANTITY AND QUALITY OF STORM RUNOFF IN TWO BASINS IN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-09321

TRANSFERS ACROSS AN AIR-WATER INTERFACE AT HIGH WIND SPEEDS: THE EFFECT OF SPRAY,
Stanford Univ., CA. Dept. of Civil Engineering.
C. S. Wang, and R. L. Street.
Journal of Geophysical Research, Vol. 83, No. C6, p 2959-2969, June 20, 1978. 12 fig, 3 tab, 31 ref. NSF ATM73-06538.

Descriptors: *Air-water interfaces, *Winds, *Sea spray, *Energy transfer, Laboratory tests, Model studies, Hydraulic models, Instrumentation, Equipment, Drops(Fluids), Analysis techniques, Data processing, Heat transfer, Evaporation, Heat, Energy, Interfaces, Oceanography, Meteorology.

The generation of spray under high wind speed conditions has been investigated in a laboratory wind, water wave research facility. An electrostatic capacitance wire probe system was used to measure spray. Mean energy transfers were determined by a standard boundary layer integral technique. For a given wind velocity, the spray concentration decreases logarithmically with increased distance from the mean water surface. The spray concentration and distribution results of this study are consistent with field and other laboratory studies (with one exception). While wave breaking, whitecapping, and bubble bursting during spray formation contribute to increased interface roughness, calculations based on the laboratory data showed that the latent and sensible heat transfers from the spray drops make a negligible contribution to the energy transfer observed. The marked increase in measured energy transport under spray conditions is due almost entirely to increased transfer from the roughened interface (there is a linear correlation between the latent and total heat transfers and the root-mean-square water surface displacement). However, extrapolation of the laboratory results suggested strongly that spray drops make a significant contribution to the energy transfer in field situations with wind, temperature, and humidity conditions equivalent to those in the laboratory because of greatly increased droplet boundary layer thicknesses in the field. (Sims-ISWS)
W78-09341

BREAKING INVARIANTS IN SHOALING WAVES,
Scripps Institution of Oceanography, La Jolla, CA.
W. G. Van Dorn.
Journal of Geophysical Research, Vol. 83, No. C6, p 2981-2988, June 20, 1978. 10 fig, 1 tab, 24 ref. ONR N0014-69-A-0200-6012.

Descriptors: *Waves(Water), *Ocean waves, *Shoals, Laboratory tests, Shallow water, Shores, Energy, Wavelengths, Velocity, Depth, Oceans, Oceanography, *Wave kinematics, Breaking waves.

The inability of present theory to describe correctly the shoaling transformation of surface gravity waves is well recognized. It owes, at least in part, to the lack of experimental information on internal flow fields. This paper described a portion of the results from laboratory experiments in which the time histories of surface elevation, crest speed, and horizontal subsurface flow velocities in trains of uniform waves were measured at a plurality of stations before and after breaking, as functions of (uniform) beach slope and wave frequency. It was found that over gentle slopes, wave breaking is characterized by invariancy of crest profiles and kinematics and that most important breaking parameters can be expressed in terms of period and breaker height, the latter of which appears to be related simply to deepwater height and steepness. (Sims-ISWS)
W78-09342

TESTS OF LOW-DENSITY MARINE LIMESTONE FOR USE IN BREAKWATERS,
Coastal Engineering Research, Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-09360

FLOAT TETHER TERMINATOR,
For primary bibliographic entry see Field 8B.
W78-09429

BREAKWATER STABILITY STUDY, IMPERIAL BEACH, CALIFORNIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-09469

DOLOS ARMOR UNITS USED ON RUBBLE-MOUND BREAKWATER TRUNKS SUBJECTED TO NONBREAKING WAVES WITH NO OVERTOPPING,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-09470

FIELD STUDY OF THE EFFECTS OF STORMS ON THE STABILITY AND FATE OF DREDGED MATERIAL IN SUBAQUEOUS DISPOSAL AREAS,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5E.
W78-09471

FEASIBILITY OF PINTO ISLAND AS A LONG-TERM DREDGED MATERIAL DISPOSAL SITE,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5E.
W78-09474

PORT ONTARIO HARBOR, NEW YORK, DESIGN FOR WAVE PROTECTION AND PREVENTION OF SHOALING; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-09475

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA,
Coastal Engineering Research Center, Fort Belvoir, VA.
D. L. Harris, and B. R. Bodine.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 795, Price codes: A09 in paper copy, A01 in microfiche. General Investigation of Tidal Inlets (Joint program of Army Coastal Engineering Research Center, Fort Belvoir, Va, and Army Engineer Waterways Experiment Stations, Vicksburg, MS) GITI Report 6, June 1977. 195 p, 2 tab, 52 fig, 3 append, 73 ref.

Descriptors: *Hydraulic models, *Mathematical models, *Model studies, , North Carolina, *Masonboro Inlet(NC), *Tidal inlets, *Simulation analysis.

Four models of Masonboro Inlet, North Carolina, have been developed in a program for assessing the value of models in investigating coastal inlet hydraulics problems. A distorted scale, fixed-bed physical model, a lumped parameter numerical model, and two two-dimensional numerical models were included in the study. Equations are used to investigate the correspondence between model flows. This analysis shows that it should be possible to simulate the major aspects of tidal flow about equally well with either physical or numerical models, that physical models should be most useful for investigating the interaction of the flow of primary importance with boundary conditions or with flows of smaller scale, and that numerical models should be most useful for investigating the interaction between the flow of primary importance and larger scale or external phenomena such as the effects of storms and of the earth's rotation. The assumptions employed in the derivation of the equations used with the lumped parameter model were found to be more restrictive in application than originally supossed. New equations are presented which display these assumptions more clearly. (See W78-09478 thru W78-09481) (WES)
W78-09477

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA; APPENDIX 1: FIXED-BED HYDRAULIC MODEL RESULTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. A. Sager, and W. C. Seabergh.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 796, Price codes: A04 in paper copy, A01 in microfiche. General Investigation of Tidal Inlets (Joint program of Army Coastal Engineering Research Center, Fort Belvoir, VA. and Army Engineer Waterways Experiment Station, Vicksburg, Miss.) GITI Report 6, App 1, June 1977. 69 p, 6 photos, 33 pl.

Descriptors: *Model studies, *Hydraulic models, *Mathematical models, North Carolina, *Masonboro Inlet(NC), *Tidal inlets, *Fixed-bed models, *Simulation analysis.

This appendix discusses the verification, base tests, and predictive test of a fixed-bed hydraulic model of Masonboro Inlet, N. C., as part of the evaluation of the state-of-the-art inlet modeling techniques. It presents the data necessaryf for a comparison of results of the physical and numerical models discussed in the basic report and in Appendices 2-4. Further information concerning the physical fixed-bed model of which this report is a summary can be found in the reports 'Physical Model Simulation of the Hydraulics of Masonboro Inlet, N. C.' (in preparation), and 'Supplementary Tests of Masonboro Inlet Fixed-Bed Model' (in preparation). (See also W78-09477) (WES)
W78-09478

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA; APPENDIX 2, NUMERICAL SIMULATION OF HYDRODYNAMICS (WRE),
Water Resources Engineers, Inc., Austin, TX.
F. D. Masch, R. J. Brandes, and J. D. Reagan.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 797, Price codes: A09 in paper copy, A01 in microfiche. General Investigation of Tidal Inlets (Joint program of Army Coastal Eng Res Ctr, Ft Belvoir, VA, and Army Engineer Waterways Experiment Station, Vicksburg, Miss) GITI Report 6, App 2, Vol 1-2, Jun 77. 343 p, 65 fig, 11 tab, 10 ref.

Descriptors: Hydrodynamics, *Hydraulic models, *Mathematical models, North Carolina, *Tidal inlets, *Masonboro Inlet(NC), Finite difference method, *Simulation analysis.

A two-dimensional finite difference tidal hydrodynamics model has been adapted to Masonboro Inlet, North Carolina. The model was initially calibrated to simulate prototype conditions of September and October 1969. Operational runs were then undertaken to simulate tides and currents corresponding to pre-project undeveloped inlet conditions of November 1964 and modified inlet and north jetty conditions of June 1967. For each case, the model was operated with mean and spring ocean tides. The tidal hydrodynamics model applied at Masonboro Inlet uses an explicit numerical solution of the basic equations of motion and the continuity equation. As structured, the model includes bathymetric data for the inlet, bottom roughness, inundated areas and other features of the system. Because of the size and detail required in the simulations, a dual-model approach is employed. (See also W78-09477) (WES)
W78-09479

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA: APPENDIX 3, NUMERICAL SIMULATION OF HYDRODYNAMICS (TRACOR),
Coastal Engineering Research Center, Fort Belvoir, VA.
R. J. Chen, and L. A. Hembree, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 799, Price codes: A13 in paper copy, A01 in microfiche. General Investigation of Tidal Inlets (Joint program of Army Coastal Engineering Research Center, Fort Belvoir, VA, and Army Engineer Waterways Experiment Station, Vicksburg, Miss) GITI Report 6, App 3, June 1977. 253 p, 1 app, 63 fig, 18 tab, 15 ref.

Descriptors: Hydrodynamics, *Hydraulic models, *Mathematical models, *North Carolina, *Masonboro Inlet(NC), *Tidal inlets, Tidal flats, *Simulation analysis.

The purpose of this project to modify an existing two-dimensional numerical hydrodynamic model to be applied to Masonboro Inlet, North Carolina. The model essentially consists of a numerical solution to the time-dependent linearized shallow-water equation. One of the modifications was the incorporation of tidal flats which are important in the Masonboro Inlet system. The second was to devise a procedure for handling open water boundaries at which no boundary conditions were available. Using data for September 1969 supplied by CERC, the friction factor was adjusted to simulate the observed tide stage variation. Satisfactory verification was obtained against tidal stage variation and intratidal current phasing. The magnitude of the computed currents were consistently small but this is not thought to seriously delimit the model's utility. (See also W78-09477) (WES)
W78-09480

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA; APPENDIX 4, SIMPLIFIED NUMERICAL (LUMPED PARAMETER) SIMULATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
C. J. Huval, and G. L. Wintergerst.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 800, Price codes: A06 in paper copy, A01 in microfiche. General Investigation of Tidal Inlets (Joint program of Army Coastal Engineering Research Center, Fort Belvoir, VA, and Army Engineer Waterways Experiment Station, Vicksburg, Miss) GITI Report 6, App 4, June 1977. 115 p, 4 app, 15 tab, 24 fig, 20 ref.

Descriptors: *Hydraulic models, *Mathematical models, North Carolina, *Tidal inlets, *Masonboro Inlet(NC), *Lumped parameter approach.

This report summarizes a mathematical model study of water motions in two horizontal dimensions for Masonboro Inlet, North Carolina. The study was part of the Corps of Engineers' General Investigation of Tidal Inlets research program

(GITI) and was designed to meet two primary objectives. The first objective was to evaluate the effectiveness of state-of-the-art physical and mathematical modeling techniques in predicting the effects of major changes to an inlet on the hydraulics of the inlet. A second objective was to determine whether simple model tests, performed quickly and for a reasonable cost, could be relied on to evaluate the design of inlet improvements. The mathematical and physical models were initially calibrated using bathymetric and hydraulic data collected at the inlet in September 1969. Selected parts of the calibrated model were subsequently remolded for prediction of hydraulic characteristics for the following conditions: (1) preproject undeveloped inlet conditions, November 1964 bathymetry; and (2) modified inlet and north jetty conditions, July 1966 bathymetry. Results of the mathematical model investigations are discussed. (See also W78-09477) (WES)
W78-09481

AQUATIC DISPOSAL FIELD INVESTIGATION, GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE; APPENDIX A: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF SEDIMENTATION,
Moody Coll. of Marine Sciences and Maritime Research, Galveston, TX. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5E.
W78-09482

AQUATIC DISPOSAL FIELD INVESTIGATION, GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE; APPENDIX B: INVESTIGATION OF WATER-QUALITY PARAMETERS AND PHYSICOCHEMICAL PARAMETERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5E.
W78-09483

AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; APPENDIX A: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF BOTTOM SEDIMENTATION,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5E.
W78-09484

AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX C: EFFECTS OF DREDGED MATERIAL DISPOSAL ON THE CONCENTRATION OF MERCURY AND CHROMIUM IN SEVERAL SPECIES OF MARINE ANIMALS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5E.
W78-09485

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX B: WATER-QUALITY PARAMETERS AND PHYSICOCHEMICAL SEDIMENT PARAMETERS.
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5E.
W78-09486

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX C: PREDISPOSAL BASELINE CONDITIONS OF BENTHIC ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 5E.
W78-09487

DEVELOPMENT OF A MATHEMATICAL WATER QUALITY MODEL FOR GRAYS HARBOR AND THE CHEHALIS RIVER, WASHINGTON.
Battelle Pacific Northwest Lab., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-09518

FOOD-CHAIN RELATIONSHIPS IN SUBTIDAL SILTY SAND MARINE SEDIMENTS AND THE ROLE OF MEIOFAUNA IN STIMULATING BACTERIAL PRODUCTIVITY,
Institut fur Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 6G.
W78-09578

WATER MOVEMENT AND SEASONAL ALGAL GROWTH IN HAWAII,
Hawaii Univ., Honolulu. Dept. of Botany.
B. Santelices.
Marine Biology, Vol 43, No 3, 1977, p 225-235, 7 fig, 2 tab, 40 ref.

Descriptors: Environment, Aquatic environment, *Algae, Distribution, Sea water, *Seasonal, Light, Temperature, Salinity, *Hawaii, Algal growth.

This study was undertaken to search for the presence of groups of ecological species on a tropical shore, to evaluate the importance of water movement on the structuring of shallow-water tropical algal communities, and to describe seasonal changes of algal floras in a tropical reef. The environmental parameters measured were light, temperature, water movement, and salinity. An observed pattern of decrease of biomass during July-September and maximum biomass in February-May did not show any significant correlation with any of these parameters except that the period of minimum biomass coincided with the period of maximum water movement. Four groups of ecological species emerged during the study; one had positive correlations with light intensity and negative correlations with water movement; a second had the opposite trend; a third showed an irregular pattern of distribution throughout the year; and a fourth showed an irregular annual cycle which did not correlate with any of the parameters but did correlate with another species of the same genus. It was concluded that all species studied had horizontal changes of biomass throughout the year which correlated with horizontal and seasonal changes of water movement on the reef. (Chilton-ORNL)
W78-09583

METALS IN AN ACID MINE STREAM AND ESTUARY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W78-09596

SEASONAL AND VERTICAL DISTRIBUTION AND GROWTH OF JUVENILE AND ADULT CAPELIN (MALLOTUS VILLOSUS) IN THE ST. LAWRENCE ESTUARY AND WESTERN GULF OF ST. LAWRENCE,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 6G.
W78-09597

TRACE METAL CONCENTRATIONS IN ESTUARINE SEDIMENTS: MOBILIZATION, MIXING OR PRECIPITATION,
Waterloopkundig Lab., Delft (Netherlands).
For primary bibliographic entry see Field 5B.
W78-09601

MARINE DYNAMICS AND ITS EFFECTS ON CURRENT MEASURING TRANSDUCERS,
National Oceanic and Atmospheric Administration, Sterling, VA.
For primary bibliographic entry see Field 7B.
W78-09651

SUSCEPTIBILITY OF COASTAL PLAIN AQUIFERS TO CONTAMINATION, FAIRFAX COUNTY, VIRGINIA, A COMPUTER COMPOSITE MAP,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09735

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

COLORADO RIVER DESALINIZATION, WILD DUCK STUDY,
Colorado State Univ., Fort Collins, Dept. of Physiology and Biophysics.
For primary bibliographic entry see Field 5G.
W78-09799

3B. Water Yield Improvement

CHARACTERISTICS OF ARIZONA PONDEROSA PINE STANDS ON SANDSTONE SOILS,
Arizona Univ., Tucson.
P. F. Ffolliott, and M. B. Baker, Jr.
Department of Agriculture, Forest Service, Ft. Collins, Colo., Rocky Mt. Forest and Range Experiment Station, General Technical Report RM-44, 7 p, November, 1977. 2 fig, 20 ref, 1 tab.

Descriptors: *Forest soils, *Sandstones, *Soil water, *Water yield, Sedimentary rocks, Igneous rocks, Arizona, Pine trees, Ponderosa pine trees, Soil types.

Limited information is available for ponderosa pine (Pinus ponderosa) forest types growing on sedimentary-derived soils. Based on a 4-year study of ponderosa pine watersheds on sedimentary soils, annual water yield is about 25% of that from volcanic soils, herbage production is lower even though forest densities are less, and forest site index is higher. (Witt-IPC)
W78-09528

THE WELLTON-MOHAWK: WHERE NECESSITY IS TEACHING THEM TO SAVE WATER,
R. Ross.
Irrigation Age, Vol 11, No 8, p 30, May-June, 1977. 1 fig.

Descriptors: *Water conservation, Irrigation effects, Salinity, Saline water, Mexico.

In 1973, an agreement was signed between Mexico and the United States that could have far reaching influences on how southwestern American farmers irrigate. Leaders of the two nations signed documents which said that by a given date, the level of salts in the Colorado River, as it enters Mexico, would be held to certain 'reasonable' limits. Reaching those limits will require new irrigation technology in the 64,000-acre Wellton-Mohawk Irrigation and Drainage District, east of Yuma, Arizona. And what those farmers learn, to satisfy the agreement, could be applicable to many other arid areas within the United States and worldwide, as water and energy demands increase. (Skogerboe-Colorado State)
W78-09668

SOIL-ASPHALT MIXTURE FOR CANAL SEEPAGE CONTROL: LABORATORY STUDY,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 4A.
W78-09787

3C. Use Of Water Of Impaired Quality

EFFECTS OF IRRIGATION ON WATER QUALITY IN THE SAND PLAIN OF CENTRAL WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-09306

EXCHANGEABLE SODIUM AND SOIL WATER BEHAVIOR UNDER FIELD CONDITIONS,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2G.
W78-09329

NO SIMPLE ANSWERS ON SALINITY,
For primary bibliographic entry see Field 5G.
W78-09666

THE WELLTON-MOHAWK: WHERE NECESSITY IS TEACHING THEM TO SAVE WATER,
For primary bibliographic entry see Field 3B.
W78-09668

CONTRIBUTION TO THE MICROMORPHOLOGY OF SOME SALINE SOILS OF THE NORTH NILE DELTA IN EGYPT,
National Research Centre, Cairo (Egypt). Soils Lab.
For primary bibliographic entry see Field 2G.
W78-09719

CLAY IN RELATION TO PEDALITY AND STABILITY OF MICROSTRUCTURE IN NILE ALLUVIAL SOILS,
Cairo Univ., Giza (Egypt). Dept. of Soils.
For primary bibliographic entry see Field 2G.
W78-09722

OBSERVATIONS OF SOIL WATER AND SALT MOVEMENT UNDER DRIP AND FLOOD IRRIGATION IN AN APPLE ORCHARD,
Commonwealth Scientific and Industrial Research Organization, Merbein (Australia). Div. of Horticultural Research.
J. G. Obbink, and D. M. Alexander.
Agricultural Water Management, Vol. 1, No. 2, p 179-190, September, 1977. 4 fig, 3 tab, 10 ref.

Descriptors: Soil water, *Soil water movement, *Soil moisture, Salts, Salinity, *Saline soils, *Flood irrigation, Surface irrigation, Irrigation practices, Irrigation systems, Orchards, Apples, Crop response, *Drip irrigation.

Part of a mature apple orchard, previously flood irrigated, was converted to drip irrigation in August 1971 and maintained until May 1975. The remainder of the orchard was irrigated as before. Annual estimates were made of moisture, total soluble salts and chloride content of soil samples and of growth, leaf chloride and yield of trees from the two irrigation treatments. Soil moisture was also monitored with a neutron moisture meter. Very high salt concentrations were observed in the various soil layers in the drip irrigation treatment. The flood irrigation treatment had lower and less variable concentrations of salts. Yields and chloride content of leaves sampled each January did not differ significantly between treatments. Tree girths were smaller under drip irrigation. The drip system, using a low pressure head, filtered water and outlets wrapped in fiberglass, operated satisfactorily for the period of the trail. (Skogerboe-Colorado State)
W78-09762

FIELD MEASUREMENTS OF AMMONIA VOLATILIZATION FROM SURFACE APPLICATIONS OF AMMONIUM SALTS TO A CALCAREOUS SOIL,
Agricultural Research Service, Temple, TX. Blackland Conservation Research Center.
For primary bibliographic entry see Field 5B.
W78-09794

3D. Conservation In Domestic and Municipal Use

STATE'S RIGHTS REVISITED: THE NINTH CIRCUIT LEADS THE BUREAU OF RECLAMATION TO WATER.
For primary bibliographic entry see Field 6E.
W78-09700

3E. Conservation In Industry

SYSTEMS CLOSING IN KRAFT PULP MILLS,
Swedish Forest Products Research lab., Stockholm.
For primary bibliographic entry see Field 5D.
W78-09488

TECHNICAL STATUS OF EFFLUENT-FREE SULFITE PULP MILLS (TECHNISCHER STAND DER ABWASSERFREI ARBEITENDEN SULFITZELLSTOFFABRIK),
Chemiefaser Lenzing AG. (Austria).
For primary bibliographic entry see Field 5D.
W78-09489

WATER AND ITS ROLE IN PAPERMAKING (WASSER UND SEINE ROLLE BEI DER PAPIERHERSTELLUNG),
Chemische Fabrik Pelzer und Roehrl, Mainz (West Germany).
J. Varka.
Das Papier, Vol 31, No 10A, p V17-V21, November, 1977. 3 fig, 30 ref. English summary.

Descriptors: Pulp and paper industry, *Industrial water, Hydrogen bonding, Temperature, Ions, Water reuse, Recycling, Water quality, Cations, Water properties, Salts, Chemical precipitation, Water temperature, *Pulp wastes, Industrial wastes, White water(Paper machines), Waste paper.

The properties of water depend on the degree of association of its molecules. Hydrogen bonding is influenced both qualitatively and quantitatively by temperature and the presence of ions. Increased recycling, both of white water and of waste paper, influences ion content and water quality and, hence, the production process. The negative consequences of increased concentrations of polyvalent cations and of large ions with a weak ionic field are discussed, with reference to stock preparation, refining, electrokinetic processes in stock suspensions and deposition of contaminating substances. Various possibilities are considered for eliminating the growth of salt concentrations and consequent production disturbances. These involve either reducing the amount of salts introduced or precipitating them as fillers on the paper web. (Ward-IPC)
W78-09495

START-UP AND OPERATION OF BIOLOGICAL TREATMENT PLANTS IN PAPER MILLS (INBETRIEBNAHME UND BETRIEB VON BIOLOGISCHEN KLAERANLAGEN IN PAPIERFABRIKEN),
For primary bibliographic entry see Field 5D.
W78-09498

POTENTIAL FOR WATER REUSE IN AN EGYPTIAN POULTRY PROCESSING PLANT,
Alexandria Univ. (Egypt). Higher Inst. of Public Health.
For primary bibliographic entry see Field 5D.
W78-09556

FATE OF AFLATOXIN B2 IN A TWO-STEP MICROBIAL RECOVERY SYSTEM FOR FOOD INDUSTRY WASTES,
Economics Lab., Inc., St. Paul, MN. Capsule Testing Labs.
For primary bibliographic entry see Field 5D.
W78-09558

WATER CONFLICTS FROM THE VIEWPOINT OF A REGULATION,
Utah State Engineers' Office, Salt Lake City.
D. C. Hansen.
*Relative rights, *Thermal conductivity, *Energy transfer, *Electric power, *Water allocation(Policy), Thermal properties, Thermal water, Geothermal studies, Legal aspects, Prior appropriation, Competing uses, Irrigation, Water utilization, Water shortage, Energy, Energy conversion, Electricity, Water resources development, Hydrologic budget, Hot springs, Geysers.

The potential for geothermal development in the western United States appears very good. However, the fact remains that water is the medium by which the heat energy is conveyed in a geothermal system. Thus, the interrelationship between the geothermal system and other hydrologic systems needs to be examined. Water availability may be the most potentially limiting factor of geothermal development in the west. For the west is an arid region and even the existing water supply has been, to a large extent appropriated. The effect on present water rights of any geothermal development is especially important because of the large quantities of water that would be consumptively used in the generation of electricity from geothermal sources. A complicating factor is that we do not yet have sufficient experience or knowledge to determine the extent of the effect that geothermal development would have on groundwater resources. The author advises installation of extensive monitoring systems to detect the extent of interference early in the development of the geothermal resources. Thereafter, decisions could be made relative to providing compensation for those injured. (Baumbach-Florida)
W78-09730

WATER FOR INDUSTRIAL DEVELOPMENT IN GEORGE, HANCOCK, PEARL RIVER, AND STONE COUNTIES, MISSISSIPPI,
Geological Survey, Nashville, TN. Water Resources Div.; and Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-09744

GROUNDWATER WITHDRAWN FOR MUNICIPAL, INDUSTRIAL, AND IRRIGATION USE IN THE UPPER PEACE AND ALAFIA RIVER BASINS, WEST-CENTRAL FLORIDA, 1970-74,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-09755

3F. Conservation In Agriculture

SPEED GOVERNOR FOR IRRIGATION SYSTEM,
Wade (R. M.) and Co., Portland, OR. (Assignee).
G. Cornelius.
U.S. Patent No. 4,067,497, 9 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 2, p 571, January 10, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Flow control, Application equipment.

In an irrigation line supported by towers and rotatable about a central pivot, one tower, for example, the outermost tower, includes a governor system for providing that increased water flow is provided to the water motor driving that tower as that tower is driven up a grade, and decreased water flow is provided to the water motor driving that tower as the tower is driven down a grade, as compared to the water flow to the water motor as the tower is driven over generally level ground. Thus the invention provides a drive apparatus which compensates for unevenness in terrain to be irrigated so as to insure substantially even irrigation of the land. (Sinha-OEIS)
W78-09425

TOWER DRIVE MECHANISM FOR SELF-PROPELLED SPRINKLER SYSTEM,
Frontier Machinery, Inc., Walla Walla, WA. (Assignee).
R. T. Pringle, and K. R. Ames.
U.S. Patent No. 4,068,679, 6 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 3, p 960, January 17, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, Sprinkler irrigation, Irrigation efficiency, Application equipment, Water delivery, Self-propelled irrigation systems.

A tower drive mechanism is described for a self-propelled sprinkler system having a water conduit elevationally supported by spaced towers. Each tower has a frame with leg members extending downward and outward interconnecting with a cross axle tube. Tandem wheel assemblies are mounted on the frame adjacent respective ends of the axle tube. A single electric motor is connected to one of the wheel assemblies so that the drive shaft does not become entangled with field debris or vegetation. The wheel assemblies and the motor have their individual worm gear reduction boxes. (Sinha-OEIS)
W78-09430

OSCILLATING SPRINKLING DEVICE,
Etablissements Carpano and Pons (France). (Assignee).
M. Chauvigne
U.S. Patent No. 4,069,976, 8 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 4, p 1395, January 24, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation practices, Irrigation efficiency, Flow control, Water delivery, Application equipment.

A device which enables the sprinkling of a liquid on a substantially rectangular surface, while ensuring a regular distribution is provided. The device comprises a rotary motor element, which may be a turbine, actuable by the pressure of a sprinkling liquid alternately in one direction of rotation or the other. An oscillating sprinkler element, permanently kinematically connected to the rotary driving element, pivots about an approximately horizontal axis alternately in one direction of rotation or the other according to the direction of rotation of the driving element. Means are provided for controlling the change of direction of the driving element so that the jet of liquid under pressure from a single supply duct alternates in first and second directions. (Sinha-OEIS)
W78-09437

INFLUENCE OF TRICKLE AND SURFACE IRRIGATION ON RETURN FLOW QUALITY,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-09443

ASSESSMENT OF IRRIGATION RETURN FLOW MODELS,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5B.
W78-09445

EFFECTS OF IRRIGATION METHODS ON GROUNDWATER POLLUTION BY NITRATES AND OTHER SOLUTES,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 5B.
W78-09446

NITRATE IN EFFLUENTS FROM IRRIGATED LANDS (ANNUAL REPORT),
California Univ., Berkeley.
For primary bibliographic entry see Field 5B.
W78-09447

PROCEEDINGS OF THE SOLAR IRRIGATION WORKSHOP, (1977).
Energy Research and Development, Albuquerque, NM. Sandia Labs.
Available from the National Technical Information Service, Springfield, VA 22161 as SAND 77-0992, Price codes: A04 in paper copy, A01 in microfiche. Workshop held in Albuquerque, New Mexico, July 7-8, 1977. 60 p. Published June 1977, as Report SAND 77-0992.

Descriptors: *Solar irrigation, Energy, *Pumps, *Pumping plants, Irrigation wells, *Irrigation efficiency, Economics, *Irrigation systems, Wind velocity, *Energy conversion.

The Energy and Research and Development Administration Solar Irrigation Workshop was structured to be a major vehicle for information dissemination and technology transfer. It covered a wide range of subject matter related to crop irrigation including current hardware, economics, experiments, and international requirements. Speakers represented manufacturers, ranchers, governmental entities, universities and research firms. An anticipated heterogeneous attendee population dictated a format of many brief presentations rather than fewer more detailed discussions. This was done to expose the participants to the various expert speakers and to give them a cursory introduction to their particular expertise. These proceedings reflect the same intent. They consist of one page abstracts for each presentation, a brief biographical sketch of each speaker and sources for further information on each subject. (Skogerboe-Colorado State)
W78-09448

SOLAR TECHNOLOGY APPLICATIONS: A LITERATURE REVIEW OF SOLAR THERMAL POWERED IRRIGATION SYSTEMS,
California Univ., Livermore. Lawrence Livermore Lab.
H. W. Newkirk.
Available from the National Technical Information Service, Springfield, VA 22161 as UCID-17510, Price codes: A02 in paper copy, A01 in microfiche. Report UCID-17510, June 1977. 18 p, 1 fig, 32 ref.

Descriptors: *Thermal power, Powerplants, *Irrigation systems, Pumping plants, Pumping, *Solar technology, Reviews, *Literature review.

A summary is presented of published information on solar thermal powered irrigation systems. It is a compilation of literature references and a survey of on-going work in this field. Much of the material outlined is tentative, rapidly changing, and highly variable in time and place. The information should therefore be considered a guide rather than a set of specifications and will be updated as additional information and references appear in the literature. (Skogerboe-Colorado State)
W78-09449

SOIL PROPERTIES AND IRRIGATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. W. Grimes.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation for all Reasons, p 40-44, February 13-15, 1977. 2 fig, 3 tab, 8 ref.

Descriptors: Soils, *Soil properties, *Irrigation, Irrigation effects, Root development, Soil moisture, Soil water, Soil investigations, Soil environment, Soil physical properties, *Water management(Applied), *Decision making.

Consideration of all soil properties important to water management decisions is beyond the scope of this report. Emphasis is placed on some techniques for using water related properties of soils in management decisions and impedance characteristics that reduce effective plant root extension. (Skogerboe-Colorado State).
W78-09452

SELECTING THE SYSTEM FOR THE SITE,
oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
M. N. Shearer.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation fo all Reasons, p 45-49, February 13-15, 1977.

Descriptors: Irrigation, *Irrigation systems, *Irrigation practices, Soils, Soil properties, *Sites, Soil physical properties, Sprinkler irrigation, Infiltration, Soil texture, Climates.

The title suggests that something about the 'site' has considerable influence on the type of irrigation system that should be installed at a specific location. If we assume that this is true, we are confronted with the problem of identifying those characteristics which are significant. (Skogerboe-Colorado) State).
W78-09453

TRAFFIC COMPACTION AND IRRIGATION,
National Tillage Machinery Lab., Auburn, AL.
A. C. Trouse, Jr.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation for all Reasons, p 50-53, February 13, 15, 1977. 1 tab.

Descriptors: *Irrigation, Irrigation practices, Irrigation effects, Soils, *Soil compaction, Soil moisture, Soil water, Crop production.

When traffic compaction is present, no amount of irrigation will guarantee superior crop yeilds. Neither will well irrigated fields guarantee top production when soils are only mildly compressed, a common, bur less recognized, situation on may farms today. If moisture is to increase crop production, it must be both available and readily retrievable when needed, by whatever its method of entry into the soil. (Skogerboe-Colorado State)
W78-09454

TAILORING YOUR SOIL FOR DRAINAGE AND IRRIGATION,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
W. H. Daniel.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation For All Reasons, p 54-58, February 13-15, 1977.

Descriptors: *Irrigation, *Drainage, Irrigation effects, Drainage effects, Soils, Soil properties, Turf, Turf grasses, Irrigation design, *Irrigation efficiency.

In much of the world, one of the most evident limitations of climate is the lack of available water. The fantastic advancement of the irrigation industry has been matched by the creative ideas of current installations. In the management of fine turf areas, the reduction of the limitations has been the target for many turf managers. Irrigation improvements have given most turf managers excellent tools for the day by day application of water at preferred quantities, at preferred times and under uniform application conditions. A study of several 18-hole golf course irrigation designs reveals that the number of heads being used vary from 800 to 1200. These, when combined with satellites and controllers for individual operations of the valves and heads, become effective systems. Many, in fact, most turf areas are developed on existing natural soil. Obviously, this includes a wide variety of soil types, each having varying infiltration and drainage potentials. For intensely used turf areas, extensive soil modifications have evolved as systems of construction. Four of these - vertical trenching, sand bedding, Purr-wick and PAT systems should be of interest. (Skogerboe-Colorado State)
W78-09455

DRIP AS SUPPLEMENTAL IRRIGATION,
Trickl-Eez Co., St. Joseph, MI.
J. R. Nye.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation for all Reasons, p 73-76, February 13-15, 1977.

Descriptors: *Supplemental irrigation, Irrigation systems, *Irrigation practices, Water conservation, Irrigation efficiency, *Drip irrigation.

The use of drip or trickle irrigation as a supplement to natural rainfall is finding increased usage throughout the Midwest, Eastern and Southern states. By using technology developed mainly in California and the other western states, where drip irrigation has found widespread use as an efficient labor saving method of irrigation, growers who have never irrigated befor are adapting it to orchards, vineyards, vegetable croplands, and it may even find usage in field crops (Skogerboe-Colorado State).
W78-09456

FERTILIZATION WITH DRIP IRRIGATION: CONCJEPTS, PRACTICES AND PROBLEMS,
Agrispect, Inc., Riverside, CA.
L. Francis.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation for all Reasons, p 80-15, 1977. 2 fig

Descriptors: *Irrigation, Irrigation effects, Irrigation practices, *Fertilization, Fertilizers, Nutrients, *Drip irrigation.

Fertilizer needs of our crops can be largely applied by means of injection through the drip irrigation system, so long as the proper adjustment is used and the chemicals used are thoroughly understood. (Skogerboe-Colorado State).
W78 09457

PECULIARITIES OF DRIP IRRIGATION SYSTEM DESIGN,
Olson Engineering Systems, Indio, CA.
B. R. Olson, Jr.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation for all Reasons, p 84-87, February 13-15, 1977.

Descriptors: Irrigation, *Irrigation systems, *Irrigation practices, Soils, Soil properties, Water conservation, Irrigation design, Sprinkler irrigation, *Drip irrigation.

Drip irrigation is generally considered as a point source application of water at a rate that does not exceed the basic intake rate of the soil. There are certain critieria or 'peculiarities' concerning drip irrigation system design as compared to sprinkler or surface irrigation systems. The design engineer is responsible for critically analyzing these criteria. (Skogerboe-Colorado State).
W78-09458

NITROGEN, CHLORIDE, AND WATER BALANCE WITH IRRIGATED RUSSET BURBANK POTATOES IN A SANDY SOIL,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W78-09652

PHOTOSYNTHESIS OF SUGARBEETS UNDER N AND P STRESS: FIELD MEASUREMENTS AND CARBON BALANCE,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
J. W. Cary.
Agronomy Journal, Vol. 69, No. 5, p 739-744, September-October 1977. 7 fig, 1 tab, 10 ref.

Descriptors: Crop production, *Photosynthesis, *Sugarbeets, *Phosphorus, *Nitrogen, Carbon balance, Crop response, Nutrients, Fertilizers, Fertilization, Measurement.

Advances in crop management are limited by inability to recognize changes in growth resulting from short-term fluctuations in plant environment. Simple, rapid, and nondestructive methods are needed to indicate daily and hourly rates of growth under field conditions. Because plant carbon balance is one possible approach to this problem, CO2 gas exchange parameters were measured on Beta vulgaris leaves of field-grown plants to learn whether or not they might signal the onset of nitrogen and P stresses. The sugarbeets were grown on field plots of Portneuf silt loam soil and allowed to develop severe N and P stresses. Carbon dioxide exchange and stomatal resistance of intact plant leaves were measured with small leaf chambers during 1 minute periods. Leaf water potentials were also measured in the field with a hydraulic press. The CO2 compensation points, dark respiration, and osmotic pressures of excised leaf tissue were measured in the laboratory by standard methods. Photosynthesis per unit leaf area was reduced in advanced stages of N deficiency; however, none of the measurements satisfactorily indicated the onset of N or P stress because of heterogeneity between leaves. (Skogerboe-Colorado State)
W78-09653

ARID AND SEMI-ARID LANDS: PROBLEMS AND PROSPECTS,
Cairo Univ. Giza (Egypt).
For primary bibliographic entry see Field 6G.
W78-09655

ROLE OF CHANGES IN SOLUTE CONCENTRATION IN MAINTAINING FAVORABLE WATER BALANCE IN FIELD-GROWN COTTON,
California Univ., Davis. Dept. of Agronomy and Range Science.
J. M. Cutler, D. W. Rains, and R. S. Loomis.
Agronomy Journal, Vol. 69, No. 5, p 773-779, September-October 1977. 5 fig, 49 ref.

Descriptors: *Cotton, Crop response, *Soil water, Soil moisture, *Irrigation, Irrigation effects, Crop production, Agriculture.

Cotton shows various adaptive responses to water deficits, including alterations in cellular osmotic concentrations. The role of changes in solute concentration in maintaining favorable water balance in field-grown cotton was evaluated under wet and dry irrigation treatments. The experiments were conducted with a fine loamy mixed, calcareous thermic-Typic Torriorthents soil in a semi-arid environment. Leaf diffusive resistance, measured by a resistance porometer, was unaffected by leaf water potential while the typical response to light was maintained. Leaf blade elongation rate was less in plants with low leaf water potential. The rate was maximal in the early evening and depressed during the midday water potential minimum and at night. Some blade enlargement occurred during time intervals when leaf water potentials were as low as -19 to -23 bars. (Skogerboe-Colorado State)
W78-09658

SOIL CONSERVATION ON AGRICULTURAL LAND: THE CHALLENGE AHEAD,
Soil Conservation Service, Washington, DC.
R. M. Davis.
Journal of Soil and Water Conservation, Vol. 32, No. 1, p 5-8, January-February 1977. 5 ref.

Descriptors: *Agriculture, *Soil conservation, Soil management, Crop production, Erosion, Soil erosion, Water quality.

Agriculture is a dynamic industry. Its technology and economics change constantly. Within this dynamic framework, soil conservationists, for more than four decades now, have tried to keep one objective clearly in view: To bring about improved soil and water management through a voluntary, cooperative program with conservation districts and landusers. Today, soil conservationists still find themselves confronted by change and challenge. Some suggestions are made as to how public involvement can aid in solving these problems. (Skogerboe-Colorado State)
W78-09659

NEMATICIDE DISTRIBUTION UNDER A DRIP EMITTER,
Georgia Univ., Athens. Dept. of Agricultural Engineering.
P. M. Garvey, and J. L. Chesness.
Paper No. 77-2014 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 16 p, 3 fig, 3 tab, 17 ref.

Descriptors: *Nematocide, Soils, Soil properties, Irrigation, Irrigation effects, *Irrigation systems, *Path of pollutants, Water pollution, *Drip irrigation.

Distribution of nematicide in the soil when applied at different concentrations through a drip irrigation emitter was studied. Concentrations of 30, 800, and 1500 ppm were used and soil volumes exposed to lethal concentrations of the nematicide were determined for each. (Skogerboe-Colorado State)
W78-09660

DRIP AND SPRINKLER IRRIGATION OF CARROTS AND ONIONS,
Montana State Dept. of Health and Environmental Sciences, Helena. Subdivision Bureau.
J. D. Melstad, and D. W. DeBoer.
Paper No. 77-2013 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 13 p, 1 fig, 6 tab, 8 ref.

Descriptors: *Carrots, *Onions, *Sprinkler irrigation, Irrigation systems, Irrigation, *Drip irrigation.

One carrot and two onion varieties were drip and sprinkler irrigated. Drip yields were greater than sprinkler yields when equal gross amounts of water were used. Drip onions and carrots were larger on the average than sprinkler onions and carrots. (Skogerboe-Colorado State)
W78-09661

TRICKLE IRRIGATION: PREVENTION OF CLOGGING,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
R. G. Gilbert, F. S. Nakayama, and D. A. Bucks.
Paper No. 77-2011 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 23 p, 4 fig, 3 tab, 17 ref.

Descriptors: *Clogging, Irrigation, Irrigation systems, Irrigation practices, Irrigation efficiency, Filtration, Sediment load, *Trickle irrigation, Colorado River, Irrigation water.

Cloggings of several types of trickle emitters delivering Colorado River irrigation water to mature citrus trees was prevented by a combination of filtration and chemical treatments, which removed suspended load, and controlled microbial slime development and precipitation of carbonates. (Skogerboe-Colorado State)
W78-09662

MANUFACTURING VARIATION OF EMITTERS IN TRICKLE IRRIGATION SYSTEMS,
Rain Bird Technical Services, Logan, UT.
K. Solomon.
Paper No. 77-2009 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 20 p, 4 fig, 4 tab, 9 ref.

Descriptors: *Irrigation systems, Uniformity, *Irrigation efficiency, Irrigation, Irrigation practices, *Trickle irrigation, *Emitters.

Emitter manufacturing variation is shown to significantly affect trickle system efficiencies. Values of the Coefficient of Manufacturing Variation are given for several emission devices. Emission rate distributions are shown for typical trickle system conditions, and are evaluated according to Emission Uniformity and Water Storage Efficiency concepts. (Skogerboe-Colorado State)
W78-09663

ECONOMICS OF CENTER PIVOT END GUNS,
Rain Bird Sprinkler Mfg. Corp., Logan, UT.
R. D. von Bernuth.
Paper No. 77-2008 presented at the Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 9 p, 3 fig, 3 tab, 4 ref.

Descriptors: *Sprinkler irrigation, Economics, Irrigation practices, Irrigation engineering, Irrigation systems, *Center pivot sprinklers, Costs.

Gun type sprinkler used as 'end guns' on center pivots are a popular means of gaining additional irrigated acreage. Several economic factors factors which result from using 'end guns' should be considered before arriving at the conclusion to use one. (Skogerboe-Colorado State)
W78-09664

CENTER PIVOT END SPRINKLER PATTERN ANALYSIS AND SELECTION,
Rain Bird Technical Services, Logan, UT.
K. Solomon, and M. Kodama.
Paper No. 77-2007 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 24 p, 6 fig, 2 tab, 9 ref.

Descriptors: *Sprinkler irrigation, Irrigation efficiency, Irrigation engineering, *Irrigation design, Sprinklers, *Center pivot sprinklers.

Application patterns from center pivot end sprinklers are determined from stationary distribution curves and presented in generalized form. Criteria are defined for evaluating end sprinkler selections relative to efficient utilization of land, water, and energy resources. Procedures are given for relating sprinklers and machine variables with end sprinkler performance. (Skogerboe-Colorado State)
W78-09665

CENTER PIVOTS: FINANCING OR LEASING,
A. J. LoBello.
Irrigation Journal, Vol 27, No 4, p 16-17, July-August, 1977. 1 fig, 1 tab.

Descriptors: Irrigation, *Irrigation systems, *Sprinkler irrigation, Economics, Financing, Leases, *Center pivots.

Center pivot systems are the fastest-growing sector of the irrigation equipment market. Of the two million acres coming under irrigation each year, it is estimated that 60 per cent now are center pivot, with the market growing about 15 per cent each year. At that rate, center pivot can be expected to constitute up to half of the systems in the United States in future years, and a total of some 50 million acres will come under this type of irrigation. Center pivot system currently run from $30,000 to $60,000 per unit. So, next to the right irrigation system for his needs, the ability to offer a customer the best financing package is one of the most improtant marketing tools a dealer has. Four financing plans are discussed. (Skogerboe-Colorado State)
W78-09667

ENERGY AND IRRIGATION SYSTEM PLANNING,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research.
A. Humpherys.
Irrigation Age, Vol 11, No 7, p 74-75, April, 1977. 2 tab.

Descriptors: *Irrigation systems, Irrigation engineering, Irrigation practices, Irrigation design, Economics, *Planning, *Energy, *Pumping.

Most irrigators are concerned with the spiraling costs and threatened shortages of energy for irrigation pumping. Energy costs are expected to continue increasing and, in some areas, limited energy supplies may restrict irrigation development. Irrigation systems are normally based on a least cost design. With low energy costs, for example, it has been more economical to use smaller pipes than would be used for minimum-energy designs. Future systems may require a minimum-energy design to minimize energy inputs. As energy costs increase, this also may be the least cost design. (Skogerboe-Colorado State)
W78-09669

GROWTH OF SPRINKLERS SIX TIMES FASTER THAN FURROW IRRIGATION.
Irrigation Age, Vol. 11, No. 5, p 28, 48, February, 1977. 1 fig, 1 tab.

Descriptors: *Sprinkler irrigation, *Furrow irrigation, Irrigation methods, Irrigation practices, Irrigation systems.

Sprinkler irrigation accounts for the major portion of the growth in irrigated areas in the United States. Between 1974 and 1975 the rate of growth of sprinkler irrigation was 6.2 times the rate of growth of gravity irrigation. The rapid increase in center pivot irrigation accounts for a major proportion of this growth in sprinkler irrigation. (Skogerboe-Colorado State)
W78-09670

SOLAR IRRIGATION SYSTEM BEGINS OPERATING IN NEBRASKA.
Irrigation Journal, Vol. 27, No. 5, p 37, September-October, 1977. 1 fig.

Descriptors: Irrigation, Irrigation practices, *Irrigation systems, Solar radiation, *Nebraska, *Solar irrigation systems.

One of the first crop irrigation systems to be powered by solar energy, began operating the end of July in Mead, Nebraska. The solar unit, designed by the Massachusetts Institute of Technology's Lincoln Laboratory, will use approximately 120,000 solar cells to convert the sun's rays into electricity. The unit drives a ten horsepower pump to irrigate 80 acres of corn and soybeans in the summer. In addition to irrigation, the solar powered system will be used during the fall and winter to dry crops that will be harvested from the field. (Skogerboe-Colorado State)
W78-09671

WATER'S KEY TO PROFITABLE ALFALFA SEED PRODUCTION.
Irrigation Age, Vol. 12, No. 2, p 38, 40, October, 1977. 3 fig.

Descriptors: *Alfalfa, *Crop production, Irrigation, Irrigation efficiency, Irrigation practices, *Washington, Seeds.

Water for irrigation, or the lack of it at critical times in the growing season, has turned the western end of Wala Walla County, Washington into one of the nation's prime locations for alfalfa seed production. Irrigation water for the area comes from the Blue Mountains. Unfortunately, water flow from the mountains stops the first of June and doesn't resume unitl September. This limits the growing of row crops which require summer-long irrigation. But for alfalfa seed, the availability of water is suitable. (Skogerboe-Colorado State)
W78-09672

THE FINE ART OF USING ENOUGH, BUT NOT TOO MUCH BORON,
Hawaii Univ., Honolulu. Dept. of Plant Physiology.
J. E. Bowen.
Crops and Soils Magazine, Vol. 29, No. 9, p 12-14, August-September, 1977. 2 fig, 1 tab.

Descriptors: *Boron, Nutrients, *Fertilizers, Fertilization, Crop production, *Crop response.

During the past 50 years several seemingly different diseases have appeared in different crops. These diseases were puzzlers to both farmers and agricultural researchers. It has now been determined that all of these diseases are actually caused by the same problem; a lack of boron. (Skogerboe-Colorado State)
W78-09673

LATERAL FLUSHING VALVES: A GUIDE TO PLANNING, INSTALLATION, OPERATION AND MAINTENANCE,
AMIAD Filtration and Irrigation Systems, Khorazim (Israel).
F. Beth.
Drip/Trickle Irrigation, Vol. 2, No. 1, p 27-29, January/February 1977.

Descriptors: Irrigation, Irrigation systems, *Irrigation practices, Suspended solids, Sprinkler irrigation, Orifices, Velocity, *Valves(Flushing), *Planning, Operations and maintenance.

There is now a well recognized need for the regular cleaning of irrigation lines where equipment with relatively small orifices is used; as with sprinklers, spray and mist nozzles, drippers, and simple orifices. The need becomes even more critical when the dirt load in the available water is high. The ability of a system to flush the irrigation network is provided in the lateral flushing valve, which has been developed during the last few years. It provides an automatic flushing action for cleaning all the irrigation lines at least once during each irrigation cycle. (Skogerboe-Colorado State)
W78-09674

CONSERVATION TILLAGE IN THE WESTERN CORN BELT,
Iowa State Univ., Ames. Dept. of Agronomy.
M. Amemiya.
Journal of Soil and Water Conservation, Vol. 32, No. 1, p 29-36, January-February 1977. 8 tab, 59 ref.

Descriptors: *Crop production, Agriculture, Soil erosion, Soil management, Soil conservation, Water quality, Erosion, *Cultivation, Corn(Field), *Great Plains.

Fertile soils and favorable climate make the western Corn Belt-Iowa, Minnesota, Missouri, and the humid areas of eastern Nebraska and eastern South Dakota - one of the world's outstanding grain-producing regions. For the western Corn Belt to continue to use its productive soils and favorable climate to help meet domestic and world agricultural needs will depend on how prudently the land resource is used. Soil erosion is the dominant limitation to agriculture on at least 30 percent of the region's cropland, and this cropland's potential contribution to watershed sediment yeild is very high. (Skogerboe-Colorado State)
W78-09675

CONSERVATION TILLAGE IN THE PACIFIC NORTHWEST,
Agricultural Research Service, Pullman, WA.
R. I. Papendick, and D. E. Miller.
Journal of Soil and Water Conservation, Vol. 32, No. 1, p 49-56, January-February, 1977. 4 fig, 1 tab, 49 ref.

Descriptors: *Cultivation, Crop production, Soil erosion, Erosion, Water conservation, Runoff, Soil surface, Soil properties, Soil management, Land resources, Agriculture, *Pacific Northwest US.

Despite years of research and development, tillage and cropping practices to conserve soil and water in the Pacific Northwest have not completely achieved the goals of efficient water use and soil protection. Precipitation and irrigation water still run off, and soil losses remain high. In the Palouse Region, for example, where the moldboard plow is widely used, erosion is as great as anywhere in the United States. There is a trend in many areas to reduced tillage and surface residue systems. (Skogerboe-Colorado State)
W78-09676

FUTURE USE OF AGRICULTURAL LAND FOR NONAGRICULTURAL PURPOSES,
Arkansas Univ., Fayetteville. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 4A.
W78-09677

IRRIGATION IN WYOMING,
Wyoming Univ., Laramaie. Dept. of Engineering.
D. J. Brosz.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation for All Reasons, p 173-175, February 13-15, 1977.

Descriptors: *Irrigation, *Wyoming, Irrigation practices, Resources, Resource development, Water, Water conservation.

Wyoming has the opportunity to finance, through minerals, its own water projects; any size, without having to obtain money from the federal government. Now, state funds made available for loans can be authorized for: (1) Reclamation of new lands (irrigation); (2) Development of new water supplies for existing irrigated land that is short of water supplies; (3) Construction of reservoirs, diversion works, canals, pipelines, pumping stations, etc.; and (4) Development of groundwater. (Skogerboe-Colorado State)
W78-09678

PRACTICAL GROUND WATER MANAGEMENT,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
D. D. Axthelm.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation for All Reasons, p 168-172, February 13-15, 1977.

Descriptors: *Groundwater, *Irrigation, Groundwater resources, Groundwater recharge, Groundwater mining, Groundwater basins, *Nebraska, Natural resources, Resources.

The emphasis on ground water development for irrigation lasted about a century. Concern has now shifted from development to management of the ground water resources. This emphasis will continue indefinitely. There is a current need to develop practical management methods and techniques. (Skogerboe-Colorado State)
W78-09679

SCHEDULING AND MONITORING IRRIGATION WITH INFRA-RED PHOTOGRAPHY,
Crop Protection, Inc., Umatilla, OR.
M. Pitney.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation for All Reasons, p 176-177, February 13-15, 1977.

Descriptors: *Scheduling, *Irrigation, Irrigation practices, Soil moisture, Soil water, *Infrared radiation, Crop production, Crop response, *Aerial infrared photography, Remote sensing, *Monitoring.

Aerial infra-red photography is being used in agriculture to identify plants which are under stress from disease, moisture and nutrients. By interpretation of the infra-red reflectance, as recorded on film, it is possible to distinguish between healthy and unhealthy foliage. The value of photography is in the early detection of the stressed plants. The photography also makes the application of corrective measures quick and efficient. (Skogerboe-Colorado State)
W78-09680

IRRIGATION TECHNOLOGY AND AGRICULTURE PRODUCTION,
Western Empire Corp., Irrigon, OR.
D. Logan.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation For All Reasons, p 178-180, February 13-15, 1977.

Descriptors: Irrigation, *Irrigation practices, Irrigation effects, Agriculture, *Crop production, *Oregon, *Technology(Irrigation).

An irrigation farmer presents his views of irrigated agricultural development and irrigation technology. (Skogerboe-Colorado State)
W78-09681

PLANNING SYSTEMS TO MAXIMIZE QUALITY AND PROFIT,
E. L. Bean.
In: Proceedings of the 1977 Annual Technical Conference, Irrigation for all Reasons, p 67-69, February 13-15, 1977.

Descriptors: Irrigation, Irrigation practices, Irrigation design, *Turf irrigation, Turf grasses, Water conservation, Soils, Sprinkler irrigation, *Irrigation systems.

Various design factors as related to irrigation systems are presented and discussed with particular emphasis on turf irrigation systems. (Skogerboe-Colorado State)
W78-09682

INFLUENCE OF IRRIGATION AND ENVIRONMENTAL FACTORS ON GRAPEFRUIT ACIDITY,
Volcani Agricultural Research Organization, Bet Dagan (Israel).
Y. Levy, A. Bar-Akiva, and Y. Vaadia.
Journal of the American Society of Horticultural Science, Vol. 103, No. 1, p 73-76, January, 1978, 1976 Series, No. 272-E. 4 fig, 21 ref.

Descriptors: *Moisture stress, Water requirements, Plant growth, Water supply, *Irrigation effects, Water demand, *Environmental effects, *Grapefruit, *On-site tests, Sampling, Israel, Negev Desert.

Previous studies of desert grown grapefruit (Citrus paradise Macf.) indicated grapefruit's acidity level increased in certain years during the winter months, especially in January, and caused the fruit to be less palatable. This irrigation experiment conducted in the northern Negev Desert, tested the environmental effects of different irrigation intervals on a grapefruit orchard. Fruit sampling indicated summer water stress in grapefruit caused high titratable acidity levels during the winter. The environmental effects of water reduction in the summer months could last up to six months. Brief, sudden rises of fruit acidity during the winter months correlated with correspondingly high daytime temperatures. Short-term warming did not effect the grapefruit's root environment. (Jewkes-Arizona)
W78-09713

HISTORY AND CHALLENGES IN SOIL AND WATER CONSERVATION AND MANAGEMENT,
Association of North Central State Agricultural Experiment Station, Ames, IA.
For primary bibliographic entry see Field 2G.
W78-09714

THE EFFECT OF CLIMATE ON IRRIGATED COTTON YIELDS UNDER SEMI-ARID CONDITIONS: TEMPERATURE-YIELD RELATIONSHIPS,
Isreal Meteorological Service, Bet-Dagan. Div. of Agricultural Meteorology.
J. Lomas, M. Mandel, and Z. Zemel.
Agricultural Meteorology, Vol. 18, No. 6, p 435-453, 1977. 7 tab, 6 fig, 26 ref.

Descriptors: *Semiarid climate, *Crop response, *Cotton, *Air temperature, *Yield equations, Irrigated crops, Crop production, Plant growth, Growth stages, Seeds, Germination, Mature growth stage, Coastal Plains, Harvesting, Irrigation practices, Fertilization, Soil environment, Variability, Flowering, Boll development, Israel, Agricultural practices, Sowing, Growing season.

The relationship between air temperature and cotton yields is reviewed for seed germination and emergence, early growth, flowering, and boll development and maturation. A data base was analyzed for cotton fiber yields in the Central

Coastal Plain of Israel, covering an 11-year period (1961-1971). Various agricultural practices such as sowing and harvesting dates, timing and amounts of irrigation and fertilization, and soil characteristics were noted. Multivariate temperature-yield analysis was performed, showing a wave-like response. Weekly maximum temperatures accounted for 28 percent, and weekly minimum temperatures for 14 percent of the variability of commercial cotton yields. Optimal temperatures are given for the four stages of plant growth through the entire growing season. (Popkin-Arizona)
W78-09717

A SIMULATION MODEL APPROACH FOR RELATING EFFECTIVE CLIMATE TO WINTER WHEAT YIELDS ON THE GREAT PLAINS,
Barnard Coll., New York.
For primary bibliographic entry see Field 2G.
W78-09723

FEDERAL LAW, IRRIGATION AND WATER POLLUTION,
For primary bibliographic entry see Field 5G.
W78-09724

GROUNDWATER WITHDRAWN FOR MUNICIPAL, INDUSTRIAL, AND IRRIGATION USE IN THE UPPER PEACE AND ALAFIA RIVER BASINS, WEST-CENTRAL FLORIDA, 1970-74,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-09755

RATIONALISATION OF IRRIGATION RATES IN A DEVELOPING COUNTRY,
Central Water Commission, New Delhi (India).
C. V. Gole, V. N. Amble, and M. M. L. Chopra.
Internationa Commission on Irrigation and Drainage Bulletin, Vol. 26, No. 1, p 31-40, 49, January, 1977. 1 tab, 6 ref.

Descriptors: *Irrigation water, Irrigation, Irrigation practices, *Pricing, *Water demands, Economics, *Water rates.

The problem of fixation of irrigation rate assumes particular importance in a developing country like India where the State has to assume responsibility for the large scale supply of irrigation. The irrigation rate has then to be determined balancing two opposing considerations. On the one hand, it is necessary to recover the costs and even a share of the benefit received by the irrigator in the interest of resource mobilization for further development as the benefit of irrigation accures only to a small section of the population. On the other hand, the producer has to be provided the incentive for increasing production through greater utilization of irrigation. Practices with regard to irrigation rates in various States of India and some other countries are reviewed and principles for arriving at a rational structure of irrigation rates are discussed. (Skogerboe-Colorado State)
W78-09761

DRIP IRRIGATION,
K. Shoji.
Scientific American, p 62-68, November, 1977. 5 fig, 1 tab.

Descriptors: Irrigation, Irrigation systems, *Irrigation efficiency, Crop production, Soil water, Soil water movement, *Water conservation, *Saline water, Salinity, *Drip irrigation.

Plastic pipes laid on the surface of the ground deliver water to plants drop by drop. The system reduces stress on the plant, conserves water and works well with saline water. (Skogerboe-Colorado State)
W78-09767

SOIL AND WATER CONSERVATION PRACTICES FOR POLLUTION CONTROL,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-09768

COMPARISON OF SURFACE-DRAINED AND SUBSURFACE-DRAINED CLAYPAN SOILS,
Illinois Univ. at Urbana-Champaign Dept. of Agricultural Engineering.
P. N. Walker.
Paper No. 77-2589 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977. Chicago, Illinois, 6 p, 5 fig, 1 tab, 3 ref.

Descriptors: *Corn(Field), *Crop production, Drainage, Irrigation, *Irrigation effects, *Drainage effects, Furrow irrigation, Sprinkler irrigation.

Corn grown in claypan soil received ten different combinations of drainage and irrigation treatments. One year's yield data indicate no major differences between the drainage treatments or between sprinkler and furrow irrigation. Irrigated plot yields averaged 9.3 tonnes/ha. Nonirrigated plot yields averaged 4.3 tonnes/ha. (Skogerboe-Colorado State)
W78-09769

CAPILLARY POTENTIAL DISTRIBUTIONS IN ROOT ZONES USING SUBSURFACE IRRIGATION,
Department of Agriculture, Watkinsville, GA.
For primary bibliographic entry see Field 2G.
W78-09770

TRICKLE AND SPRINKLER IRRIGATION OF GRAIN SORGHUM,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
C. J. Ravelo, E. A. Hiler, and T. A. Howell.
Transactions of the American Society of Agricultural Engineers, Special Edition, Vol. 20SW, p 96-99, February 20, 1977. 5 fig, 3 tab, 18 ref.

Descriptors: *Sprinkler irrigation, *Crop response, *Grain sorghum, Lysimeters, Crop production, Irrigation systems, Water measurement, Water control, Water balance, *Trickle irrigation.

Crop response and water use efficiency (ratio of grain yield to total crop water use) of grain sorghum in an environmentally controlled lysimeter installation were investigated using trickle and sprinkler irrigation. Also, effects of different trickle irrigation frequencies on the crop growth and grain yield were studied. Results indicate no significant differences in yield or water use efficiency when using trickle and sprinkler irrigation with three irrigations per week. Also, trickle irrigation frequencies of 1, 2, and 3 irrigations per week appeared to have no significant effect on yield or water use efficiency of grain sorghum on a layered sandy loam soil. (Skogerboe-Colorado State)
W78-09772

IMPROVED SEMI-AUTOMATIC GATES FOR CUT-BACK SURFACE IRRIGATION SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-09773

RECLAIMING PARTIALLY CLOGGED TICKLE EMITTERS,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 5G.
W78-09774

SUGAR BEET RESPONSE TO WATER STRESS IN SANDY SOILS,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
E. C. Stegman, and A. Bauer.
Transactions of the American Society of Agricultural Engineers, Special Edition, Vol. 20SW, p 469-473, June 20 1977. 12 fig, 1 tab, 13 ref, 1 equ.

Descriptors: *Sugar beets, Plant growth, *Crop response, Crop production, Soil water, Irrigation effects, *Soil moisture, Leaves, *Water stress, *Sands.

Leaf xylem pressure data suggest brief reductions to about -14 to -15 bars may be tolerable provided average pressure over 10-20 day intervals is above -12bars. Seasonal average pressures of -15 and -21 bars reduce yields to 0.6 and 0.1 that of a nonstress treatment, respectively. Water management criteria based upon allowable levels of leaf xylem pressure are suggested. (Skogerboe-Colorado State).
W78-09776

MANAGEMENT OF BED-FURROW IRRIGATED SOIL WITH LIMITED AND NO-TILLAGE SYSTEMS,
Southwestern Great Plains Research Center, Bushland, TX.
J. T. Musick, A. F. Wiese, and R. R. Allen.
Transactions of the American Society of Agricultural Engineers, Special Edition, Vol. 20SW, p 666-672, August 20, 1977. 1 fig, 4 tab, 8 ref.

Descriptors: *Irrigation systems, *Furrow systems, Crop production, Management, *Soil water, Irrigation water, Grain sorghum, *Furrow irrigation, Cultivation.

Limited and no-tillage management in the Southern Plains can be beneficially used in irrigated cropping systems. About 75 percent of the irrigation in this region is by the graded-furrow method. Learning how to manage beds and furrows between crops is essential for development of practical management systems. Results are reported of 7 years of field research in developing and evaluating limited and no-tillage management systems for irrigated crop production. (Skogerboe-Colorado State).
W78-09777

IMPROVING WATER USE IN SPRINKLING FOR BLOOM DELAY,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
B. J. Barfield, G. M. White, T. C. Bridges, and C. Chaplin.
Transactions of the American Society of Agricultural Engineers, Special Edition, Vol. 20SW, p 688-691, 696, August 20, 1977. 5 fig, 8 ref.

Descriptors: *Sprinkler irrigation, Cooling, *Peaches, *Fruit crops, Evaporation, Mist, Transpiration, Frost protection, Water utilization.

Bud development was delayed on Redhaven peach trees in 1975 by using evaporative cooling from sprinkler irrigation when bud temperatures exceeded 4.4C. 104 cm of water were applied. Analysis was made of the potential reduction in water use and cooling that would have been obtained if sprinkling had been initiated at bud temperatures ranging from 4.4 to 9C whenever cooling potential existed. Cooling potential was measured by the difference between dry bud temperature and wet bulb temperature. The optimum set points for initiating sprinkling were dry bud temperature of 6.7C and a cooling potential of 2.0C. (Skogerboe-Colorado State)
W78-09778

IRRIGATION APPLICATION DEPTHS FOR OPTIMUM CROP PRODUCTION,
South Dakota State Univ., Brookings, Dept. of Agricultural Engineering.
D. W. DeBoer, D. D. Brosz, and J. L. Wiersma.
Transactions of the American Society of Agricultural Engineering.

Descriptors: *Sprinkler irrigation, *Soil moisture, Corn(Field), *Crop production, Grains(Crops), *Application methods, *Water utilization, Sirface irrigation, Irrigation water, Evapotranspiration, *South Dakota, Tensiometers.

Consideration of all soil properties important to water management decisions is beyond the scope of this report. Emphasis is placed on some techniques for using water related properties of soils in management decisions and impedance characteristics that reduce effective plant root extension. (Skogerboe-Colorado State).
W78-09779

ESTIMATING RUNOFF FROM FURROW IRRIGATION,
Kansas State Univ., Garden City. Garden City Experiment Station.
For primary bibliographic entry see Field 4A.
W78-09780

GYPSUM BLOCKS, TENSIOMETERS RELIABLE SOIL MOISTURE MONITORS.
Irrigation Age, Vol. 11, No. 7, p 31, 40, 48, April, 1977. 1 fig, 4 tab.

Descriptors: *Tensiometers, *Soil moisture, Soil water, Crop production, Irrigation, *Irrigation efficiency.

Two dependable, easy to use methods for irrigation scheduling are electrical resistance blocks and tensiometers. Both systems will help conserve water and increase yields. A brief run-down on each with suggestions on how to use them is presented. (Skogerboe-Colorado State)
W78-09781

ESTIMATING LEAF WATER POTENTIAL IN SAFFLOWER,
Pahlavi Univ., Shiraz (Iran). Dept. of Irrigation.
A. R. Sepaskhah.
Agronomy Journal, Vol. 69, No. 5, p 894-896, September-October 1977. 1 fig, 14 ref.

Descriptors: Crop production, Greenhouses, Laboratory tests, Laboratory equipment, Leaves, *Safflower, *Estimating, Measurement.

The pressure chamber technique is used for rapid measurements of plant water potential. Comparison of this method with thermocouple psychrometer technique is required at various stages of growth for different crops. Xylem water potential estimated by pressure chamber and leaf water potential measured by thermocouple psychrometer were correlated for safflower leaves at vegetative and flowering stages of growth in greenhouse conditions. The results of the two methods were linearly related for both growth stages but the equations were different at the 1% level. The values of ordinate intercept were nearly equivalent to the xylem sap osmotic potentials at the both stages of growth. (Skogerboe-Colorado State)
W78-09783

THE DEPENDENCE OF IRRIGATION REQUIREMENTS ON WATER-TABLE DEPTH IN DRAINED LANDS,
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gidrotekhniki i Melioratsii, Moscow (USSR).
Y. N. Nikolski.
Agricultural Water Management, Vol. 1, No. 2, p 191-196, September, 1977. 3 fig, 9 ref.

The amount of irrigation water required to maintain an optimal average water content in the root zone for maximum crop yield is dependent on the water-table depth as well as on evapotranspiration. An approximate expression is derived in terms of soil constants for the vertical soil water flux, which may be directed upwards or downwards, above the water table. This has been used in a water-balance equation in order to estimate the irrigation requirement. Satisfactory agreement is found between results calculated using this theoretical relationship and published experimental work. (Skogerboe-Colorado State)
W78-09785

DRIP IRRIGATION STRIKES BACK AT WATER SHORTAGES,
California Univ., Riverside.
S. Davis.
Irrigation Age, Vol. 11, No. 9, p 31, 35, July-August, 1977.

Descriptors: Irrigation, Irrigation systems, *Irrigation practices, *Water conservation, *Drip irrigation.

To solve the drought problem in 1977, or during any dry year, one must learn to store more water and make more use of our available water. One efficient way to accomplish the latter is with drip irrigation. (Skogerboe-Colorado State)
W78-09788

SUGAR BEETS TOLERATE MORE LIMITED IRRIGATION,
Texas A and M Univ., Lubbock. Research Center.
L. New.
Irrigation Age, Vol 12, No 1, p 51-52, September, 1977. 2 fig, 1 tab.

Descriptors: *Sugar beets, Irrigation, *Irrigation effects, Irrigation practices, *Water conservation, Evapotranspiration, *Water demand.

Sugar beets, once considered to have high and critical demands for water, have yielded well under more limiting irrigation in field tests near Hereford, Texas. In 5-year irrigation demonstrations, sugar beets that were irrigated on 3-week intervals averaged 27.3 tons per acre, while beets that were irrigated on 2-week intervals averaged 26.7 tons. Irrigation applications averaged about 8 inches less when irrigating on the 3-week frequency. In a third comparison, sugar beets irrigated on 4-week intervals averaged 24.3 tons per acre. (Skogerboe-Colorado State)
W78-09789

NEUTRON PROBE PROMISING SCHEDULING TOOL,
Bureau of Reclamation, Boulder City, NV. Lower Colorado Regional Office.
A. S. Dronsfield.
Irrigation Age, Vol. 11, No. 8, p 38, May-June, 1977. 1 fig.

Descriptors: *Soil water, *Soil moisture, Crop production, Irrigation, Irrigation efficiency, Irrigation practices, *Neutron probe(Soils).

The Neutron Probe is now a field tool and can be used to determine when to irrigate and how much water to apply. It has been recognized as an excellent research instrument for determining soil moisture content. (Skogerboe-Colorado State)
W78-09792

IRRIGATED SOYBEANS: BIG YIELDS FROM A LITTLE TIMELY WATER,
J. Schleicher.
Irrigation Age, Vol. 11, No. 7, p 16, 18, 20, April, 1977. 2 fig.

Descriptors: *Soybeans, *Crop production, Irrigation, *Irrigation efficiency, Irrigation water, Crop response.

Soybean irrigation has a strong hold in the Midwest. In Nebraska last year, an estimated 200,000 acres of soybeans were produced under irrigation. Some 120,000 acres of soybeans were grown with supplemental water in Texas. Another 90,000 acres were irrigated in Missouri in 1976, 35,000 acres in Kansas, and an estimated 17,000 acres in Oklahoma. (Skogerboe-Colorado State)
W78-09793

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

HYDROLOGIC DATA OF THE COASTAL DRAINAGE BASINS OF SOUTHEASTERN MASSACHUSETTS, PLYMOUTH TO WEWEANTIC RIVER, WAREHAM,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09304

HYDROLOGIC DATA OF THE CHARLES RIVER BASIN, MASSACHUSETTS,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09305

FLOOD PROFILES OF THE ALAFIA RIVER, WEST-CENTRAL FLORIDA, COMPUTED BY STEP-BACKWATER METHOD,
Geological Survey, Tallahassee, FL. Water Resources Div.
A. F. Robertson.
Water-Resources Investigations 77-74 (open-file report), March 1978. 21 p, 8 fig, 2 tab, 9 ref.

Descriptors: *Flood frequency, *Flood peak, *Flood discharge, *Flood profiles, Flood recurrence interval, Flood data, Flood routing, Streamflow, Gaging stations, Florida, *Alafia River, West-central Florida, *Step-backwater method.

The Alafia River is a coastal stream that discharges into Hillsborough Bay. The river and its two principal tributaries, North Prong Alafia River and South Prong Alafia River, drain an area of 420 sq mi of predominantly rural land. However, near the coast, urban residential developments are increasing. The flood plain of the river is subject to flooding, particularly during large regional storms. Peak-discharge frequencies have been determined for data available at two gaging stations in the basin. The flood profiles for peak discharges of recurrence intervals of 2.33, 5, 10, 25, 50, 100, and 200 years have been determined using the step-backwater method. These profiles can be used in conjunction with topographic maps to delineate the area of flooding. Flood profiles were not determined for the tidally affected area near the mouth of the river. Flood marks were located that can be associated with the 1960 flood which occurred when Hurricane Donna passed over the area. (Woodard-USGS)
W78-09308

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1977--VOLUME 2. LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09311

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1977.
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09312

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1977--VOLUME 1. NEW YORK EXCLUDING LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09313

CHARACTERISTICS OF THE HYDROLOGIC REGIME OF LARGE SIBERIAN RESERVOIRS,
Yu. I. Podlipskiy, and V. M. Shirokov.
Soviet Hydrology: Selected Papers, Vol. 15, No. 3, p 171-178, 1976. 6 fig, 2 tab, 6 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol. 5, p 36-52, 1975.

Descriptors: *Reservoirs, Hydrologic properties, *Classification, Runoff, Storage, Suspended solids, Sedimentation, Reservoir silting, Reservoir storage, Water temperature, Cold regions, Hydrology, *Siberia(USSR), *USSR.

At the present time, 10 large reservoirs are in operation or under construction in Siberia. In some cases the head at the water power system reaches 100 m or more. Siberia has such gigantic reservoirs as the Bratsk Reservoir with a volume of about 170 cu km, the Krasnoyarsk Reservoir, etc. Large new hydraulic engineering installations are to be built in the future. The magnitude of runoff regulation will exceed 400 cu m of the useful storage of reservoirs by the year 2000 and will amount to about 25% of all Siberian water resources. By that time, the exploitation of the economic potential of water power resources will reach 35-40%. This rate of development of Siberian rivers makes it possible even now to raise the question of determining the main characteristics of the hydrologic regime of large future reservoirs. To evaluate the diversity of reservoirs created in Siberia, their topological classification was developed. From pertinent investigations it was found that large reservoirs develop under the effect of both natural conditions and river regulation. Among the most important natural factors determining the individual character of reservoirs are the land features that are flooded and surround the reservoirs and the landscape of those geographic zones where the reservoirs are created. The water management factors that affect reservoirs include the nature of their utilization and their operating conditions during regulation of water reserves. (Sims-ISWS)
W78-09336

SOLUTIONS OF BOUSSINESQ'S EQUATION FOR SEEPAGE FLOW,
Argonne National Lab., IL. Div. of Environmental Impact Studies.
For primary bibliographic entry see Field 2F.
W78-09343

UNBIASED PLOTTING POSITIONS-A REVIEW,
Ireland Office of Public Works, Dublin.
For primary bibliographic entry see Field 7C.
W78-09348

THE IMPACT OF SEASONAL FLOW CHARACTERISTICS AND DEMAND PATTERNS ON REQUIRED RESERVOIR STORAGE,
Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
K. Hoshi, and S. J. Burges.
Journal of Hydrology, Vol. 37, No. 3/4, p 241-260, May 1978. 5 fig, 4 tab, 18 ref.

Descriptors: *Streamflow, *Routing, *Reservoirs, *Synthetic hydrology, *Model studies, Reservoir storage, Seasonal, Storage requirements, Stochastic processes, Mathematical models, Statistical models, Analytical techniques, Water demand, Markov processes, Annual, Correlation analysis, Statistical methods, Theoretical analysis.

Annual streamflow volumes, modeled by AR(1) and autoregressive moving average model (ARMA(1,1)) processes, were generated and disaggregated to seasonal flow volumes and routed through a reservoir algorithm to determine the within-year capacity of a single reservoir needed to satisfy a specified demand sequence. Six seasons, each of two months duration, were used to investigate the impact of seasonal demand-seasonal flow variability coupling. Annual synthetic flows were disaggregated by a modified version of the disaggregation scheme which has been developed by Valencia and Schaake. Annual demand levels of 0.3, 0.5, and 0.7 of the mean annual flow were used. Three seasonal patterns representing relatively uniform demand, demand in phase with streamflow, and demand out of phase with streamflow were used. Modeling the skewed distributions of seasonal flows was shown to be important at all demand levels investigated. (See also W73-11141) (Humphreys-ISWS)
W78-09350

INTEGRATING ECOLOGICAL AND SOCIAL CONSIDERATIONS INTO URBAN FLOOD CONTROL PROGRAMS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6G.
W78-09460

HYDROLOGIC EFFECTS OF THE TONKAWA CREEK FLOOD ABATEMENT PROGRAM,
Agricultural Research Service, Chickasha, OK. Southern Great Plains Water Research Center.
R. R. Schoof, J. W. Naney, and W. M. Boxley.
Water Resource Bulletin, American Water Resources Association Vol. 14, No. 3, June 1978, p 629-639, 6 fig, 1 table, 4 ref.

Descriptors: Hydrology, *Flood control, *Floodwater-retarding impoundments, Streamflow, Channelization, Water yield, *Oklahoma, Impoundments, Reservoir operation, *Washita River basin(Okla), *Tonkawa Creek(Okla).

Floodwater-retarding impoundments, controlling 68 percent of the drainage area of Tonkawa Creek, a Washita River tributary in southwestern Oklahoma, have reduced the total flow volume about 36 percent over a 5-year period. Analyses showed the reduction occurred primarily in the less-than-2.5-cfs flow range, indicating the base flow regime has been altered. However, channelizing the downstream, mild-sloped, 3.6 miles of Tonkawa Creek that flows across a Washita River terrace increased the flow volume fourfold at the outlet. A double-mass-curve analysis of water yield from a 1,127-square-mile Washita basin segment versus an untreated tributary showed the yield has not changed after 25 percent of the tributary area had been treated. Therefore, the flow reduction caused by structures is being offset by increased yields from channelization. (ARS)
W78-09461

PLAYER'S GUIDE. THE RIVER BASIN MODEL.
Washington Environmental Research Center, DC. Environmental Studies Div.
For primary bibliographic entry see Field 6A.
W78-09522

RECREATION AND INSTREAM FLOW. VOLUME 1, FLOW REQUIREMENTS, ANALYSIS OF BENEFITS, LEGAL AND INSTITUTIONAL CONSTRAINTS.
Cortell (Jason M.) and Associates, Inc., Waltham, MA.
For primary bibliographic entry see Field 6E.
W78-09543

CODIFIED AND UNCODIFIED STATE LAWS AND AGENCY RULES AND REGULATIONS BEARING ON WATER AND RELATED LAND RESOURCES IN MINNESOTA, VOLUME 1.
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W78-09571

SHORT-TERM FORECASTING OF WATER RUN-OFF FROM SNOW AND ICE,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-09645

TRICKLE IRRIGATION: PREVENTION OF CLOGGING,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 3F.
W78-09662

FUTURE USE OF AGRICULTURAL LAND FOR NONAGRICULTURAL PURPOSES,
Arkansas Univ., Fayetteville. Dept. of Agricultural Economics and Rural Sociology.
B. W. Spaulding, and E. O. Heady.
Journal of Soil and Water Conservation, Vol. 32, No. 2, p 88-93, March-April 1977. 2 fig, 6 tab, 16 ref.

Descriptors: Agriculture, *Urbanization, *Land use, *Land development, Land resources, Land management, Land classification, Agricultural land.

A procedure to estimate the acreage of agricultural land needed for nonagricultural purposes in the continental United States to the year 2000 was developed. The acreage to be converted by the turn of the century represents a 2.2 percent reduction in the nation's existing agricultural land base. Overall, the nation's productive capacity in agriculture will not be impaired significantly by this loss of land to nonagricultural purposes. However, the impacts will likely be significant at state and local levels. (Skogerboe-Colorado State)
W78-09677

STATE'S RIGHTS REVISITED: THE NINTH CIRCUIT LEADS THE BUREAU OF RECLAMATION TO WATER.
For primary bibliographic entry see Field 6E.
W78-09700

HYDROLOGIC DATA FOR LITTLE ELM CREEK, TRINITY RIVER BASIN, TEXAS, 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09736

TECHNIQUE FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-09737

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1977--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09738

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1977--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09739

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1977.
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09740

SELECTED HYDROLOGIC DATA, YAMPA RIVER BASIN AND PARTS OF THE WHITE RIVER BASIN, NORTHWESTERN COLORADO AND SOUTH-CENTRAL WYOMING,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09748

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, A SUMMARY OF WATER SOURCES, USE, TREATMENT, AND CAPACITY OF WATER-SUPPLY SYSTEMS,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 5F.
W78-09753

IMPROVED SEMI-AUTOMATIC GATES FOR CUT-BACK SURFACE IRRIGATION SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. G. Evans.
Transactions of the American Society of Agricultural Engineers, Special Edition, Vol. 20SW, p 105-108, 112, February 20, 1977. 7 fig, 1 tab, 12 ref.

Descriptors: Surface irrigation, *Gates, *Irrigation systems, *Automation, *Furrow irrigation, Furrow systems, Irrigation design, Irrigation efficiency, Irrigation practices.

One of the most effective means of improving application efficiency and uniformity in furrow irrigation systems is the cut-back concept. The cut-back systems are very amendable to automation, however, one of the largest obstacles to its widespread use has been a lack of simple, inexpensive and reliable equipment to automate the systems. A much simplified version of a semi-automatic 'drop-open' type of gate has been developed and its construction, field operation and reliability are discussed. A simplified 'drop-closed' type of gate is also discussed. Both gate types are constructed of aluminum, use mechanical Coret timers and are interchangeable. (Skogerboe-Colorado State)
W78-09773

CALLAHAN RESERVOIR: II. INFLOW AND OUTFLOW SUSPENDED SEDIMENT PHOSPHORUS RELATIONSHIPS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 5G.
W78-09775

ESTIMATING RUNOFF FROM FURROW IRRIGATION,
Kansas State Univ., Garden City. Garden City Experiment Station.
F. E. Ohmes, and H. L. Manges.
Transactions of the American Society of Agricultural Engineers, Special Edition, Vol. 20SW, p 1089-1092, December 20, 1977. 3 fig, 2 tab, 6 ref.

Descriptors: *Furrow irrigation, Inflow, *Runoff, Irrigation efficiency, Equations, Flow rates, *Agricultural runoff, *Estimating.

Inflow into and outflow from furrows during irrigation were measured. Both theory and field measurements have shown that runoff rate from a graded furrow can be expressed as a function of time for the rising portion of the runoff hydrograph and then becomes constant. Volume of runoff can be determined by integrating the runoff equations. (Skogerboe-Colorado State)
W78-09780

SOIL-ASPHALT MIXTURE FOR CANAL SEEPAGE CONTROL: LABORATORY STUDY,
Department of Agriculture, Lethbridge (Alberta). Research Station.
T. G. Sommerfeldt.
Canadian Agricultural Engineering, Vol. 19, No. 2, p 111-115, December, 1977. 5 fig, 3 tab, 10 ref.

Descriptors: Laboratory tests, *Seepage control, Seepage, Asphalt, Soils, Irrigation canals, Model studies, Salinity, Linings, Canals.

A material for lining irrigation canals composed of soil, anionic asphalt emulsion, Wyoming bentonite, an enzymatic wetting agent, and water was developed in the laboratory. Discs of the material were tested for seepage control, and resistance to erosion, weathering, freezing, and thawing. A ditch model was subjected to a continuous stream of water for 30 days. The material was satisfactory under laboratory conditions. It had some flexiblity and, when wet, was soft and spongy, similar to gum rubber. This flexibility would be advantageous for canals where shifting of the base or frost-heaving is a problem. But, because of its softness, damage from livestock and similar traffic may be a problem. (Skogerboe-Colorado State)
W78-09787

U.S. RESERVOIR INVENTORY,
National Reservoir Research Program, Fayetteville, AR.
R. M. Jenkins.
U.S. Dept. of the Interior, April 1, 1976. 35 p, 35 tab.

Descriptors: *Reservoirs, *Reservoir fisheries, *Reservoir sites, *Reservoir yield, Artificial lakes, Reclamation, Recreation Demand, United States, *Reservoir Inventory(US).

A nationwide compilation of reservoirs in the United States as of January 1, 1976 arranged by states and listed by name and average surface area has been prepared. A 1960 inventory of U.S. Waters totalled 6,450,000 acres. In the next decade, 314 reservoirs totalling 5,394,000 acres were added. In the next six years, to 1976, 173 reservoirs totalling 930,000 acres have been added. (EIS-Katz)
W78-09797

THE EFFECTS OF ALTERED STREAMFLOWS ON FISH AND WILDLIFE IN CALIFORNIA,
Jones and Stokes Associates, Inc.,
For primary bibliographic entry see Field 5C.
W78-09798

4B. Groundwater Management

HYDROLOGIC DATA OF THE COASTAL DRAINAGE BASINS OF SOUTHEASTERN MASSACHUSETTS, PLYMOUTH TO WEWEANTIC RIVER, WAREHAM,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09304

HYDROLOGIC DATA OF THE CHARLES RIVER BASIN, MASSACHUSETTS,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09305

STRATIGRAPHIC AND HYDROGEOLOGIC FRAMEWORK OF PART OF THE COASTAL PLAIN OF TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-09310

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1977--VOLUME 2. LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09311

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1977.
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09312

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1977--VOLUME 1. NEW YORK EXCLUDING LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09313

FLOW THROUGH UNCONFINED AQUIFERS CONTAINING INTERCEPTOR DRAINS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
E. G. Youngs, and M. A. Al-Najim.
Journal of Hydrology, Vol. 37, No. 3/4, p 339-348, May 1978. 5 fig, 11 ref.

Descriptors: *Aquifers, *Drainage, *Model studies, *Water table aquifers, Groundwater movement, Drains, Storm drains, Interceptor sewers, Seepage, Mathematical models, Flow, Analytical techniques, Theoretical analysis, Equations, Laboratory tests, Hele-Shaw analog.

The flow into interceptor drains, located in an aquifer bounded by water standing at different levels in two parallel vertical ditches which extend in depth to a horizontal floor on which the aquifer rests, and the discharge into the downstream ditch were shown to be related to the water levels in the ditches by a modified form of Dupuit's formula. For the case of an aquifer resting on an inclined impermeable floor, seepage analysis gives an approximate expression which is an extended form of that obtained without the inclusion of interceptor drains. Hele-Shaw analog results were used to give experimental confirmation of the theoretical relationships. (Humphreys-ISWS)
W78-09355

UNSTEADY FLOW TO A PUMPED WELL IN AN UNCONFINED FISSURED AQUIFER,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 2F.
W78-09356

CONTROLLING IMPOUNDMENTS WHICH MAY POLLUTE GROUNDWATER,
Maryland Water Resources Commission, Annapolis. Permits Div.
For primary bibliographic entry see Field 5G.
W78-09419

TEHRAN GROUND WATER POLLUTION BY DETERGENTS,
Tehran Univ. (Iran). Dept. of Environmental Health.
For primary bibliographic entry see Field 5A.
W78-09421

A PRELIMINARY ASSESSMENT OF THE EFFECTS OF SUBSURFACE SEWAGE SLUDGE DISPOSAL ON GROUNDWATER QUALITY,
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Program.
For primary bibliographic entry see Field 5C.
W78-09572

TETRACHLOROETHYLENE IN CONTAMINATED GROUND AND DRINKING WATERS,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5B.
W78-09593

NITROGEN, CHLORIDE, AND WATER BALANCE WITH IRRIGATED RUSSET BURBANK POTATOES IN A SANDY SOIL,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W78-09652

PRACTICAL GROUND WATER MANAGEMENT,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-09679

FEDERAL GROUNDWATER RIGHTS: A NOTE ON CAPPAERT V. UNITED STATES,
Stanford Univ., CA., School of Law.
C. J. Meyers.
Land and Water Law Review, Vol. 13, No. 2, p. 377-389 (1978).

Descriptors: *Groundwater management, *Federal reservations, *Federal-state water rights conflicts, *Water allocation(Policy), *Competing uses, Prior appropriation, Legal aspects, Water rights, Aquifers, Groundwater mining, Groundwater availability, Groundwater resources, Withdrawn lands, Distribution, Equitable apportionment, Planning, Water supply, Water utilization, Wells, Well spacing, Water pumping, Sage yield, Reservation doctrin.

The United States Supreme Court decision in Cappaert v. United States lays the foundation for extensive federal claims to groundwater. The author broadly states the rule as follows: the withdrawal of federal lands from entjry and their reservaton for other purposes (refuges, parks) reserves groundwater as may be needed to realize the purposes of the reservation, and the government may pump groundwater even if the pumping interferes with groundwater use by others. Moreover, the government may enjoin groundwater pumping by others if such pumpinginterferes with groundwater use by others. Moreover, the government may engjoin groundwater pumping by others if such pumping interfers with government use of groundwater for a reservaton purpose. With such precedent for sweeping governmental claims, competition between federal and private groundwater users is inevitable. The author proposes federal legislation; (1) instituting a sound groundwater regimen, (2) appointing basin manajgers to contested qauifers, and (3) treating all pumpers as equals under the same rules regarding well interference, division of safe yield, and right to mine. In the absence of legislation, federal courts must construct a fair and maximally efficient system of distribution groundwater. A similar fair distribution policy and 'Rule of Reason' are appropriate in adjudicating Indians' claims to groundwater. (Baumbach-Florida)
W78-09726

WATER CONFLICTS FROM THE VIEWPOINT OF A REGULATION,
Utah State Engineers' Office, Salt Lake City.
For primary bibliographic entry see Field 3E.
W78-09730

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1977--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09738

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1977--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09739

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1977.
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09740

CALIBRATION OF A MATHEMATICAL MODEL OF THE ANTELOPE VALLEY GROUND-WATER BASIN, CALIFORNIA,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-09741

WATER FOR INDUSTRIAL DEVELOPMENT IN GEORGE, HANCOCK, PEARL RIVER, AND STONE COUNTIES, MISSISSIPPI,
Geological Survey, Nashville, TN. Water Resources Div.; and Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-09744

SUMMARY OF WATER RESOURCES FOR THE CAMPO, CUYAPAIPE, LA POSTA, AND MANZANITA INDIAN RESERVATIONS AND VICINITY, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09746

SELECTED HYDROLOGIC DATA, YAMPA RIVER BASIN AND PARTS OF THE WHITE RIVER BASIN, NORTHWESTERN COLORADO AND SOUTH-CENTRAL WYOMING,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09748

PREDICTING SOLUTE TRANSPORT IN SUBSURFACE WATERS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-09752

GEOCHEMICAL AND HYDROLOGIC DATA FOR WELLS AND SPRINGS IN THERMAL-SPRING AREA OF THE APPALACHIANS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09754

GROUNDWATER WITHDRAWN FOR MUNICIPAL, INDUSTRIAL, AND IRRIGATION USE IN THE UPPER PEACE AND ALAFIA RIVER BASINS, WEST-CENTRAL FLORIDA, 1970-74,
Geological Survey, Tallahassee, FL. Water Resources Div.
A. F. Robertson, L. R. Miller, and D. C. Parsons.
Open-file report 78-29, March 1978. 59 p, 4 fig, 11 tab, 3 ref.

Descriptors: *Groundwater, *Withdrawal, *Water utilization, *Water supply, *Florida, Municipal water, Industrial water, Irrigation wells, *Upper Peace and Alafia River basins, Floridan aquifer.

Data are presented for ground-water withdrawals for municipal, industrial and irrigation use in the upper Peace and Alafia River basins during 1970-71. Within the 1,160-square-mile study area, the principal source of ground water is the Floridan aquifer. Methods used to determine ground-water withdrawal include: metering water use; relating measured well discharge to power consumption of pumping time; and relating water use to phosphate production, citrus irrigation or processing. About 90 percent of municipal pumpage is metered, and annual pumpage increased from 11,165 million gallons in 1970 to 13,455 in 1974. Water use per ton of phosphate produced is estimated to be 3,320 gallons per ton prior to 1971 and 2,460 gallons per ton from 1971 through 1974. Estimated ground-eater use by the phosphate industry has declined from 93.3 billion gallons in 1970 to 78.7 in 1974. Citrus irrigation pumpage is obtained by extrapolating pumpage obtained from pilot areas of unmeasured areas and has declined from 33.4 billion gallons in 1970 to 31.3 in 1974. The citrus processing industry used about 4.9 billion gallons in 1970 and about 5.9 in 1974. (Woodard-USGS)
W78-09755

HYDROGEOLOGY OF THE OBSERVATION WELL SITE AT THE U.S. GEOLOGICAL SURVEY NATIONAL CENTER, RESTON, VIRGINIA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-09757

NEBRASKA'S GROUND WATER MANAGEMENT ACT,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6E.
W78-09763

EFFECTS OF PHOSPHATE MINERALIZATION AND THE PHOSPHATE INDUSTRY ON RADI-

UM-226 IN GROUND WATER OF CENTRAL FLORIDA,
Office of Radiation Programs, Las Vegas, NV.
For primary bibliographic entry see Field 5G.
W78-09800

4C. Effects On Water Of Man's Non-Water Activities

RELATION OF URBAN LAND-USE AND LAND-SURFACE CHARACTERISTICS TO QUANTITY AND QUALITY OF STORM RUNOFF IN TWO BASINS IN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
M. A. Sylvester, and W. M. Brown, III.
Available from Supt. of Documents, GPO, Washington, DC 20402; Price, $2.00. Water-Supply Paper 2051, 1978. 49 p, 21 fig, 5 tab, 40 ref.

Descriptors: *Urban runoff, *Storms, *Discharge(Water), *Water quality, *Sediment transport, River basins, Pollutants, Topography, Land use, Effects, Evaluation, California, *San Francisco Bay area, *Sacramento-San Joaquin Delta area.

Two basins (Castro Valley Creek, in Alameda County, and Strong Ranch Slough, in Sacramento County) in the San Francisco Bay and Sacramento-San Joaquin Delta region (Bay-Delta region) were sampled intensively (3-15 minute intervals) during three storms between October 1974 and April 1975. Both basins are primarily residential, but the Strong Ranch Slough basin is almost entirely urbanized and nearly flat, while the Castro Valley Creek basin possesses some rural areas and slopes greater than 70 percent in the headwaters. Water discharge and concentrations of suspended solids, chemical oxygen demand, 5-day biochemical oxygen demand, nitrite and nitrate, total Kjeldahl nitrogen, total orthophosphorus, and setteable matter were usually greater at the Castro Valley Creek basin than at the Strong Ranch Slough basin. Concentrations of these constituents and water discharge changed more rapidly at the Castro Valley Creek basin than at the Strong Ranch Slough basin. Of the four subbasins sampled (two in each basin), constituent concentrations in runoff from a residential subbasin were usually greatest. (Woodard-USGS)
W78-09321

SEDIMENTATION RATES AND A REVISED SEDIMENT BUDGET FOR LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-09339

SOIL WATER DEPLETION AFTER FOUR YEARS OF FOREST REGROWTH IN SOUTHWESTERN WISCONSIN,
North Central Forest Experiment Station, St. Paul, MN.
R. S. Sartz, and M. D. Knighton.
Department of Agriculture, Forest Service, Research Note NC-230, 3 p, 1978. 7 ref, 2 tab.

Descriptors: *Soil water, *Withdrawal, *Forests, *Vegetation regrowth, *Lumbering, Clear-cutting, Water storage, *Wisconsin, Percolation.

The effect of tree harvesting on water depletion from a 150-cm thick soil mantle does not appear to have diminished by the 7th year after the trees were cut. Mean seasonal depletion was 41, 64, and 146 mm for all vegetation removed, woody vegetation only removed, and uncut treatments, respectively. After 4 years of regrowth, the original bare and clearcut treatments depleted only 21 and 35% as much water as the uncut forest. (Witt-IPC)
W78-09524

CHARACTERIZATION AND IMPACT OF STORMWATER RUNOFF FROM VARIOUS LAND COVER TYPES,
Wiggins-Rimer and Associates, Durham, NC.
For primary bibliographic entry see Field 5B.
W78-09598

THE FLEXURAL MOTIONS OF A FLOATING ICE SHEET INDUCED BY MOVING VEHICLES,
Saskatchewan Research Council, Saskatoon.
For primary bibliographic entry see Field 2C.
W78-09643

SEDIMENT DISCHARGE FROM HIGHWAY CONSTRUCTION NEAR PORT CARBON, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
R. E. Helm.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 793, Price codes: A13 in paper copy, A01 in microfiche. Water-Resources Investigations 78-35, April 1978. 27 p, 19 fig, 6 ref.

Descriptors: *Sedimentation, *Land use, *Road construction, *Sediment discharge, *Storm runoff, Water quality, Turbidity, Color, Surface waters, Sediment transport, Suspended load, Sediment yield, *Pennsylvania, *Delaware River basin, Schuylkill County(Penn).

The effects of highway construction on suspended-sediment loads were studied in the upper reaches of the Schuylkill River basin, Schuylkill County, Pennsylvania, from April 1975 to March 1977. From March 1975 to October 1976, 4.3 miles of State Route 209 was relocated through the upper reaches of the basin, a mountainous watershed with a drainage area of 27.1 square miles. About 16,000 tons of suspended-sediment was discharged from the basin during the construction. The highway construction produced about 8,000 tons or 50 percent of the total sediment discharge. Steep slopes, the availability of fine coal wastes, coal-washing operations, and other land uses in the basin were responsible for most of the remaining sediment discharge. Seventy percent of the total suspended-sediment discharge occurred during eight storms. (Woodard-USGS)
W78-09750

4D. Watershed Protection

EROSION PROCESSES ON STEEP GRANITIC ROAD FILLS IN CENTRAL IDAHO,
Forest Service (USDA) Boise, ID. Intermountain Forest and Range Experimental Station.
For primary bibliographic entry see Field 2J.
W78-09330

PREDICTING BASE FLOW USING HYDROGEOLOGIC PARAMETERS,
Agricultural Research Service, Chickasha, OK. Southern Great Plains Watershed Research Center.
J. W. Naney, D. G. DeCoursey, B. B. Barnes, and G. A. Gander.
Water Resources Bulletin American Water Resources Association Vol. 14, No. 3, June 1978, p 640-650, 6 fig, 11 ref.

Descriptors: *Data flow, *Groundwater discharge, *Groundwater flow, *Forecasting, *Unit hydrograph, Solar radiation, Evaporation, Decomposition, Air temperature, Flow, Effluent streams, Soil moisture, Field capacity, Water permeability, Specific yield, Transmissivity, Gravitational flow, Watershed, *Recharge, *Water table, Tile, Discharge, Storage, Moisture content.

A method is presented for predicting base flow using easily measured, or estimated, hydrogeologic parameters. A mathematical model based upon the theory of subsurface flow to parallel drains is applied to a small watershed in Oklahoma. An example of model application is presented for a five-year period of record from this small watershed. Three years of data are used to calibrate the model, and two years of data are used for model validation. Hydrographs of observed and predicted base flow are presented for the five-year period of record. We concluded from this limited application of the model, on a small watershed, that the modeling techniques discussed herein were valid and should be tested for longer time periods on a larger watershed to determine their general applicability. (ARS)
W78-09334

SENSITIVITY OF OPTIMIZED PARAMETERS IN WATERSHED MODELS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-09345

A MOISTURE-ACCOUNTING WATERSHED MODEL FOR SINGLE-STORM EVENTS BASED ON TIME-AREA CONCEPT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2A.
W78-09351

AGRICULTURE RUNOFF MANAGEMENT (ARM) MODEL--VERSION II. REFINEMENT AND TESTING,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5B.
W78-09444

NATURAL REFORESTATION RECLAIMS A WATERSHED: A CASE HISTORY FROM WEST VIRGINIA,
Sao Paulo Univ. (Brazil). Dept. de Silvicultura.
W. P. Lima, J. H. Patric, and N. Holowaychuk.
Department of Agriculture, Forest Service Boomall, Penn., Northeastern Forest Experimental Station. Research Paper NE-392, 7 p, 1978. 2 fig, 23 ref, 3 tab.

Descriptors: *Small watersheds, *Streamflow, *Reforestation, Water yield, Land management, Soil erosion, Watersheds(Basins), *West Virginia, Hydrology, Farms, Land.

Thirteen years of hydrologic data from two contiguous small watersheds in West Virginia were analyzed to determine the effects on streamflow of natural reforestation on abandoned farmlands. From 1958 to 1970, streamflow on the watersheds was unchanged. The history of land use on the study area helps explain the apparent lack of hydrologic effects of reforestation. Aerial photographs taken in 1933, 1945, 1956, and 1968 documented the rapid advance of reforestation. Observations of streamflow began about 25 years after farming had terminated; any measurable hydrologic effects of natural reforestation probably occurred before these observations. (Witt-IPC)
W78-09525

FLUVIAL SEDIMENT IN OHIO,
Geological Survey, Lansing, MI. Water Resources Div.; and Geological Suvey, Columbus, OH Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-09742

PREDICTION OF SEDIMENT TRANSPORT IN A GRASSED MEDIA,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.

B. J. Barfield, E. W. Tollner, and J. C. Hayes.
Paper No. 77-2023 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 23 p, 7 fig, 3 tab, 13 ref.

Descriptors: Model studies, Sediments, *Sediment control, Sediment loads, Sediment transport, Vegetation, *Vegetation effects, *Forecasting.

A steady state model is presented for determining the sediment filtration capacity of a grass media under varying flow rates, sediment loads, particle sizes, flow durations, channel slopes, and media density. It is possible to use the model to predict the required media spacing, channel slope, and length of media to give a desired outflow concentration for given flow conditions. (Skogerboe-Colorado State)
W78-09764

COMPARATIVE ERODIBILITY OF LOESS SOILS IN POLAND AND THE UNITED STATES,
Agricultural Research Service, Columbia, MO. North Central Watershed Research Center.
R. F. Piest, and S. Ziemnicki.
Paper No. 77-2511 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977. Chicago, Illinois, 29 p, 7 fig, 3 tab, 17 ref.

Descriptors: Erosion, *Soil erosion, *Iowa, *Sediment transport, Erosion control, *Erosion rates, *Poland.

Historic erosion patterns between loess soil regions of Poland and southwestern Iowa were compared. A rational interpretation of the measured soil losses reported by various researchers was attempted through application of the Universal Soil Loss Equation. Gullying rates and causes in both countries were examined. (Skogerboe-Colorado State)
W78-09766

EVALUATION OF WILD OAT STRAW AS A SOIL EROSION RETARDANT USING SIMULATED RAINFALL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
M. J. Singer, and J. Blackard.
Agronomy Journal, Vol. 69, No. 5, p 811-814, September-October, 1977. 3 fig, 2 tab, 13 ref.

Descriptors: Erosion, *Soil erosion, Rainfall, *Oats, Runoff, Mulches, *Erosion control.

Soil cover is recognized as an important factor in soil erosion control. This study was made to determine the quantitative relationship between cover percent for one cover type and soil loss under simulated rainfall. Data from this experiment are used to calculate a cover coefficient for wild oat straw similar to the 'C' factor in the Wischmeier Universal Soil Loss Equation. The R, K, L, S, and P factors were kept constant during the experiments. A rainfall simulator was used in the laboratory to produce 30 min rainfall events of 76 mm/hour (3 in/hour) intensity on soil material at 9% slope. Under these conditions, wild oat straw significantly reduced sediment loss at cover levels of 50% or more. A significant reduction in runoff volume was observed for cover percentages exceeding 90%. (Skogerboe-Colorado State)
W78-09784

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1977--VOLUME 1. NEW YORK EXCLUDING LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09313

CHEMICAL AND PHYSICAL QUALITY OF SELECTED PUBLIC WATER SUPPLIES IN FLORIDA, AUGUST-SEPTEMBER 1976,
Geological Survey, Tallahassee, FL. Water Resources Div.
G. A. Irwin, and H. G. Healy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 504, Price codes: A10 in paper copy, A01 in microfiche. Water-Resources Investigations 78-21, March 1978. 200 p, 5 fig, 30 tab, 68 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Water supply, *Florida, Potable water, Water analysis, Sampling, Chemical analysis, Trace elements, Nutrients, Pesticides, Physical properties, Water treatment, Desalination, Evaluation.

Results of a 1976 water-quality reconnaissance made by the U.S. Geological Survey indicated that, with few exceptions, all public water supplies in Florida are of high quality and meet the standards set forth in the National Interim Primary Drinking Water Regulations. Occasionally the concentrations of fluoride, turbidity, cadmium, chromium, and lead approximated, equaled, or exceeded maximum contaminant levels with exceedences occurring very infrequently. The pesticides 2,4-D and silvex, were detected in some public supplies throughout the State mainly in surface water. Although pesticides were not detected in concentrations approaching the maximum levels established in the regulations, their presence does signal that the activities of man are beginning to affect some water resources. (Woodard-USGS)
W78-09320

ANALYTICAL IMPLICATIONS OF HARMONIZED MONITORING SCHEMES,
Water Research Centre, Medmenham (England). Water Quality and Health Div.
A. L. Wilson.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 1, p 57-66, January 1978. 13 fig.

Descriptors: *Water quaity, *Water analysis, *Coordination, *Monitoring, Measurement, Control, Statistical methods, Foreign research, Reliability, Quality control, Testing procedures, Methodology, Statistics, Testing, Analytical techniques, Analysis, Great Britain.

The harmonized monitoring scheme aims to ensure that analytical results meet specified standards of accuracy, and this requirement carries a number of important implications for the analyst. This paper considered a number of these implications within the general context of water quality measurement rather than for the harmonized monitoring scheme only. To achieve valid comparison of experimental estimates of the qualities of different waters, the natural spatial and temporal variability of quality must be taken into account, i.e., appropriate sampling positions, times, and frequencies must be used. If this is not done, these factors may have a greater effect on comparability than analytical factors. This paper was restricted to sample handling and analytical considerations, but the importance of the other aspects of sampling was emphasized. Many interlaboratory studies have shown that analytical errors not of a few per cent but of several hundred per cent may arise in some laboratories and that errors of 20 to 100% are common. On this basis, it is taken for granted in this paper that positive action generally is necessary to ensure comparability of results. (Humphreys-ISWS)
W78-09331

COLLABORATIVE TESTING OF A MANUAL SODIUM ARSENITE METHOD FOR MEASUREMENT OF NITROGEN DIOXIDE IN AMBIENT AIR,
Environmental Monitoring and Support Lab., Research Triangle Park, NC.
J. H. Margeson, J. C. Suggs, P. C. Constant, Jr., M. C. Sharp, and G. W. Scheil.
Environmental Science and Technology, Vol. 12, No. 3, p 294-297, March 1978. 2 fig, 3 tab, 8 ref.

Descriptors: *Nitrogen compounds, *Methodology, *Quality control, *Testing procedures, *Analytical techniques, *Kansas, Sodium arsenite, Gases, Testing, Monitoring, Evaluation, Statistics, Analysis, Measurement, Chemistry, Laboratory tests, Data collection, *Collaborative testing, *Nitrogen dioxide monitoring, *Kansas City(Mo).

The sodium arsenite method for 24-h integrated measurement of NO2 in ambient air was subjected to a collaborative test. Ten collaborators sampled ambient air and, simultaneously, the same ambient air spiked with a reliable source of NO2 for 4 days at a common site in Kansas City, Missouri. NO2 concentrations of 50-370 micrograms/cu m were sampled. Within and between laboratory standard deviations were 8 and 11 micrograms/cu m, respectively, over the range 84-312 micrograms NO2/cum. The method has a bias of -3% of the concentration over the above range. The lower detectable limit (LDL) of the method was 8 micrograms/cu m. The test results indicated that the method will produce accurate, precise measurements of ambient NO2 concentrations. (Henley-ISWS)
W78-09332

ANALYZER FOR CONTINUOUS DETERMINATION OF DISSOLVED OXYGEN, PH, ELECTRICAL CONDUCTIVITY, TEMPERATURE, AND TRANSPARENCY IN NATURAL WATERS,
Akademiya Nauk SSSR, Moscow. Inst. Geokhimii i Analiticheskoi Khimii.
L. G. Solov'yev, A. S. Ponomarev, V. G. Lazarev, and V. M. Kin.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 313-315, 1976. 4 fig, 1 tab, 7 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 63, p 134-138, 1976.

Descriptors: *Water quality, *Sampling, *Ships, *Instrumentation, Equipment, Electronic equipment, Measurement, Surveys, Rivers, Dissolved oxygen, Hydrogen ion concentration, Electrical conductance, Water temperature, Turbidity, *USSR.

It is difficult to study the hydrochemical regime of natural waters without using automatic methods of analysis because of the large area natural waters occupy. Submerged or towed sensors are used widely in oceanography. The information from these sensors is recorded and analyzed on board ship. Such systems are inadvisable for the study of the hydrochemistry of rivers and polluted waters. It is better to use systems with continuous sample delivery to the ship's laboratory for monitoring some characteristics with a measuring device. Such systems have never been used in the Soviet Union, with the exception of some specialized instruments for monitoring individual parameters. Measurements in the Volga reach from

Kuybyshev city to Yakhrom city (Moscow Canal) were made continuously with the analyzer using the sampling device and a recorder. A record of many days of the pH, dissolved oxygen, electrical conductivity, transparency, and temperature was obtained. The measurements showed that these characteristics changed little in some river and reservoir reaches and considerably in others. The performed investigations testify to the advisability of automating continuous measurements for the study of the hydrochemical regime of natural waters. Automated systems do not preclude the use of standard methods of hydrochemical analysis but supplement them, help selecting ship's stations, and offer great possibilities for investigating the rapidly varying properties and composition of natural waters over larger areas. (Sims-ISWS)
W78-09338

ATMOSPHERIC LOADING OF PHOSPHORUS AND OTHER CHEMICALS TO LAKE MICHIGAN,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 5B.
W78-09340

THE ROLE OF STANDARD REFERENCE MATERIALS IN ENVIRONMENTAL MEASUREMENTS,
National Bureau of Standards, Washington, DC.
J. R. McNesby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 893, Price codes: A02 in paper copy, A01 in microfiche. Proceedings National Conference on Health, Environmental Effects, and Control Technology on Energy Use, Report No. 600/776-002(Environmental Protection Agency), p 58-60, February 9-11, 1976. 1 tab.

Descriptors: *Standards, *Pollutants, *Air pollution, *Water pollution, *Energy, Materials testing, Water quality, Air environment, Materials, Clean Air Act, Public health, Environmental engineering, Pollution abatement, Environmental sanitation, Measurement, Publications, Reference materials, Certified standards.

The raionale for the importance of accurate as well as precise environmental measurement was presented. The role Standard Reference Materials is to provide the analyst with NBS certified samples to facilitate the ability to make accurate measurement. Available energy related Standard Reference Materials were listed, and those expected to be developed along with target dates were tabulated. (Henley-ISWS)
W78-09361

ATMOSPHERIC SCAVENGING OF HYDROCHLORIC ACID,
Illinois Inst. of Tech. Research Inst. Chicago.
E. O. Knutson, and D. L. Fenton.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-30670, Price codes: A05 in paper copy, A01 in microfiche. NASA CR-2598, August 1975. 76 p, 16 fig, 13 tab, 33 ref, 3 append. NAS8-30807.

Descriptors: *Environmental effects, *Washouts, *Air pollution, *Pollutants, *Water pollution, Chemical properties, Acids, Water chemistry, Water properties, Environment, Ecology, Atmosphere, Fallout, Precipitation(Atmospheric), Water pollution sources, Water quality, Acidity.

The scavenging of hydrogen chloride from a solid rocket exhaust cloud was investigated by an experiment in which water drops were caused to fall at terminal velocity through a confined solid rocket exhaust cloud. The water drops were collected and analyzed to determine the amount of HCl captured during fall. The concentration of HCl within the chamber during the time of the scavenging experiment was measured by means of bubblers. Tests showed that the measured chamber HCl concentration, together with the measured HCl deposition on the chamber walls, accounted for 81 to 94% of the theoretical HCl. This mass balance lends confidence to the measurement techniques. It was found that the HCl captured by water drops during fall is approximately one-half that predicted by the classical Frossling correlation, which applies to water drops falling through a 'clean' HCl cloud. No effect of humidity n the scavenging efficiency was detected. The humidity range covered was 69-98%. The experimental scavenging results for 0.9 mm drops was extended mathematically to cover natural rains. An example calculation for scavenging of HCl from a solid rocket exhaust cloud was given using an idealized Kennedy Space Center rain cycle. This cycle contains an aggregate of two hours of light rain (6.4 mm/hr), 15 minutes of medium rain (24 mm//hr), and five minutes of heavy rain (55 mm/hr). It was calculated that this rain cycle would reduce the cloud HCl concentration to 20.6% of its value in the absence of rain. (Henley-ISWS)
W78-09362

SIMULTANEOUS DETERMINATION OF TRACE METALS IN INDUSTRIAL AND DOMESTIC EFFLUENTS BY DIFFERENTIAL PULSE ANODIC STRIPPING VOLTAMMETRY,
Benedict Coll., Columbia, SC. Dept. of Chemistry.
J. T. Kinard.
Journal of Environmental Sciences and Health, Vol. A12, No. 10, p 531-547, 1977. 3 fig, 6 tab, 12 ref.

Descriptors: *Analytical techniques, *Trace elements, *Digestion, *Anodes, *Electrochemistry, Spectrophotometry, Zinc, Cadmium, Copper, Lead, Electrodes, Domestic wastes, Industrial wastes, Measurement, Waste water treatment.

Differential pulse anodic stripping voltammetry, following Parr acid digestion bomb treatment, was tested for the simultaneous analysis of trace metals in industrial and domestic wastes. Effluent from textile, printing, meat packing, slaughter house, soft drink, dyeing and finishing, steel mill, aluminum, egg processing, and chicken farm industries and domestic wastes were placed as 0.1-10 ml samples in a Teflon digestion cup containing 2.5-3 ml nitric acid and heated to 200C. The samples were heated 2-7 hrs, cooled, and diluted with sodium acetate to pH 5.5-5.8. The solutions were purified on a Chelex 100 column and placed in an electrolysis cell for analysis. Recovery of zinc, cadmium, lead, bismuth, and copper during simultaneous determinations by the differential pulse anodic stripping voltammetry technique ranged from 93.9-107%. The technique was superior to atomic absorption in terms of detection limits, sensitivities, and cost. (Lisk-FIRL)
W78-09400

BIODEGRADABILITY TESTING AND ITS RELEVANCE TO ENVIRONMENTAL ACCEPTABILITY,
Unilever Ltd., Port Sunlight (England). Unilever Research Lab.
P. A. Gilbert, and G. K. Watson.
Tenside Detergents, Vol. 14, No. 4, p 171-177, 1977. 3 tab, 36 ref.

Descriptors: *Biodegradation, *Analytical techniques, *Microbial degradation, *Oxidation, *Inhibition, Activated sludge, Chemical oxygen demand, Carbon, Biomass, Cultures, Waste water treatment, Municipal wastes.

Definitions, techniques, and limiting parameters of biodegradability of municipal waste water are reviewed. Distinctions are made between biodegradation, biodegradability, functional biodegradation, environmentally acceptable biodegradation, ultimate biodegradation, complete mineralization, bio-elimination, biological hardness, and biological softness. Definitions are also provided for elimination, acclimatization, biomass, constitutive enzymes, dieaway testing, enrichment or elective culture techniques, inducible, enzymes, inoculation, inoculum, and substrate. Conditions influencing biodegradation include: acclimatization, enzymatic co-oxidation, waste concentration inhibition, temperature, pH, inorganic salt composition and concentration, and the presence of certain compounds during testing. Test methods are classified as: die-away techniques where only the test compound is present; die-away techniques, where other organic carbon sources besides the test compound are present; and activated sludge techniques. Analytical techniques include specific chemical analysis for each compound, radio-labelled compound, oxygen uptake and carbon dioxide generation, dissolved organic carbon, COD, biomass, and pure culture analysis. Limitations, advantages, and selection of the testing procedures are reviewed. (Lisk-FIRL)
W78-09402

THE BACTERIAL METABOLISM OF 4,4'-DICHLOROBIPHENYL, AND ITS SUPPRESSION BY ALTERNATIVE CARBON SOURCES,
Amsterdam Univ., (Netherlands). Lab. of Environmental and Toxicological Chemistry.
For primary bibliographic entry see Field 5D.
W78-09404

ISOLATION OF SALMONELLA FROM SEWAGE WITH A NEW PROCEDURE OF ENRICHMENT,
Hellenic Pasteur Inst., Athens (Greece).
P. Vassiliadis, D. Trichopoulos, A. Kalandidi, and E. Virouchaki.
Journal of Applied Bacteriology, Vol. 44, No. 2, p 233-239, 1978. 3 tab, 13 ref.

Descriptors: *Salmonella, *Cultures, *Sewage bacteria, *Sampling, *Isolation, Competition, Data collections, Incubation, Pathogenic bacteria, Sewers, Pollutant identification, Analytical techniques, Waste water disposal, Municipal wastes.

A total of 151 strains of salmonellae belonging to 27 serotypes were isolated by three enrichment methods using municipal wastes samples collected from the sewer system in Athens, Greece. Sewer samples collected by 40 gauze-wrapped Moore swabs were incubated in 200 ml buffered peptone broth for 18-22 hrs at 37C; 0.1 ml aliquots of the peptone media were then enriched at 37C for 48 hrs in Rappaport's medium formula R25, at 43D for 48 hrs in R10 medium, or at 34C for 48 hrs in Muller-Kauffmann's tetrathionate broth. Subcultures were derived for each of these enrichment media on brilliant green-deoxycholate agar and incubated for 24 hrs at 37C. Of the 27 serotypes isolated, four were formerly unreported in Athens' sewage. The Rappaport enrichment media isolated more serotypes and strains than the tetrathionate broth. R10 at 43C isolated 103 strains and 24 serotypes; R25 at 37C isolated 82 strains and 19 serotypes; and M-K tetrathionate broth isolated 25 strains and 11 serotypes. While the R10 medium yield more salmonellae serotypes and strains, the growth of competing organisms was inhibited in this media compared to the other two media. Smaller quantities of inoculum were required for the Rappaport enrichment media. (Lisk-FIRL)
W78-09406

QUANTITATIVE ANALYSIS OF HYDROCARBONS IN SEWAGE SLUDGE FROM WASTE WATER PURIFICATION STATIONS,
Institut d'Hygiene, Geneva (Switzerland). Service de Toxicologie Industrielle, d'Analyse de l'Air et de Protection Center le Bruit.
J. C. Landry, and J. Dennemont.
Travaux de Chimie Alimentaire et d'Hygiene, Vol 69, No 1, p 96-108, 1978. 6 fig, 2 tab, 9 ref.

Descriptors: *Organic compounds, *Analytical techniques, *Gas chromatography, *Sewage sludge, *Hydrolysis, Separation techniques, Chemical analysis, Pollutant identification, Solvents, Waste water treatment, Municipal wastes.

A gas chromatography technique, incorporating pentane-benzene elution and pentadecane as an internal standard, permitted polycycic aromatic hydrocarbon quantification in sewage sludge samples with varying solids contents. The technique, which employed direct hydrolysis of sewage sludges containing 40-95% water rather than Soxhlet extraction, was tested on sludge samples obtained from five Swiss waste water treatment plants. A 10 g sample of sludge was homogenized and hydrolyzed with a 30 ml solution of methanolic potassium hydroxide for 1.5 hrs, followed by the addition of 25 ml pentane. Duplicate sludge samples were mixed with pentane and 0.25 micrograms pentadecane to provide an internal standard. In some of the samples, pentane elution was incomplete and a pentane-benzene solution was added to elute polar hydrocarbons. The sample was filtered, adjusted to pH 2.5, and extracted with 25 ml pentane. The sample was then placed in a column containing 40 g activated silica gel in pentane, eluted with 250 ml pentane-benzene, concentrated to 0.2-1.0 ml, and analyzed by gas chromatography at 120-320C. The total areas of the sample peaks were compared to corresponding pentadecane peaks, employed as an internal standard. Results correlated well with predicted surface areas when high concentrations of hydrocarbons were present. Hydrocarbon recovery ranged 96.0-98.9% in samples bearing more than 50% solids. (Lisk-FIRL)
W78-09407

RECOVERY OF ASCARIS EGGS FROM SLUDGE,
Cincinnati Univ., OH. Dept. of Biological Sciences.
K. B. Meyer, K. D. Miller, and E. S. Kaneshiro.
Journal of Parasitology, Vol. 64, No. 2, p 380-383, April, 1978. 2 tab.

Descriptors: *Animal parasites, *Analytical techniques, *Detergents, *Volumetric analysis, *Sewage sludge, Centrifugation, Membrane processes, Filtration, Pollutant identification, Waste water treatment, Municipal wastes.

The zinc sulfate concentration technique for quantifying Ascaris ova in sewage sludge was enhanced by pretreatment with hypochlorite and an anionic detergent. A 75 g sample of mixed sludge seeded with Ascaris eggs was mixed with 100 ml of 2.62% hypochlorite, swirled, mixed with additional hypochlorite to obtain a 225 ml volume, and allowed to react for 50 min. The sample was centrifuged at 4C for 2 min and the solids fraction was mixed with 2 ml of anionic detergent and distilled water to a 225 ml volume. The mixture was centrifuged again, washed twice with distilled water, mixed with 75 ml of 33.2% zinc sulfate solution, and then centrifuged. The supernatant containing the eggs was passed through an 0.45 micron membrane filter; the recovered eggs were incubated in the dark for 10 days at 25C. The hypochlorite and anionic detergent treatment recovered 71% of the eggs, compared to 38% recovery with hypochlorite alone. Higher recovery rates were obtained when larger quantities of eggs were seeded in the sludge. Hypochlorite did not interfere with egg viability or destroy nonviable eggs. (Lisk-FIRL)
W78-09408

PRACTICAL METHOD FOR DETECTING POLIOVIRUS IN ANAEROBIC DIGESTER SLUDGE,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Science and Engineering.
J. S. Glass, R. J. Van Sluis, and W. A. Yanko.
Applied and Environmental Microbiology, Vol. 35, No. 5, p 983-985, 1978. 2 tab, 10 ref.

Descriptors: *Viruses, *Anaerobic digestion, *Sound waves, *Flocculation, *Separation techniques, Cultures, Toxicity, Heavy metals, Diseases, Pollutant identification, Sludge digestion, Dewatering, Waste water treatment, Municipal wastes.

Poliovirus was eluted from anaerobic digested sludge and dewatered composted sludge with beef extract addition, sonic disruption, and dithizone-chloroform extraction. A 47% poliovirus recovery was achieved when 10 mg sludge solids were suspended in 200 ml of 3% beef extract, disrupted by sonic treatment for 2 min, and centrifuged for 20 min; eluted viruses were assayed on monolayers of Buffalo green monkey kidney cells cultured in a medium with 10% fetal bovine serum. Virus recovery was increased to 60-65% when the beef extract eluates were concentrated to 8-12 ml by organic flocculation. The poliovirus isolation frequency was 100% when the elution and concentration method was applied to undigested liquid sludge, digested liquid sludge, and dewatered digested sludge. Poliovirus isolation in dewatered digested sludge, composted for 6 or more days, was limited because of mammalian monolayer cell death attributed to toxic concentrations of heavy metals formed by organic flocculation of digester solids eluates. Detoxification of the cytotoxic concentrates was achieved by extraction of the concentrated eluates with dithizone in chloroform. Poliovirus recovery after solvent extraction averaged 98.9%. The elution-concentration-extraction technique had a detection limit of about 1 infective virus unit/concentrated sample. (Lisk-FIRL)
W78-09409

TEHRAN GROUND WATER POLLUTION BY DETERGENTS,
Tehran Univ. (Iran). Dept. of Environmental Health.
K. Imandel, N. Razeghi, and P. Samar.
Water, Air, and Soil Pollution, Vol. 9, No. 1, p 119-122, January, 1978. 2 fig, 3 ref.

Descriptors: *Detergents, *Colorimetry, *Groundwater, *Aquifer testing, *Volumetric analysis, Analytical techniques, Water quality standards, Water wells, Sampling, Water pollution, Impaired water quality, Municipal wastes.

Detergent concentrations in groundwater aquifers were analyzed in 316 wells with depths ranging from 8-330 m in Tehran, Iran. Samples were analyzed by the methylene blue colorimetric technique; calibration curves were calculated by the least squares method. Detergent concentrations in samples collected over a 10-mo period ranged from traces to 1.403 mg/liter. The average concentration of detergents, within a confidence limit of 95% and a permissible error of plus or minus 0.005, was calculated at 0.1163-0.1593 mg/liter as methylene blue active substance. The United States and the World Health Organization permit detergent concentrations of 0.5-1.0 ppm in drinking water, below Tehran sampled concentrations. An isoconcentration map of detergent concentration distribution revealed localization in industrial and urban areas. (Lisk-FIRL)
W78-09421

APPLICATION AND DETERMINATION OF ORGANIC POLYMERS,
Stevens Inst. of Tech., Hoboken, NJ.
For primary bibliographic entry see Field 5D.
W78-09440

SUSCEPTIBILITY OF THREE FAMILIES OF FRESHWATER FISH TO DIELDRIN (IN SPANISH),
V. Canestr.
Mem Soc Cienc Nat La Salle 35(102), p 301-308, 1975.

Descriptors: *Characidae, *Cichlidae, *Insecticides, *Pimelodidae, *Dieldrin, Freshwater fish, Bioassay, Water pollution effects.

Acute bioassays were performed to determine the relative susceptibility of representatives of families Characidae, Cichlidae, and Pimelodidae to sub-lethal doses of dieldrin. Susceptibility was similar in systematic groups in the same family. Susceptibility was greater in Characidae than in Cichlidae, Pimelodidae being the least susceptible. Species difference among the same families were small.--Copyright 1978, Biological Abstracts, Inc.
W78-09491

COMPARATIVE MEASUREMENTS OF CHEMICAL OXYGEN DEMAND OF KRAFT PULP MILL EFFLUENTS VIA THE DICHROMATE AND PERMANGANATE METHODS (MEDIDAS COMPARATIVAS DE LA DEMANDA QUIMICA DE OXIGENO AL DICROMATO Y LOS INDICES DE PERMANGANATO. EN EFLUENTES DE FABRICACION DE PASTA KRAFT),
Instituto Nacional de Investigaciones Agrarias, Madrid (Spain).
D. Garcia Martin, R. M. Caminos Muruzabal, and M. Concepcion Garcia Vallejo.
Investigacion y Tecnica del Papel, Vol 14, No 54, p 985-1005, October, 1977. 1 appendix, 1 illus, 8 ref, 8 tab. English summary.

Descriptors: *Pulp wastes, *Chemical oxygen demand, *Water analysis, Testing procedures, Wastes, Industrial wastes, Water pollution sources, Organic matter, Pulp and paper industry, Analytical techniques, Water chemistry, Water properties, Testing, Chemical analysis, Kraft mills, Permanganates, Dichromates.

A comparison of dichromate and permanganate methods for determining the oxidizability of organic materials in kraft mill effluents indicated the Leithe modification of the dichromate method to be preferable to the standard procedure, and the acid permanganate method to be preferable to the alkaline permanganate method. (Speckhard-IPC)
W78-09507

IDENTIFICATION OF SOME NEUTRAL CHLORINATED ORGANIC COMPOUNDS IN SPENT BLEACH LIQUORS,
Swedish Forest Products Research Lab., Stockholm.
K. Lindstrom, and J. Nordin.
Svensk Papperstidning, Vol. 81, No. 2, p 55, February 10, 1978. 3 ref, 1 tab.

Descriptors: *Bleaching wastes, *Waste identification, *Chlorine compounds, Pulp waste, Wastes, Industrial wastes, Water pollution sources, Pollutant identification, Gas chromatography, Spectroscopy, Pulp and paper industry, Organic compounds, Aromatic compounds.

Eighteen neutral organic chlorine compounds were identified in the ether-soluble fraction of chlorination-stage kraft pulp bleaching effluent by means of gas chromatography/mass spectrometry techniques. Most of these compounds amounted to less than 0.1 g/ton of bleached pulp. The 18 compounds include trichloro-allene, tetra- and pentachloropropene, monochloroacetylfuran, mono- and dichloro-8-hydroxycymene, tri- and tetrachlorothiophene, di- and trichloroformylthiophene, di- and trichloroacetylthiophene, dichloropropionylthiophene, monochlorobenzaldehyde, trimethoxytrichlorobenzene, and mono-, di-, and trichloropyrone. (Brown-IPC)
W78-09512

ANALYSES OF PAPER MACHINE WATERS WITH ION SPECIFIC ELECTRODES. PART III. VARIOUS MEASUREMENT METHODS USING CHLORIDE ION SPECIFIC ELECTRODE,
Valmet Oy., Jyvaskyla (Finland).
J. Korhonen, and P. O. Lumme.

Paperi ja Puu, Vol 59, No 9, p 558-560, 563-565, September, 1977. 6 fig, 11 ref, 8 tab.

Descriptors: *Water analysis, *Chlorides, *Pulp wastes, *Electrodes, Ions, Sodium chloride, Analytical techniques, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Storage, Waste storage, Volumetric analysis, Calibrations, White water(Paper machines), Sodium nitrate, Hydrogen sulfide.

A chloride-specific electrode was used to determine chloride concentrations in samples of two paper-machine white waters, using direct calibration with pure NaCl solutions, calibration with NaCl solutions plus ionic strength adjustment, silver nitrate titration, and the method of known addition. The calibrations methods and the method of known addition gave too high chloride concentrations when applied to samples containing hydrogen sulfide. For sulfide-free samples all methods produced satisfactory results. The effect of hydrogen sulfide on accuracy of measurements was studied by storing samples in airtight bottles and conducting analyses at weekly intervals. (See also W74-11094 and W74-11093) (Brown-IPC)
W78-09523

PHYSICO-CHEMICAL SURVEILLANCE DATA OBTAINED FOR LAKE ONTARIO, 1974 AND THEIR RELATIONSHIP TO CHLOROPHYLL A,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-09539

BIOASSAY STUDIES ON THE TOXICITY OF FISH OF DISTILLERY EFFLUENTS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Zoology-Entomology.
For primary bibliographic entry see Field 5C.
W78-09544

OLIGOCHAETES (OLIGOCHAETA) OF SOME STREAMS OF THE HIGH TATRA MTS AND THE RIVER BIALKA TATRZANSKA,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
For primary bibliographic entry see Field 5C.
W78-09546

IMPROVED METHODS OF OIL-IN-WATER ANALYSIS,
General Motors Corp., Detroit, MI. Detroit Diesel Allison Div.
P. P. Cook, P. M. Duvall, and R. C. Bourke.
Water and Sewage Works, Vol. 125, Reference Number, p 71-72, 74, 76, 78, April, 1978. 9 fig, 2 tab, 2 ref.

Descriptors: *Analytical techniques, *Oily water, *Infrared radiation, *Attenuation, *Oil wastes, Solvents, Measurement, Equipment, Pollutant identification, Analytical techniques, Instrumentation, Separation techniques, Waste water treatment, Industrial wastes.

The reference gravimetric method for calculating total oil and grease in water was modified to correlate with calibrations of the semi-automatic Horiba OCMA-200 oil monitoring device. Oil in water was measured with the Horiba unit by injecting a 10 ml sample of oily water with 10 ml Freon as a solvent into an extraction chamber and mixing the substances with a vibrating plunger. After mixing, the water and solvent were allowed to separate; the solvent was filtered into an infrared chamber; and the amount of 3.5 micron light attentuation caused by the oil was measured over 30 min. The STORET 00556 reference method utilized 30 ml of Freon for eac of these sample extractions over 6 min. This method was modified by adding 150 ml solvent for each extraction and increasing the extraction time to 45-60 min for 80% of the oil. The flask used in the reference method was predried at 200C, stored in a desiccator, and weighed on a silica-bearing desiccating balance to determine tare weight at equilibrium. This procedure prevented errors in weight determination due to moisture adsorption. Calibrations were more accurate when the extraction timer was removed from the Horiba unit, the pH was adjusted to 2, the internal solvent heater was disconnected, and the cover was removed during measurements. (Lisk-FIRL)
W78-09561

DETECTION OF VIRUSES IN WATER OF THE BALTIC SEA (IN GERMAN),
Kiel Univ. (West Germany). Abt. Hygiene and Microbiologie.
J. Steinmann.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Betriebshyg Praev Med 164(5/6), p 492-497, 1977.

Descriptors: Enterovirus, E. coli, Outfalls, Picornavirus, Sewage, *Viruses, *Baltic Sea, *Pollutant identification.

Virological examination of water of the Baltic Sea in the neighborhood of a sewage outfall was done. By means of an apparatus for concerntrating viruses in water, it was possible to detect enteroviruses in 4 to 11 samples. The amount of viruses varied from 5-125 pfu (plaque forming units) in 101; the ratio of virus to Escherichia coli titer varied from 1:11, 111 to 1:1000,000. Factors influencing the decrease of virus titer in seawater were briefly discussed.--Copyright 1978, Biological Abstracts, Inc.
W78-09563

THE DEGRADATION OF AN AZO DYE IN AQUEOUS SOLUTIONS BY HIGH-INTENSITY ELECTRON-BEAM IRRADIATION,
Japan Atomic Energy Research, Takasaki. Takasaki Radiation Chemistry Research Establishment.
For primary bibliographic entry see Field 5D.
W78-09566

COOLING TOWER ENVIRONMENT--1978 (WITH SUPPLEMENT).
Maryland Univ., College Park. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 149, Price codes: A23 in paper copy, A01 in microfiche. Proceedings of Symposium on Environmental Effects of Emissions, held May 1978. 544 p, Supplement separately bound, Co-chairmen: Richard S. Nietubiez and R. Lamar Green. OWRT A-999-MD(13).

Descriptors: *Cooling towers, *Emissions, Drift, *Drift eliminators, *Drift prediction, Drift measurement, *Drift effects, Vegetation, Soils, Saline aerosols, Fluorescent dyes, Plume modeling, Airborne monitoring, *Ecological effects, Simulated drift, Reviews, Technology, Conferences, Air pollution effects, Salts, *Model studies, *Vapor plumes, Path of pollutants, Environmental effects.

Wet cooling towers provide a means of discharging to the atmosphere waste heat from industrial operations including electric generating plants. Heat is discharged from these towers resulting in a warm moist plume with entrained droplets (drift) of circulating water. The drift droplets will contain the minerals in the circulating water which will be deposited downwind of the cooling tower. The environmental impact of these emissions has not yet been adequately documented. A Symposium was held at the University of Maryland at College Park May 2-4, 1978 to bring together principal investigators involved in research on the environmental impact of cooling tower drift emissions. Thirty-three papers were presented portraying current state-of-the-art for cooling tower technology including drift eliminators design, plume modeling, predictions of drift deposition and ecological effects and field measurements to verify such predictions. In particular, recent results from the Maryland Chalk Point Cooling Tower Project were presented. These data show that under the somewhat limited peak load mode of operation of the generating unit with cooling tower no measurable environmental effect of deposition from cooling tower emissions has been found. However, research with simulated drift emissions in excess of predicted emissions from full load operations will cause damage to annual crops and perennial vegetation. Threshold levels for unacceptable levels of damage have not been established.
W78-09570

THIN-LAYER CHROMATOGRAPHIC DETERMINATION OF BENZO(A)PYRENE AND OTHER POLYCYCLIC AROMATIC HYDROCARBONS (IN RUSSIAN),
Academy of Medicine, Sofia (Bulgaria). Center for Hygiene.
R. Vasileva.
Gig Sanit (4), p 74-75, 1977.

Descriptors: Anthracene, *Pyrenes, *Aromatic hydrocarbons, *Chromatography(Thin-layer), *Pollutant identification, Methodology, Analytical techniques.

The TLC method uses a combination of cellulose, aluminum oxide, gypsum, liquid paraffin and benzene as absorbent. The sensitivity of the method is 1 ng for benzo(a)pyrene and 50 ng for anthracene, pyrene and 1,2,5,6-dibenzanthracene. A combination of TLC with spectrophotometry results in 92-97% determination.--Copyright 1978, Biological Abstracts, Inc.
W78-09587

THE SOLUBILITY OF AROCLOR 1254 IN SEA-WATER,
Oregon State Univ., Corvallis. School of Oceanography.
C. S. Wiese, and D. A. Griffin.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 4, April, 1978, p 403-411, 1 fig, 3 tab, 15 ref. Office of Sea Grants 2-37187 and 04-3-1854, NSF-IDOS GX-37350 USPHS ES-00210.

Descriptors: *Water pollution sources, *Water chemistry, *Polychlorinated biphenyls, Sea water, Analytical techniques, Solubility, *Pollutant identification, *Aroclor 1254.

Interest in the determination described in this paper derived from experiments designed to test the effects of polychlorinated biphenyl compounds on marine animals. Seawater was autoclaved, Aroclor 1254 was added, and the mixture was stirred. A standard solution of the Aroclor 1254 was analyzed by microcoulometric gas chromatography. The chlorine content of each major peak was determined by GLC-MS and referenced to a technique of Webb and McCall (1972). The equilibrium concentration of Aroclor 1254 in membrane filtered seawater was 28.1 + or - 1.8 ppb at 16.5C. In seawater which had been both membrane and carbon filtered the equilibrium concentration was 24.7 + or - 2.3 at 16.5C. These values are lower than those reported in the literature and it is suggested that four factors (stirring, salinity, organic content, and temperature) may be responsible for this difference with stirring having the most impact. (Chilton-ORNL)
W78-09589

THE TOXICITY OF MCPA TO FISH. LIGHT AND ELECTRON MICROSCOPY AND THE CHEMICAL ANALYSIS OF THE TISSUE,
Jyvaskyla Univ., (Finland). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-09592

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1977--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09738

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1977--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09739

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1977.
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09740

SUMMARY OF WATER RESOURCES FOR THE CAMPO, CUYAPAIPE, LA POSTA, AND MANZANITA INDIAN RESERVATIONS AND VICINITY, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09746

SELECTED HYDROLOGIC DATA, YAMPA RIVER BASIN AND PARTS OF THE WHITE RIVER BASIN, NORTHWESTERN COLORADO AND SOUTH-CENTRAL WYOMING,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09748

IDENTIFICATION, INDEXING AND EXCHANGE OF DATA ON ENVIRONMENTAL POLLUTANTS,
Geological Survey, Reston, VA. Water Resources Div.
G. L. Thompson.
In: Proceedings, 4th Joint Conference on Sensing of Environmental Pollutants, held in New Orleans, Louisiana, November 6-11, 1977. American Chemical Society, p 238-240, 1978. 1 ref.

Descriptors: *Data storage and retrieval, *Hydrologic data, Water resources, *Water pollution sources, *Pollutants, Environmental effects, Indexing, Monitoring, Networks, Computers, Information retrieval, Information exchange, *Environmental pollutants, *Data base, *National Water Data Exchange.

The services rendered by the National Water Data Exchange (NAWDEX) Program are designed to facilitate effective support to environmental water-data indexing, and to disseminate data vital to programs concerned with environmental water pollution abatement. NAWDEX has amassed a large amount of environmental information on available water data and has access to extensive data resources and services available through its member organization. The ability of NAWDEX to provide assistance in locating and acquiring needed water data continues to improve as new data resources and services become available through interaction with new member organizations. The program represents a concerted effort to improve the quality and efficiency of data access and transfer from collectors to users. This effort improves communication throughout the water-data community, stimulates awareness of existing water data, provides data-search assistance more readily to those who need it, reduces the time and cost required to obtain data, increases the utilization of existing water data, helps to reduce redundancy in data collection, and facilitates resources-development planning for special monitoring, network design, and water-data management. (Woodard-USGS)
W78-09749

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09751

GEOCHEMICAL AND HYDROLOGIC DATA FOR WELLS AND SPRINGS IN THERMAL-SPRING AREA OF THE APPALACHIANS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09754

FIELD AND LABORATORY PROTOCOLS FOR EVALUATING THE EFFECTS OF CHEMICAL SUBSTANCES ON AQUATIC LIFE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-09796

5B. Sources Of Pollution

APPLICATION OF AN OIL SPILL VULNERABILITY INDEX TO THE SHORELINE OF LOWER COOK INLET, ALASKA,
South Carolina Univ., Columbia. Dept. of Geology.
J. Michel, M. O. Hayes, and P. J. Brown.
Environmental Geology, Vol. 2, No. 2, p 107-117, 1978. 8 fig, 3 tab, 7 ref.

Descriptors: *Oil spills, *Oil pollution, *Alaska, *Exploration, *Drilling, Oil wells, Coasts, Beaches, *Shores, *Berms, Geomorphology, *Terrain analysis, *Geological surveys, *Sediments, Oil, Environmental effects, Water pollution sources, Geology, *Cook Inlet(Alas).

Offshore tracts in Alaska's lower Cook Inlet are scheduled to be opened for exploratory petroleum drilling in the near future. Because of the potential for oil spills resulting from this activity, a field study of the coastal zone was conducted in June 1976. A total of 1216 km of shoreline was classified into 3 types: erosional (45 percent), neutral (38 percent), and depositional (17 percent). This classification was used in conjunction with a vulnerability index of potential oil spill damage, developed through study of three major oil spills, to predict the longevity of oil in the different coastal environments of the Inlet. We propose that the use of this type of vulnerability indexing, in conjunction with a biological susceptibility index and oil spill trajectory models, would provide a rational basis for decision making concerning the location of on- and off-shore oil facilities and the design of oil spill contingency plans. (EIS-Deal)
W78-09301

EFFECTS OF IRRIGATION ON WATER QUALITY IN THE SAND PLAIN OF CENTRAL WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
S. M. Hindall.
Wisconsin Geological and Natural History Survey, Madison Information Circular No 36, February 1978. 50 p, 20 fig, 1 plate, 3 tab, 34 ref.

Descriptors: *Water pollution sources, *Groundwater, *Surface waters, *Fertilizers, *Pesticides, Nutrients, Irrigation effects, Water quality, Path of pollutants, *Wisconsin, Central Wisconsin sand plain.

The abnormal occurrence of nutrients and pesticides in ground and surface waters of the sand plain of central Wisconsin reflects intensive farming and heavy chemical application. Concentrations of nitrogen, the primary nutrient, in ground water in irrigated areas are about twice as high as in the nonirrigated areas, and about four times greater than the State average. The nutrients, phosphorus and potassium, are present only in low concentrations. High concentrations of iron in ground water is the only area-wide problem encountered. Except for a few constituents, chemical quality of surface water in the study area is essentially the same as that for ground water. Heavy pesticide use is not reflected in the waters of the area. A single pesticide, DDT, was detected in the ground water, whereas DDT, DDE, diazinon, and 2,4,5-T, were detected in the surface water. Distinct seasonal or general trends in either ground-water or surface-water quality were not evident during the study. Data collected indicate the water quality is stable. Present agricultural practices do not appear to be causing further changes in water quality. (Woodard-USGS)
W78-09306

RELATION OF URBAN LAND-USE AND LAND-SURFACE CHARACTERISTICS TO QUANTITY AND QUALITY OF STORM RUNOFF IN TWO BASINS IN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-09321

ATMOSPHERIC LOADING OF PHOSPHORUS AND OTHER CHEMICALS TO LAKE MICHIGAN,
Minnesota Univ., Minneapolis.
S. J. Eisenreich, P. J. Emmuling, and A. M. Beeton.
Journal of Great Lakes Research, Vol. 3, No. 3-4, p 291-304, December 1977. 8 fig, 8 tab, 37 ref. EPA No. R 803238.

Descriptors: *Great Lakes, *Lake Michigan, *Fallout, *Water pollution sources, *Phosphorous, On-site data collections, Precipitation(Atmospheric), Sampling, Pollutants, Calcium, Magnesium, Potassium, Sodium, Sulfates, Silica, Chlorides, Rainfall, Analysis, Analytical techniques, Hydrogen ion concentration, Spatial distribution, Temporal distribution, Organic carbon.

Bulk precipitation was collected on a monthly basis in the Lake Michigan basin for 18 months during 1975-1976 to determine atmospheric total phosphorus (TP) loadings to Lake Michigan. The sampling network consisted of bulk collectors at 23 land stations and 2 in-lake buoys located off urban and rural areas. Annual TP loading to Lake Michigan for 1976 based on loading rates of 0.184 and 0.303 micro grams/sq cm/mo for the north and south basins, respectively, was 1,690,000 Kg/year, representing approximately 16% of the total P budget. North and south basins showed different TP loading properties with approximately 62% depositing in the south basin. Seasonal variations in loading rates showed maxima in late spring and early summer, and minima in winter. In-lake buoy samplers yielded enhanced loading of TP compared to land stations. Wet-only precipitation concentrations for TP average 15% of bulk deposition values. Weighted-average TP concentrations in bulk precipitation were 0.050 and 0.064 mg/l in the north and south basins, respectively. Atmospheric TP loading was correlated closely to Ca and Mg loading, independent of precipitation amount, and exhibited a large dry fall component. Wind-blown soil and re-entrained dust are believed to be the major source of atmospheric phosphorus addition to Lake Michigan. (Humphreys-ISWS)
W78-09340

CONCENTRATION-DEPENDENT DIFFUSION APPLIED TO GROUNDWATER CONTAMINATION PROBLEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak, and V. V. N. Murty.
Journal of Hydrology, Vol. 37, No. 3/4, p 333-337, May 1978. 4 fig, 3 ref.

Descriptors: *Groundwater, *Water pollution, *Groundwater movement, *Aquifers, Analytical techniques, Theoretical analysis, Mathematical models, Diffusion, Path of pollutants, Porous media, Rates, Concentration-dependent diffusion.

Contamination of groundwater aquifers from stationary sources occurs in several situations. Streams, lakes, drainage channels, waste-water disposal sites or stagnant ponds containing contaminated water and laterally connected to groundwater aquifers cause the spread of the contaminant into adjoining aquifers. Whenever contamination occurs from stationary water bodies, it is likely in some cases that the concentration of a particular contaminant in the source decreases with time owing to artificial or natural recharge with freshwater from external sources. An analytical solution to the problem of concentration-dependent diffusion with decreasing concentration at the source was presented. The solution is non-dimensionalized and it can be used to predict the contamination in an aquifer from a source in whch the contamination concentration decreases with time. (Humphreys-ISWS)
W78-09354

ENVIRONMENTAL BEHAVIOR OF ANIONIC AND NONIONIC SURFACTANTS (DAS UMWELTVERHALTEN ANIONISCHER AND NICHTIONISCHER TENSIDE),
Prater and Gamble European Technical Center, Grimbergen (Belgium).
For primary bibliographic entry see Field 5C.
W78-09405

TEHRAN GROUND WATER POLLUTION BY DETERGENTS,
Tehran Univ. (Iran). Dept. of Environmental Health.
For primary bibliographic entry see Field 5A.
W78-09421

ANION MOBILITY IN SOILS: RELEVANCE TO NUTRIENT TRANSPORT FROM TERRESTRIAL TO AQUATIC ECOSYSTEMS,
Washington Univ., Seattle. Coll. of Forest Resources.
D. W. Johnson, and D. W. Cole.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 725, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-068, June, 1977. 27 p, 8 fig, 1 tab, 50 ref, 1 append.

Descriptors: *Nutrients, *Soil chemistry, Ions, *Anions, Adsorption, Leaching, Model studies, Water pollution sources, Anion exchange.

Nutrient transport from terrestrial to aquatic ecosystems in strongly mediated by soil chemical interactions. Ions deposited on or biologically released within the soils can enter into a variety of exchange and precipitation reactions prior to (or instead of) entering aquatic ecosystems. Current knowledge of soil anion adsorption reactions and their effects on leaching is reviewed and a simple model, based on anion production and adsorption considerations, to predict and explain nutrient transport is described. The relationship of this approach to that based on cation production and adsorption is discussed. (Skogerboe-Colorado State)
W78-09442

AGRICULTURE RUNOFF MANAGEMENT (ARM) MODEL--VERSION II. REFINEMENT AND TESTING,
Hydrocomp, Inc., Palo Alto, CA.
A. S. Donigian, Jr., D. C. Beyerlein, H. H. Davis, Jr., and N. H. Crawford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 105, Price codes: A14 in paper copy, A01 in microfiche. Report EPA-600/3-77-098, August, 1977. 294 p, 108 fig, 17 tab, 3 append.

Descriptors: *Watersheds(Basins), Georgia, Michigan, Hydrology, Pesticides, Sediments, Nutrients, Runoff, Water quality, *Model studies, *Watershed management, *Agricultural runoff, *Agricultural watersheds.

The Agricultural Runoff Management (ARM) Model has been refined and tested on small agricultural watersheds in Georgia and Michigan. The ARM Model simulates the hydrologic, sediment production, pesticide, and nutrient processes on the land surface and in the soil profile that determine the quantity and quality of agricultural runoff. The research and model refinements related to soil moisture and temperature simulation, pesticide degradations, nutrient transformations and plant nutrient uptake are discussed. The goal is to evaluate and improve the pesticide and nutrient simulation capabilities of the ARM Model. However, the runoff and sediment modeling is also analyzed since these are the critical transport mechanisms of agricultural chemicals. (Skogerboe-Colorado State)
W78-09444

ASSESSMENT OF IRRIGATION RETURN FLOW MODELS,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
W. R. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 897, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/2-76-219, October 1976. 75 p, 4 fig, 11 ref. 7 append.

Descriptors: *Return flow, Water quality, *Model studies, Soils, Aquifer systems, Crops, Application methods, *Irrigation, Salinity, Mathematical models, Soil chemistry, Water consumption, Drainage, Leaching, *Evaluation.

Throughout the Western United States irrigation return flows contribute to the problem of water quality degradation. Evaluating the effectiveness of alternative management strategies involves models which simulate the processes encompassed by irrigated agriculture. The development and application of these models require multidisciplinary expertise. A workshop involving 15 specialists in the varied aspects of irrigation return flow modeling was held to review the status of these models. Irrigation return flow and conjunctive use models recently developed by the Bureau of Reclamation served as focal points for the workshop. As the field verification and potential applications of these models were discussed, several general problems were identified where further investigation is needed. Particular emphasis was given to the description of the spatially varied aspects of soil, crop, and aquifer systems, and the proper alignment of model objectives with available data. The large number and diversity of existing models illustrate the individualistic nature of irrigation return flow modeling. In order to effect more widespread utilization of existing models, a systematic procedure should be developed to update and disseminate this modeling technology. (Skogerboe-Colorado State)
W78-09445

EFFECTS OF IRRIGATION METHODS ON GROUNDWATER POLLUTION BY NITRATES AND OTHER SOLUTES,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
C. W. Wendt, A. B. Onken, O. C. Wilke, and R. D. Lacewell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 322, Price codes: A16 in paper copy, A01 in microfiche. Report EPA-600/2-76-291, December 1976. 330 p, 197 fig, 46 tab, 23 ref.

Descriptors: *Irrigation practices, Fertilizers, Nitrogen, Isotopes, *Water pollution, Soil water, *Nitrates, *Irrigation water, *Fertilization.

Sprinkler irrigation, furrow irrigation, subirrigation, automated subirrigation, criteria for applying irrigation water, methods of applying fertilizer and sources of fertilizer were investigated as to their potential to decrease possible pollution from nitrate and other solutes in a loamy fine sand soil overlying a shallow aquifer in Knox County, Texas. Less nitrate-nitrogen was available for leaching in subirrigation systems than furrow and sprinkler systems. Less irrigation water was applied with automated subirrigation systems than with the other irrigation systems. However, crop water requirement was not significantly changed--the soil water was more efficiently used. Fertilizer remained in the root zone if the water applied was based on potential evapotranspiration and leaf area regardless of the irrigation system or the criteria used to apply the irrigation water. Banded fertilizers moved differently in the different irrigation systems. Subirrigation has the possibility of having irrigation return flow with lower concentrations of other solutes than sprinkler or furrow systems. Banding fertilizer in the bed was superior to banding below the level of the water furrow and applications in the irrigation water relative to quality of irrigation return flow. No other source of nitrogen fertilizer was indicated to be superior. Current fertilization practices are not causing major increases in the nitrate-nitrogen level in the aquifer. (Skogerboe-Colorado State)
W78-09446

NITRATE IN EFFLUENTS FROM IRRIGATED LANDS (ANNUAL REPORT),
California Univ., Berkeley.
P. F. Pratt, J. W. Biggar, F. E. Broadbent, D. D. Focht, and L. J. Lund.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 673, Price codes: A05 in paper copy, A01 in microfiche. Report NSF/RA-770308, July 1977. 91 p, 13 fig, 17 tab, 14 ref.

Descriptors: *Nitrates, Nitrification, Chemical reactions, Denitrification, *Irrigated land, Effluents, Irrigation, *Nitrogen, Soil-water-plant relationships, Soil properties, Leaching, Water quality control, Water pollution.

Progress is reported in the development of technologies for measurements of NO3(-) leaching and denitrification and in understanding of the factors that influence the quantities of nitrogen that go into various sinks. Research on various aspects of the nitrogen cycle in the soil-plant-water system are discussed, including: (1) nitrogen transformations with particular emphasis on denitrification; (2) crop utilization of nitrogen; (3) incorporation of nitrogen into and cycling in soil organic matter; (4) fluxes of water through the root zone; and (5) effects of soil profile properties on nitrogen leaching and denitrification. (Skogerboe-Colorado State)
W78-09447

METHODOLOGY FOR CALIBRATING STORMWATER MODELS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
T. K. Jewell, T. J. Nunno, and D. D. Adrian.

Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. EE3, p 485-501, June 1978. 3 fig, 6 tab, 16 ref. OWRT A-095-MASS(1) and B-059-MASS(1).

Descriptors: *Water quality, *Storm water, *Urban planning, Hydrology, *Computer models, Sewers, Environmental engineering, Regional planning, Water pollution, Management, Biochemical oxygen demand, Computer programs, Hydrologic data, Sensitivity analysis, Maple Brook basin(Greenfield Mass), Equations, Systems analysis, Prediction, Pollutants, Simulation analysis.

In order to deal with the difficulties involved in gathering storm runoff data, an increased emphasis is being placed on the use of computer models for predicting quantity and quality of urban stormwater runoff. Calibration involves minimization of deviations between measured field conditions and model output by adjusting parameters within the model. A method is presented for calibrating coupled quantity-quality stormwater management models; the United States Environmental Protection Agency Storm Water Management Model is used as an example. Quantity and quality subroutines are separated, and each is calibrated using measured data. Data from six storm events are used for quantity calibration and data from five storm events used for quality calibration. Model parameters are adjusted, based on sensitivity analyses, until predicted and measured outputs are within stated calibration criteria. The calibrated models are then recombined and the coupled model is used to predict annual pollutant loadings. Loading rates are compared with loading rates predicted using a single storm event calibrated model. This method provides an accurate and economic tool for predicting alternative futures. (Bell-Cornell)
W78-09459

FIELD STUDY OF THE EFFECTS OF STORMS ON THE STABILITY AND FATE OF DREDGED MATERIAL IN SUBAQUEOUS DISPOSAL AREAS,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5E.
W78-09471

FEASIBILITY OF PINTO ISLAND AS A LONG-TERM DREDGED MATERIAL DISPOSAL SITE,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5E.
W78-09474

AQUATIC DISPOSAL FIELD INVESTIGATION, GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE; APPENDIX B: INVESTIGATION OF WATER-QUALITY PARAMETERS AND PHYSICOCHEMICAL PARAMETERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5E.
W78-09483

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX B: WATER-QUALITY PARAMETERS AND PHYSICOCHEMICAL SEDIMENT PARAMETERS.
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5E.
W78-09486

POLLUTION FROM SEVERAL WOOD SPECIES IN HARDBOARD PRODUCTION,
Industrial Environmental Research Lab.- Cincinnati, Corvallis, OR. Food and Wood Products Branch.
V. Dallons.
Forest Products Journal, Vol 28, No 1, p 42-47, January, 1978. 10 fig, 6 ref, 4 tab.

Descriptors: *Pulp wastes, *Water pollution, *Hardboard, Effluents, *Water pollution sources, Wastes, Industrial wastes, Dissolved solids, Suspended solids, Chemical oxygen demand, Biochemical oxygen demand, Hydrogen ion concentration, Pine trees, Softwood, Hardwood, Aspen(Populus), Oak(Quercus alba), Pine(Pinus strobus), Douglas-fir(Pseudotsuga menziesii).

Different species of wood chips (viz., Populus, Quercus alba, Pinus strobus, and Pseudotsuga menziesii) were streamed at various pressures and times, refined in a Bauer refiner, and dewatered. The water samples were analyzed for total, dissolved, and suspended solids; soluble and total COD and BOD; and pH to determine the pollution loadings from hardboard mills. The more severe cooking conditions required to manufacture S2S (smooth 2 sides) hardboard resulted in higher raw waste loadings of soluble BOD and COD than in S1S (smooth 1 side) board production for the same species of wood. The amount of suspended solids in the raw waste load proved to be independent of cooking conditions but highly dependent on the species of wood used. Actual loads from hardboard mills deviate from the experimentally determined BOD and COD raw waste loadings because of process variations such as the amount of white water recycling. A reduction of unnecessarily severe cooking conditions could reduce the raw waste load at some S2S hardboard mills. (Swichtenberg-IPC)
W78-09506

COMPARATIVE MEASUREMENTS OF CHEMICAL OXYGEN DEMAND OF KRAFT PULP MILL EFFLUENTS VIA THE DICHROMATE AND PERMANGANATE METHODS (MEDIDAS COMPARATIVAS DE LA DEMANDA QUIMICA DE OXIGENO AL DICROMATO Y LOS INDICES DE PERMANGANATO. EN EFLUENTES DE FABRICACION DE PASTA KRAFT),
Instituto Nacional de Investigaciones Agrarias, Madrid (Spain).
For primary bibliographic entry see Field 5A.
W78-09507

COMPOSITION OF PULP INDUSTRY EFFLUENTS (COMPOSICION DE LAS AGUAS RESIDUALES DE LA INDUSTRIA DE LA PASTA),
Centro de Investigaciones del Agua, Madrid (Spain).
J. M. Arias Carrillo.
Investigacion y Tecnica del Papel, Vol 14, No 54, p 925-940, October, 1977. 6 tab. English summary.

Descriptors: *Pulp wastes, *Sulfite liquors, *Chemical composition, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Water pollution, Chemical wastes, Black liquor, Spent sulfite liquor, Wood, Chemical structure.

After a brief introduction to the chemical structure of the main components of wood, the chemical composition of pulp mill effluents (especially kraft black liquor and spent sulfite liquor) is reviewed along with their polluting capacities. (Speckhard-IPC)
W78-09508

REMOVAL OF METHANOL FROM THE SULPHATE (PULPING) PROCESS,
Rosenlew (Oy. W.) A. B., Pori (Finland).
For primary bibliographic entry see Field 5D.
W78-09510

COMPOSITION OF BEECH MAGNEFITE PULP BLEACHING EFFLUENT (ZLOZENIE ODPADOVYCH VOD Z BIELENIA BUKOVEJ MAGNEFITOVEJ BUNICINY),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
T. Halmova, and L. Balhar.
Vyskumne Prace z Odboru Papiera a Celulozy, Vol. 22, p V37-V40, 1977. 2 ref, 8 tab, English summary.

Descriptors: *Bleaching wastes, *Sulfite pulp mills, Magnesium sulfite, Sulfite liquors, Wastes, Industrial wastes, Pulp wastes, Water pollution sources, Pulp and paper industry, Chemical oxygen demand, Biochemical oxygen demand, Water pollution, Mangefite pulp, Beech trees(Fagus).

The amount of dissolved organic compounds leaving a magnefite pulp mill with the bleachery effluent depends on the unbleached pulp yield and the bleaching process used. Pulp with better than 90% brightness can be obtained with an unbleached pulp kappa number of 18.1-26.4 and a CECEHHH sequence or a sequence utilizing chlorine dioxide. With the CECEHHH sequence, the following pollution load is generated: 54.2-86.49 kg/ton of COD (chromate), 18.79-34.0 kg/ton of COD (Kubel) and 20.68-32.69 kg/ton of 5-day BOD. The pollution loads generated by each stage in the CEH, CEHHH, and CECEHHH bleaching of beech magnefite pulps with a kappa number of 18.1-26.4 are given. (Trubacek-IPC)
W78-09514

DEVELOPMENT OF A MATHEMATICAL WATER QUALITY MODEL FOR GRAYS HARBOR AND THE CHEHALIS RIVER, WASHINGTON.
Battelle Pacific Northwest Lab., Richland, WA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 729, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., October 1974. 56 p, 22 fig, 4 tab, 10 ref.

Descriptors: *Water quality, *Model studies, *Simulation analysis, *Hydrodynamics, *Grays Harbor(Wash), *Chehalis River(Wash), Estuaries, Tide flat channels, Biochemical oxygen demand, Dissolved oxygen, Nitrogen, Salinity, Phosphorus, Ammonia, Chlorophyll, Coliform bacteria, Washington.

This report documents the application of a hydrodynamic and water quality model to Grays Harbor and the Chehalis River, Washington. The Battelle-Northwest models (EXPLORE-I (for tidally influenced systems) and PIONEER-I (for nontidal systems) were combined to simulate concentrations of water quality parameters. The EXPLORE-I code was applied to the tidally influenced portions of Grays Harbor and the PIONEER-I code to the Chehalis River. Modifications were made to the EXPLORE-I code for this project and included: conversion to IBM computer, addition of 'tide flat channels,' options to specify quality of incoming seawater, options to use only a subset of model parameters, and conversion to metric units. The model was successfully calibrated and verified for dissolved oxygen in 1970, 1971, and 1972. Waste discharge and water quality data were obtained from extensive surveys supervised by the Washington State Department of Ecology. It was found that the quality of incoming seawater and benthic oxygen demand were extremely important variables affecting water quality in the Harbor and lower Chehalis River. Lack of data precluded calibration and verification of the PIONEER-I model, although it was set up and applied to the Chehalis River. (Bell-Cornell)
W78-09518

SYSTEMS PROGRAM FOR THE ANALYSIS OF NONURBAN, NONPOINT SOURCE POLLUTANTS IN THE MISSOURI BASIN REGION,
Midwest Research Inst., Kansas City, MO.
A. E. Vandegrift, and S-y. Chiu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 602, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Office of Water Programs, Denver, Colorado, May 1973. 123 p, 15 fig, 8 tab, 6 append.

Descriptors: *Missouri River, Surface waters, *Environmental effects, *Long-term planning, *Water pollution control, *Data collections, Water policy, Decision making, Watersheds(Basins), Agriculture, Mathematical models, Systems analysis, *Computer programs.

A program for the analysis of nonurban, nonpoint source pollutants in the Missouri River Basin was conducted at Midwest Research Institute under the sponsorship of the Environmental Protection Agency (EPA). The ultimate goal of the program is to develop system models that can be used by EPA to assess the impact of nonpoint source pollutants on the quality of surface water and to facilitate long-range planning for pollution control. The program consists of three phases: Phase I (the work conducted to date) involved efforts to (1) provide physical data in order to establish relationships that can be used to predict and assess water quality problems, establish abatement priorities, and determine effects under various conditions; and (2) provide economic base data that can be used for cost projections, economic analyses, incentive development, and EPA policy determination for the various components of nonpoint source pollution. Phase II and Phase III involve development models, analytical tools and computer programs that EPA can use to implement effective pollution-control programs. This report describes the results accomplished in Phase I of the program. The principal results concern: determination of data needs and data sources; preliminary data evaluation; data compilation; and report organization. Phase I conclusions include: the methodology developed to treat nonurban situations is unique and useful for similar studies; and available data are sufficient for economic projection. (See also W78-09520) (Bell-Cornell)
W78-09519

SYSTEMS PROGRAMS FOR THE ANALYSIS OF NONURBAN, NONPOINT SOURCE POLLUTANTS IN THE MISSOURI BASIN REGION. SUPPLEMENT,
Midwest Research Inst., Kansas City, MO.
A. E. Vandegrift, and S-y. Chiu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 603, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Office of Water Programs, Denver, Colorado, May 1973. 44 p, 1 fig, 4 appen.

Descriptors: *Missouri River, *Water quality control, *Data processing, *Streams, *Environmental effects, Watersheds(Basins), Computer programs, Rural areas, Hydrology, Mathematical models, Systems analysis.

A program for the analysis of nonurban, nonpoint source pollutants in the Missouri River Basin has been conducted at Midwest Research Institute under the sponsorship of the Environmental Protection Agency (EPA). The ultimate goal of the program is to develop system models that can be used by EPA to assess the impact of nonpoint source pollutants on the quality of surface water and to facilitate long-range planning for pollution control. Presented herein is a supplement to the report on Phase I of the program, which involved efforts to (1) provide physical data in order to establish relationships that can be used to predict and assess water quality problems, establish abatement priorities, and determine effects under various conditions; and (2) provide economic base data that can be used for cost projections, econimic analyses, incentive development, and EPA policy determination for the various components of nonpoint source pollution. Data have been collected, evaluated, compiled and organized. This supplement provides a user's manual and computer program listing. (See also W78-09519) (Bell-Cornell)
W78-09520

SYNOPTIC RAINFALL DATA ANALYSIS PROGRAM (SYNOP),
Hydroscience, Inc., Westwood, NJ.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 563, Price codes: A06 in paper copy, A01 in microfiche. Prepared for: Municipal Environmental Research Lab., Environmental Protection Agency, Cincinnati, Ohio, July 1976. 115 p, 1 fig, 1 tab.

Descriptors: *Water pollution, *Rainfall, *Storms, *Computer programs, Surface waters, Runoff, Statistical methods, Rainfall records, Storm loadings, Weather bureau, Magnetic tapes, FORTRAN, Effects.

An integral part of the assessment of the effects of storm loads on water quality is the statistical evaluation of rainfall records. Hourly rainfall records of many years' duration are cumbersome and difficult to analyze. The purpose of this rainfall data analysis program is to provide the user with a tool for summarizing and statisticaly characterizing a rainfall record of interest using U.S. Weather Bureau magnetic tapes. Statistical analysis of variables of interest (volume, duration, intensity, and time between storms) are given to determine seasonal trends which are of importance in assessing impacts and selecting control alternatives for storm related loads. This publication is Appendix E of the Final Report. (Bell-Cornell)
W78-09521

SUMMARY REPORT ON THE LONG-TERM WATER QUALITY OF THE SOUTH PLATTE RIVER BASIN 1966-1972,
Environmental Protection Agency, Denver CO. Region VIII.
J. E. Hardaway, and R. L. Fox.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 570, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-908/2-74-002, August 1974. 117 p, 19 fig, 10 tab, 7 append.

Descriptors: *South Platte River(CO), *Water quality, *Water pollution effects, *Coliforms, *Dissolved oxygen, *Biochemical oxygen demand, Rivers, Tributaries, Watersheds(Basins), Denver(CO), Monitoring, Basic data collections, Nutrients, Nitrate, Phosphate, Ammonia.

Analysis of water quality data collected 1968-72 at 21 sampling stations in the South Platte River Basin (Colorado) shows that surface water quality significantly deteriorates as it passes through the Denver metropolitan area. At Denver coliforms and BOD5 levels have increased in recent years, and dissolved oxygen has sometimes dropped below the acceptable limit of five mg/l. A monitoring system is proposed to improve data reliability and comprehensiveness. Highest coliform concentrations were usually at the Franklin Street station, averaging 550,000/100 ml for total coliforms, and 3000/100 ml for fecal coliforms. Levels have occasionally risen to 100 times the mean values. DO content decreased from a median upstream of about eight mg/l to a median of six mg/l at Denver, with lows of two mg/l. BOD5 increased to a median of about 15 mg/l in the metropolitan area, with highs over 25 mg/l. Nitrate, phosphate, and ammonia all showed high levels from Denver as far as 100 km downstream to Kersey. Phosphate and ammonia were particularly high at seven and six mg/l. Overall deterioration of water quality in the main stem occurred throughout the metropolitan area, not just downstream from the major treatment plants. Over the study period there was a general decrease in coliform bacteria, but an increase in recent years in the Denver area. DO has varied in a cyclical but unpredictable fashion. BOD5 have been relatively consistent, except at Henderson which doubled in the first quarter of 1973. (Lynch-Wisconsin)
W78-09531

CLARK FORK RIVER STUDY - MONTANA - JULY, AUGUST, 1973.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5C.
W78-09532

DILLON RESERVOIR - BLUE RIVER STUDY - COLORADO, JUNE, JULY, AUGUST - 1973.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5C.
W78-09533

MICROBIAL TRANSFORMATION OF (14)C-LABELLED 2,4,6-TRINITROTOLUENE IN AN ACTIVATED-SLUDGE SYSTEM,
Army Natick Research and Development Command, MA.
For primary bibliographic entry see Field 5D.
W78-09553

METROPOLITAN WATER SYSTEMS OPERATION: CONTINUOUS MODELING OF FLOW QUANTITY AND QUALITY IN THE SUPPORTING RIVER BASIN,
Dallas Water Utilities Dept. TX. Operations Analysis Div.
For primary bibliographic entry see Field 5C.
W78-09569

HEAVY METALS CONTAINED IN RUNOFF FROM LAND RECEIVING WASTES,
Minnesota Agricultural Experiment Station, St. Paul.
W. E. Larson, and R. H. Dowdy.
In: Disposal of Residues on Land, Proceedings of the National Conference on Disposal of Residues on Land, St. Louis, Missouri, September 13-15, 1976. p 21-26, 3 fig, 5 tab, 16 ref.

Descriptors: *Waste disposal, *Water pollution, Sewage disposal, Sludge disposal, *Heavy metals, Runoff, *Path of pollutants.

Heavy metals were measured in runoff waters and eroded sediments on a sewage sludge treated area. Soils on the area were primarily Typic Hapludolls on up to 10% slopes. The sludge was low in metals and 28.5 mt/ha was applied over a 2 year period. Zn, Cu, Cd, Pb, Ni, and Cr concentrations in the runoff were low with concentration of Zn and Cu being greater in sediment than in waters except during periods of snowmelt or storms. (Chilton-ORNL)
W78-09573

INSECTICIDES, POLYCHLORINATED BIPHENYLS AND METALS IN AFRICAN LAKE ECOSYSTEMS. II. LAKE MCILWAINE, RHODESIA,
South Dakota State Univ., Brookings. Dept. of Chemistry.
Y. A. Greichus, A. Greichus, H. A. Draayer, and B. Marshall.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 4, April, 1978, p 444-453, 1 fig, 3 tab, 21 ref.

Descriptors: Environmental effects, *Water pollution effects, Pollutants, *Pesticide residues, *Insecticides, *Polychlorinated biphenyls, *Metals, Lakes, *Africa.

This paper reports results of concentrations of selected contaminants in one of three African lake ecosystems. Results from Hartbeespoort and Vioelvlei Dams, Republic of South Africa, have been previously reported. Lake McIlwaine is a highly eutrophic lake formed by an earth dam. Insecticide residues most commonly detected were DDT, DDD, DDE and dieldrin. Levels of total insecticides for all types of samples from Lake McIlwaine were higher than those of Voelvlei and lower than those of Hartbeespoort except bottom sediments which had higher levels than either of the others. Generally, PCB's were higher than those of Voelvlei and lower than those of Hartbeespoort. Highest concentrations of metals (except for arsenic and copper) were found in an area near the sewage effluent of Salisbury. Evidence for the accumulation of lead and mercury in food chains was found in cormorant carcasses. (See also W78-09575) (Chilton-ORNL)
W78-09574

INSECTIDES, POLYCHLORINATED BIPHENYLS AND METALS IN AFRICAN LAKE ECOSYSTEMS. III. LAKE NAKURU, KENYA,
South Dakota State Univ., Brookings. Dept. of Chemistry.
Y. A. Greichus, A. Greichus, B. D. Ammann, and J. Hopcraft.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 4, April, 1978, p 454-461, 1 fig, 2 tab, 7 ref.

Descriptors: Environmental effects, *Water pollution sources, Pollutants, *Pesticide residues, *Insecticides, *Polychlorinated biphenyls, *Metals, Lakes, *Africa, *Ecosystems.

This paper presents the results of the last of four studies on concentrations of selected contaminants in African lake ecosystems. The other three lakes involved in these studies were Hartbeespoort and Voelvlei Dams, Republic of South Africa, and Lake McIlwaine, Rhodesia. Lake Nakuru is a closed system with no outlet. In general, levels of arsenic, manganese, lead, zinc and mercury did not appear unusual when compared to these metals in the other three lakes. Levels of cadmium in water, chironomids, aquatic insects, and fish were higher in Lake Nakuru. Bottom sediments from the Nakuru Lake were higher in cadmium than in other portions of the lake. Concentrations of insecticide residues and PCB's in the lake did not appear at present to be a pollution problem. (See also W78-09574) (Chilton-ORNL)
W78-09575

A STUDY OF ESCHERICHIA COLI SURVIVAL IN HIGH LATITUDE WATERS (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Inst. (USSR).
O. N. Trunova, and N. I. Pilipas.
Gig Sanit (8), p 104-105, 1977.

Descriptors: *Bactericidal activity, *Barents Sea, Contamination, Reservoirs, Russian-SFSR, Sewage, USSR, Water pollution, *E coli, *Self-purification, Sea water, Potable water.

Using E. coli, a comparison was made of the bactericidal activity of sea water from a bay of the Barents Sea (Russian SFSR, USSR) contaminated with commercial and domestic sewage with that of drinking water from a reservoir. Natural sea water had a significantly higher bactericidal activity than fresh water. In tests with natural and inactivated sea water of the presence of biological factors of self-purification, the destruction of E. coli occurred faster than in autoclaved water. Test microbes died more slowly in samples of sea water preserved a low temperature than at 20 degrees C, indicating a retardation of the self-purification processes in conditions of high latitude waters.--Copyright 1978, Biological Abstracts, Inc.
W78-09577

EFFECT OF FERTILIZER ON THE RISE IN NITROGEN CONTENT IN SOURCES OF DRINKING WATER (IN RUSSIAN),
All Union Research Inst. of Tea and Subtropical Plants, Colchis (USSR).
M. K. Daraseliya, T. A. Glonti, and N. S. Babilodze.
Soobshch Akad Nauk Gruz Ssr 85(3), p 685-688, 1977.

Descriptors: Plantation, Tea, Potable water, *Nitrogen, Fertilizers, Water pollution sources, *Path of pollutants, Springs, Water wells.

High concentrations of nitric N, reaching 50 mg/l of water, were discovered in springs and wells located in the area of tea plantations intensively fertilized with N. It is necessary to raise the ratio of N utilization by plants and to select N forms less susceptible to washing out.--Copyright 1978, Biological Abstracts, Inc.
W78-09579

HYGIENIC ASSESSMENT OF THE EFFECTIVENESS OF MEASURES USED FOR PREVENTING CONTAMINATION OF THE TOMI RIVER (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5G.
W78-09582

TETRACHLOROETHYLENE IN CONTAMINATED GROUND AND DRINKING WATERS,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
W. Giger, and E. Molnar-Kubica.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 4, April, 1978, p 475-480, 1 fig, 1 tab, 11 ref.

Descriptors: *Water pollution sources, Path of pollutants, Pollutants, Potable water, *Organic wastes, Organic compounds, *Switzerland, Industrial wastes, Groundwater, *Tetrachloroethylene.

A study is reported at the evaluation of the source of the tetrachloroethylene contamination in the water supply of the town of Dubendorf. It was found that water was supplied to Dubendorf from Lake Zurich and from three wells. One of these wells was found to be contaminated with levels ranging between 500 and 1000 micro g/l tetrachloroethylene. How the solvent reached the aquifer is presently under investigation. This case study points out the fact that the widely used tetrachloroethylene is of particular concern as a potential pollutant of sub-surface waters. (Chilton-ORNL)
W78-09593

METALS IN AN ACID MINE STREAM AND ESTUARY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, D. T. E. Hunt, and A. W. Morris.
The Science of the Total Environment, Vol. 9, No. 1, January, 1978, p 75-86, 4 fig, 4 tab, 22 ref.

Descriptors: Environmental effects, *Water pollution sources, *Acid mine water, Acid streams, *Copper, *Zinc, *Manganese, Metals, Estuaries, Sediments.

Analysis of water and sediments of an acid mine stream showed that the river water at the mouth has concentrations of zinc, copper and manganese at least two orders of magnitude above normal river water after dilution by non-metalliferous tributaries. Iron is precipitated from the water along the length of the stream. Copper and zinc are lost from solution by adsorption onto hydrated ferric oxide at pH values of 4.5 for copper and 6.0 for zinc. Concentrations of manganese are affected by dilution. Estuarine waters were found to contain high concentrations of copper and zinc. 50% of the znc and 90% of the copper in the sediment is in a potentially mobile form. Only a few organisms are able to survive in the environment. (Chilton-ORNL)
W78-09596

CHARACTERIZATION AND IMPACT OF STORMWATER RUNOFF FROM VARIOUS LAND COVER TYPES,
Wiggins-Rimer and Associates, Durham, NC.
A. E. Rimer, J. A. Nissen, and D. E. Reynolds.
Journal Water Pollution Control Federation, Vol. 50, No. 2, February, 1978, p 252-264, 7 fig, 7 tab.

Descriptors: Environmental effects, *Land use, *Land classification, Water quality, Runoff, *Storm runoff, Water pollution.

The purpose was to relate the major findings of the Pollution Source Analysis (PSA) and to discuss the impact of various types of land cover on the quality of storm water runoff. The primary objective of the PSA was to determine whether nonpoint source pollution problems existed in the study area. Land use types utilized in the sampling program were: low-activity rural, high-activity rural, low-activity residential, high-activity residential, low-activity commercial, high-activity commercial, and urban. The data generated in the sampling program of specific land uses indicated that the level of nonpoint source pollution generally increases impervious area. The only major exception to this trend was the central business district type land use. (Chilton-ORNL)
W78-09598

AN IN SITU DETERMINATION OF THE DISAPPEARANCE OF COLIFORMS IN LAKE MICHIGAN,
Marquette Univ., Milwaukee, WI.
A. E. Zanoni, W. J. Katz, H. H. Carter, and R. C. Whaley.
Journal Water Pollution Control Federation, Vol. 50, No. 2, February, 1978, p 321-330, 4 fig, 2 tab, 21 ref.

Descriptors: Environmental effects, *Water pollution sources, Wastes, Waste dilution, Bacteria, Enteric bacteria, Lakes, Freshwater, *Lake Michigan, *Coliforms, *Path of pollutants.

Six fecal coliform net surveys were conducted in Lake Michigan off the Milwaukee metropolitan area. Beginning at a point when three rivers discharge into the lake, fecal coliform counts dropped significantly with distance into the lake. It was concluded that this reduction in count is the result of both natural die-off and environmental dilution. To establish the die-off kinetics of enteric bacteria while excluding the dilution effect, tests were conducted at the outfall of the Milwaukee South Shore wastewater treatment plant. Total coliform die-off coefficient was estimated to be 8.72 per day. In general, results showed that a relatively rapid disappearance rate of enteric bacteria occurred in deep freshwater. (Chilton-ORNL)
W78-09599

TRACE METAL CONCENTRATIONS IN ESTUARINE SEDIMENTS: MOBILIZATION, MIXING OR PRECIPITATION,
Waterloopkundig Lab., Delft (Netherlands).
W. Salomons, and W. G. Mook.
Netherlands Journal of Sea Research, Vol 11, No 2, p 119-129, November 1977, 3 fig, 3 tab, 15 ref.

Descriptors: *Water pollution sourcer, *Trace elements, Sediments, Deposition, Estuaries, Metals.

A decrease was observed in the trace metal concentrations of bottom sediments in the seaward direction in the estuaries of the rivers Rhine and Ems. It was concluded that this decrease is caused by the mixing of marine (low metal concentrations) and fluvial (high metal concentrations) sediments. Good agreement between the metal concentrations calculated and those observed in the estuarine deposits shows that the mixing process mainly controls the trace metal concentrations. There was no evidence found for mobilization. (Chilton-ORNL)
W78-09601

NITROGEN, CHLORIDE, AND WATER BALANCE WITH IRRIGATED RUSSET BURBANK POTATOES IN A SANDY SOIL,
Wisconsin Univ.-Madison. Dept. of Soil Science.
P. G. Saffigna, D. R. Keeney, and C. B. Tanner.
Agronomy Journal, Vol. 69, No. 2, p 251-257, March-April 1977. 3 fig, 6 tab, 22 ref.

Descriptors: *Nitrogen, *Chlorides, Irrigation, Irrigation effects, *Potatoes, Sands, Sprinkler irrigation, Fertilizers, Fertilization, Groundwater, Wisconsin, Lysimeters, Irrigation efficiency.

Large applications of sprinkler irrigation and N fertilizer have been implicated in causing nitrate contamination of ground water in central Wisconsin. Field and lysimeter experiments were established in 1972 and 1973 on the Plainfield loamy sand to determine the effect of reducing the amount of sprinkler-irrigation and fertilizer N on potato tuber yields and on the field water and N balance. Two main treatments were used. The conventional (CON) treatment received irrigation water and N fertilizer according to current recommendations. The improved (IMP) treatment received less irrigation water than the CON treatment in both years. A satisfactory mass balance of water, N and Cl for potatoes grown in the lysimeters was obtained. Drainage accounted for considerable amounts of water, N, and Cl outputs with nearly all of the remainder going to evapotranspiration and plant uptake. The carefully managed IMP treatment decreased NO3(-)N leaching from 200 to 120 kg N/ha and lowered the overall average NO3(-)N concentration of the leachate from 23 to 16 mg NO3(-)N/liter. However, the additional costs required to effect a small savings in N fertilizer is probably not justified. (Skogerboe-Colorado State)
W78-09652

NEMATICIDE DISTRIBUTION UNDER A DRIP EMITTER,
Georgia Univ., Athens. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-09660

STORM WATER MANAGEMENT MODEL DEVELOPED BY CIVIL ENGINEERS.
Water and Pollution Control, Vol. 116, No. 1, p 20, January, 1978.

Descriptors: *Computer programs, *Data collections, *Storm water, *Overflow, *Sewerage, Instrumentation, Measurement, Watersheds(Basins), Waste water treatment, Municipal wastes.

University of Toronto's Department of Civil Engineering has developed a computer program to analyze storm water overflow characteristics under multi-storm conditions. The program model, called RAFFI, simulates the conditions of storm water runoff in a sewer system in one or more watershed areas during one or more storms. The computer model simplifies storm runoff measurement and also expands the capabilities of other programs. The computer analysis has been reduced from the conventional $300-400 for a six hour event to $15-20/computer run for a 6-month record. RAFFI monitors frequency, duration, volume, and pollution parameters of the overflows, including those which reach water bodies during storm runoff. Because the program's model simulates the overall performance of a sewer system during storm conditions, potential solutions to overflow problems are more readily available. The program model can be used in conjunction with more detailed models such as the Water Resources Engineers Model or the Hydrograph Volume Model. (Lisk-FIRL)
W78-09709

SUSCEPTIBILITY OF COASTAL PLAIN AQUIFERS TO CONTAMINATION, FAIRFAX COUNTY, VIRGINIA, A COMPUTER COMPOSITE MAP,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09735

WATER FOR INDUSTRIAL DEVELOPMENT IN GEORGE, HANCOCK, PEARL RIVER, AND STONE COUNTIES, MISSISSIPPI,
Geological Survey, Nashville, TN. Water Resources Div.; and Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-09744

IDENTIFICATION, INDEXING AND EXCHANGE OF DATA ON ENVIRONMENTAL POLLUTANTS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-09749

PREDICTING SOLUTE TRANSPORT IN SUBSURFACE WATERS,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. Rubin.
In: Proceedings of the World Conference, Towards a Plan of Actions for Mankind, Vol 1, Long-Range Mineral Resources and Growth: Pergamon Press, New York, p 267-280, 1977. 2 tab, 42 ref, append.

Descriptors: *Path of pollutants, *Groundwater, *Forecasting, *Analytical techniques, *Waste disposal, Landfills, Injection wells, Solutes, Model studies, Subsurface waters, Reviews, Evaluation.

In connection with problems of mineral-resources utilization and waste-product disposal, considerations of measures like conservation, reuse and recycling will have to include analyses of various supporting and alternative operations. One such analysis will call for assessing the environmental impact of accidental or controlled waste-product incorporation into the subsurface layers of the earth. Assessment of this kind concerns itself largely with the dangers of polluting useable groundwater resources. Among other things, it takes into consideration the possibility of moderating or eliminating such dangers by utilizing the dispersive, pollutant-fixing and pollutant-degrading capabilities of the subsurface zones. The analysis in question requires the capability to predict, as quantitatively as possible, the course of solute transport and the resulting pollutant concentrations in any given subsurface environment. This paper discusses briefly the present status of the techniques for making such predictions. (Woodard-USGS)
W78-09752

SOIL-SALT INTERACTIONS IN RELATION TO SALT CONTROL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5G.
W78-09771

CALLAHAN RESERVOIR: II. INFLOW AND OUTFLOW SUSPENDED SEDIMENT PHOSPHORUS RELATIONSHIPS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 5G.
W78-09775

A MODEL FOR THE TRANSPORT OF PESTICIDES IN SOIL WITH DIFFUSION-CONTROLLED RATES OF ADSORPTION AND DESORPTION,
Laboratorium voor Insekticide-nonderzoek TNO, Wageningen (Netherlands).
M. Leistra.
Agriculture and Environment, Vol 3, No 4, p 325-335, October, 1977. 5 fig, 1 tab, 13 ref.

Descriptors: Adsorption, *Model studies, Soils, Soil investigations, Rainfall, Simulation analysis, *Pesticides, *Path of pollutants, Diffusion.

The downward movement of a pesticide in soil, caused by different rainfall patterns, was simulated in a computation model. The movement occurred in the mobile region of a hypothetical soil system by convection together with hydrodynamic dispersion, and by diffusion. Lateral transport took place by diffusion into and out of a soil region with a stagnant liquid phase. With 40 mm of rainfall in 2 days, lateral diffusion distances of a few mm or more caused substantial deviation from the concentration-depth relationship for equilibrium adsorption. With 40 mm of rainfall scattered over 20 days, lateral diffusion distances up to a few mm had little effect, but those of about 10 mm or more had a very strong influence. The initial condition near the soil surface was extremely import. When the pesticide was initially present in the mobile region, overall mobility was comparatively great. Mobility was much lower than with instantaeous adsorption and desorption, when the initial condition was equilibrium between the mobile and stagnant regions near the soil surface. (Skogerboe-Colorado State)
W78-09790

FIELD MEASUREMENTS OF AMMONIA VOLATILIZATION FROM SURFACE APPLICATIONS OF AMMONIUM SALTS TO A CALCAREOUS SOIL,
Agricultural Research Service, Temple, TX. Blackland Conservation Research Center.
W. L. Hargrove, D. E. Kissel, and L. B. Fenn.
Agronomy Journal, Vol. 69, No. 3, p 473-476 1977. 1 fig, 2 tab, 16 ref.

Descriptors: Ammonium, *Ammonium salts, Soils, *Soil investigations, *Calcareous soils, Nitrogen, Fertilizers, Fertilization.

Many laboratory experiments have been conducted to study ammonia volatilization from N fertilizers, but few experiments have been conducted under field conditions. The objective of this study was to evaluate ammonia volatilization in the field from ammonium sulfate and ammonium nitrate applied to the surface of a calcareous soil, Houston Black Clay, that belongs to the fine, montmorillonitic, thermic family of Udic Pellusterts. Volatilization was evaluated indirectly by measuring N uptake by Coastal bermudagrass and directly by measuring ammonia at is volatilized. In the field plot study, estimated losses ranged from 3 to 10% of the applied N for ammonium nitrate, from 36 to 45% of the aplied N for pelleted ammonium sulfate, and from 25 to 55% of the applied N for liquid ammonium sulfate at rates of 140 and 280 kg N/ha. (Skogerboe-Colorado State)
W78-09794

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: NITROAROMATICS,
Syracuse Research Corps., NY. Center for Chemical Hazard Assessment.
P. H. Howard, J. Santdonato, J. Saxenda, J. Malling, and D. Greninger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 078, Price codes: A99 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 560/2-75-010, June 1976. 60 p. 152 tab, 69 fig, 689 ref.

Descriptors: *Nitrogen compounds, *Environmental effects, Public health, Pesticides, Monitoring, Biological properties, *Reviews, Physical properties, Chemical properties, *Toxicity, Freshwater fish, Bioassay, *Environmental contaminants, *Nitroaromatics, Environmental exposure factors, *Nitrophenols, Nitrotoluenes, Nitroanilines, Toxicity-humans, Toxicity-birds and mammals, Carcinogenicity, Toxicity-plants, Toxicity-fish, Toxicity-microorganisms.

This report considers the large number of chemicals which contain at least one nitro substituent on an aromatic ring. Approximately 250-300 chemicals are listed as commercial nitroaromatic compounds. However, only about 40 compounds are produced or consumed annually in quantities over 500,000 pounds and perhaps another 50-100 compounds exceed 100,000 pounds. Nitroaromatic compounds are used as pesticides, perfumes, explosives, and chemical intermediates. This report focuses on the non-pesticidal nitroaromatics. Because of the large number of compounds considered in this report, comprehensive information on individual compounds could not be developed. However, adequate information is available to provide priorities for further study and research. Production volume, uses, environmental fate, monitoring, and biological effects were considered. In general nitroaromatic compounds appear to be fairly persistent and exhibit either hematologic or metabolic effects at high levels of exposure. Most of the large-volume nitroarmoatics have not been screened for carciongenic, mutagenic, or teratogenic effects. (EIS-Katz)
W78-09795

EFFECTS OF PHOSPHATE MINERALIZATION AND THE PHOSPHATE INDUSTRY ON RADIUM-226 IN GROUND WATER OF CENTRAL FLORIDA,
Office of Radiation Programs, Las Vegas, NV.
For primary bibliographic entry see Field 5G.
W78-09800

5C. Effects Of Pollution

APPLICATION OF AN OIL SPILL VULNERABILITY INDEX TO THE SHORELINE OF LOWER COOK INLET, ALASKA,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-09301

ASSESSMENT OF DAMAGE TO FISH LARVAE BY ENTRAINMENT SAMPLING WITH SUBMERSIBLE PUMPS,
Wisconsin Electric Power Co., Milwaukee.
For primary bibliographic entry see Field 8I.
W78-09302

DISINHIBITION CAUSED BY THE MOLLUSCICIDE N-TRITYL MORPHOLINE (FRESCON) IN THE NERVOUS SYSTEM OF A FRESHWATER SNAIL,
Agricultural Research Council, Brighton (England). Unit of Invertebrate Chemistry and Physiology; and Cambridge Univ. (England). Zoological Lab.
Pesticide Biochemistry and Physiology, Vol. 8, p 225-240, 1978. 3 tab, 12 fig, 24 ref.

Descriptors: *Mode of action, Biochemistry, *Pesticides, *Molluscicides, Mollusks, Gastropods, Snails, Biological membranes, Inhibitors, Chloride, Aquatic animals, Animal physiology, Membranes, Electrochemistry, Laboratory tests, Frescon, Nervous system, Nerve synapses, Gradients, Lymnaea, Disinhibition, N-trityl morpholine, Polarization.

When applied to the isolated nervous system of Lymnaea stagnalis, Frescon (Shell Chemicals) produces spontaneous, summated 'bursts' of synaptic potentials, affecting nearly all the cells in synchrony. Experiments with chloride-free salines containing acetate, propionate, sulfate, nitrate, or bromide ions showed that reversal of chloride inhibitory postsynaptic potentials can produce 'bursts' of the same form as those induced by Frescon. The Frescon 'bursts' are preceded by a progressive change in the reversal potential of spontaneous inhibitory postsynaptic potentials, presumably also resulting from a reduction in the chloride gradient across the cell membrane. It is thus proposed that Frescon acts to alter neuronal intracellular chloride levels, giving rise to a state of 'disinhibition' in which the fine balance between excitatory and inhibitory processes is upset. (EIS-Katz)
W78-09303

PRIMER ON LAKES IN WASHINGTON,
Geological Survey, Tacoma, WA. Water Resouces Div.
For primary bibliographic entry see Field 2H.
W78-09307

LIMNOLOGY OF LAGUNA TORTUGUERO, PUERTO RICO,
Geological Survey, Fort Buchanan, PR. Water Resouces Div.
For primary bibliographic entry see Field 2H.
W78-09314

BIODEGRADABILITY TESTING AND ITS RELEVANCE TO ENVIRONMENTAL ACCEPTABILITY,
Unilever Ltd., Port Sunlight (England). Unilever Research Lab.
For primary bibliographic entry see Field 5A.
W78-09402

ENVIRONMENTAL BEHAVIOR OF ANIONIC AND NONIONIC SURFACTANTS (DAS UMWELTVERHALTEN ANIONISCHER AND NICHTIONISCHER TENSIDE),
Prater and Gamble European Technical Center, Grimbergen (Belgium).
N. T. V. de Oude.
Tenside Detergents, Vol. 14, No. 4, p 189-194, July-August, 1977. 7 fig, 6 tab, 14 ref.

Descriptors: *Surfactants, *Detergents, *Testing procedures, Water quality, *Sampling, Streams, Outfall sewers, Discharge(Water), Analytical techniques, Boron, Waste water disposal, Municipal wastes.

The distribution and toxicity of anionic and nonanionic surfactants in a receiving stream were investigated at a Belgian community without sewage treatment facilities. During the first part of 1976, 85 families recorded their use of detergent supplied for household use during the test period. Samples of river water were collected periodically above and at a sewage outfall, and 1 km below the outfall. The samples were chemically and physically analyzed for detergent components concentrations, degradation, and mineralization with die-away tests. The river and waste waters at the three sampling sites were analyzed with an Azure A reactive substance for anionic surfactants, similar to the methylene blue techniques and Cobalt-thiocyanate method for nonionic detergents. Boron concentrations were also recorded as an indicator substance normally not found in the water or wastes. Toxic units calculated from modified toxicity tests in the water ranged from 3.05-6.90 while 44.1-87.5% Azure A reactive substance was found. (Lisk-FIRL)
W78-09405

ISOLATION OF SALMONELLA FROM SEWAGE WITH A NEW PROCEDURE OF ENRICHMENT,
Hellenic Pasteur Inst., Athens (Greece).
For primary bibliographic entry see Field 5A.
W78-09406

THE EFFECTS OF MADISON METROPOLITAN WASTEWATER EFFLUENT ON WATER QUALITY IN BADFISH CREEK, YAHARA AND ROCK RIVERS,
Texas Univ., Dallas.
G. F. Lee.
Transactions of the Wisconsin Academy of Sciences, Arts and Letters, Vol. 65, p 163-179, 1977. 1 tab, 3 fig, 14 ref.

Descriptors: *Discharge lines, *Diversion structures, Rivers, *Water quality, *Sampling, Nutrient removal, Treatment facilities, Trickling filters, Activated sludge, Chlorination, Biochemical oxygen demand, Suspended solids, Dissolved oxygen, Phosphorus, Nitrogen, Ammonia, Nitrates, Nitrites, Algae, Waste water treatment, Waste water disposal, Municipal wastes.

The impact of diverting the flow of treated effluent from the Madison Metropolitan Sewerage District's Nine Springs Sewage Treatment Plant in Wisconsin to the Badfish Creek was examined. A $3.5 million pipeline was constructed to divert effluent flows to Badfish Creek rather than the Yahara and Rock Rivers, which flow into Lakes Waubesa and Kegonsa where excessive amounts of algae were growing. Activated sludge, trickling filters, and chlorination are employed by the plant before effluent is discharged to the diversion ditch leading to the creek. Flows measured over the period from 1952-1970 ranged from a low of 16.2 mgd in 1953 to a high of 31.3 mgd in 1970; BOD ranged 16-47 mg/liter and suspended solids ranged 15-52 mg/liter. The higher pollutant concentrations occurred during 1961-1963 when the treatment facility was undergoing construction. Water samples from 12 stations on the Badfish Creek and the Yahara and Rock Rivers were analyzed for BOD, suspended solids, total and soluble P, nitrates, nitrites, ammonium, and organic nitrogen. Inorganic nitrogen and orthophosphate concentrations in the Yahara River just below the point where Badfish Creek enters have increased since effluent has been diverted. Nutrient levels in the Rock River below the Yahara River junction have also increased. This increase in orthophosphate has been partially attributed to increased loads of phosphorus on the treatment plant. Dissolved oxygen levels at the first sampling station on Badfish Creek often dropped below 3 mg/liter; dissolved oxygen levels at stations on the lower Yahara River were usually above the critical level. (Lisk-FIRL)
W78-09422

GROWTH AND METAL UPTAKE ON SNAP BEANS GROWN ON SEWAGE SLUDGE-AMENDED SOIL: A FOUR-YEAR STUDY,
Agricultural Research Service, St. Paul, MN.
For primary bibliographic entry see Field 5E.
W78-09439

ASSESSMENT AND SIGNIFICANCE OF SEDIMENT-ASSOCIATED OIL AND GREASE IN AQUATIC ENVIRONMENTS,
Naval Biosciences Lab., Oakland, CA.
For primary bibliographic entry see Field 5E.
W78-09468

AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX C: EFFECTS OF DREDGED MATERIAL DISPOSAL ON THE CONCENTRATION OF MERCURY AND CHROMIUM IN SEVERAL SPECIES OF MARINE ANIMALS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5E.
W78-09485

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX C: PREDISPOSAL BASELINE CONDITIONS OF BENTHIC ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 5E.
W78-09487

SUSCEPTIBILITY OF THREE FAMILIES OF FRESHWATER FISH TO DIELDRIN (IN SPANISH),
For primary bibliographic entry see Field 5A.
W78-09491

SYNOPTIC RAINFALL DATA ANALYSIS PROGRAM (SYNOP),
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5B.
W78-09521

THE PHASED DIVISION OF THE FRESHWATER DINOFLAGELLATE CERATIUM HIRUNDINELLA: ITS USE AS A METHOD OF ASSESSING GROWTH IN NATURAL POPULATIONS,
Freshwater Biological Association, Windemere (England).
M. D. Heller.
Freshwater Biology, Vol. 7, No. 6, p 527-533, 1977. 3 fig, 1 tab, 18 ref.

Descriptors: *Diurnal, *Dinoflagellates, *Ceratium hirundinella, *Plant growth, *Cell division, *Esthwaite water(England), Biorhythms, Phased division, Synchronized division, Phytoplankton, Algae, England, Cytological studies, Lakes, Eutrophication, Methodology, Analytical techniques.

Overnight phasing of cell division by the dinoflagellate Ceratium hirundinella was investigated in 1974-75 in Esthwaite River, a productive lake of the English Lake District, where it often dominates the summer phytoplankton. Counts from samples were made of complete Ceratium, cells, in the process of division, and fronts and backs of divided cells. About 2000-3000 complete cells were counted from each sample. Maximum proportion of Ceratium cells found dividing at any time was 5.8 + or - 1%, and the time of optimum division was 03.00 G.M.T. The daily rate of division during the main phase of population increases was similar to the rate deduced from overall population increments. The proportion of algal cells in a population dividing per day can be used as a method of assessing the population growth rate independently of the observed increase in cell density. Phased cell division facilitates both sampling and conversion to a growth rate or doubling time. Phased or partially synchronized division of C. Hirundinella in Esthwaite Water occurred during a similar number of hours (8-10) of the night and early morning as found for this and other species of Ceratium in other studies. Calculation of growth rates from nocturnal division rates is complicated by: (1) night-to-night variation in division rates, and (2) possible depth-differentiation of different division stages. (Lynch-Wisconsin)
W78-09530

SUMMARY REPORT ON THE LONG-TERM WATER QUALITY OF THE SOUTH PLATTE RIVER BASIN 1966-1972,
Environmental Protection Agency, Denver CO. Region VIII.
For primary bibliographic entry see Field 5B.
W78-09531

CLARK FORK RIVER STUDY - MONTANA - JULY, AUGUST, 1973.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-225 580, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-908/2-74-001, January 1974. 25 p, 10 fig, 2 tab, 2 append.

Descriptors: *Pulp wastes, *Clark Fork River(MT), *Bioindicators, *Water pollution effects, *Hoerner Waldorf Corporation, Pulp and paper industry, Sewage treatment, Meat packing industry, Rivers, Biochemical oxygen demand, Dissolved oxygen, Benthic fauna, Invertebrates, Conductivity, Coliforms, Missoula(MT).

A water quality and biological study was conducted July-August 1973 on the 79-km stretch of the Clark Fork River (Montana) between Missoula and Alberton to assess effects of seepage or surface discharges from the Hoerner Waldorf Corporation paper mill, located west of Missoula. The study, showed no effects on dissolved oxygen or biochemical oxygen demand, but slight conductivity and color increases were evident throughout the study area. Effects on the benthic invertebrate community were greater from discharges of the Missoula Wastewater Treatment Plant and the Dailey Meat Packing Plant than from Hoerner Waldorf pond seepage. DO was above the 7.0 mg/l minimum; total coliforms did not exceed the 1000/100 ml limit, with highest density monitored downstream from the treatment and packing plants, (664/100 ml), and mean fecal coliforms were less than 100/100 ml at all sites, except at the station downstream from the treatment and packing plants (144/100 ml). Below the Hoerner Waldorf ponds, color increased by five units to about 10 units. The biological study indicated this reach of the river was of good quality. Pollution-sensitive stoneflies and mayflies were present at all sampling stations. Upstream of the STP and Hoerner Waldorf discharges none of organisms were pollution tolerant, compared with 70-76% downstream; however recovery was noted 10-23 km further downstream. (Lynch-Wisconsin)
W78-09532

DILLON RESERVOIR - BLUE RIVER STUDY - COLORADO, JUNE, JULY, AUGUST - 1973.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 571, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-908/2-74-002, January 1974, 35 p, 11 fig, 10 tab, 8 ref, 3 append.

Descriptors: *Dillon Reservoir(CO), *Blue River(CO), *Phytoplankton, *Nutrients, *Trophic level, Ten Mile Creek(CO), Phosphorus, Nitrogen, Molybdenum, Water pollution effects, Algae, Eutrophication, Oligotrophy, Reservoirs, Organic loading, Tributaries, Waste water treatment, Bioassay, Basic data collections, Limiting factors, Algal growth potential, Toxicity, Rivers, Watershed(Basins).

A study of existing nutrient levels in Dillon Reservoir (Colorado), and organic and nutrient contributions from major tributaries and wastewater treatment plants during summer 1973, showed that nitrogen concentrations were significant but not excessive and phosphorus levels were not less than 0.05 mg/l except at the outlets of the Blue River Arm and Dillon Bay. Phytoplankton growth indicated the reservoir is gradually changing from oligotrophy to a more enriched state; diatom bloom was observed in July. Algal assays on water from three reservoir locations indicated phosphorus limitation. High molybdenum levels, resulting from mining in the Ten Mile Creek watershed, were found at all cross-sections of the reservoir (mean -351 micrograms/l), especially at the outlet of Ten Mile Creek Arm. Highest concentrations were found near the bottom. Irrigation of forage crops with water from Ten Mile Creek or Dillon Reservoir could have toxic effects on livestock. Molybdenum algal assay showed existing concentrations in the reservoir have no effect on algal growth, however. Greatest tributary organic and phosphorus loading to the reservoir was in June from the Blue River--2368 kg BOD5/day and 45 kg P/day. Three sewage treatment plants discharge effluents directly to the reservoir (Frisco, East Dillon, and Summit County No. 1), Breckenridge STP discharges to the Blue River, and Copper Mountain STP discharges to Ten Mile Creek. Dillon Reservoir provides part of Denver's water supply. (Lynch-Wisconsin)
W78-09533

POWELL RIVER: MORE AND BETTER WATER,
B. C. Research Ltd, Vancouver.
A. E. Birkbeck, and C. Bowden.
Water and Pollution Control, Vol. 113, No. 12, p 28-30, December 1975. 2 fig, 3 tab, 6 ref.

Descriptors: *Powell River(British Columbia Canada), *Hammil Lake(British Columbia Canada), *Water supply, *Potable water, *Odor-producing algae, *Eutrophication, *Flow augmentation, Odor, Canada, Lakes, West Lake(British Columbia Canada), Thermal stratification, Algae, Cyclotella, Diatoms, Chlorella, Succession, Trophic level, Oligotrophy.

Means investigated for augmenting the drinking water supply to communities in the District of Powell River (British Columbia, Canada) by means of a larger abstraction pipe from Hammil Lake (also known as West Lake), while eliminating recurring taste and odor problems. Taste-producing algae were found only above the 60-ft depth, indicating that the water intake should be relocated at that depth where cold water is available throughout the year. Other recommendations: (1) Water should be abstracted at least 15 ft above the lake bottom to avoid drawing benthic sludge into the system; (2) Pressure reduction and subsequent dissolution of air from supersaturated waters should be controlled to prevent corrosion of pipework and air locks in flow measurement equipment; (3) Sediment removal equipment will not be required. Hammil Lake, about one-half mile wide by one mile long, is located in a densely forested area. Results of the study, initiated in 1972, show that the lake thermally stratified and was stable during the summer, clarity was excellent, water chemistry was satisfactory, and turbidity, organic carbon, hardness and metal contaminants were all low. However, nutrient concentrations were at levels capable of supporting algal blooms. A bloom of taste-producing algae forms between the surface and the hypolimnion during the summer. The most abundant algal genus was the diatom Cyclotella, followed by the chlorophyte Chlorella. (Lynch-Wisconsin)
W78-09534

CALCIUM AND CATION SORPTION BY CLADOPHORA FROM THE GREAT LAKES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.

S. Sikes.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 100-105, October 1977. 5 fig, 1 tab, 20 ref.

Descriptors: *Calcium, *Cations, *Cladophora glomerata, *Sorption, *Strontium, *Eutrophication, Ions, Algae, Chlorophyta, Nutrients, Hydrogen ion concentration, Turbulence, Wisconsin, Lakes, *Great Lakes, Regression analysis, Concentration, Ion exchange, Adsorption, Cation adsorption.

A study of calcium sorption, to evaluate usefulness of the filamentous green alga Cladophora glomerata as a scavenger of exotic cations, showed that total calcium uptake was directly proportional to calcium concentration at low levels (2-20 mg Ca/l), but became saturated at high levels (13 mg Ca/g at 20-100 mg Ca/l). This uptake was largely an ion-exchange reaction, favoring polyvalent cations of small hydrated radius. Cladophora for these batch culture experiments was isolated from the Milwaukee breakwall in Lake Michigan. Effects of concentration, pH, and turbulence were studied and the influence of calcium sorption on that of another ion was assessed by comparing calcium and strontium uptake by Cladophora. Strontium uptake was similar to that of calcium, but Cladophora preferentially adsorbed strontium over calcium by a factor of 1.25. Because exotic cations bound to Cladophora could largely be lost through ion-exchange and dilution in the absence of their source, such accumulations may not be as important as previously thought. Calcium and strontium sorption data for Cladophora from each of the Great Lakes and some inland Wisconsin sites were subjected to analysis of variance; all specimens showed the same cationic sorptive capacity. Turbulence contributed to the variability of calcium sorption through affecting calcium diffusion gradients and pH through affecting calcium solubility of calcium. (Lynch-Wisconsin)
W78-09535

MACROPHYTES OF THE DAM RESERVOIR AT GOCZALKOWICE,
Polish Academy of Sciences, Pszczyna. Hydrobiological Station; Polish Academy of Sciences, Pszcyna. Hydrobiological Station.
T. Kuflikowski.
Acta Hydrobiologica, Vol. 19, No. 2, p 145-155, 1977. 5 fig, 4 ref.

Descriptors: *Goczalkowice Reservoir(Poland), *Eutrophication, *Aquatic weeds, *Macrophytes, *Water level fluctuations, *Water pollution effects, Reservoirs, Nutrients, Phosphorus, Nitrogen, Submerged plants, Potamogeton crispus, Potamogeton perfoliatus, Potamogeton pectinatus, Potamogeton lucens, Polygonum amphibium, Myriophyllum spicatum, Drawdown, Depth, *Poland.

Overgrowth of Goczalkowice Reservoir, Poland by submersed macrophytes during 1973-75, after an earlier period of stabilization (1959-65) and a period of periodic plant die-off (1966-72), seems to result from very high and stable average water level and increased nitrogen and phosphorus levels. Considerable water level fluctuations occurred 1970-72, and this, with the absence of a proper littoral zone, resulted in relatively low macrophyte overgrowth. In 1956-59 vegetative cover experienced high growth, followed by stability in 1959-65. In 1966 Rorippa amphibia suddenly appeared, covering about one ha of the large reservoir, but disappeared in 1967 and has not been observed since. Lowering of the water level by only one m from the average of 245.5 m above sea level uncovers about 500 ha of the bottom, killing all plants. In addition, submersed plants which emerge more than half their height above the water surface are killed as well, as noted during drawdowns in 1965 and 1972 for repair of bottom outlets. The 1972 drawdown lowered the water level to 253 m and uncovered about 800 ha of the bottom. Most plants died, except for those in the deepest areas and a belt of land and littoral vegetation. In 1970-75 submersed species which increased and achieved dominance included Potamogeton crispus, P. perfoliatus, P. pectinatus, Polygonum amphibium, and Myriophyllum spicatum, while Potamogeton lucens, dominant up to 1974, decreased. (Lynch-Wisconsin)
W78-09536

QUANTITATIVE AND QUALITATIVE COMPOSITION OF BOTTOM FAUNA IN POLLUTED PARTS OF LAKE VANERN AND SOME ASPECTS ON WATER QUALITY INDICES,
Statens Naturvardsverk, Stockholm (Sweden). Undersoknings Lab.
B. Nagell, C. C. Landahl, and H. Lann.
Vatten, Vol 4, p 434-441, 1977. 2 fig, 2 tab, 18 ref.

Descriptors: *Lake Vanern(Sweden), *Benthic fauna, *Water quality indices, *Water pollution effects, *Bioindicators, *Chironomidae, *Oligochaetes, Larvae, Midges, Worms, Lakes, Oligotrophy, Species composition, Species diversity, Diversity indices, Distribution, Faunal Lists.

Chironomids and oligochaetes in the benthic fauna of five bays of Lake Vanern, Sweden, are analyzed using data collected in February and March 1971, and the use of species diversity indices for assessing water quality is discussed. Lake Vanern, the largest in Scandinavia with an area of 5600 sq km and a maximum depth of 106 m, supplies water, commercial fishing, and recreational. While the five bays are moderately to severely polluted, the lake is as a whole oligotrophic. The bays studied were Byviken, Barofjarden, Kattfjorden, Saterholmsfjarden, and Asfjorden. Results are presented tables, and a comparison of percent similarity of oligochaetes/chironomids is figured. Spatial distribution was mainly widespread for seven species and intermittent for one. Among chironomids, Procladius spp. and Monodiamesa bathyphila were distributed in areas widely differing in water quality. The three most pollution-resistant oligochaetes had a wide distribution. The main purpose of the study was to describe bottom fauna composition quantitatively for improved statistical comparison with future results. Benthic fauna, especially chironomid midge larvae and oligochaete worms, have proven useful for water quality assessment because: (1) most species are practically stationary, (2) many species have well-defined environmental requirements, and (3) most species live on the bottom for nearly a year. (Lynch-Wisconsin)
W78-09537

PHOSPHATE AND SILICATE KINETICS FOR THE LAKE MICHIGAN DIATOM DIATOMA ELONGATUM,
Michigan Univ., Ann Arbor. Div. of Biological Sciences.
S. S. Kilham, C. L. Kott, and D. Tilman.
Journal of Great Lakes Research, Vol. 3, No. 1-2, October 1977, p 93-99. 5 fig, 1 tab, 35 ref. NSF GB-41315 and OCE 76-10183.

Descriptors: *Diatoma elongatum, *Lake Michigan, *Phosphates, *Silicates, *Kinetics, *Diatoms, Algae, Phytoplankton, Succession, Species composition, Nutrients, Eutrophication, Lakes, Absorption, Plant growth, Limiting factors, Silicon, Phosphorus.

Growth and uptake responses by a clone of the Lake Michigan diatom Diatoma elongatum to limiting concentrations of silicate and phosphate under batch and semi-continuous conditions were investigated. Kinetic data reported here are thought to be the first for a diatom isolated from the Great Lakes. Under phosphate-limited batch growth conditions the half-saturation constant for growth (K) was 0.02 microM phosphate-phosphorus and the maximum growth rate (mu sub m) was 0.7 doublings/day; under silicate-limited conditions, K was 1.51 microM silicon dioxide-silicon, and mu sub m was 1.2 doublings/day. Results from these direct measurements of growth under nutrient limitation agree well with steady state kinetic information obtained for a two-step (uptake and utilization) growth model. Batch uptake experiments and steady state growth experiments provided kinetic information used to estimate the calculated half-saturation constant for growth. K was 0.03 microM phosphate-phosphorus under phosphate limitation, and 1.18 microM silicon dioxide-silicon under silicate limitation. A dependence of the coefficient of luxury on the steady state growth rate was observed. D. elongatum can store up to 28 times more phosphate than needed, and up to 4.4 times more silicate. As more data become available it should be possible to evaluate the importance of nutrient competition among algae as a factor in determining species composition and seasonal succession of lake phytoplankton. (Lynch-Wisconsin)
W78-09538

PHYSICO-CHEMICAL SURVEILLANCE DATA OBTAINED FOR LAKE ONTARIO, 1974 AND THEIR RELATIONSHIP TO CHLOROPHYLL A,
Canada Centre for Inland Waters, Burlington (Ontario).
R. E. Kwiatkowski, and A. H. El-Shaarawi.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 132-143, 1977. 3 fig, 6 tab, 21 ref.

Descriptors: *Chlorophyll, *Lake Ontario, *Phytoplankton, *Indicators, *Particulate organic carbon, *Total particulate nitrogen, *Eutrophication, Great Lakes, Pheopigments, Carbon, Nitrogen, Secchi disks, Transparency, Water temperature, Lakes, Algae, Biomass, Equations, Regression analysis, Monitoring, Seasonal.

Physical-chemical data from 15 cruises on Lake Ontario in April-November 1974 were used to: (1) describe the spatial and temporal distribution of chlorophyll-a; (2) find the statistical relationship between chlorophyll-a and sounding depth, Secchi depth, transmissivity, temperature, integrated particulate organic carbon (POC), and total particulate nitrogen (TPN); (3) assess the stability of such relationships over time; and (4) represent the data with an autoregressive scheme. Significant correlations were found between chlorophyll-a and the other parameters, and first-order autoregressive equations were established for all measured parameters. Multiple-regression analyses showed that for chlorophyll-a, the physico-chemical parameters explained 74% of spring variability, 49% of summer variability, and 78% of fall variability. The parameters showed certain seasonal patterns; (1) Secchi disk and transmissometer indicated a decreasing pattern until mid-August, then an increase; (2) POC and TPN mean values increased rapidly to a mid-June maximum; (3) temperature means increased rapidly until August, then rapidly decreased; (4) mean sounding depth remained constant throughout the study; and (5) chlorophyll-a was bimodal with spring and fall peaks. The biomass indicators POC and TPN correlated significantly (P is greater than 0.025) with chlorophyll-a in 11 of the 15 multiple regression equations. (Lynch-Wisconsin)
W78-09539

BIOASSAY STUDIES ON THE TOXICITY OF FISH OF DISTILLERY EFFLUENTS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Zoology-Entomology.
H. S. Gill, and H. S. Toor.
Acta Hydrobiologica, Vol. 18, No. 3, p 229-234, 1976. 2 tab, 11 ref.

Descriptors: *Toxicity, *Fish, *Effluents, *Distilleries, *Lethal limit, *Bioassay, Carp, Cyprinus carpio, Water pollution effects, Profit analysis, Pollutants, Water pollution control, Water quality indexes, Jagatijit Distilleries(Hamira Kapurthala India).

Carp, Cyprinus carpio, were used to test lethal effects of wastewater from Jagatjit Distilleries, Hamira, Kapurthala, India. Concentrations of 5%, 10%, 20%, 35%, 45%, 60%, and 100% plus a control were tested, with 10 fish measuring 3-5 cm in each test. Temperature was maintained at about 30C. Mortality was monitored at 24, 48, 72, and 96 hours. In the control and concentrations of 5% and 10%, no fish died. In 20% concentration, 40% died after 24 hours, and 90% after 96 hours. In 35% concentration, 70% died in 24 hours, and 100% in 96 hours. In 45% concentration, 90% mortality occurred within 24 hours, and the remaining fish died in 72 hours. At 60 and 100% concentrations, all fish died within 24 hours. At 60 and 100% concentrations, all fish died within 24 hours. With increasing concentrations pH decreased, from 7.85 in the control to 6.20 in undiluted effluent. Conductivity, nitrates, and phosphates increased. Five-day biochemical oxygen demand of the effluent was very high (7,700 mg/l). Median Tolerance Limit (TLm), the concentration at which 50% of test animals are able to survive, was calculated at 23.9% for 24 hours, and 17.66% for 48 hours. The safe concentration, below which there are no adverse sublethal or chronic effects on the fish, is estimated at 2.91%; effluents from the distillery should be diluted below this level. Behavioral reactions of the fish to the various concentrations are described. (Lynch-Wisconsin)
W78-09544

OLIGOCHAETES (OLIGOCHAETA) OF SOME STREAMS OF THE HIGH TATRA MTS AND THE RIVER BIALKA TATRZANSKA,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
E. Dumnicka.
Acta Hydrobiologica, Vol. 18, No. 3, p 305-315, 1976. 4 fig, 2 tab, 14 ref.

Descriptors: *Oligochaetes, *Water pollution effects, *Bialka Tatrzanska River(Poland), *Tatra Mountains(Poland), *Rybi Potok River(Poland), Streams, Rivers, Mountains, Annelids, Aquatic animals, Systematics.

Twenty-five species of Oligochaeta of Tatra Mountain streams and rivers in Poland were identified, 12 of them new for that region. Changes in the oligochaetes, apparently caused by water pollution, were found in one stream. Material was collected in the Sucha Woda stream, Bialka and tributaries (Rybi Potok and Toztoka), and the Przelecz pod Chlopkiem Pass stream between 1962-72. Oligochaeta occurred primarily on sandy substrata in lentic areas, and constituted 1-18% of the macrofauna. A total of 4, 341 specimens of 25 species (four families) were collected. Ten species of the family Naididae were identified, eleven of Enchytracida, three of Lumbriculidae, and one of Haplotaxidae. No species of Tubificidae were found. Species of Enchytraeidae range from 44.5% to 100% of the oligochaeta in the streams. Between 1963 and 1971 great changes in the oligochaete fauna of Rybi Potok occurred, due to increased sewage pollution from the Morskie Oko mountain shelter. Whereas in 1962-63 enchytracids made up 50% of oligolchaeta, by 1971-72 none were found. Haplotaxis gordioides likewise disappeared, while new species of Naididae made their appearance. In spite of these indications of increasing pollution, it is likely that in 1962-63 pollution effects were already being felt, as evidenced by its similarity to the Bialka; the Rybi Potok can be viewed as typical of an intermediate stage between clean montane stream and submontane river. (Lynch-Wisconsin)
W78-09546

REPORT OF THE DANE COUNTY ADVISORY COUNCIL FOR LAKE QUALITY IMPROVEMENT, A FRAMEWORK FOR LAKE MANAGEMENT.
Wisconsin Lake Quality Improvement Advisory Council, Madison.
University of Wisconsin Water Resources Management Program, Madison, September 1975. 7 fig, 59 tab.

Descriptors: Dane County(WI), *Lake Mendota(WI), *Lake Monona(WI), *Eutrophication, *Water management(Applied), *Methodology, Madison(WI), Wisconsin, Lakes, Urban runoff, Agricultural runoff, Shore protection, Wetlands, Aquatic weed control, Harvesting of algae, Algae, Algal control, Institutions, Administration, Information exchange, Public relations, Social participation.

Recommendations for management of eutrophic Lake Mendota and Monona (Madison, Wisconsin) are presented by the Dane County Advisory Council for Lake Quality Improvement, formed pursuant to resolution of the County Board in February 1975. The Council, composed of 27 representatives of local governmental and citizen interest groups, with technical assistance from the University of Wisconsin Water Resources Management Program, was created to develop a multi-jurisdictional program for water quality improvement. Goals were to: (1) integrate existing data on lake problems and causes; (2) list lake protection and rehabilitation measures; (3) evaluate these measures in terms of practicality, cost, and compatibility with community goals; and (4) select the most feasible alternatives and prepare an implementation plan which designates administrative and jurisdictional responsibilities. Six study subcommittees were established in the summer of 1975: (1) urban runoff control, (2) rural runoff control, (3) in-lake management, (4) wetlands and shoreline protection, (5) lake management institutions and jurisdiction, and (6) information and communication needs. The report contains an overview of current lake status, recommendations of the subcommittees, and reports from each subcommittee. Recommendations cover such measures as control of leaves and grass debris, street-cleaning, rainwater dispersion, aerial photography, weed harvesting, and farm conservation. (Lynch-Wisconsin)
W78-09552

RESPIRATORY INHIBITION OF ACTIVATED SLUDGE BY DYES (SENRYO NI YORU KASSEIODEI NO KOKYUSOGAI),
Gifu Univ. (Japan). Dept. of Engineering.
For primary bibliographic entry see Field 5D.
W78-09567

METROPOLITAN WATER SYSTEMS OPERATION: CONTINUOUS MODELING OF FLOW QUANTITY AND QUALITY IN THE SUPPORTING RIVER BASIN,
Dallas Water Utilities Dept. TX. Operations Analysis Div.
L. D. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 131, Price codes: A23 in paper copy, A01 in microfiche. Completion Report, March 1978. 512 p, 1 fig, 1 tab, 12 ref, 1 append. (separately bound). OWRT C-5054(4200(1).

Descriptors: *Water quaity, *Hydraulic models, Rivers, *Unsteady flow, *Oxygen demand, Municipal wastes, Texas, Biochemical oxygen demand, Algae, Temperature, Open channel flow, Nutrients, Coliforms, *Dallas(Tex), *Trinity River(Tex), *Model studies, Cities, *Forecasting.

A dynamic river model was prepared to predict water quality in the upper Trinity River near the Dallas, Texas metropolitan area. Dissolved oxygen simulation considered the effects of biochemical oxygen demand (carbonaceous and nitrogenous), benthic oxygen demand, reaeration, algal respiration and photosynthesis, zooplankton respiration, and temperature. Other water quality attributes simulated were suspended solids, coliform bacteria, bacterial viruses, sodium and chloride, and nitrogen and phosphorus concentrations. Model input data included waste water treatment plant effluent hourly flow rates and quality related concentrations, headwater and tributary inflows, river channel descriptive parameters, and climatological data including wind speed, air temperature, wet bulb temperature, and cloud cover. The model employed a new method for reducing numerical dispersion error. Calibration was aided by a continuous dissolved oxygen monitor in the river which showed the diurnal oxygen variation. The program was written in the PL/I computer language.
W78-09569

A PRELIMINARY ASSESSMENT OF THE EFFECTS OF SUBSURFACE SEWAGE SLUDGE DISPOSAL ON GROUNDWATER QUALITY,
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Program.
D. C. Mosher.
In: Disposal of Residues on Land, Proceedings of the National Conference on Disposal of Residues on Land, St. Louis, Missouri, September 13-15, 1976 p. 185-188, 3 fig, 4 tab, 3 ref, 68-01-3108.

Descriptors: Environmental effects, *Waste disposal, Sewage disposal, Sludge disposal, Water quality, Heavy metals, Groundwater, *Water pollution effects, *Sewage sludge.

This project attempts to determine differences in groundwater contamination resulting from subsurface sewage sludge disposal (burial of sewage sludge with or without municipal solid waste in trenches, pits or area type landfills) at eight land disposal sites. Data from this study and other studies of solid wastes only show contamination of groundwater has occurred at all sites. Unlike solid waste only sites, the subsurface sewage sludge sites showed a definite trend toward contamination of groundwater with heavy metals. It was concluded that the limited scope of this study does not justify abandonment of subsurface sewage sludge disposal but that it does justify greater emphasis in groundwater resource evaluation for sites which will accept sewage sludge. (ORNL-Chilton)
W78-09572

INSECTICIDES, POLYCHLORINATED BIPHENYLS AND METALS IN AFRICAN LAKE ECOSYSTEMS. II. LAKE MCILWAINE, RHODESIA,
South Dakota State Univ., Brookings. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-09574

INSECTIDES, POLYCHLORINATED BIPHENYLS AND METALS IN AFRICAN LAKE ECOSYSTEMS. III. LAKE NAKURU, KENYA,
South Dakota State Univ., Brookings. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-09575

LIGHT-MEDIATED RECOVERY OF N2-FIXATION IN THE BLUE-GREEN ALGAE ANABAENA SPP. IN O2 SUPERSATURATED WATERS,
Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
H. W. Paerl.
Oecologia, Vol. 32, 1978, p 135-139, 2 fig, 1 tab, 11 ref.

Descriptors: Environmental effects, *Light, *Algae, *Nitrogen fixation, *Oxygen, *Supersaturation, *Cyanophyta, Water pollution effects, *Anabena.

In spite of the fact that N2-fixation in blue-green algae is known to be O2 sensitive, two species of Anabeana have been found to be capable of

neturalizing the inhibitory effects of O2, possibly by employing reductive processes in the cell. The process is light-mediated. It was concluded that nitrogenase recovery by Anabaena in response to O2 supersaturation mAy be an adaptive mechanism during blooms. The mechanism represents optimization of radiant energy. (Chilton-ORNL)
W78-09576

FOOD-CHAIN RELATIONSHIPS IN SUBTIDAL SILTY SAND MARINE SEDIMENTS AND THE ROLE OF MEIOFAUNA IN STIMULATING BACTERIAL PRODUCTIVITY,
Institut fur Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 6G.
W78-09578

LIGHT EFFECTS ON NUTRIENT-LIMITED, OCEANIC PRIMARY PRODUCTION,
Oceanic Inst., Waimanalo, Hawaii.
P. Bienfang, and K. Gundersen.
Marine Biology, Vol 43, No 3, 1977, p 187-199, 9 fig, 1 tab, 57 ref. NSF DES 75-14110 and DES 15-03608.

Descriptors: *Environmental effects, *Light, *Productivity, Photosynthesis, *Primary production, *Phytoplankton, Growth rates, Nutrients, Nutrient requirements.

This work describes the controlling effect of ambient light upon phytoplankton dynamics throughout several oligotrophic water columns, when both light quality and quantity influence the phytoplankton response and where the photic substrate is measured in physiologically meaningful units of visible quanta flux. Ambient nutrients, vertical light profiles, phytoplankton biomass, and primary production were measured. Vertical profiles of phytoplankton activity and incident quanta flux are analyzed in terms of a substrate limited system. Comparison of data from isolated oceanic regions with data from near a shore station indicates that although large differences in the phytoplankton parameters exist throughout the entire photic zones of these regions, the hyperbolic A(z)-q(z) relationship describes the data fairly well in both cases. It is suggested that this relationship may apply to the general case of an oligotrophic water column. (Chilton-ORNL)
W78-09580

TOXICITY EVALUATION OF A COMPLEX METAL MIXTURE TO THE SOFTSHELL CLAM MYA ARENARIA,
Environmental Research Lab., Narragansett, RI.
R. Eisler.
Marine Biology, Vol 43, No 3, 1977, p 265-276, 7 fig, 7 tab, 20 ref.

Descriptors: Environmental effects, *Water pollution effects, *Metals, Toxicity, *Clams, Aquatic animals, Manganese, Zinc, Lead, Nickel, Copper, Cadmium, Mortality, Biomagnification, Mya arenaria.

Adult clams were continuously subjected to a flowing seawater solution containing 7200 microg/l Mn, 2500 microg/l Zn, 70 microg/l Pb, 50 microg/l Ni, 50 microg/l Cu, and 1 microg/l Cd. They were also subjected to solutions of 20% strength of the above amounts. Experiment I was conducted at 0 to 10C and Experiment 2 at 16 to 20C. In Experiment I, all clams exposed to 100% solution died between the 4th and 10th week. Survivors at 6 weeks contained 19 times more Pb, 14 x more Zn, 12 x more Cu, 10 x more Mn, 3 x more Ni, and 0.1 x more Cd than controls with minor whole body elemental changes. Clams exposed to 20% solution survived for the 112 day experimental period and at that time contained 5 x more Cu, 4 x more Mn, 3 x more Zn, and 2 x more Pb than controls. In Experiment 2, all animals exposed to 100% solution died between 6 and 14 days. At 7 days survivors contained 25 x more Pb, 13 x more Cu, 11 x more Zn, 7 x more Mn, and 3 x more Ni than controls. Mortality in animals exposed to 20% solution was only slightly higher than controls with survivors at 14 days containing 12 x more Mn, 7 x more Pb, 7 x more Zn, 4 x more Cu, and more Ni than controls. (Chilton-ORNL)
W78-09584

EFFECTS OF SALINITY ON FOOD INTAKE, ABSORPTION AND CONVERSION IN THE RAINBOW TROUT SALMO GAIRDNERI,
Stirling Univ. (Scotland). Dept. of Biology.
M. G. McLeod.
Marine Biology, Vol. 43, No. 2, 1977, p 93-102, 7 fig, 3 tab, 38 ref.

Descriptors: Environmental effects, *Salinity, Troyut, *Rainbow trout, Absorption, Foods, Food habits, Growth rate, *Water pollution effects, Food intake(Fish), Energy conversion(Fish).

Trout were acclimated to salinities of freshwater, 7.5, 15.0, 28.0, and 32.5% and temperature of 10C. At each change in salinity during the step-wise acclimation, there was a decrease in growth rate which could be accounted for by a fall in food intake. The greatest decrease in food intake and growth rate occurred after the increase of salinity from 15.0 to 28.0%. Recovery of food intake and growth rate to pre-change levels occurred within 14 days. Food absorption efficiency was calculated in terms of total dry matter, energy and total nitrogen. There was a negative linear relationship between salinity and absorption efficiency. Conversion efficiency was calculated in the same terms. A tendency for conversion efficiency to decline with salinity, especially between 28.0 and 32.5%, was observed. (Chilton-ORNL)
W78-09586

EFFECTS OF SALINITY ON FASTED RAINBOW TROUT, SALMO GAIRDNERI,
Stirling Univ. (Scotland). Dept. of Botany.
M. G. MacLeod.
Marine Biology, Vol. 43, No. 2, 1977, p 103-107, 3 fig, 12 ref.

Descriptors: Environmental effects, *Salinity, *Rainbow trout, Nutrient removal, Nutrient requirements, Weight, *Water pollution effects, Fasting(Fish).

Rainbow trout which had been acclimated for 120 days in freshwater and at salinities of 7.5, 15.0, and 32.5% at 10C were fasted for up to 48 days under the same conditions. It was found that weight loss could be adequately described by a straight line between Days 7 and 48. Mean weight losses in trout weighting 100 to 155 g and 80 to 95 g over the whole period in fresh water and salinities of 7.5 and 15.0% were 11 and 15% respectively. During the period from 20 to 48 days, trout maintained in 32.5% S lost significantly more weight than trout in the other three salinities. Muscle water and liver water content of trout maintained at 32.5% S decreased between Days 19 and 37. (Chilton-ORNL)
W78-09588

THE SOLUBILITY OF AROCLOR 1254 IN SEAWATER,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5A.
W78-09589

MIREX INCORPORATION IN THE ENVIRONMENT: TOXICITY IN HYDRA,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
K. Y. Luc, and A. A. de la Cruz.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 4, April, 1978, p 412-416, 3 tab, 24 ref.

Descriptors: Environmental effects, *Water pollution effects, Pesticides, Absorption, Invertebrates, Aquatic life, *Toxicity, *Mortality, Freshwater, *Mirex, Hydra.

This study is part of a series of investigations on the toxicity, physiological and ecological effects of mirex to non-target organisms. Behavioral changes (retraction of body tubes and tentacles) were observed when hydra were exposed to various concentrations of mirex solution. Mortalities of 78%, 20%, and 6% occurred after 144 hours of exposure to mirex solutions at concentrations of 1.0, 0.1, and 0.01 ppm respectively. Peak mortality occurred ater 96 hours exposure at 1.0 ppm concentration. It was suggested that, although the toxicity of mirex in this experiment appears to be low, the slow or delayed action of mirex and its biological magnification in animal tissue should not be overlooked. (Chilton-ORNL)
W78-09590

EFFECT OF DDT ON NADH-CYTOCHROME B5 REDUCTASE ACTIVITY IN THE FRESHWATER PLANARIAN, PHAGOCATA VELATA,
Middle Tennessee State Univ., Murfreesboro. Dept. of Biology.
R. L. Baldwin, and M. R. Wells.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 4, April, 1978, p 428-430, 1 fig, 9 ref.

Descriptors: Environmental effects, *Water pollution effects, Insecticides, *DDT, Aquatic animals, Freshwater, Invertebrates, *NADH-cytochrome reductase, *Enzymes, Planaria, *Phagocata velata.

P. velata fed DDT showed an initial increase in NADH-cytochrome reductase 6 hours after feeding followed by a decline in activity after 24 hour and a significant decline 120 hours after feeding. The ability of the species to encyst during unfavorable conditions appears to be complemented with a system of microsomal enzymes capable of degrading chemicals known to be harmful in higher organisms. (Chilton-ORNL)
W78-09591

THE TOXICITY OF MCPA TO FISH. LIGHT AND ELECTRON MICROSCOPY AND THE CHEMICAL ANALYSIS OF THE TISSUE,
Jyvaskyla Univ., (Finland). Dept. of Chemistry.
M. L. Hattula, H. Reunanen, and A. U. Arstila.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 4, April, 1978, p 465-470, 1 tab, 8 ref.

Descriptors: Environmental effects, *Water pollution effects, Herbicides, Fish, Toxicity, Acetic acid, Organic wastes, Chemical analysis, Electron microscopy, MCPA, 4-o-cresol, 4-chloro-2-phenoxyacetic acid.

Investigations showed that fish tissues concentrated 4-chloro-2-phenoxyacetic acid (MCPA) in the same amount in spite of differences in water concentrations. Histopathological studies showed no changes in fish tissue at exposure levels of 10-60 ppm MCPA. Fish which lived only 3-5 days in 100 ppm commercial MCPA were found to live over 10 days in pure grade MCPA. Tissue concentrations of 4-o-cresol were five times greater in fish exposed to commercial product leading to the conclusion that this impurity, which is fat soluble rather than water soluble as the pure grade MCPA is, caused the earlier death of the fish. It was concluded that pure grade MCPA is relatively safe to fish. (Chilton-ORNL)
W78-09592

REVIEW OF CURRENT LITERATURE CONCERNING THE ACUTE AND CHRONIC EFFECTS OF PESTICIDES ON AQUATIC ORGANISMS,
Florida State Univ., Tallahassee. Dept. of Biological Science.
R. J. Livingston.
CRC Critical Reviews in Environmental Control, Vol. 7, No. 4, November 1977, p 325-351, 3 tab, 258 ref.

Descriptors: Environmental effects, *Water pollution effects, Pesticides, Aquatic life, Toxicity, *Reviews, *Literature reviews, *Bibliography, *Pesticide toxicity.

This review physiochemical and biological inplication of the use of herbicides, fungicides, and organochlorine, organophosphate, and carbamate insecticides. Diversity of formulation and variability of environmental effets from one habitat to the next complicates the determination of safe concentrations of pesticides in the aquatic system. Information on the acute toxicity of selected pesticides is presented in tabular form. It was concluded that the ultimate determination of environmental impact due to pesticide contamination is long-term, comprehensive field analysis and that it is in this area that there is the least amount of information available. (Chilton-ORNL)
W78-09595

METALS IN AN ACID MINE STREAM AND ESTUARY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W78-09596

CHARACTERIZATION AND IMPACT OF STORMWATER RUNOFF FROM VARIOUS LAND COVER TYPES,
Wiggins-Rimer and Associates, Durham, NC.
For primary bibliographic entry see Field 5B.
W78-09598

AN IN SITU DETERMINATION OF THE DISAPPEARANCE OF COLIFORMS IN LAKE MICHIGAN,
Marquette Univ., Milwaukee, WI.
For primary bibliographic entry see Field 5B.
W78-09599

ACUTE TOXICITY OF COPPER, CADMIUM, AND ZINC TO LARVAE OF THE CRAB PARAGRAPSUS QUADRIDENTATUS (H. MILNE EDWARDS), AND IMPLICATIONS FOR WATER QUALITY CRITERIA,
Victoria Ministry for Conservation Melbourne (Australia). Marine Pollution Studies Group.
M. Absanullah, and G. H. Arnott.
Australian Journal of Marine and Freshwater Research, Vol 29, No 1, February, 1978, p 1-8, 2 tab, 29 ref.

Descriptors: Environmental effects, *Water pollution effects, Water quality, Toxicity, *Copper, *Cadmium, *Zinc, Larvae, *Crabs, Paragrapsus quadridentatus.

Experiments showed larval/96-h LC50 values P. quadridentatus to be 0.17 mg/l/for copper, 0.49 mg/l for cadmium and 1.23 mg/l for zinc. Potency ratios of the three metals were Cu/Cd 3:1, Cu/Zn 7:2, and Cd/Zn 2:4. Larvae were found to be more sensitive to heavy metals than adults. Application of the 0.01 factor (recommended in Victorian water quality criteria) to 96-h LC50 values determined in this study gives concentrations which are below the recommended minimal risk concentrations for copper and zinc. In view of the known greater sensitivity of larvae to heavy metal toxicity, it is questioned whether the same application factor should be applied to LC50 data for both adult and larval stages. (Chilton-ORNL)
W78-09600

CHEMISTRY AND BIOLOGICAL HAZARD OF A COAL ASH SEEPAGE STREAM,
Oak Ridge National Lab., TN. Environmental Sciences Div.
C. C. Coutant, C. S. Wasserman, M. S. Chung, D. B. Rubin, and M. Manning.
Journal Water Pollution Control Federation, Vol 50, No 4, April, 1978, p 747-753, 1 fig, 3 tab, 12 ref.

Descriptors: Environmental effects, *Water pollution effects, Fossil fuels, Waste water(Pollution), Acidic water, Ash ponds, *Coal ash, Seepage.

This study was conducted to characterize the chemical nature and biological hazard of seepage water flows from ash pond systems of coal-fired electric power stations. The study was conducted at the TVA's Bull Run Steam Plant. It was found that acidic, iron-rich seepage water is produced within the ash deposits through physical and microbiological process. These seepage conditions may mobilize the contaminants. An iron floc results when the acidic seepage enters the slightly alkaline river water, which is detrimental to fish and bottom organisms in the area. (Chilton-ORNL)
W78-09602

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: NITROAROMATICS,
Syracuse Research Corps., NY. Center for Chemical Hazard Assessment.
For primary bibliographic entry see Field 5B.
W78-09795

FIELD AND LABORATORY PROTOCOLS FOR EVALUATING THE EFFECTS OF CHEMICAL SUBSTANCES ON AQUATIC LIFE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., and K. L. Dickson.
Journal of Testing Evaluation, 1978, Vol. 6, No. 2, p 81-90. 1 tab, 2 fig, 18 ref.

Descriptors: Methodology, *Bioassay, *Laboratory tests, Laboratory equipment, *On-site investigations, Aquatic animals, Aquatic environment, Water pollution, *Water pollution effects, Toxicity, *Chemicals, Chemical wastes.

One of the difficulties of evaluating the hazard associated with the release of a chemical substance into the environment is to determine how much testing is necessary to delimit its effects adequately. Since different classes of toxicants have different biological effects, it would be wasteful of both time and money to carry out extremely detailed and comprehensive tests for even the most innocuous materials. It would be equally inappropriate to carry out limited tests for very dangerous materials-as painful experience has already shown. Protocols to sort out which materials require extensive testing and which do not, as well as which decision criteria should be at each stage in a test series, are essential to the establishment of reasonable water quality standards. This true not only for laboratory studies but also for assessments of effects in the receiving system itself. Two illustrative protocols, one for the laboratory studies of aquatic organisms and the other for field studies in freshwater receiving systems, are described. (EIS-Katz)
W78-09796

THE EFFECTS OF ALTERED STREAMFLOWS ON FISH AND WILDLIFE IN CALIFORNIA,
Jones and Stokes Associates, Inc.,
C. Hazel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 245, Price codes: A01 in paper copy, A01 in microfiche. Fish and Wildlife Service Report OBS-76/33, Dec. 1976, 48 p, 34 ab, 7 fig, 13 ref.

Descriptors: *California, Methodology, Dams, Freshwater fish, Stream fisheries, Streams, *Streamflow, Water allocation(Policy), Water control, Water policy, Water resources, Water rights, Water structure, Water development, Hydrology, *Minimum flow, *Instream flow, *Water release management.

This report contains analysis findings, and conclusions and recommendations regarding changed flow regimes below dams, the impact of fisheries, and methodologies used to assess flow requirements for 46 dams and diversions in California. (EIS-Katz)
W78-09798

5D. Waste Treatment Processes

RECYCLING AND WATER QUALITY,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-09316

FLOCCULATION-FLOTATION AIDS FOR TREATMENT OF COMBINED SEWER OVERFLOWS,
Hercules Inc., Cumberland, MD. Allegany Ballistics Lab.
N. F. Stanley, and P. R. Evans.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 780, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/2-77-140, August 1977. 92 p, 17 fig, 29 tab, 7 ref.

Descriptors: *Flotation, *Flocculation, *Coagulation, *Chemical reactions, *Floats, Suspended solids, Cleaning, Storm water, Overflow, Combined sewers, Waste water treatment, Municipal wastes.

Chemical flocculants and buoyant flotation aids were investigated for removing suspended solids from combined sewer overflows. Laboratory batch tests achieved a 70-100% suspended solids removal when 100 mg/liter of the polystrene flotation aid Dylex KCD-340, 100 mg/liter of FeC13 as a coagulant, and 1 mg/liter of Hercofloc 810 as a flocculant were added. In pilot plant tests, the flocculants and buoyancy aids lost their effectiveness when stored for long periods of times. Suspended solids were reduced by 67-87% when problems with the chemicals and buoyancy aids were corrected; suspended solids were reduced by 50-77% with air flotation in the same pilot plant. The success of the process was considered economically dependent upon recovery and reuse of the flotation aids. Cleaning the flotation aid surface of adhering solids for reuse in the flocculation-flotation process was unsuccessful. Further investigations of the process were rejected in favor of air flotation treatment of combined storm overflows. (Lisk-FIRL)
W78-09364

PERFORMANCE EVALUATION OF EXISTING LAGOONS-PETERBOROUGH, NEW HAMPSHIRE,
JBF Scientific Corp., Wilmington, MA.
S. P. Bowen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 390, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-77-085, August 1977. 101 p, 6 fig, 6 tab, 2 append.

Descriptors: *Sewage lagoons, *Ponds, *Chlorination, *Coliforms, *Biochemical oxygen demand, Oxidation lagoons, Chemical oxygen demand, Suspended solids, Alkalinity, Anaerobic

conditions, Freezing, Aeration, Waste water treatment, Sampling, Monitoring, Municipal wastes.

The performance of waste water treatment lagoons in Peterborough, New Hampshire, was monitored over a 12-month period with respect to federal standards for effluent quality. The treatment plant had average and design flows of 0.5 mgd and 2.14 mgd, respectively; three treatment lagoons without aeration had a total surface area of 21 acres. Chlorination of the treated effluent was conducted before discharge. Fecal coliforms and suspended solids were efficiently removed during the entire study; BOD and COD were adequately reduced during all but four months of the study. During these winter months, total BOD was reduced by 60% to about 52 mg/liter and pH dropped to below 6.0. The reduced efficienty of the treatement lagoons was attributed to anaerobic conditions created by an ice cover. The installation of induced air aeration equipment in one or more ponds was recommended. A 27% seepage loss was recorded in the plant which was BOD and hydraulically underloaded. Average effluent dissolved oxygen levels of 2 mg/liter dropped to zero during the winter months; ammonia-nitrogen concentrations increased and nitrate-nitrogen decreased during the cold periods. Total phosphorus was reduced by about 10% for the year; nitrate-nitrogen was removed to below detectable levels. Alkalinity doubled during the winter months because of the necessary increase in residual chlorine levels from 2 mg/liter to 40-50 mg/liter. (Lisk-FIRL)
W78-09365

DOWNFLOW GRANULAR FILTRATION OF ACTIVATED SLUDGE EFFLUENTS,
District of Columbia Dept. of Environmental Services, Washington. EPA-DC Pilot Plant.
R. P. G. Bowker.
Available from the National Technical Information Service, Springfield, VA. 22161 as PB-272 317, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-660/2-77-144, Sept 1977. 55 p, 16 fig, 6 tab, 6 ref, 1 append.

Descriptors: *Activated sludge, *Filtration, *Sands, *Coals, *Suspended solids, Flow rates, Filters, Granules, Porous meida, Hydraulic systems, Pilot plants, Waste water treatment, Municipal wastes.

The impact of downflow granular filtratin media properties on activated sludge effluents from plug flow, complete mixing, and step aeration operations was evaluated in pilot plant studies. The filtration media consisted of anthracite in particle sizes ranging 1.0-2.0 mm, with or without sand with effective particle sizes of 0.4-0.9 mm. The media depth in the filter was varied over 38-64 cm for the anthracite and 30-38 cm for sand. Hydraulic loadings on 0.1 sq m filters were varied over 3-9 gpm/sq ft. Breakthrough of suspended solids in the activated sludge treated waste water occurred during tests with single media anthracite with particle sizes of 1.65 and 2.0 mm. Breakthrough was observed to increase at higher flow rates. With a dual media of 2.0 mm anthracite and 0.9 mm sand, higher quality effluent was obtained with higher suspended solids loadings and longer run times. Backwashing tests of the dual filter media demonstrated that a 13% bed fluidization at a 35 gpm/sq ft flow rate was effective in cleaning. The growth of filamentous organisms and Nordica species interfered with some of the experiments, as did low suspended solids concentrations in some of the activated sludge influent. (Lisk-FIRL)
W78-09366

WASTEWATER DEMINERALIZATION BY TWO-STAGE FIXED-BED ION EXCHANGE PROCESS,
Los Angeles County Sanitation Districts, Whittier, CA.
C. L. Chen, and R. P. Miele.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 591, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/2-77-146, Sept 1977. 81 p, 19 fig, 27 tab, 4 ref.

Descriptors: *Ion exchange, *Demineralization, *Carbon, *Adsorption, *Resins, Anion exchange, Cation exchange, Dissolved solids, Pilot plants, Waste water treatment, Municipal wastes.

A 2.5 gpm two-stage and an automated 4 gpm single-staged fixed ion exchange pilot plant were used to investigate the impact of carbon adsorption pretreatment of waste water on ion exchange performance. The 2.5 gpm pilot plant, located in the sewage treatment plant at Pomona, California, contained primary cation, primary anion, secondary cation, and secondary anion exchange columns, operated in series. Regenerants were first applied to the secondary exchange columns and then to the primary columns in a downflow direction to insure monovalent ion removal efficiency from the secondary columns. Resin longevity studies were conducted with the 4 gpm single-stage pilot plant over 32 mos. Resins remained stable throughout the tests. The two-stage plant reduced total dissolved solids by 90% at regenerant concentrations of 17.6 gal/liter H2SO4 in the cation column with 85% regeneration efficiency and 9.6 gal/liter NH3 in the anion exchanger with 90% regeneration efficiency. Costs associated with reducing total dissolved solids from 600 to 60 mg/liter in a 10 mgd operation were $0.059/1,000 liters. (Lisk-FIRL)
W78-09367

FEASIBILITY OF TREATING SEPTIC TANK WASTE BY ACTIVATED SLUDGE,
District of Columbia Dept. of Environmental Services, Washington. EPA-DC Pilot Plant.
S. M. Bennett, J. A. Heidman, and J. F. Kreissl.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 105, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-141, August 1977. 67 p, 17 fig, 12 tab, 10 ref.

Descriptors: *Activated sludge, *Septic tanks, *Domestic wastes, *Pilot plants, *Treatment facilities, Continuous flow, Organic loading, Chemical oxygen demand, Performance, Aeration, Sludge treatment, Waste water treatment, Municipal wastes.

Pilot plant studies evaluated the impact of septic tank wastes on municipal activated sludge treatment facilities. Septic tank pumpings, generated at an estimated volume of 13 million cu m/yr, were introduced into a 1,980 gpd activated sludge pilot plant on a continuous flow basis and on a shock load basis. Batch aeration tests were also conducted for the shock load studies. A control unit treating only primary effluent was also operated over the four month study period. The municipal activated sludge pilot plant was able to accommodate both continuous and intermittent loads of septic tank wastes without significant interference with effluent quality. While the strength and organic loading of the septic wastes introduced on a continuous feed basis influenced the response of the activated sludge system, wastes with COD levels below 3 g/g mixed liquor volatile suspended solids/day did not disrupt treatment performance. Unacclimated activated sludge systems were also able to accommodate septage. Results of the study also indicate that sufficient excess aeration, especially for shock septage loads, and adequate sludge handling facilities are necessary for municipal activated sludge treatment of septic wastes. (Lisk-FIRL)
W78-09368

USER ACCEPTANCE OF WASTEWATER SLUDGE COMPOST,
Culp/Wesner/Culp, Clean Water Consultants, El Dorado Hills, CA.
For primary bibliographic entry see Field 5E.
W78-09370

STORM SEWAGE: SEPARATION AND DISPOSAL,
R. McGillivray.
Public Health Engineer, Vol. 6, No. 2, p 90-93, 1978.

Descriptors: *Storm drains, *Storm water, *Surface runoff, *Sewerage, *Overflow, Urban runoff, Drainage water, Surface waters, Rain water, Combined sewers, Storm runoff, Equipment, Pipes, Storage tanks, Settling basins, Construction materials, Waste water treatment.

Considerations in designing storm water disposal sewers were discussed in a symposium sponsored by the Scottish District Center and attended by the Scottish Working Party on Storm Sewage in Glasgow, Scotland, on December 14, 1977. Increases in dry weather sewage flows, industrial discharges to municipal sewers, water removal from rivers, paved areas, and changes in the properties of surfaces runoff have mandated the investigation of pollutants in surface runoff and separated or combined storm sewer designs. About 20% of the storm water overflows reported by districts in Scotland were termed unsatisfactory; the overflows had BOD concentrations in the range of 25-50% of those found in dry weather sewage flows. River purification boards in Scotland have adopted regulations allowing parts of industrial complexes to be connected to sanitary sewers, eliminating dual manholes functioning for separated sanitary and storm sewer systems, and encouraging the use of different pipe materials, such as fireclay and concrete, for sanitary sewers and for storm sewers to assist in identification. Stilling ponds were recommended for overflow systems to reduce flow velocities, reduce turbulence, and promote settling. High side-weirs were considered the most efficient means of overflow control. Storm sewer installations in several Scottish municipalities, pilot plant studies of storm water tanks, and combined sewer investigations were reviewed. (Lisk-FIRL)
W78-09371

TAKE THE PICK AND SHOVEL WORK OUT OF COMPUTATION,
For primary bibliographic entry see Field 7C.
W78-09372

OCEAN BAN BUOYS SLUDGE PROCESSES.
For primary bibliographic entry see Field 5E.
W78-09373

U-TUBE CONNECTIONS FOR WASTEWATER PONDS,
Tenneco Chemicals, Pasadena, TX.
For primary bibliographic entry see Field 8C.
W78-09374

CHICAGO PIONEERS IN CORRECTING WATER POLLUTION, CONTROLLING FLOODS.
Civil Engineering-ASCE, Vol. 48, No. 7, p 58-62, July, 1978. 5 fig, 1 tab.

Descriptors: *Tunnels, *Detention reservoirs, *Combined sewers, *Flooding, *Stream improvement, Excavation, Tunneling machines, Overflow, Storm runoff, Tunnel construction, Aeration, Reservoir storage, Tertiary treatment, Treatment facilities, Waste water treatment, Storm water, Municipal wastes, Sewerage.

A $2.8 billion Tunnel and Reservoir Plan under construction in Chicago, Illinois, will intercept combined sewer overflows and store the waste water for subsequent treatment when the storm subsides. The first phase of the project includes the excavation with a tunnel boring machine of 13-

35 ft or 4.0-10.7 m diameter tunnels in the limestone strata 200 ft below the surface. The tunnel will receive an unreinforced surface coating to reduce rock breakage within the tunnel and to prevent exfiltration of sewage into aquifers which have a higher water table than the tunnels. Overflows will be retained in the tunnels and in a series of five reservoirs during storms and will be pumped to the treatment plants when dry weather flow resumes. As a cost-effective alternative to upgrading waste water treatment plants to tertiary treatment, instream aeration was chosen to maintain dissolved oxygen levels in receiving streams. Ten aeration units will supply an average of 165,300 lb 02/day to streams; instream aeration has the advantage of reducing non-point source pollutants that would not reach treatment plants. Districts lying outside Chicago's combined sewer system will be protected from flood damage by channel improvements and the construction of six reservoirs in the Upper Salt Creek Watershed. (Lisk-FIRL)
W78-09375

PROGRAM THE MANNING EQUATION,
Camp, Dresser, and McKee Inc., Boston, MA.
For primary bibliographic entry see Field 7B.
W78-09376

KNOW-HOW IMPORTANT IN REHABILITATING FLOODED SEWER LINES,
Pennsylvania Dept. of Public Works, Johnstown.
For primary bibliographic entry see Field 8G.
W78-09377

INNOVATIVE DESIGN SLATED FOR TEXAS TOWN,
Bovay Engineers, Inc., Houston, TX.
S. B. Garland, and D. F. Werner.
Water and Wastes Engineering, Vol. 15, No. 3, p 32, 34, 38, March, 1978. 3 fig, 1 tab.

Descriptors: *Treatment facilities, *Equalizing reservoirs, *Oxidation lagoons, *Sludge digestion, *Storage tanks, Storm water, Storm surge, Aeration, Jets, Dewatering, Chlorination, Disinfection, Waste water treatment, Municipal wastes.

A 2.45 mgd contact stabilization plant operating in conjunction with an existing 0.85 mgd plant was designed for Lake Jackson, Texas, to accomodate peak flows up to 16.5 mgd. Primary treatment consists of screening and grit removal with Dynecco's Aqua-Guard, employing bar screen openings of 0.25 inches. An equalization/surge basin was selected for storing the peak storm water flows and for on-line control of diurnal fluctuations. Overflows in the two-section 700,000 gal equalization basin pass over a weir into the storage basin where the waste water is used as makeup when the peak flow subsides. The two-channel configuration provides a backup system when one channel is under repair and reduces the energy required for mixing waste ater in a 700,000 gal tank. Pentech jet aerators at a depth of 22 ft were selected for the contact, equalization, and stabilization tanks, and for the aerobic digesters because of their lower power requirements. The aerators are guaranteed to maintain a dissolved oxygen concentration above 2 mg/liter and a tank bottom velocity of 1 ft/sec. The Leopold Clair-Vac floating siphon sludge collector accomodates the design specifications for size, shape, operation, and maintenance. Sludge is aerobically digested, gravity thickened, and dewatered by a belt filter press; scum is transported by an air lift pump to the filter press. Before discharge, the treated effluent is chlorinated for a contact period of 20 min with a Pentech jet disinfection system. (Lisk-FIRL)
W78-09378

REDUCING COLIFORM AND SALMONELLA BACTERIA DURING ANAEROBIC DIGESTION,
Vanderbilt Univ., Nashville, TN. Dept. of Environmental Engineering ad Policy Management.
M. B. Cooke, E. L. Thackston, and G. W. Malaney.
Water and Sewage Works, Vol. 125, No. 1, p 50-53, January, 1978. 4 fig, 2 tab.

Descriptors: *Salmonella, *Coliforms, *Anaerobic digestion, *Sewage bacteria, *Sampling, Pathogenic bacteria, Treatment facilities, Analytical techniques, Water pollution sources, Waste water treatment, Municipal wastes.

The reduction of salmonellae and coliforms by anaerobic digestion was examined in three sewage treatment plants in Tennessee. Samples of primary-treated and anaerobically-digested sludge were collected from each plant over three days and analyzed by the multiple tube fermentation technique for coliforms and by the Alley-Malaney membrane filter technique for salmonellae. Similar coliform concentrations before digestion were apparent in raw sludge from all three plants; anaerobic digestion at the two Murfreesboro treatment plants reduced coliforms by 10,000-fold on the third sampling day, while significantly lower reductions were observed in Nashville's Dry Creek plant. Salmonellae concentration by 1,000-10,000-fold, while concentrations were reduced 100-fold by the Dry Creek plant. The greater reductions at the Murfreesboro plants were attributed to detention times of 50 and 38 days; Dry Creek detention time averaged 9 days. (Lisk-FIRL)
W78-09379

SOME TESTS ON THE MEMBRANE FILTER PLATE,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 5E.
W78-09380

WASTEWATER TREATMENT PLANT IS REGIONAL SUCCESS,
Gwin, Dobson and Foreman, Inc., Altoona, PA.
R. T. Dobson.
Water and Wastes Engineering, Vol. 15, No. 1, p 46-48, January, 1978. 1 fig, 2 tab.

Descriptors: *Treatment facilities, *Activated sludge, *Aeration, *Sludge treatment, *Pulp and paper industry, Chlorination, Incineration, Dewatering, Polymers, Interceptor sewers, Disinfection, Sludge disposal, Waste water treatment, Municipal wastes, Concrete pipes, Construction materials.

A regional waste water treatment plant in Tyrone, Pennsylvania, treats 9.0 mgd of combined municipal and paper mill wastes. One-third of the design flow is generated by the Westvaco Corp. paper mill which provides primary treatment of its wastes; provisions have been made to expand the municipal treatment plant to 30 mgd. The waste water receives comminution, primary clarification and chlorination. Paper mill sludges with a high clay content are mixed with sewage sludges, conditioned with polymers, thickened, centrifuged, incinerated in a fluidized bed reactor, and discharged to a landfill. Effluent during the initial phase of operation contained 15.6 mg/liter BOD and 19.8 mg/liter suspended solids. A 3,000-linear ft reinforced concrete interceptor sewer with a diameter of 48 inches and a capacity of 36 mgd was constructed to connect the new treatment facility to the site of the former treatment plant. (Lisk-FIRL)
W78-09381

CENTRAL PIVOT SPRAY SYSTEM CONTROL STORM LAKE POLLUTION,
J. C. Rosse.
Water and Sewage Works, Vol. 125, No. 1, p 72-75, January, 1978. 2 tab.

Descriptors: *Spray irrigation, *Oxidation lagoons, *Biological treatment, *Aeration, *Storage tanks, Irrigation practices, Pilot plants, Return flow, Crop production, Soybeans, Corn(Field), Treatment facilities, Ammonia, Nutrients, Waste water treatment, Groundwater, Industrial wastes, Municipal wastes, Fishkill.

A system of lagoon treatment, storage, and central pivot spray irrigation has been installed to treat a combined municipal and industrial food processing waste flow in Storm Lake, Iowa. The waste water, containing high concentrations of ammonia-nitrogen and sulfate, is treated in two waste water plants and/or diverted to the lagoons which provide biological treatment, stabilization, anaerobic and aerobic treatment, and storage. The stored waste water is used to spray irrigate leased cropland; a 630-ft Model 2071 Valley electric drive center pivot system with five drive towers irrigates a 33-acre circle. Pilot plant studies on a 40-acre tract planted with corn crop during the growing season increased the yield by 30%; 18.7 inches applied to a soybean crop increased the yield by up to 100%. Groundwater studies have indicated that waste water applications up to 18.7 inches/yr would not adversely affect groundwater, dependent upon annual precipitation. Waste water is stored during the winter months when ammonia-nitrogen levels are the highest to prevent fishkill in the receiving streams. (Lisk-FIRL)
W78-09382

EFFLUENT TREATMENT PROCESS USES FILAMENT-WOUND GLASS FIBER/EPOXY.
For primary bibliographic entry see Field 8G.
W78-09383

NEW HAMPSHIRE SECTION NAMES TREATMENT FACILITY STATE'S OUTSTANDING CE ACHIEVEMENT,
B. M. Lally.
Civil Engineering-ASCE, Vol. 48, No. 2, p 84-85, February, 1978.

Descriptors: *Treatment facilities, *Sludge treatment, *Incineration, *Aeration basins, *Chlorination, Air circulation, Instrumentation, Automation, Ozone, Gases, Waste water treatment, Interceptor sewers, Municipal wastes.

The New Hampshire division of the American Society of Civil Engineers has cited the Manchester, New Hampshire, 26 mgd waste water treatment plant as a significant engineering achievement. The waste water treatment project provides for the construction of 20 miles of interceptor sewers, a pumping plant, and expansion of the facility to 60 mgd. The treatment facility, which will reduce the pollution load on the Merrimack River, provides secondary waste water treatment with 2 primary and 2 secondary clarifiers, aeration basins, chlorination, sludge thickening, and sludge incineration. Venturi scrubbers mounted in the incinerators reduce the particulate emissions into the air. The treatment system is electrically monitored and remotely controlled; gas analyzers and negative room pressure equipment have been installed in potentially hazardous areas of the plant. Air exhausted from these areas by negative pressure is treated with ozone for deodorizing the gases before release. Air in areas containing toxic or explosive supplies is exchanged 12 times/hr. (Lisk-FIRL)
W78-09384

HOME REMEDY HELPS FIGHT SLUDGE BULKING,
N. Barber.
Water and Sewage Works, Vol. 125, No. 4, p 45-46, April, 1978. 2 fig, 1 tab.

Descriptors: *Sodium compounds, *Neutralization, *Sludge treatment, *Coagulation, *Aerated lagoons, Food processing industry, Al-

kalinity, Treatment facilities, Chlorination, Suspended solids, Biochemical oxygen demand, Waste water treatment, Municipal wastes.

Sodium bicarbonate treatment of waste water bearing large volumes of high pH, starchy industrial wastes has improved sludge settleability in the Wilbraham, Massachusetts, municipal waste water treatment facility. The treatment plant has fluctuating volume and organic loads which range 30,000-130,000 gpd and 1500-2500 ppm BOD. The higher flow rates and BOD occur during the week when a potato chip plant and an ice cream plant are in operation. Waste water laden with starch and having a pH up to 12.2 flows to the plant once each week when the potato chip plant's tanks are washed. A 300 lb dose of sodium bicarbonate is added to the aeration tanks, followed by subsequent additions of 50 lb/day on Monday through Wednesday and 100 lb/day on Thursday and Friday. Aerated waste water is settled and chlorinated before discharge with 30 ppm BOD and suspended solids. The sludge volume index was decreased to 80-90, alkalinity was increased from 285-344 mg/liter and sludge solids content was increased by 1.5-2.5% with sodium bicarbonate treatment. Waste sludge volume decreased from 14,000-9,000 gpd and mixed liquor suspended solids increased from 6,460-11,600 ppm within 6 mos. (Lisk-FIRL)
W78-09385

PERFORMANCE, DESIGN AND OPERATION OF NORTHERN EXTENDED AERATION PLANTS,
Department of the Environment, Edmonton (Alberta). Northern Technology Center.
P. W. Given, and D. W. Smith.
Canadian Journal of Civil Engineering, Vol. 5, No. 1, p 70-82, March, 1978. 12 fig, 2 tab, 19 ref.

Descriptors: *Aerated lagoons, *North America, *Cold regions, *Performance, *Organic loading, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Hydraulic structures, Waste water treatment, Municipal wastes.

The performance of extended aeration treatment plants in northern Canadian territories and Alaska with mean temperatures below freezing was compared in a literature review with the performance of plants located south of the O C mean annua isotherm and National Sanitation Foundation (NSF) plants. The northern plants were found to have stronger sewage than the non-northern plants with influent BOD and COD concentrations averaging 289 mg/liter and 722 mg/liter, respectively, in the northern regions and 156 mg/liter and 405 mg/liter, respectively, in the non-northern regions. BOD was reduced by 56%, COD by 51%, and suspended solids by 58% in the northern plants; the non-northern plants reduced BOD by 60%, COD by 47%, and suspended solids by 44%. Optimum remova rates established by NSF for BOD and suspended solids were 89% and 87%, respectively. Low performance standards in the northern treatment plants were attributed not to temperature but to hydraulic and organic overloading, failure to scrape the clarifiers and maintain sludge returns, and insufficient aeration. (Lisk-FIRL)
W78-09386

WAUSAU SOLVES DUAL PROBLEM BY USING FILTER PRESS,
Becher-Hoppe Engineers, Inc., Schofield, WI.
G. J. Bizjak, and A. E. Becher, Jr.
Water and Wastes Engineering, Vol. 15, No. 2, p 28-30, 32, February, 1978. 2 fig, 1 tab.

Descriptors: *Filtration, *Sludge treatment, *Dewatering, *Sewage sludge, *Water treatment, Filters, Porous media, Separation techniques, Sludge disposal, Landfills, Waste water treatment, Treatment facilities, Municipal wastes.

A Zimpress cloth filter press installed in the Wausau, Wisconsin, waste water treatment plant dewaters combined waste water and water treatment sludges. Thickened water treatment sludges, comprising about one-third of the daily 16,209 lbs of combined sludge treated, are mixed with waste water sludges in an oxidized storage tank where they are further concentrated from the initial 4% or higher solids content. The sludge flows by gravity to one of two ram-type filter press feed pumps with hydraulic capacities of 125 gpm at 100 lbs/sq inch. The flow-controlled, pressure-compensating filter press is floor mounted and contains cast iron plates controlled by an automatic mechanism. The press has a polypropelene-monofilament yarn filter with a surface area of 1,381.8 sq ft; under continuous operation, the press has a cycle time of 2.25 hrs. A filter cake with a total solids content of 45% is produced; the press frame allows for future expansion by 40%. Filtrate is returned to the aeration tanks and the sludge cake is disposed of in a landfill. The solids dewatering system cost a total of $429,678. (Lisk-FIRL)
W78-09387

RADIATION TREATMENT OF WASTE WATER,
Energy Research and Development Administration, Washington, DC. Div. of Biomedical and Environmental Research.
D. S. Ballantine.
Water Pollution Control, Vol. 77, No. 1, p 87-96, 1978. 8 fig, 3 tab, 35 ref.

Descriptors: *Radiation, *Gamma rays, *Electromagnetic waves, *Cobalt radioisotopes, *Nuclear wastes, Cesium, Nuclear reactors, Irradiation, Equipment, Disinfection, Sewage sludge, Waste water treatment, Municipal wastes.

Design criteria for radiation treatment of waste water are reviewed and two sewage irradiation systems are described. Radiation has been found to: reduce the BOD and COD concentrations in sewage; improve biodegradation; destroy cyanide and chlorinated organic pesticides; enhance settling, filtering, and dewatering properties of sludge; and disinfect pathogenic sewage bacteria. Electron accelerators and gamma radiation with cobalt-60 or cesium-137 are cited as the primary sources of radiation. Cesium-137 has the disadvantages of being less available, producing less kilowatts/curie, and diminishing by 50% through self-adsorption. Marketing of cobalt-60 is more extensive, but with increased use of nuclear power, cesium-137 will be more readily available. The Geisselbulach, West Germany, sewage treatment plant utilizes cobalt-60 to irridate municipal sludge for disinfection before land application; the system includes an irradiation shaft equipped with a reaction vessel and a recirculation system for complete exposure to the radiation. A 50 kilovolt electron accelerator utilized at the Dear Island Waste Treatment plant in Boston, Massachusetts, incorporates aeration and spreading of the sludge on a rotating drum which moves the sludge under the accelerator beam. Although the design sludge thickness is 2 mm, radiation from the electron accelerator penetrates to about 0.3 cm. A cost comparison of the three irradiation systems reported that a cobalt-60 source cost $0.89/kl, cesium-137 radiation cost $0.75/kl and a 3-million volt electron accelerator cost $0.40/kl of sludge treated. (Lisk-FIRL)
W78-09388

COMPUTER-CONTROLLED PLANT FEATURES ADVANCED TREATMENT.
Public Works, Vol. 109, No. 2, p 50-54, February, 1978. 2 tab.

Descriptors: *Computers, *Automation, *Tertiary treatment, *Activated sludge, *Instrumentation, Flowmeters, Settling basins, Aeration, Chlorination, Lime, Polymers, Sludge treatment, Dewatering, Filtration, Incineration, Monitoring, Sludge disposal, Waste water treatment, Municipal wastes.

A 12 mgd addition to an existing 4 mgd sewage treatment plant in the New Jersey township of Parsippany-Troy Hills was designed with computerized control. The plant addition includes: 2 grit chambers, 6 primary settling tanks, 6 diffused air aeration tanks with activated sludge, 6 final settling basins, and 2 chlorine contact tanks for sodium hypochlorite disinfection. A planned 18 mgd advanced waste water treatment addition will include: 4 nitrification tanks and clarifiers; 4 methanol reduction tanks, supplying about 9,100 lbs methanol/day; 4 denitrification tanks and clarifiers; and 8 multi-media filters, each with a 400 sq ft surface area. The 12 mgd addition will supplement the existing anaerobic digestion and vacuum filter dewatering of sludge with gravity thickening of primary sludge and air flotation of waste activated sludge. It will also incorporate chemical conditioning with lime, aluminum chloride, and polymers; vacuum filter dewatering; incineration in two multiple hearth furnaces; and ash storage in lagoons. Control of the plant is maintained by a Fischer and Port computer-based real time system with a dual computer arrangement. The computer system controls 14 plant operations and monitors 9 others with magnetic flowmeters in the plant addition. The computer system controls flows to the primary settling tanks, to the aeration tanks, to the secondary settling basins, and activated sludge, the air flow in the diffused aeration tanks; the number of blowers on-line, primary sludge pumping, and sodium hypochlorite disinfection are also computer controlled. (Lisk-FIRL)
W78-09389

UNIQUE SLUDGE HANDLING SYSTEM CHOSEN IN DUBUQUE,
Henningson, Durham, and Richardson, Omaha NE. Environmental Engineering Dept.
For primary bibliographic entry see Field 5E.
W78-09390

CHEMICAL FLOCCULABILITY OF SLUDGE ORGANISMS IN RESPONSE TO GROWTH CONDITIONS,
Pittsburgh Univ., PA. Dept. of Civil and Environmental Engineering.
Y. C. Wu.
Biotechnology and Bioengineering, Vol. 20, No. 5, p 677-696, 1978. 10 fig, 4 tab, 19 ref.

Descriptors: *Flocculation, *Nutrients, *Deficient elements, *Activated sludge, *Cytological studies, Neutralization, Chemical precipitation, Phosphorus, Nitrogen, Nutrient removal, Settling velocity, Waste water treatment, Municipal wastes.

The influence of nutrient deficient wastes on alum flocculation of sludge organisms was evaluated in an activated sludge system without cellular recycle. Microbial samples were cultivated in a continuous-flow activated sludge reactor at 25C, using a hydraulic retention time of 4.5 hrs and an aeration rate of 2,000 ml/min/liter. Cell capsule formation occurred under phosphorus and nitrogen limitation; capsules were throught to be negatively-charged polymers when formed in neutral conditions. While the unit cell surface charge was not influenced by low nutrient restrictions, it increased significantly when COD:N and COD:P ratios increased above 34:1 and 290:1, respectively. This phenomenon was attributed to increased capsule material accumulation. Biological solids productions, bacterial cell surface properties, and residual and soluble P content in the culture media were controlled by the influent feed concentrations of N and P; these conditions, in turn, directly affected the chemical flocculation efficiency of the system. Higher alum doses were required to flocculate nutrient-starved dispersed microorgan-

isms because of the higher unit cell surface charge and resistance to charge neutralization. The ratio of alum-to-phosphorus for 90% phosphorus remova was higher than the stoichiometric relationship of these substances at equilibrium; an alum-to-phosphorus ratio of 1.17:1-2.0:1 was required to produce effluent soluble phosphorus concentrations of 6.68-9.03 mg/liter. Sludge settling velocity increased with increasing nutrient concentrations in the feed. (Lisk-FIRL)
W78-09391

CO-DISPOSAL OF SEWAGE SLUDGE USING REFUSE-DERIVED FUEL,
Clinton Bogert Associates, Fort Lee, NJ.
For primary bibliographic entry see Field 5E.
W78-09392

LIME/SODIUM BICARBONATE TREATMENT INCREASES SLUDGE DIGESTER EFFICIENCY,
Church and Dwight Co., Inc., Piscataway, NJ.
N. R. Barber.
Journal of Environmental Sciences, Vol. 21, No. 2, p 28-30, 1978. 2 fig, 1 tab, 4 ref.

Descriptors: *Anaerobic digestion, *Lime, *Sodium compounds, *Methane bacteria, *Alkalinity, Carbon dioxide, Cations, Methane, Sewage sludge, Microbial degradation, Waste water treatment, Calcium carbonate, Municipal wastes, Acid bacteria.

Combined lime and sodium bicarbonate treatment of sewage sludge during anaerobic digestion is evaluated. Methane-forming bacteria require a pH of 6.8-7.2 for optimum methane generation; neutrality is maintained by chemical treatment of the sludge to counteract the effect of acid-forming bacteria. When added to the digester to raise the pH, lime reacts with CO2 and can cause a vacuum to form at different CO2 partial pressures. In imbalanced digesters, the vacuum potential increases and air may flow into the digester with toxic effects on the methane-forming bacteria. Excess lime addition in the presence of CO2 can form insoluble calcium carbonate which will not increase alkalinity. The use of lime and sodium carbonate in anaerobic digestion reduces the toxicity of divalent cations. The combined treatment also reduces the presence of high pH patches in the sludge liquor. It is recommended that lime be added initially to increase the pH to 6.3-6.5, followed by sodium bicarbonate to increase pH to the optimum 6.5-7.2. The chemicals are added to maintain a digester alkalinity of 2,500-5,000 mg/liter as CaCO3 and a volatile acid concentration of 300-500 mg/liter as acetic acid. Sodium bicarbonate additions of 500 mg/liter/day will maintain a sodium concentration of 137 mg/liter; additions of 1,500 lb sodium bicarbonate/1 million gal influent sludge will increase bicarbonate alkalinity by 180 mg/liter when digester alkalinity falls below 2,500 mg/liter. (Lisk-FIRL)
W78-09393

THE COMPARISON OF ACTIVATED AND DIGESTED SLUDGE APPLIED TO FLOWERING CHINESE CABBAGE, BRASSICA PARACHINESIS BAILEY,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5E.
W78-09394

RECLAIMED SEWAGE WATER: A HYDROPONIC GROWTH MEDIUM FOR PLANTS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5E.
W78-09395

LAND TREATMENT: PRESENT STATUS, FUTURE PROSPECTS,
Metcalf and Eddy, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5E.
W78-09396

AUTOMATIC CONTROL OF A DIFFUSED AIR TREATMENT PLANT,
B. L. Thurley.
Brown Boveri Review, Vol. 64, No. 11, p 693-698, November, 1977. 6 fig.

Descriptors: *Instrumentation, *Measurement, *Analog models, *Digital computers, *Automation, Monitoring, Aeration, Settling basins, Dissolved oxygen, Sewage sludge, Analytical techniques, Waste water treatment, Treatment facilities, Municipal wastes.

Automatic monitoring and control systems are described for diffused air aeration waste water treatment facilities. Debris buildup on the raking screens and sludge accumulation in the digester can be monitored by Deltapi E transmitter with air fed Pneumerstats; data can be displayed on a milliammeter indicator and computing bin. Venturi flume throat constricters in grit channels are employed as flowmeters when connected to a Lea series A recorder or transmitter. This series can be used to control a penstock for maintaining appropriate flows. Sediment removal from the primary settling tanks, final sedimentation tanks, and storm tanks is controlled by ultrasonic sludge level detectors. A Veriflux magnetic flowmeter, connected to a Flexel LB-52 flow controllers, and a computing bin maintain the flow of air in the diffused aeration system. Activated sludge return is measured by the Veriflux meter; Simplex high-intensity aeration cones control the aeration intensity by varying the rotational speed. Mackereth lead anodes, surrounded by a cathode contained in a semipermeable polyethylene membrane, monitor the dissolved oxygen content of the effluent. Kent Deltapi E transmitters are also used to measure gas pressures in the digesters. Analog displays can be connected to digital telemetry systems for data collections in large plants. (Lisk-FIRL)
W78-09397

BUBBLE POWER CUTS SEWAGE PLANT ENERGY USE.
Engineering News-Record, Vol. 200, No. 17, p 16, April, 1978.

Descriptors: *Biological treatment, *Activated sludge, *Aeration, *Rotational flow, *Plastics, Construction materials, Design data, Biodegradation, Bubbles, Waste water treatment, Financing, Treatment facilities, Municipal wastes.

Polyethylene biological contact cylinders, installed in Philadelphia, Pennsylvania's Northeast waste water treatment plant, may receive additional government funding as an innovative design. The 190 mgd treatment plant installed 22 surfact units, each 25 ft long with a 12 ft diameter, providing a total of 2.2 million sq ft of surface area. The honeycombed cylinders contain angled cups which catch the air from the aeration bays, causing the cylinders to rotate at about 0.8 rpm without a power source. An estimated $850,000/year will be saved in power costs with the biological treatment system, which also reportedly increases the activated sludge process efficiency. The surfact system is expected to provide an additional 28% of the costs of upgrading the secondary treatment plant to 250 mgd. The city may receive an additional 10% funding for the $160 million project as an incentive for designing innovative sewage treatment techniques. (Lisk-FIRL)
W78-09398

AUTOMATIC CONTROLS PREVENT CHLORINE SPILL HAZARDS,
H. Last.
American City and County, Vol. 93, No. 5, p 89-90, May, 1978. 1 fig.

Descriptors: *Chlorine, *Instrumentation, *Leakage, *Monitoring, *Neutralization, Gases, Air pollution, Automatic control, Chlorination, Treatment facilities, Air circulation, Municipal wastes.

A chlorine scrubbing system installed in the Tonawanda, New York, waste water treatment plant chemically neutralizes chlorine spills automatically. The system contains five chlorine detectors installed at floor level in the chlorine storage room and chlorine feed room to seal off the rooms and stop the ventilation system when chlorine is detected in the air. An alarm is activated and the scrubbing system pumps create a draft to circulate the chlorine contaminated air through one or more of the three ejector venturi scrubbers. The chlorine is neutralized with caustic sodium hydroxide solution in the venturi scrubbers and neutralized air is recirculated through mist eliminators to the room where the leak originated. The scrubbing system continues to operate until the chlorine content in the air is reduced to 1 ppm. The use of caustic soda does not significantly change the character of the treatment plant effluent which is discharged into the Niagara River. (Lisk-FIRL)
W78-09399

SIMULTANEOUS DETERMINATION OF TRACE METALS IN INDUSTRIAL AND DOMESTIC EFFLUENTS BY DIFFERENTIAL PULSE ANODIC STRIPPING VOLTAMMETRY,
Benedict Coll., Columbia, SC. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-09400

FEED YOUR PLANT LIQUID FERTILIZER,
Bryant-Curington, Inc., Austin, TX.
D. R. Brosman.
Water and Wastes Engineering, Vol. 15, No. 5, p 89, 96, May, 1978.

Descriptors: *Textiles, *Fertilizers, *Nutrients, *Activated sludge, *Nitrogen, Phosphorus, Ammonium compounds, Phosphorus compounds, Plastic pipe, Waste water treatment, Industrial wastes.

The conversion of textile waste treatment facilities to extended aeration-activated sludge treatment required nutrient additions in the form of liquid fertilizer. Studies of effluent from the 3 mgd plant at Mission Valley Mills, Inc., in New Braunfels, Texas, revealed the need for an additional 100 lbs/day nitrogen and 20 lbs/day phosphorus to activated sludge effluent. Preliminary studies indicated that anhydrous nitrogen would cost $0.20/lb and phosphoric acid would cost $24.31/100 lb. Liquid fertilizer, added at a rate of 500 lbs/day with an Nip ratio of 20:8, cost about $166/ton, based on 1977 costs. An estimated annual savings of $4,887.35 has been realized with liquid fertilizer doses costing $29/day, as opposed to $42.39/day for separate nutrient additions. The fertilizer, with a nearly netural pH, is added at a rate of about 11 lbs/gal. A polyvinyl chloride feed pipe delivers the liquid fertilizer to the aeration basin from a 6,400 gal steel storage tank via a chemical feed pump. The liquid fertilizer does not affect carbon steel, stainless steel, and polyvinyl chloride, but can corrode brass and aluminum; nutrient addition can be adjusted to accommodate BOD variations. (Lisk-FIRL)
W78-09401

PURIFICATION OF WASTE WATER--CONTAINING ORGANIC WASTE INCLUDES TREATMENT WITH MIXTURE OF A SILICA GEL AND CELLULOSE,
Soviet Patent SU-290-694. Issued April 28, 1978.
Derwent Soviet Inventions Illustrated, Vol. A, No. 7, p 2-3, 1978.

Descriptors: *Organic wastes, *Patents, *Cellulose, *Silica, *Gels, Ureas, Ammonia, Lipids, Filtration, Waste water treatment, Sewage bacteria, Oxygen demand, Municipal wastes.

A patented process to reduce oxygen demand and pathogenic bacteria in waste water employs Cellogel paste, a mixture of silica gel and cellulose. The Cellogel is mixed with 20 ml of water and added to waste water containing organic wastes such as fatty acids, urea, and ammonia. About 58G of Cellogel is added for each liter of waste water contining an oxygen demand of 2,175-4,360 mg/liter. After the paste is added, the effluent mixture is clarified and filtered. The final effluent has an average oxygen demand of 150-112 mg/liter; staphyloccoccus bacterial counts of 680,000 may be reduced by 100% after 45 min of contact with Cellogel. The Cellogel treatment process is especially suitable for closed cycle fife support systems. (Lisk-FIRL).
W78-09403

THE BACTERIAL METABOLISM OF 4,4'-DICHLOROBIPHENYL, AND ITS SUPPRESSION BY ALTERNATIVE CARBON SOURCES,
Amsterdam Univ., (Netherlands). Lab. of Environmental and Toxicological Chemistry.
M. T. M. Tulp, R. Schmitz, and O. Hutzinger.
Chemosphere, Vol. 7, No. 1, p 103-108, 1978. 2 fig, 26 ref.

Descriptors: *Sewage bacteria, *Polychlorinated biphenyls, *Activated sludge, *Metabolism, *Anaytical techniques, Chlorination, Biodegradation, Soils, Bacteria, Gas chromatography, Mass spectrometry, Organic compounds, Path of pollutants, Waste water treatment.

Gas chromatography-mass spectrometry (GC-MS) was used in experiments to examine the metabolism of 4,4'-dichlorobiphenyl by activated sludge bacteria. In shake culture studies, 50 ppm of the test compound, dissolved in ether, was added to vessels containing an inoculum of sludge supernatant. D-glucose, glycerol, peptone, yeast extract, and humic acid were used as alternate carbon sources for an unsedimented activated sludge inoculum. In soil studies, the test compound was continuously filtered through an inoculated column contaning garden soil and coarse sand. The metabolites were isolated at the termination of the experiments by acidification with H_2SO_4, hydrolysis, three ether extractions, and centrifugation. Retention times and relative intensities during GC-MS revealed that 4-chlorobenzoic acid and 4,4'-dichloro-2,3- biphenyldiol were the major byproducts of 4,4'-dichlorobiphenyl metabolism. The formation of these metabolites by the mixed bacterial populations in the activated sludge cultures was suppressed to below detection limits when alternate carbon sources were made available. No metabolites were detected in similar experiments with higher chlorinated isomers, including 2,4',5-tri-,2,2',5,5'-tetra-, 2,2',3,4,5'-penta-, 2,2',3,4,5,5'-hexa-, and decachlorobiphenyl. (Schulz-FIRL)
W78-09404

QUANTITATIVE ANALYSIS OF HYDROCARBONS IN SEWAGE SLUDGE FROM WASTE WATER PURIFICATION STATIONS,
Institut d'Hygiene, Geneva (Switzerland). Service de Toxicologie Industrielle, d'Analyse de l'Air et de Protection Contre le Bruit.
For primary bibliographic entry see Field 5A.
W78-09407

RECOVERY OF ASCARIS EGGS FROM SLUDGE,
Cincinnati Univ., OH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W78-09408

PRACTICAL METHOD FOR DETECTING POLIOVIRUS IN ANAEROBIC DIGESTER SLUDGE,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5A.
W78-09409

DESIGN OF DRYING BEDS FOR SURPLUS ACTIVATED SLUDGE,
P. B. B. Vosloo.
Water Pollution Control, Vol. 77, No. 1, p 71-74, 1978. 1 fig, 2 ref.

Descriptors: *Activated sludge, *Drying, *Settling basins, *Separation techniques, *Hydrologic systems, Sludge treatment, Sludge disposal, Valves, Drainage, Weirs, Overflow, Sands, Filtration, Waste water treatment, Municipal wastes.

An excess activated sludge drying bed was designed to act as both a settling tank and a drying bed. The settling/drying bed contains a 200-250 mm deep layer of fine, ungraded sand that may be obtained from the construction site. The rectangular bed has one end wall, opposite the sludge inlet, that acts as an overflow weir rising 300 mm above the sand level. A 150-300 mm wide channel runs between this weir and another located upstream; the channel is divided into 5 sections with drainage means 500 mm below the sand level, connecting to the main overflow weir which discharges into a downstream collecting trough. The drainage valves within the troughs are closed when the mixed liquor is introduced. Water in excess of the bed capacity spills over the main weir into the collection trough as sludge settles to a 100-200 mm thickness. The surface water is drained sequentially through the trough valves serving the 5 sections of the upstream weir at heights above the sand level of 75, 120, 165, 210, and 255 mm. Liquid that is not drained from the surface filters through the sand bed and the sludge layer is allowed to evaporate. The design application rate is 1.5 kgk/sq m with an excess activated sludge drying time of 4 days. (Lisk-FIRL)
W78-09410

AUTOTHERMAL THERMOPHILIC AEROBIC DIGESTION,
Union Carbide Corp., Tonawanda, NY. Linde Div.
M. S. Gould, and R. F. Drnevich.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE2, p 259-270, April, 1978. 3 fig, 2 tab, 7 ref, 1 append.

Descriptors: *Digestion, *Sludge digestion, *Aerobic conditions, *Aeration, *Oxygen requirements, Mass transfer, Dissolved oxygen, Heat balance, Sewage bacteria, Pilot plants, Model studies, Salmonella, Waste water treatment, Municipal wastes.

Autothermal thermophilic aerobic digestion with high purity oxygen aeration of sewage sludge was evaluated in pilot plant studies. Based on a stoichiometric oxygen-to-volatile solids ratio of 1.50, the heat generation coefficient was estimated as 9.150 BTU/lb oxidized volatile solids. Cell synthesis contributed to a higher net oxygen requirement of 1.6-1.8 lb oxygen/lb oxidized volatile solids. Oxygen aeration during the thermophilic operation increased the oxygen saturation of the system and significantly enhanced mass transfer with less aeration power input than air systems. Digestion systems and the pilot plant study utilized a two-stage operation in which heating was limited to the first stage with mass transfer heating of the second stage. An air aeration system was unable to attain thermophilic digestion without supplementary heat, was mass transfer limiting, and was unable to operate efficiently at high solids loading. An autothermal thermophilic digester with oxygen aeration was operated in the first stage at temperatures exceeding 50C over a period of 1.4-2.3 days. Heat leaks and reduced mass transfer to the second stage necessitated insulation of the pilot plant. Volatile solids were reduced by 30-40% in the first stage at retention times of 1.4-2.3 days, with overall reductions of about 80%. The pilot plant operation reduced salmonellae and Pseudomonas acruginosa to below detection limits. (Lisk-FIRL)
W78-09411

BIOLOGICAL FILTRATION THROUGH A PACKED-COLUMN,
Montpellier-2 Univ (France). Lab. de Genie Chemique, Traitement et Epuration des Eaux.
S. Elmaleh, H. Labaquere, and R. Ben Aim.
Water Research, Vol. 12, No. 1, p 41-46, 1978. 6 fig, 5 ref.

Descriptors: *Columns, *Mathematical models, *Porosity, *Water purification, *Oxygen requirements, Biological treatment, Packed beds, Filtration, Porous media, Nutrient removal, Laboratory tests, Model studies, Performance, Permeability, Biodegradation, Waste water treatment, Municipal wastes.

Mathematical models predicting porosity decrease, oxygen depletion, and purification efficiency in a packed column during biological filtration of waste water were tested in a laboratory column reactor packed with crushed brick and fed with a dissolved substrate. Porosity decrease is calculated from initial porosity of the packed column which is diminished by the ratio of initial biomass concentration to density as a partial product of the specific growth rate to oxygen transfer coefficient ratio minus the growth yield rate with respect to the specific growth rate and time. Oxygen depletion is determined as a function of influent oxygen concentration, the oxygen transfer coefficient according to the filtration velocity, the specific area, porosity, and the initial biomass concentration with respect to the specific growth rate and time. Purification efficiency is taken as the product of the height of column efficiency at a specific growth rate and time and the ratio of specific growth rate and initial biomass concenttration to filtration velocity and initial substrate concentration. Performance predictions calculated from these design parameters agreed with data obtained with the laboratory packed column. Although certain assumptions in the models are oversimplified, the models are considered accurate enough for laboratory tests of filter designs. (Lisk-FIRL)
W78-09412

ENSURING CLARITY AND ACCURACY IN TORQUE DETERMINATIONS,
For primary bibliographic entry see Field 8C.
W78-09413

FACTORS INFLUENCING LOW SPEED SURFACE AERATION SELECTION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
H. H. Sherrard.
Water and Sewage Works, Vol. 125, No. 2, p 32-35, February, 1978. 3 fig, 4 tab, 5 ref.

Descriptors: *Aeration, *Mathematical models, *Kinetics, *Hydraulic systems, *Hydraulic equipment, Nitrification, Biochemical oxygen demand, Equations, Nitrogen, Aerated lagoons, Waste water treatment, Municipal wastes.

Parameters influencing the selection of low speed surface aerators are reviewed for activated sludge systems in which the kinetic coefficients for BOD and nitrification are known. Oxygen demands under different conditions are calculated from waste water treatability and subsequent biokinetic coefficients. From these values, sludge age is calculated for use in determining balanced biochemical stoichiometrical equations to predict oxygen

demand by microorganisms. Stoichiometric equations are developed for calculating influent waste water BOD and total Kjeldahl nitrogen (TKN) concentrations, removal efficiencies of BOD and TKN, sludge production related to time, and the variable yield coefficient. The overall mass transfer coefficient under aerator design conditions is calculated for selecting the aerator shaft horsepower in conjunction with a nomograph. The mathematical models are applied to conditions in a 1 mgd waste water treatment facility treating effluent with BOD levels of 350 mg/liter. The results of the model studies demonstrate that greater horsepower capacities are required for tanks with larger aeration volumes, higher values of hydraulic retention time, and higher concentrations of TKN. (Lisk-FIRL)
W78-09414

CALCULATION AND COMPARISON OF ACTIVATED SLUDGE BASINS AS CONTINUOUS STIRRED TANK OR PLUG FLOW REACTORS,
Technische Univ., Berlin, (West Germany). Inst. fuer Chemieingenieurtechnik.
A. Mehring, and U. Wiesmann.
German Chemical Engineering, Vol. 1, No. 1, p 31-38, 1978. 11 fig, 2 tab, 29 ref.

Descriptors: *Activated sludge, *Mathematical models, *Kinetics, *Equations, *Sewage sludge, Analytical techniques, Theoretical analysis, Model studies, Design criteria, Waste water treatment, Municipal wastes.

A theoretical analysis of continuous activated sludge reactors operated as completely mixed continuous stirred tanks (CST) or as plug flow reactors (PF) without back-mixing considered the performance of reactors and their limiting conditions. The maximum recycle ratio was calculated as a function of the sludge recycle, thickening, and outlet ratios derived from the microorganism balance. Equations were developed for the dimensionless concentration of the substrate and of the microorganisms at the reactor inlet, the balance of substrates and microorganisms in dimensionless form, and the dimensionless substrate concentration at the outlet. The dimensionless mean cell residence time was derived as a function of assumed values of substrate concentration and recycle ratio. Significant fractional conversion was observed only after a specific mean residence time was exceeded. Application of the equations to PF and CST reactors with sludge recycle assumed a constant oxygen concentration in an isothermal and steady-state process. The results indicated that a higher minimum mean residence time was required by the PF reactor to avoid washout of the bacterial culture; PF reactors provided higher fractional conversion. With lower residence times and fractional conversion, the CST reactor was considered superior. (Lisk-FIRL)
W78-09415

LAB STUDY HELPS SOLVE AEROBIC DIGESTER PROBLEMS,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.
I. Benefield, R. Seyfarth, and A. Shindala.
Water and Sewage Works, Vol. 125, Reference Number, p R-60, R-62-64, R-66-68, R-70, 1978. 20 fig, 13 ref.

Descriptors: *Aerobic conditions, *Sludge digestion, *Laboratory tests, *Temperature, *Design data, Model studies, Chemical oxygen demand, Oxygen requirements, Nitrates, Suspended solids, Waste water treatment, Municipal wastes.

Laboratory batch and continuous flow digesters were made to compare solids destruction rate coefficients, oxygen demand, and supernatant characteristics under temperature variations in studies to develop design parameters for continuous flow aerobic digesters. Acclimated sludge was digested on a batch feed mode at temperatures of 30, 40, and 50C with aeration for 15 days. COD, nitrate, orthophosphate, oxygen uptake, and volatile suspended solids were measured after 5, 10, and 15 days of aeration. Similar conditions were maintained in continuous feed digesters; waste sludge was replaced daily with batch feed sludge for aeration times of 5, 10, and 15 days. Analyses were conducted over 7 days, after steady-state was reached. The modified Arrhenius relationship for calculating the reaction rate constant for volatile suspended solids degradation was not applicable to the temperature variations employed in the study. Specific oxygen uptake rates were highest in the continuous feed digester maintained at 30C, lowest at 40C, and constant between 5-15 days in all continuous digesters. COD values in batch and continuous digesters were significantly different; the highest COD levels in continuous digesters were observed at 50C. Little variation in nitrate and orthophosphate levels in the batch and continuous digesters was apparent; nitrifying bacteria were sustained in the 40C continuous digester but not in the 40C batch digester. (Lisk-FIRL)
W78-09416

RESPONSE OF ACTIVATED SLUDGE PROCESSES TO ORGANIC TRANSIENTS-KINETICS,
Los Angeles County Sanitation Districts, Whittier, CA.
M. W. Selna, and E. D. Schroeder.
Journal Water Pollution Control Federation, Vol. 50, No. 5, p 944-956, May, 1978. 15 fig, 3 tab, 21 ref.

Descriptors: *Activated sludge, *Kinetics, *Model studies, *Organic loading, *Chemical oxygen demand, Mathematical models, Sewage sludge, Settling velocity, Analytical technique, Waste water treatment, Unsteady flow, Municipal wastes.

The impact of square-wave transient loading variations, 2-7 times the steady-state organic levels, on growth rates, substrate utilization rates, and settling rates was investigated using mixed liquor from an activated sludge reactor. Mean cell residence time ranged over 5.5-11.5 days, with hydraulic residence times in the aeration tank of 6.0-6.9 hrs. Transient loading was accomplished by increasing the steady-state COD of 265 mg/liter to 520-1,950 mg COD/liter. The Monod equation adequately described the results when applied before step-down and when soluble effluent COD calculations were modified. Transient loading variations did not significantly affect suspended solids concentrations of sludges which initially had good settling properties; large deviations in growth rates and organic removal rates were observed. Soluble effluent COD increased significantly with square-wave transient loadings at four times the steady-state parameters. Results of the study indicated that effluent COD could be controlled by regulating steady-state unit growth rates as an inverse function of mean cell residence time; a 5-day mean cell residence time did not adversely affect substrate utilization. (Lisk-FIRL)
W78-09417

UTILIZING STOICHIOMETRY FOR DENITRIFICATION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
J. H. Sherrard, and R. Sivasubramanian.
Water and Sewage Works, Vol. 125, No. 6, p 104-106, 108, June, 1978. 5 fig, 2 tab, 12 ref.

Descriptors: *Denitrification, *Alcohols, *Mathematical models, *Nitrates, *Biomass, Chemical reactions, Analytical techniques, Equations, Kinetics, Anaerobic digestion, Nitrogen, Waste water treatment, Municipal wastes.

Balanced stoichiometric equations were used to calculate methanol additions and waste sludge production for denitrification of waste water under anaerobic conditions. Formulas were derived for predicting methanol requirements, biomass production, effluent waste concentration, waste treatment efficiency, sludge protection, and variable cell yield coefficients. Utilizing predetermined kinetic coefficients of denitrification at 10, 20, and 30C and an influent nitrate-nitrogen concentration of 14 mg/liter, the kinetic equations were solved for a selected initial methanol concentration; solutions were utilized to develop a stoichiometric equation for denitrification. From this balanced equation, methanol doses at various mean cell retentions times and temperatures were calculated as a function of observed cell yield coefficients. The study determined that methanol requirements for denitrification decreased with increasing mean cell retention time and increased with increasing temperature. Waste sludge production increased with shorter mean cell retention times and higher temperatures. Higher methanol doses were required for higher influent concentrations of nitrate-nitrogen and dissolved oxygen. (Lisk-FIRL)
W78-09418

CONTROLLING IMPOUNDMENTS WHICH MAY POLLUTE GROUNDWATER,
Maryland Water Resources Commission, Annapolis. Permits Div.
For primary bibliographic entry see Field 5G.
W78-09419

THE EFFECTS OF MADISON METROPOLITAN WASTEWATER EFFLUENT ON WATER QUALITY IN BADFISH CREEK, YAHARA AND ROCK RIVERS,
Texas Univ., Dallas.
For primary bibliographic entry see Field 5C.
W78-09422

REUSE, ENERGY, SLUDGE: IN WHAT DIRECTION ARE WE GOING,
L. Greifer.
Water and Wastes Engineering, Vol. 15, No. 1, p 37-38, 40, 42-44, January, 1978.

Descriptors: *Treatment facilities, *Pilot plants, *Irrigation practices, *Return flow, *Incineration, Ultimate disposal, Viruses, Ammonia, Disinfection, Chlorination, Groundwater recharge, Injection, Energy sludge digestion, Sludge disposal, Sludge treatment, Waste water treatment, Municipal wastes.

Pilot plant studies and current waste water treatment practices are reviewed for the reuse of waste water and energy generation from sludge disposal techniques. The Odessa, Texas, sewage treatment plant discharges its wastes to a secondary treatment facility in a petrochemical plant which uses the treated water as cooling tower makeup and boiler feed water; the petrochemical wastes are recharged into injection wells for oil production. An Israeli pilot plant recharges the waste water into potable aquifers after oxidation lagooning, lime conditioning, clarification and chlorination; the recharged water is used for irrigational and industrial purposes but also fulfills potable water standards. Autothermic copyrolysis of sewage sludge and refuse-derived rather than fossil fuel required a fuel-to-sludge ratio of 1:2 and a sludge solids content of 24%. Orange County, California, has utilized digester gas and waste heat from secondary treatment operations with a fuel value of 600 BTU/cu ft as a power supply. A comparison of pyrolysis and incineration in Arlington County, Virginia, indicated that pyrolysis required lower temperatures and less combustion air, while producting enough steam to power the afterburner. Pyrolysis in conjunction with activated carbon reduced suspended solids by 95%, grease to 10 mg/liter, BOD above 30 mg/liter, and heavy metals by 75.0-99.9%. Co-incineration of sludge and refuse produced 150,000 kilowatt hrs/day of power. Viruses in sludge supernatant were disin-

fected within 3 days at 35C. Land application, pH adjustment, and ocean disposal of sewage sludge were also reviewed. (Lisk-FIRL)
W78-09423

WATER REORGANIZATION--AIMS, ACHIEVEMENT AND THE FUTURE,
Thames Water Authority, London (England).
For primary bibliographic entry see Field 5G.
W78-09424

PROCESS AND SYSTEM FOR ANAEROBIC TREATMENT OF BIOCHEMICAL WASTE,
Hitachi, Ltd. (Japan). (Assignee).
M. Ishida, R. Haga, and Y. Odawara.
U.S. Patent No. 4,067,801, 11 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 2, p 667, January 10, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Anaerobic digestion, Activated sludge, Separation techniques, Methane fermentation, Acid fermentation, Biochemical wastes.

In a system for treatment of biochemical waste such as activated sludges, the waste is subjected to anaerobic stabilization processes, which include two phases of an acid fermentation and a methane fermentation effected in separate reactors. The waste after the acid fermentation is then separated into a liquid effluent for the methane fermentation and a waste sludge. The waste sludge which may cause secondary environmental pollution is re-treated within the anaerobic stabilization processes without withdrawing from the system. It is preferable to recover the cells of acid formers from the waste after the acid fermentation in order to enhance the efficiency of the stabilization. (Sinha-OEIS)
W78-09426

EXTRACTION OF FERTILIZER SALTS AND ORGANIC SUBSTANCES OF HIGH NUTRITIVE VALUE FROM INDUSTRIAL WASTE WATERS,
Reggiane Officine Meccaniche Italiane S.p.A., Milan (Italy). (Assignee).
P. Baldassari.
U.S. Patent No. 4,069,033, 5 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 3, p 1080, January 17, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Dissolved solids, Organic wastes, Fertilizers, Food processing industry, Separation techniques, Usable waste products, Fodder additives.

The known treatments of waste water refer mainly to the depuration of these waste waters and less to the problem of the recovery of useful substances contained in them. The principal object of this invention is to permit the separation of high Totally Dissolved Solids (TDS) content waste waters from low TDS content waste waters, the latter being then treated with conventional biological methods, while the high TDS content waste waters are subjected to a series of successive operations allowing end products such as organic concentrates to be used as additives for fodder and fertilizing salts to be obtained. The process includes the following operating phases: Automatic diversion of high TDS content waste waters from those of low TDS content by means of a conductivity or density measuring instrument; mixing high TDS content with strong acids or bases to form stable salts; filtration of the solution to eliminate the insoluble substances; concentration of the solution by means of evaporation; crystallization of the concentrated solution; and separation by means of centrifugation of the fertilizer salts from the mother liquors containing organic substances of high nutritive value. (Sinha-OEIS)
W78-09431

PURIFICATION APPARATUS FOR WATER PURIFICATION AND PURIFICATION SYSTEM THEREFOR,
Transportbeton-Beratungs-Gesellschaft mit beschrankter Haftung, Ratingen (West Germany). (Assignee).
B. Friesenborg, and H. Eberhardt.
U.S. Patent No. 4,069,143, 13 p, 9 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 966, No 3, p 1112, January 17, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Industrial wastes, Separation techniques, Suspended solids, Cements, Limestones, Alkaline water, Recycling.

A purification apparatus for water purification with a settling device for sediment comprises a settling vessel and a separate sediment container, which for the purification, sand open in communicative connection with each other in the assembled condition and are sealed tightly in the connection plane toward the outside by a seal, and for exchange of the sediment the containers are constructed moveable relative to each other. The settling vessel is supported with a roller wagon on running rails and has longitudinally variable supports which each comprises a telescopic tube with a spring arranged in it. A purification system includes a separation device and a collection vessel in inlet and outlet communication, respectively, with the settling vessel, the separation device including a vibrating screen, a supply line entering the settling vessel, and a purge from the collection vessel spraying water on the screen. The system has the advantage that the accumulating wastes are considerably reduced since the granular additives and the alkaline waste water can again be fed back into the circuit course. (Sinha - OEIS)
W78-09432

WASTE WATER TREATMENT WITH OXYGEN,
Chemetron Corp., Chicago, IL. (Assignee).
E. Abrams, and A. J. Masella.
U.S. Patent No. 4,069,147, 12 p, 2 fig, 1 tab, 9 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 3, p 1114, January 17, 1978.

Descriptors: *Patents, *Waste water treatment, Organic wastes, *Water pollution treatment, Activated sludge, Oxygen, Biodegradation, Aerobic bacteria, Absorption, Aeration, *Oxygenation(Biological).

The organic pollutants in a waste water stream can be reduced 90-95% by providing oxygen to sludge organisms for biological oxygenation of the pollutants. The raw waste water and activated organisms (sludge containing little or no pollutants) are mixed in a vessel for less than 30 minutes. In this vessel, the organisms absorb and adsorb 90-95% of the organic pollutants present in the influent raw waste water. Any means for gentle agitation can be used in this vessel. The waste-enriched organisms are separated from the supernatant liquid in a clarifier and sent to an oxygenation vessel where the organisms metabolize the waste by treatment with an oxygen-containing gas having at least 30% by volume oxygen. The thus-activated organisms are returned to the mixed liquor vessel to complete the cycle. (Sinha-OEIS)
W78-09433

INDUSTRIAL WASTE WATER TREATMENT PROCESS,
Du Pont de Nemour (E. I.) and Co., Wilmington, DE. (Assignee).
D. G. Hutton, and F. L. Robertaccio.
U.S. Patent No. 4,069,148, 8 p, 1 fig, 6 tab, 14 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 3, p 1114, January 17, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Biological treatment, Activated carbon, Oxygen, Biochemical oxygen demand, Chemical oxygen demand.

Industrial waste water, containing impurities which poison or otherwise inhibit bacterial forms employed in biological treatment of waste water, is purified by a process which comprises subjecting the waste water to a biological treatment process in the presence of activated carbon or fuller's earth. A gas containing molecular oxygen is distributed within the liquid mixture during treatment to provide oxidation means. Despite the presence of the poisonous or inhibiting impurities, the process efficiently reduces the biochemical oxygen demand, chemical oxygen demand and total organic content of the waste water in an unusually rapid manner, and removes material not normally removed by the biological treatment alone. This process can be employed with industrial waste water alone or with mixtures of industrial waste water and sewage or other waste water. (Sinha-OEIS)
W78-09434

SEWAGE TREATMENT SYSTEM,
Ecodyne Corp., Chicago, IL. (Assignee).
D. G. Mason.
U.S. Patent No. 4,069,156, 7 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 3, p 1116, January 17, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Biodegradation, Microbial degradation, Aeration, Anaerobic digestion, Denitrification, Equipment.

A method and apparatus for the treatment of sewage is described in which effluent containing biodegradable wastes is first delivered to a clarification zone, and is held in the clarification zone for a time period sufficient to permit suspended solids to settle to the bottom of the zone. It is then delivered from the clarification zone to an oxidation/nitrification zone, where it is aerated and passed through a bed of submerged media which comprises a multiplicity of elements freely and randomly stacked on one another to provide interstitial area between them. The elements have a high surface area to volume ratio in order to promote the growth of aerobic microorganisms on their surface. The effluent is then delivered from the nitrification zone to a denitrification zone, where it is passed through another bed of submerged media. A carbon-containing nutrient is fed to the microorganisms to promote the anaerobic growth of the microorganisms on the media and to promote the digestion of materials. Basically, the apparatus comprises a multiplicity of zones including a clarification zone, an oxidation/nitrification zone, and a denitrification zone. (Sinha-OEIS)
W78-09436

PROCESS RELATED TO PULP BLEACHING EFFLUENT PURIFICATION USING ION EXCHANGE RESINS,
Uddeholms A. B. Hagfors (Sweden). (Assignee).
L-G. Anderson, H. R. Andersson, B. G. Broddevall, and A. Lindberg.
U.S. Patent No. 4,070,234, 8 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 4, p 1477, January 24, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Bleaching wastes, Chlorination, *Ion exchange resins, Pulp and paper industry, Counter-current washing.

A process related to pulp bleaching having a sequence comprising treatment with chlorine, extraction with alkali, and a final bleaching section which in turn may comprise a number of various bleaching stages, is described. The method is characterized in that at least a number of washing steps are connected in series counter-currentwise

from a washing step in the final bleaching section to the wash step of the first alkali extraction stage; that a strongly polluted effluent from the wash step of the first alkali extraction stage is fed through a first column containing a bed of a particulate, porous resin provided to trap (take up) and retain organic pollutants in the effluent; and that a combined effluent comprising an acidic, polluted liquor from the chlorine bleaching stage and the partly purified filtrate from the first column is fed through a second column which also contains a bed of a particulate, porous resin provided to trap organic pollutants existing in the combined effluent. The resin bed in the second column is activated by the acidic combined effluent, and chloride ions pass the resin bed without being trapped by the resin so that the chloride ions are discharged together with the purified filtrate. The purified filtrate is the final wash liquor effluent of the system. (Sinha-OEIS)
W78-09438

APPLICATION AND DETERMINATION OF ORGANIC POLYMERS,
Stevens Inst. of Tech., Hoboken, NJ.
L. K. Wang, M. H. Wang, and J. F. Kao.
Water, Air, and Soil Pollution, Vol. 9, No. 3, p 337-348, 1978. 6 fig, 67 ref.

Descriptors: *Polymers, *Polyelectrolytes, *Flocculation, *Coagulation, *Organic compounds, Anions, Cations, Sedimentation, Centrifugation, Filtration, Reverse osmosis, Flotation, Waste water treatment, Volumetric analysis, Municipal wastes.

Organic polymer applications to water and waste water are reviewed and a method to measure anionic and cationic polyelectrolytes is described. Cationic polyelectrolytes are employed as coagulants where colloids and suspended solids are negatively charged. Nonionic organic polymers are added after the onset of flocculation to agglomerate colliding particles; they can also remove phosphates when used in conjunction with ferric chloride. Anionic polymers assist in the agglomeration of negatively charged particles that have been neutralized by inorganic cations. Anionic polyelectrolytes are added as coagulation aids with alum or ferric chloride as the principle coagulants. Organic polymer treatment of waste water can enhance sedimentation, sand filtration, diatomaceous earth filtration, ultrafiltration, reverse osmosis, flotation, or centrifugation. Quantitative analysis of 0.0002-0.005 N concentrations of anionic and cationic polyelectrolytes is performed by dilute and regular direct titration with corresponding cationic and anionic titrants. Calibration curves determine the normality of cationic polyelectrolytes titrated with poly(vinyl-sulfuric acid) potassium and anionic polyelectrolytes titrated with 1,5-dmethyl-1,5-diazaundecamethylene. (Lisk-FIRL)
W78-09440

INSURING TROUBLE-FREE PUMP OPERATION,
Allis-Chalmers Corps., Milwaukee, WS. Industrial Pump Div.
For primary bibliographic entry see Field 8C.
W78-09441

CENTRIFUGE BASKET FOR SEWAGE TREATMENT SCREENS - HAS ALL-PLASTICS SEMICYLINDRICAL FRAME ELEMENTS WITH EMBEDDED SCREEN CLOTH AND GROOVE/TONGUE JOINTS AT FACE ENDS.
German Patent DS 2265-092. Issued April 13, 1978. Derwent German Patents Abstracts, Vol. A, No. 16, p 3, May, 1978.

Descriptors: *Centrifugation, *Filters, *Patents, *Filtration, *Design criteria, Joints(Connections), Screens, Plastics, Porous media, Equipment, Construction materials, Separation techniques, Waste water treatment.

A water-tight, plastic centrifuge basket to support waste water treatment filters has been patented. The plastic cage apparatus consists of a frame permanently connected to a filter grid which supports the embedded screen cloth filter medium. The frame is attached to the centrifuge unit. Plastic semi-cylindrical frame elements are mounted along the length of the cage; two or more elements are mounted in each filter cage. The elements are interconnected at both ends of the frame by tongue and groove joints that form sealed connections when in the locked position. The filter elements are disposable and prevent leakage when in use. (Lisk-FIRL)
W78-09451

BIOLOGICAL PURIFICATION PLANT FOR WASTE WATER AND SEWAGE--WITH CIRCULAR TANK DIVIDED INTO COMPARTMENTS BY VERTICAL WALLS.
French Patent FR 2354-973. Issued February 17, 1978. Derwent French Patents Abstracts, Vol. A, No. 13, p 4, May, 1978.

Descriptors: *Biological treatment, *Oxidation lagoons, *Patents, *Activated sludge, *Dewatering, Aeration, Screens, Pumps, Sludge treatment, Oily water, Waste water treatment, Municipal wastes.

A patent has been issued for a circular biological waste water treatment tank which is divided into an oxidation chamber, a decantation zone, and a sludge thickening chamber. Half of the tank provides oxidation while the other half is divided into concentric zones for decantation and sludge thickening. A bridge, spanning the top of the circular tank, provides forward and backward movement about a central axis. The bridge supports a surface aeration turbine, a porticullis-type thickener equipped with a scraper, and a rake which extends to the bottom of one of the concentric areas. Debris is initially removed from the waste water by coarse screening; grease and oil are separated out. The effluent then flows by gravity to an oxidation chamber which contains activated sludge. The oxidation chamber is connected to the decantation zone by a perforated pipe. Effluent passes through this pipe into the decantation chamber for clarification. The treated waste water is discharged to another chamber and sludge is passed to the second concentric zone for thickening. Sludge is pumped from this zone by a unit mounted on the bridge. The system simplifies shuttering construction and reduces potential blockage by reducing the need for pipe systems. (Lisk-FIRL)
W78-09462

ACTIVATED SLUDGE TRANSPORT-IN COMPACT BIOLOGICAL EFFLUENT TREATMENT PLANTS.
German Patent DS 2232-477. Issued April 6, 1978. Derwent German Patents Abstracts, Vol. A, No. 15, p 2, May, 1978.

Descriptors: *Activated sludge, *Settling basins, *Conveyance structures, *Patents, *Pumps, Biological treatment, Sludge treatment, Transport, Stabilization, Equipment, Design criteria, Waste water treatment, Municipal wastes.

An activated sludge conveyance device has been designed for compact treatment plants to minimize interference with sludge settling during operation. Scrapers mounted within the secondary sedimentation tank convey the sludge toward a suction outlet. The suction device is connected to a pump carriage which moves back and forth above a secondary sedimentation tank located near the activated sludge tank. The partition between the activated sludge tank and secondary sedimentation tank supports and guides the movement of the pump carriage. The suction pipe transports the sludge into a stabilizing chamber located in the secondary sedimentation tank. (Lisk-FIRL)
W78-09463

TREATING BADLY POLLUTED WATER BY DISINFECTION AND FLOCCULATION - ESPECIALLY USING CHLORINE, WITH SEPARATION OF SOLIDS OILS AND GREASE.
French Patent ZA 7701-432. Issued January 11, 1978. Derwent French Patents Abstracts, Vol. A, No. 12, p 2, May, 1978.

Descriptors: *Disinfection, *Flocculation, *Patents, *Oily water, *Chlorination, *Separation techniques, Aeration, Sodium compounds, Incineration, Waste water treatment, Municipal wastes.

A disinfection and flocculation process for separating solids, oils, and grease has been patented for municipal, hospital, farm, and starch manufacturing waste water treatment. The solids in the waste water are initially reduced to fine particles, homogenized, and adjusted to pH 7. Air or oxygen is then injected while the wastes are agitated, followed by disinfection with active chlorine. The waste water is transferred to a reactor where it is neutralized with aluminum sulfate and flocculated with an optional additive. The water is separated from the solids fraction and may be reused or subjected to additional thermal disinfection; sludge is removed for composting. Coarser solids are reduced to a sludge and homogenized with agitation, followed by disinfection with Ca(OH)2 and flocculation. The liquid fraction is neutralized with AlCl3 or Al2(SO3)3 to promote flocculation. (Lisk-FIRL)
W78-09464

TREATING INDUSTRIAL WASTE WATER--WITH CELLULOSE CONTAINING PPTG AGENT TO REMOVE ANIONIC DYES, OPTICAL BLEACHES ETC.
Soviet Patent SU-554-806. Issued May 11, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 17, p 1, June, 1978.

Descriptors: *Dyes, *Cellulose, *Bleaching wastes, *Patents, *Textiles, *Pulp and paper industry, Polymers, Chemical precipitation, Filtration, Anion adsorption, Tannery wastes, Color, Waste water treatment, Industrial wastes.

A patent has been granted for an anionic dye or bleach removal process employing filtration through cellulose treated with a polymeric precipitating agent. The degree of adsorption is controlled by treating the filter media with a basic polymeric precipitating agent and a polyanionic additive. In an example cited, 2,000 liters of waste water containing 200 mg of deep blue dye were filtered at 95-98C through a spruce sulfite cellulose medium which had been treated with dicyandiamine, urea, and a formaldehyde condensation product. The colorless filtrate had an average residual dye content of 4 mg/liter. The treatment method is suitable for bleach and dye-bearing waste water from paper, textile, and tannery industries; it requires small quantities of solution and less time than conventional coagulation process. (Lisk-FIRL)
W78-09465

FIELD STUDY TO DETERMINE THE FEASIBILITY OF ELECTRO-OSMOTIC DEWATERING OF DREDGED MATERIAL,
Army Engineer District, Mobile, AL.
For primary bibliographic entry see Field 5E.
W78-09473

SYSTEMS CLOSING IN KRAFT PULP MILLS,
Swedish Forest Products Research lab., Stockholm.
B. Warnqvist.
Manuscripts 17th EUCEPA Conferenence, October 10-14, 1977, Vienna, Austria, Vol 2, Paper No 29, p 218-231. 6 fig, 7 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Recycling, *Water conservation, *Water reuse, Wastes, Industrial wastes, Water pollution sources, Water pollution, Water pollution treatment, Pulp and paper industry, Costs, Kraft mills, Screening, Refining, Closed systems.

The large effluent volumes from a conventional brown stock screen room in a kraft mill can be reduced by recycling the decker effluent, by screening at high pulp consistency (3-5% as compared to the conventional 1-2%), and by in-line refining with minimum or no screening. Closed handling and treatment of coarse screen rejects can be accomplished by recooking or refining and recycling of rejects. Cost comparisons are made for in-plant measures to reduce effluent volumes vs. external treatment and for the options for closed rejects handling. (Swichtenberg-IPC)
W78-09488

TECHNICAL STATUS OF EFFLUENT-FREE SULFITE PULP MILLS (TECHNISCHER STAND DER ABWASSERFREI ARBEITENDEN SULFITZELLSTOFFABRIK),
Chemiefaser Lenzing AG. (Austria).
R. Hornke.
Manuscripts 17th EUCEPA Conference, October 10-14, 1977, Vienna, Austria, Vol 2, Paper No 30, p 232-247. 4 fig, 1 tab.

Descriptors: *Recycling, *Water pollution control, *Sulfite pulp mills, *Pulp wastes, Pulp and paper industry, Water pollution sources, Effluents, Bleaching wastes, Industrial wastes, Wastes, Water conservation, Waste water treatment, Waste treatment, *Water reuse, Sulfite liquors, Water pollution treatment, Technology, Black liquor, Closed systems.

This discussion reviews what is presently practicable, indicates what is lacking, and shows future possibilities in effluent control at sulfite mills. If the cook is removed without water, and if black liquor condensate is used for 80% of the diluting water (the rest being water from pulp dewatering), a recovery of 99% of the dry extract of the cook is possible. The screening effluent is kept separate from the bleaching effluent by using a closed-circuit screen with a press and controlling the use and discharge of water. About 89% of the solids can be sluiced out here and used for cooking liquor (raw acid) preparation. With radical water economy in bleaching and dewatering, concentrated waste liquors result. Measures are available for avoiding secondary waste waters. Black liquors must be evaporated in a nearly neutral state. Bleaching must be conducted with peroxide and simultaneous alkali extraction or with oxygen instead of chlorine. The technical status of concentrating the bleachery effluent and its further treatment is also discussed. (Ward-IPC)
W78-09489

WASTE PURIFICATION OF SULPHATE-CELLULOSE PRODUCTION-BY ELECTROLYSIS USING LEAD ANODE AT INCREASED CURRENT DENSITY.
Soviet Patent SU-551-263. Issued April 29, 1977. Derwent Soviet Inventions Illustrated, Vol A, No 10, p 2-3, April, 1978.

Descriptors: *Electrolysis, *Anodes, *Lead, *Electric currents, *Patents, Separation techniques, Construction materials, Chemical oxygen demand, Pulp and paper industry, Pulp wastes, Phenols, Lignins, Electrolytes, Color, Waste water treatment, Cellulose, Sulfates, Industrial wastes.

A patent has been issued for sulfate-cellulose waste water treatment by electrolysis using a high current density lead anode. The lead anode may be operated at current densities of 0.04-0.08 amp/sq cm with electrolyte flow rates of 6-10 liters/hr. In an example cited, biologically treated sulfate-cellulose wastes were electrolyzed with a lead anode operated at a current density of 0.05 amp/sq cm and a solution feed rate of 8 liters/hr, maintained at 20-80C. COD was reduced by 77.7% from 323-73.5 mg/liter; color index by 95.4%; and steam-volatile phenols by 99.3%, from 0.025-0.002 mg/liter. The high-current density process also reduced non-volatile phenols by 98.8%, from 0.016-0.0002, and lignin content by 100%. The degree of COD removal is reportedly higher with the lead anode than with a soluble iron anode. (Lisk-FIRL)
W78-09490

CHEMICAL RECOVERY AND UTILIZATION OF THE ORGANIC PART OF BLACK LIQUORS (ISSLEDOVANIYA PO REGENERATSII KHIMIKATOV I UTILIZATSII ORGANICHESKOI CHASTI OTRABOTANNYKH SUL'FATNYKH SHCHELOKOV),
Vsesoyuznyi-Nauchnyi Planovii Otel Tsellyulozno-Bumazhnoi Promyshlennost, Leningrad (USSR).
I. A. Khristyuk, V. M. Ardashnikova, L. A. Zadorina, O. I. Ignat'eva, and S. A. Sapotnitskii.
Bumazhnaya Promyshlennost, No 9, p 19-20, September, 1977. 1 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Kraft mills, *Chemical recovery, Pulp and paper industry, Wastes, Industrial wastes, Water pollution sources, Chemical precipitation, Lignins, Electrodialysis, Organic compounds, Organic acids, Yeasts, Steam, Phenols, Toxicity, Neutralization, Nutrients, Sulfur, Hydrogen ion concentration, Hydrogen sulfide, Waste treatment, *Black liquor.

A black liquor recovery process is described which eliminates the evaporation and combustion of the liquor. The proposed process includes precipitation of alkali lignin with organic acids (e.g., acetic acid); electrodialysis of the remaining solution to recover chemicals and separate the organic acids in the free state; recycling a part of the dialyzate for lignin precipitation; and biochemical processing of the dialyzate to produce feed yeast. Steam is blown through the acid dialyzate to remove toxic volatile phenolic compounds. The dialyzate is then neutralized, and mineral nutrients are added. The yield of Candida yeast is 35-38%. Up to 17 kg of organic acids per cu m black liquor can be used as a carbon source. In addition to full recovery of sodium and utilization of the organic components of black liquor, the method allows recovering a part of sulfur in the form of sodium sulfide, to be used in the preparation of white liquor. The content of residual sodium sulfide in black liquor does not exceed 5-7 g/liter (active sodium oxide). Acidification to a pH of 4.5-4.8 for lignin precipitation and the subsequent electrodialysis to pH 1.2-1.5 causes evolution of hydrogen sulfide, which is recovered in a scrubber sprayed with NaOH solution. This constitutes about 25% of the sulfur contained in black liquor. (Stapinski-IPC)
W78-09492

PURIFICATION OF EFFLUENTS OF PAPER MILLS PROCESSING WASTE PAPER (OCHISTKA STOCHNYKH VOD BUMAZHNYKH FABRIK, PERERABATYVAYUSCHIKH MAKULATURU),
B. S. Potskhvershvili, L. S. Murguliya, and Z. S. Dzvelaya.
Bumazhnaya Promyshlennost, No. 9, p 29-30, September, 1977. 3 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Coagulation, *Clays, Waste treatment, Water pollution treatment, Pulp and paper industry, Water pollution sources, Lime, Suspended solids, Sedimentation rates, Color, Hydrogen ion concentration, Density, Sediments, Water purification, Waste paper, Sulfuric acid, Aluminum sulfate.

Georgian (USSR) bentonite clays (askagel and gumbrin) in combination with sulfuric acid, aluminum sulfate, and lime were tested as coagulating agents for clarification of effluents of a paper mill and a board mill, both using waste paper stock in their products. Askagel in combination with lime or with sulfuric acid and aluminum sulfate gave the best results. Data are given on the suspended solids sedimentation rate, the sediment density, the color and pH of the clarified effluents, and the consumption of the coagulant. (Stapinski-IPC)
W78-09493

REVERSE OSMOSIS AND ULTRAFILTRATION (REVERSOMOSE UND ULTRAFILTRATION),
Technische Hochschule, Vienna (Austria). Inst. fuer Verfahren-stechik und Technologie der Brennstoffe.
A. E. Hackl.
Das Oesterreichische Papier, Vol 14, No 10, p 22-24, No 12, p 43-46, October, December, 1977. 9 fig, 9 ref, 5 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Bleaching wastes, *Waste water treatment, *Reverse osmosis, *Ultrafiltration, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Membrane processes, Separation techniques, Pulp and paper industry, Chemical oxygen demand, Color, Waste treatment, Osmosis, Water pollution control, Softwood, Sugars, Black liquor, Condensates, Sulfite pulp mills.

The principles and some industrial uses of reverse osmosis and ultrafiltration are briefly described, including applications in the pulp and paper industry. Experiments are then reported for studying reverse osmosis of condensates and bleachery effluents and ultrafiltration of pulping effluents, all from sulfite mills, as well as a three-stage process (ultrafiltration for the first two and reverse osmosis for the final stage) for concentrating a softwood sulfite effluent. Finally, treatments of black liquor, sulfite effluent, and paper mill effluents via both techniques are compared. Ultrafiltration was effective in preliminary concentration of, and sugar separation from, sulfite liquor and in removing COD and color from paper mill effluents. Reverse osmosis following ultrafiltration gave the best results for all types of effluents. (Ward-IPC)
W78-09494

WATER AND ITS ROLE IN PAPERMAKING (WASSER UND SEINE ROLLE BEI DER PAPIERHERSTELLUNG),
Chemische Fabrik Pelzer und Roehrl, Mainz (West Germany).
For primary bibliographic entry see Field 3E.
W78-09495

FUNDAMENTALS OF BIOLOGICAL EFFLUENT PURIFICATION (GRUNDLAGEN DER BIOLOGISCHEN ABWASSERREINIGUNG),
Papierfabrik Biberist (Switzerland).
J. C. Ulrich.
Das Papier, Vol 31, No 10A, p V74-V77, V104-V108 November, 1977. 3 fig, 2 tab. English summary.

Descriptors: *Waste water treatment, *Biological treatment, Waste treatment, Microorganisms, Aerobic treatment, Enzymes, Dissolved solids, Energy, Nutrients, Nitrogen compounds, Nitrification, Temperature, Oxygen, Trace elements, Hydrogen ion concentration, Biodegradation, Water purification, Inorganic compounds, Organic compounds, Carbon compounds.

The primary aim of biological effluent purification is to remove dissolved organic matter which nourishes microorganisms in the effluent and thus affects oxygen consumption indirectly. Biological effluent purification is an artificially increased self-cleaning, involving microorganisms mainly. Only aerobic environments are used industrially.

Both dissolved and undissolved substances are consumed by the microorganisms, partly with the assistance of enzymes; they are used, in complicated biochemical reactions, to build up body substance and to produce energy. The breakdown of the nutrients in the effluent has two stages, first, the attack on the carbon compounds and, secondly, on the nitrogen compounds (nitrification). The breakdown is temperature-dependent and is influenced by several other parameters, e.g., oxygen concentration, trace elements, and pH. Biological clarification processes are briefly described. (Ward-IPC)
W78-09496

CONSIDERATIONS REGARDING THE LAYOUT OF A BIOLOGICAL TREATMENT STAGE (UEBERLEGUNG ZUR AUSLEGUNG EINER BIOLOGISCHEN KLAERSTUFE),
Steinbeis and Co., Gemmrigheim (West Germany).
F. Riegel.
Das Papier, Vol 31, No 10A, p V77-V81, V104-V108, November, 1977. 5 fig, 2 ref, 2 tab. English summary.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, Design, Waste treatment, Water pollution treatment, Construction, Aeration, Control systems, Industrial plants, Optimization, Degradation(Decomposition), Planning, Project planning, Laboratory tests, Water pollution control.

Before a biological treatment step is introduced, the industrial plant must be adapted to the project; the hydraulic load must be minimized, processes optimized, and raw materials chosen with regard to expected biological load. Special attention must be given to systematic and thorough measurement of the composition of the incoming water. The importance of laboratory degradation tests for planning the layout is discussed, and the essential parameters for designing a biological clarification unit are pointed out. Current biological purification processes are reviewed. Finally, construction considerations are dealt with in regard to pollution control, recommending possible aeration systems and control equipment. (Ward-IPC)
W78-09497

START-UP AND OPERATION OF BIOLOGICAL TREATMENT PLANTS IN PAPER MILLS (INBETRIEBNAHME UND BETRIEB VON BIOLOGISCHEN KLAERANLAGEN IN PAPIERFABRIKEN),
G. Klapprott.
Das Papier, Vol 31, No 10A, p V81-V84, V104-V108, November, 1977. 2 fig, 2 ref. English summary.

Descriptors: *Pulp and paper mills, *Waste water treatment, *Biological treatment, *Operation and maintenance, Performance, Waste treatment, Water pollution treatment, Economics, Training, Personnel, Information exchange, Sludge, Pulp wastes, Testing, Water pollution sources, Wastes, Industrial wastes, Start-up.

Certain measures are described which are useful or necessary before and during the startup of a biological effluent clarification unit. They include meetings with various agencies and staff members concerned, and the most important performance tests. The initial operation with fresh water for performance testing is described, followed by a test run with partial and, finally, with total effluent load. The startup will take 4 or 5 weeks, until the sludge concentration builds up to the required value. Various operational experiences are described which might indicate possible difficulties with design or process. Other points discussed are economical consideration, training of operators, and exchange of information between treating plant and paper mill. (Ward-IPC)
W78-09498

LIMITS OF BIOLOGICAL PURIFICATION OF PULP MILL EFFLUENTS (GRENZEN DER BIOLOGISCHEN REINIGUNG VON ZELLSTOFFABRIKATIONSABWAESSERN),
Papierwerke Waldhof-Asschaffenburg A. G., Stockstadt am Main (West Germany).
W. Czirnich.
Das Papier, Vol 31, No 10A, p V85-V87, V104-V108, November, 1977. 1 tab. English summary.

Descriptors: *Discharge measurement, *Pulp wastes, *Chemical oxygen demand, *Legislation, Discharge(Water), Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Biological treatment, Europe, Effluents, Bleaching wastes, Taxes, Woodyard, Condensates, Germany, Assessments, Legal aspects, Waste water(Pollution).

In enforcing the effluent tax law and assessments for industrial discharges, the determining parameter for oxygen-consuming effluent pollution will be the COD. In the present official German requirements, there are several parameters which describe the effluent load differently. Some of the difficulties in computing COD are dealt with. The total effluent from pulp mills is composed of very different contributing streams. The technical difficulties and feasibilities for biological treatments of the streams from woodyards, digesters, condensates, and bleacheries are considered. (Ward-IPC)
W78-09499

EXPERIENCE WITH EFFLUENT TREATMENT IN AN INTEGRATED PULP AND PAPER MILL (ERFAHRUNGEN MIT DER ABWASSERBEHANDLUNG IN EINER INTEGRIERTEN ZELLSTOFF-UND PAPIERFABRIK),
Feldmeuhle A. G., Baienfurt (West Germany).
H. Solbach.
Das Papier, Vol 31, No 10A, p V87-V91, November, 1977. 3 fig, 2 illus, 5 tab. English summary.

Descriptors: *Waste water treatment, *Pulp wastes, *Biological treatment, *Activated sludge, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Biochemical oxygen demand, Chemical oxygen demand, Trickling filters, Bleaching wastes, Waste treatment, Separation techniques, Adsorption, *Lake Constance, Aluminum oxide.

A description is given of how an integrated pulp and board mill met the standards of the Lake Constance water pollution control commission and the official BOD and COD requirements of 20 mg oxygen and 80-150 mg permanganate/liter. First, a single-stage biological treatment plant (trickling filter) was installed for partial degradation; this was followed by an activated-sludge unit as second stage. The results with total effluent are shown, including the effect of increasing spend liquor collection from the pulp mill from 88% to 98%. The target could not be fully met due to the bleachery effluents. A new treatment for this tributary stream, adsorption on activated alumina, described here for the first time, was developed. About 80% COD elimination could be attained; since the residual load is largely broken down biologically, about 90% COD reduction is attained for the total effluent. (Ward-IPC)
W78-09500

PROBLEMS OF BIOLOGICAL PURIFICATION OF EFFLUENTS FROM SPECIALITY PAPER MILLS WITH INTEGRATED PULP PRODUCTION (DIE PROBLEME DER BIOLOGISCHEN REINIGUNG VON ABWAESSERN AUS SPEZIALPAPIERFABRIKEN MIT INTEGRIERTER HALBSTOFFERZEUGUNG),
Papierfabrik Cordier G.m.b.H., Bad Duerkheim (West Germany).
D. Cordier
Das Papier, Vol 31, No 10A, p V91-V93, V104-V108, November, 1977. 1 tab. English Summary.

Descriptors: *Pulp wastes, *Biological treatment, *Waste water treatment, Wastes, *Industrial wastes, Water pollution sources, Water pollution treatment, Europe, Foreign countries, Chemical oxygen demand, Flocculation, Sludge, Pulp and paper industry, Water purification, Economics, Burning, Incineration, Oxidation, Black liquor, Wet oxidation, Germany, Specialty papers, Costs.

Integrated specialty paper mills stock preparation processes causing effluent loads similar to those of larger pulp mills, but effluent collection and removal are too expensive for such comparatively small operations. The example given, Papierfabrik Cordier GmbH, produces mainly cotton-content paper using alkali-cooked and bleached linters in the stock. The 20 ton/day pulp mill is too small to justify burning of the black liquor, which contains most of the COD of the intergrated plant. Efforts to purify the pulping liquor by various types of flocculation all gave sludge problems in biological purification. Most satisfactory was the Zimpro wet oxidation process at high pressure, but this is an expensive solution. (Ward-IPC)
W78-09501

EFFICIENCY AND COSTS OF BIOLOGICAL EFFLUENT TREATMENT PLANTS IN PULP AND PAPER MILLS (WIRKUNGSEFFEKTE UND KOSTEN VON BIOLOGISCHEN ABWASSERREINIGUNGSANLAGEN IN ZELLSTOFF-UND PAPIERFABRIKEN),
Technische Hochschule, Damstadt (West Germany). Inst. fuer Papierfabrikation; and Technische Hochschule, Damstadt (West Germany), Wasser-und Abwasserfunschungsstelle.
H. L. Dalpke.
Das Papier, Vol 31, No 10A, p V94-V98, V104-V108, November, 1977. 8 fig, 3 tab, English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, *Costs, *Efficiencies, Water pollution treatment, Water pollution sources, Wastes, Industrial wastes, Pulp and paper industry, Surveys, Europe, Biochemical oxygen demand, Chemical oxygen demand, Operating costs, Capital costs, Economic impact, Waste treatment, Germany, Switzerland.

The results of a 1976 survey of 19 pulp and paper mills, including almost all German and Swiss pulp and paper mills operating biological clarifiers, are presented and discussed. Starting from the officially required standards and the absolute and relative loads of these clarifiers, the efficiency as regards BOD and COD is stated and related to clarifier parameters. The technical data are supplemented by investment and operating costs and by total costs per cu m of effluent, per ton of product, and per kg of BOD decrease, with some mention of the economic impact of the biological treatment. (Ward-IPC)
W78-09502

DEWATERING AND DISPOSAL OF BIOLOGICAL SLUDGE (ENTWAESSERUNG UND BESEITIGUNG VON BIOLOGISCHEM SCHLAMM),
Hannoversche Papierfabriken Alfeld (West Germany).
For primary bibliographic entry see Field 5E.
W78-09503

SPECIAL PROBLEMS OF PAPER MILLS CONNECTED TO OUTSIDE SEWAGE TREATMENT PLANTS (DIE BESONDEREN BELANGE DER AN FREMDE KLAERANLAGEN ANGESCHLOSSENEN PAPIERFABRIKEN),
Muenchen-Dachauer Papierfabriken Heinrich Nicolaus G.m.b.H. (West Germany).
G. Strittmatter.
Das Papier, Vol 31, No 10A, p V101-V108, November, 1977. 87 ref, 1 tab. English summary.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Sewage treatment, Europe, Costs, Economics, Water pollution treatment, Wastes, Industrial wastes, Water pollution sources, Pulp wastes, Waste treatment, Germany, Joint treatment.

For various reasons, many paper mills, especially small ones, are interested in being connected to an outside sewage treatment plant. This article points out some difficulties which may arise in this procedure. It is based on a questionnaire replied to be 44 such German paper mills. Most important are clear, not too restrictive, long-term contracts between the parties, requiring thorough preparation in the paper mill, such as exact effluent analysis. Cost evaluations are of great importance. Some potential problems and case histories are given. (Ward-IPC)
W78-09504

POLLUTION FROM SEVERAL WOOD SPECIES IN HARDBOARD PRODUCTION,
Industrial Environmental Research Lab.- Cincinnati, Corvallis, OR. Food and Wood Products Branch.
For primary bibliographic entry see Field 5B.
W78-09506

TREATMENT OF CONDENSATE RETURNS AT INDUSTRIAL PLANTS,
Ecodyne Corp., Union, NJ. Graver Water Div.
L. Limon.
Journal of Engineering for Power, Vol 99, p 269-273, April, 1977. 4 fig, 1 illus, 8 ref, 1 tab.

Descriptors: *Waste water treatment, *Condensates, *Industrial plants, Wastes, Industrial wastes, Pulp and paper industry, Filtration, Ion exchange, Demineralization, Filters, Boilers, Resins, Waste treatment, Water pollution treatment, Water pollution sources, Magnetic filters, Steam condensates.

It appears that with the newer designs of industrial boilers as well as the more stringent steam quality requirements, boiler condensate treatment is becoming almost a necessity for the average large industrial plants. Methods of treatment are reviewed, including filtration, sodium-cycle ion-exchange polishing, treatment using Powdex ion-exchange resins, demineralizing, and the use of magnetic filters. Field experience with sodium-cycle ion-exchange polishers and with Powdex units is reported. The pulp and paper industry has been the largest user of industrial condensate treatment. (Speckhard-IPC)
W78-09509

REMOVAL OF METHANOL FROM THE SULPHATE (PULPING) PROCESS,
Rosenlew (Oy. W.) A. B., Pori (Finland).
A. A. R. Ronnholm.
Paperi ja Puu, Vol. 59, No. 11, p 721-722, 725-726, 729-732, November, 1977. 9 fig, 24 ref, 4 tab.

Descriptors: *Pulp wastes, *Water pollution sources, *Biochemical oxygen demand, *Methyl alcohol, *Kraft pulping, Kraft mills, Wastes, Industrial wastes, Pulp and paper industry, Alcohols, Energy, Odor, Water pollution, Sulfur compounds, Waste treatment, Waste water treatment.

Methyl alcohol produced during kraft cooks causes serious water pollution when discharged into rivers or lakes, as it is the major component of kraft mill effluent BOD loads. Depending on wood species, methyl alcohol can contribute 9 to 19.5 kg of BOD per oven-dry metric ton of pulp. Effective methanol removal with the least possible amount of energy will not only considerably reduce the BOD of kraft mill effluents but also lower the emission of odorous sulfur volatiles. (Brown-IPC)
W78-09510

COMPOSITION OF BEECH MAGNEFITE PULP BLEACHING EFFLUENT (ZLOZENIE ODPADOVYCH VOD Z BIELENIA BUKOVEJ MAGNEFITOVEJ BUNICINY),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5B.
W78-09514

ANALYSES OF PAPER MACHINE WATERS WITH ION SPECIFIC ELECTRODES. PART III. VARIOUS MEASUREMENT METHODS USING CHLORIDE ION SPECIFIC ELECTRODE,
Valmet Oy., Jyvaskyla (Finland).
For primary bibliographic entry see Field 5A.
W78-09523

THE EFFECTIVENESS OF THE INTRODUCTION OF A CIRCULATION CANAL FOR PURIFICATION OF SEWAGE WATER FROM A MILK PLANT (IN RUSSIAN),
V. F. Kurts, and N. L. Rashchuk.
Gig Sanit (5), p 94-95, 1977.

Descriptors: Ambient temperature, Microbes, Russian-SFSR, Urals, USSR, *Oxidation canals, *Waste water treatment, *Industrial wastes, *Milk plant wastes.

At the milk plant of the Tyubuskiy State Farm (Russian SFSR, USSR) an experimental circulation oxidation canal was constructed to purify plant sewage before discharge into the small Sinara River. A 4-yr. stud of the hygienic effectiveness of the canal revealed that fluctuations of the basic indices of temperature, pH, suspended substances, general N, ammonia and phosphates and BOD (biochemical O2 demand) resulted in ineffective sewage purification during certain times of the year. At temperature of -25 degrees C the equipment stopped working and efforts to warm the sewage failed to prevent its temperature from falling below 4 degrees C at which point microbial populations declined. Introduction of the system in the Southern Urals where the mean annual air temperature is less than 2.3 degrees C is considered impractical.--Copyright 1978, Biological Abstracts, Inc.
W78-09545

MICROBIAL TRANSFORMATION OF (14)C-LABELLED 2,4,6-TRINITROTOLUENE IN AN ACTIVATED-SLUDGE SYSTEM,
Army Natick Research and Development Command, MA.
D. F. Carpenter, N. G. McCormick, J. H. Cornell, and A. M. Kaplan.
Applied and Environmental Microbiology, Vol. 35, No. 5, p 949-954, 1978. 4 fig, 1 tab, 23 ref.

Descriptors: *Activated sludge, *Lipids, *Proteins, *Radioactivity, *Carbon radioisotopes, Nitrogen compounds, Distillation, Biodegradation, Metabolism, Chemical precipitation, Biomass, Infrared radiation, Gas chromatography, Polymers, Waste water treatment, Industrial wastes.

The distribution of (14)C-labelled, 2,4,6-trinitrotoluene (TNT) in an activated sludge system was measured after incubation periods of 3 and 5 days. The (14)C was concentrated in the floc fraction, with less than 0.5% of the radioactivity released in (14)CO2 produced by the sludge microorganisms. The floc fraction was further fractionated to form pellets, supernatant, carbohydrates, lipids, nucleic acids, proteins, and residues. Centrifuged floc pellets contained 50% of the radioactivity in the 3-day incubation test and 52.4% in the 5-day reactor. The lipid fractions of the 3 and 5 day samples contained 30.6% and 20.5% of the radioactivity, respectively, with lesser amounts contained in the protein fraction. The radioactivity in the fractionated lipids was not incorporated into the triglycerides or phosphatides, but remained on the gas chromatography column. Thin layer chromatography of the fractionated protein confirmed that the amino acids did not contain (14)C. The bulk of the radioactivity in the lipid and protein fractions was contained in precipitates from these fractions; the lipid and protein precipitates contained amide and ester linkages, respectively. These cross-linked polymers were attributed to the reaction of fatty acids and glycerides with TNT bioreduction products in the lipid fraction and the reaction of carboxylate groups with TNT bioconversation products in the protein fraction. (Lisk-FIRL)
W78-09553

TREATMENT OF AMMONIUM SULFATE EFFLUENTS BY REVERSE OSMOSIS,
Kuwait Univ., Dept. of Chemical Engineering.
H. I. Shaban, A. M. Akbar, and M. A. Fahim.
Journal of Environmental Sciences and Health, Vol. 13, No. 4, p 315-324, 1978. 6 fig, 5 ref.

Descriptors: *Reverse osmosis, *Ammonium compounds, *Fertilizers, *Membrane processes, *Chemical wastes, Membranes, Desalination, Permeability, Separation techniques, Osmotic pressure, Flow rates, Waste water treatment, Water purification, Industrial wastes.

Reverse osmosis recovery of ammonium sulfate for the fertilizer industry was evaluated in pilot studies with ammonium sulfate neutralizing pit effluent at concentrations ranging 0.1-1.5% by weight. The ROGA-type module used in the study contained spirally-wound sheets of cellulose-acetate membrane, manufactured by Gulf Environmental Systems. Permeate flux and desalination ratio were calculated from initial tests in which the flow was maintained at 12 liters of 0.5% effluent/hr and pressure levels were varied between 340, 360, and 470 lbs/sq inch gage. The membrane, with a 4.65 sq m surface area, was stable for 300 hrs. Osmotic pressure differential increased with increasing feed concentration, while the desalination ratio decreased. Permeate flux and desalination ratio increased as the flow rate increased; water recovery averaged 98%, indicating laminar flow conditions even with the highest flow rates. Ammonium sulfate effluent strength was reduced by 50% in the permeate flux from a single reverse osmosis nodule; brine solutions were concentrated 20-fold with respect to the initial concentration after membrane processing. (Lisk-FIRL)
W78-09554

BIOLOGICAL TREATMENT SOLUTIONS UTILIZE FLUID JET GAS/LIQUID CONTACTING AND MIXING,
M. G. Mandt.
Industrial Wastes, Vol. 24, No. 3, p 34, 37-41, May/June, 1978. 9 fig, 6 tab, 4 ref.

Descriptors: *Aeration, *Jets, *Biological treatment, *Chemical wastes, Pulp and paper industry, Chemical industry, *Pulp wastes, Activated sludge, Aerated lagoons, Biochemical oxygen demand, Mixing, Oxygen demand, Sulfite liquors, Waste water treatment, Industrial wastes.

Jet gas-liquid mixing and aeration systems were evaluated for biological treatment of chemical wastes, pulp wastes, and sulfite liquors. Jet mixing establishes a high gas-liquid interface area along which mass transfer occurs; bubble release from the inertial plume forms a rising buoyant plume which is re-entrained during mixing. A Penberthy jet aeration system installed in an organic chemical plant manufacturing isocynates reduced the average BOD load of 200 mg/liter in the primary clarified effluent by 93-96.4%, with a maximum oxygen uptake rate of 127 mg/liter/hr; suspended solids were reduced by 95.8%. A Penberthy jet aeration system installed in a coated paper and specialty pulp mill treated a combined stream of neutralized black liquors from kraft and sulfite pulping. Based on a 3 mgd deep channel design of

the Pasveer oxidation ditch, seven Penberthy directional mix headers with oxygen jets operating at 800-2,500 cu ft/min provided channel velocities of 1 ft/sec. The system consistently handled BOD load fluctuations of 3,900-11,830 lb/day, with oxygen uptake rates up to 820 lb/hr and high oxygen transfer rates. Application of a Penberthy aeration system to a 14 mgd waste stream with a BOD loading of 44 lb/1000 cu ft/day from a pulp and paper mill utilizing activated sludge treatment produced an 88% BOD removal. Four directional mix aerators, in conjunction with an Eddy mix jet aerator, provided a standard oxygenation capacity of 5.3 lb oxygen/hp/hr with adsorption efficiencies of 46-47%. (Lisk-FIRL)
W78-09555

POTENTIAL FOR WATER REUSE IN AN EGYPTIAN POULTRY PROCESSING PLANT,
Alexandria Univ. (Egypt). Higher Inst. of Public Health.
A. Hamza, S. Saad, and J. Witherow.
Journal of Food Science, Vol. 43, No. 4, p 1153-1157, 1161, 1978. 3 fig, 6 tab, 9 ref.

Descriptors: *Poultry, *Food processing industry, *Recycling, *Water reuse, *Flow profiles, Water utilization, Bacteria, E. coli, Pseudomonas, Multiple purpose, Waste water treatment, Industrial wastes.

Approximately 65% of the process water used in an Egyptian poultry processing plant may be saved through process modifications, water renovation, and multiple reuse. The poultry processing operation utilized about 412.3 cu m water/day at a rate of 31.5 liters/bird. Scalding and defeathering operations accounted for 47% of the plant's water consumption, requiring about 9.2 liters/bird of waste and fresh water to flume the feathers to a rendering area. Wastes from this area of operation averaged 217.5 kg/day COD, 165.7 kg/day BOD, and 225.6 kg/day total residue; these wastes were highly contaminated with bacteria, blood, and other residues. The final effluent from this process and bleeding, evisceration, washing, chilling, and condenser operations contained 530.0 kg/day COD, 426.8 kg/day BOD, and 609.6 kg/day total residue. Effluent bacteria counts were dominated by E. coli, Pseudomonas, and Proteus; effluent bacterial counts were directly related to counts on the poultry carcasses during the various processes. Bacterial counts on the carcasses during weighing and packaging could be reduced by less human contact during these operations. A multiple water use system instituted in the plant included recycling the second chiller water to the first chiller; reusing washing water as makeup in the scalding operation; and continuously feeding uncontaminated compressor cooling waters to the scaling tank. Modification of the evisceration process and renovating and recycling of condenser water will also reduce water usage. Magnesium and iron were the only trace metals found to exceed potable water standards in the effluents. (Lisk-FIRL)
W78-09556

PILOT PLANT TREATMENT OF MUNICIPAL AND MALTING PLANT WASTEWATERS,
North Dakota State Univ., Fargo. Coll. of Engineering and Architecture.
D. Richard, R. Haag, D. Sheth, and R. J. Hynek.
Journal Water Pollution Control Federation, Vol. 50, No. 5, p 869-874, May, 1978. 7 fig, 1 tab.

Descriptors: *Biological treatment, *Food processing industry, *Domestic wastes, *Filtration, *Pilot plants, Hydraulic design, Flowrates, Biochemical oxygen demand, Activated sludge, Trickling filters, Waste water treatment, Design criteria, Industrial wastes.

Biological treatment of combined municipal and malting industry wastes was evaluated in pilot plant studies at Moorhead, Minnesota. The existing municipal activated sludge-trickling filter treatment plant was to be expanded from a capacity of 4.5 mgd to 5.25 mgd. The pilot plant was equipped with a fixed media, rotating biological reactor which was operated at flow rates of .235, .143, and .118 cu m/sq m/day. The combined malting and domestic wastes contained 905 mg/liter total BOD, 1,340 mg/liter total COD, and 180 mg/liter total suspended solids; the organic loading of the biological reactor was maintained at 1,464 g BOD/cu m at a flow rate of .235 cu m/sq m/day. The rotating biological reactor was also tested for treatment of municipal waste alone, accommodation of varying feed rates, and treatment of high strength synthetic wastes. BOD in the combined effluent was not consistently reduced by the biological reactor system, operated at hydraulic loads of .235 cu m/sq m/day, because of the high flow and strength of the waste water. The biological reactor consistently reduced BOD in municipal wastes alone when operated at .143 cu m/sq m/day with distributed feeding. BOD in the high strength synthetic effluent was reduced by about 93% with four-point distributed feed at hydraulic loadings of .118 cu m/sq m/day. Results of the pilot study indicated that the biological shaft reactor could be operated in conjunction with the existing treatment plant at a hydraulic loading of 2.1 gpd/sq ft and an organic loading of 34.16 g/sq m on a distributed or step-feed basis. (Lisk-FIRL)
W78-09557

FATE OF AFLATOXIN B2 IN A TWO-STEP MICROBIAL RECOVERY SYSTEM FOR FOOD INDUSTRY WASTES,
Economics Lab., Inc., St. Paul, MN. Capsule Testing Labs.
K. M. Johnson, and F. F. Busta.
Journal of Food Science, Vol. 43, No. 4, p 1303-1306, 1978. 4 fig, 16 ref.

Descriptors: *Food processing industry, *Lactobacillus, *Molds, *Cultures, *Proteins, Toxicity, Chromatography, Incubation, Analytical techniques, Microbial degradation, Laboratory tests, Waste water treatment, Industrial wastes.

Single cell protein recovery from food processing wastes was evaluated by a two-step microbial recovery system using Bacillus subtilis and Lactobacillus acidophilus in the presence of hepatocarcinogenic aflatoxin B2. B. subtilis was cultured for 4 hr at 37C in a model food processing waste medium spiked with 800 ppb aflatoxin B2, followed by centrifugation, penicillin inactivation, and further incubation of the supernatant. This modified medium was then innoculated with L. acidophilis, incubated for 12 hrs, and centrifuged for single cell protein harvesting. L. acidophilis was also grown separately in a protein-starch model waste medium. Aflatoxin B2 extracted from the total, supernatant, and pellet fractions of the medium was quantified by high-pressure liquid chromatography. L. acidophilis growth in the B. subtilis hydrolized medium was 100 times greater than the growth in the unmodified medium. Mean recovery of aflatoxin B2 was 55.9% from the total medium in all tests, 62.0% from the supernatant, and 65.1% from B. subtilis pellets. The two-stage microbial recovery system did not reduce the aflatoxin B2 levels. The cells also dis not concentrate the substance, indicating that single cell protein recovery from food processing wastes could be performed in the presence of aflatoxin. (Lisk-FIRL)
W78-09558

TREATMENT OF PLATING WASTES FROM THE AUTOMOTIVE INDUSTRY,
M. J. Cullinane, Jr., and J. D. Dietz.
Industrial wastes, Vol. 24, No. 2, p 29-32, March-April, 1978. 6 fig, 3 tab.

Descriptors: *Metals, *Chemical precipitation, *Equalizing reservoirs, *Flocculation, *Chromium, Lime, Sludge disposal, Flow separation, Waste water treatment, Industrial wastes.

Water consumption reductions and waste stream separation and treatment were employed to optimize waste water treatment operations in an automotive metal plating plant. Waste streams included: oily roll-building wastes, chromium-contaminated plating and cooling tower waters, alkaline buffing wastes high in suspended solids, cooling water and steam condensate, and sanitary wastes. The projected design waste water flow rate was 200 gpm/operation from buffing, plating, and other sources after water consumption measures were installed; effluent quality standards were selected to be 8-15 mg BOD/liter, pH 7.8-8.2, 5-15 mg suspended solids/liter, 0.06-0.15 mg total chrome/liter and 5-20 mg/liter fats, grease, and oils. Chemical reduction and precipitation were selected for the industrial wastes; sanitary wastes were discharged to a municipal treatment facility. Chrome plating rinse water consumption was reduced from 400 to 60 gpm by installation of a modified countercurrent rinse system employing five rinse tanks and spray rinsing. Separated chromium wastes were treated with sulfuric acid and sulfur dioxide for hexavalent chromium reduction, followed by mixing with the total plant flow and transport to an equalization basin. The effluent was pumped to a flash mixer for lime or sulfuric acid pH adjustment to 8.0-8.5, followed by flocculation and settling in a reactor-clarifier vessel. Supernatant was returned to the head of the treatment process and sludge was pumped to a storage lagoon. (Lisk-FIRL)
W78-09559

CHARGED MEMBRANE ULTRAFILTRATION OF TOXIC METAL OXYANIONS AND CATIONS FROM SINGLE- AND MULTISALT AQUEOUS SOLUTIONS,
Kentucky Univ., Lexington. Dept. of Chemical Engineering.
D. Bhattacharyya, M. Moffitt, and R. B. Grieves.
Separation Science and Technology, Vol. 13, No. 5, p 449-463, 1978. 7 fig, 4 tab, 6 ref.

Descriptors: *Membrane processes, *Filtration, *Toxins, *Metals, *Saline water, Arsenic compounds, Cadmium, Sulfates, Separation techniques, Membranes, Ion exchange, Anions, Cations, Sodium, Waste water treatment, Industrial wastes.

Ultrafiltration by a continuous flow, negatively charged, non-cellulose membrane removed As(V), Se(IV), As(III), and Cd(II) from a single and multisalt aqueous solutions. The Millipore PSAL membrane, with a surface area of 50.3 sq cm and a resistance of 450 million Pa/cm/sec, was operated at transmembrane pressure differences of 280-560 kPa/sq m for single salt solutions bearing toxic metal concentrations of 0.5-20 mM over pH values of 5-10. Higher rejections were apparent for divalent oxyanions, As(V) and Se(IV), at pH 9 than for monovalent species at pH 5; monovalent, as well as divalent oxyanion rejection, improved with increasing transmembrane pressure differences. When sodium was employed as a counter ion at a transmembrane pressure difference of 560 kPa/sq m, the rejections of 6.0 mM single salt solutions of NaH2AsO4, NaHSeO3, and CdSO4 were 0.88, 0.85, and 0.92, respectively, at pH 5. The rejections of anionic 3.0 mM NaH2AsO4 and NaHSeO3 were 0.84 and 0.79, respectively, at pH 5 and 280 kPa/sq m transmembrane pressure. Monovalent oxyanion rejection under the same conditions but in the presence of sulfate was 0.84 for As(V) and 0.73 for Se(IV); without sulfate, rejections were 0.87 for As(V) and 0.75 for Se(IV). Rejections of multisalt solutions of As(V) and Se(IV) at pH 5 were similar to those of single salt solutions. Rejection of Se(IV) was hindered by CdSO4 and by a 24 mM sulfate concentration in a 2mM multisalt solution at pH 5. (Lisk-FIRL)
W78-09560

IMPROVED METHODS OF OIL-IN-WATER ANALYSIS,
General Motors Corp., Detroit, MI. Detroit Diesel Allison Div.
For primary bibliographic entry see Field 5A.
W78-09561

TREATING AQUEOUS EFFLUENTS OF THE PETROCHEMICAL INDUSTRY,
Shell Internationale Chemie, The Hague (Netherlands).
S. J. Nijst.
Environmental Science and Technology, Vol. 12, No. 6, p 652-656, 1978. 5 fig, 3 tab.

Descriptors: *Oil industry, *Chemical wastes, *Oil wastes, *Biological treatment, *Activated carbon, Adsorption, Filtration, Model studies, Suspended solids, Chemical oxygen demand, Biochemical oxygen demand, Capital costs, Operation and maintenance, Costs, Data collections, Waste water treatment, Industrial wastes.

A task force study of petrochemical industrial waste loads and methods of treatment, conducted by the Petrochemical/Ecology Sector Group of the European Council of Chemical Manufacturers' Federations in Brussels, Belgium, selected biological treatment as the most economical and effective treatment method available. As the properties of the petrochemical raw waste loads were similar in the plants studied to those values used by the EPA to determine United States effluent guidelines, the EPA figures on raw waste loads were used in formulating a model petrochemical complex. Biological treatment can consist of activated sludge, extended aeration, biodiscs, or trickling filters in conjunction with auxiliary systems of physical or chemical waste water conditioning, depending upon the characteristics of the raw waste load. The task force also recommended sand or multimedia filtration for suspended solids removal, followed by activated carbon adsorption to reduce residual COD. The task force opted for a BOD removal standard of 93% rather than EPA's 96%. A model petrochemical treatment plant, with an influent waste load of 975 cu m/hr, reduced COD by 78% to 468 mg/liter and BOD by 93% to 36 mg/liter with biological treatment; activated carbon requirements were calculated as 1.54 kg carbon/cu m effluent. Costs associated with the treatment system construction and operation, sewer systems, and materials were calculated. (Lisk-FIRL)
W78-09562

COLOR REMOVAL IN DRAFT MILL WASTEWATER USING RECYCLED MAGNESIUM,
Rush Engineering Services Ltd., Listowel (Ontario).
R. J. Rush, and W. K. Oldham.
Journal Water Pollution Control Federation, Vol. 50, No. 5, p 875-883, May, 1978. 14 tab, 4 ref.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Magnesium, *Lime, *Chemical precipitation, Color, Carbon dioxide, Hydrogen ion concentration, Alkalinity, Coagulation, Waste water treatment, Industrial wastes.

Color removal in kraft mill waste water using lime and recycled Mg(+2) recovered from the sludge supernatant by recarbonation was investigated in jar and batch tests. Approximately 71-95% of the initial Mg(+2) added to the system could be recovered in the supernatant by recarbonation of the sludge in the color precipitation reactor. Jar tests using lime alone demonstrated that 20,000-40,000 mg/liter Ca(OH)2 would be required to reduce the color of caustic extraction effluent by 89.9-93.1%. A 300 mg/liter dose of fresh Mg(+2), in conjunction with 2,500 mg/liter Ca(OH)2 and 2 mg/liter polymer, reduced color by 92.6%. Color removal efficiency was reduced when recycled Mg(+2) replaced fresh Mg(+2) at the same lime and polymer dose. The reduced efficiency of the recycled Mg(+2) treatment was attributed to a lower effluent pH resulting from the alkalinity of the samples. Increasing the lime dosage to 5,000 mg/liter permitted a color removal of 93.4% with 240 mg/liter recycled Mg(+2) and 60 mg/liter fresh Mg(+2). Total mill effluent color was reduced by 93.0% with lime dosage of 625 mg/liter, 48 mg/liter recycled Mg(+2), and 12 mg/liter fresh Mg(+2); these doses were selected for batch tests with total mill and caustic extract effluent. Batch tests achieved a 94.8% color reduction in caustic extraction effluent with 80% recycled Mg(+2) doses. Lime recovery was also improved by the use of recycled Mg(+2). (Lisk-FIRL)
W78-09564

LANDFILL RECYCLES WASTE PAPERMILL SLUDGE,
Ayres (Owen) and Associates, Inc., Eau Claire, WI.
D. T. Schultz.
Public Works, Vol. 109, No. 6, p 83-85, June, 1978. 1 fig.

Descriptors: *Landfills, Pulp and paper industry, *Pulp wastes, *Sludge, *Linings, Infiltration, Permeability, Clays, Fibers(Plants), Municipal wastes, Leachate, Waste water treatment, Industrial wastes.

Papermill waste water sludge was considered as liner and cap material for a new sanitary landfill in Eau Claire, Wisconsin. The former landfill, which received municipal wastes and papermill sludges generated at a rate of 200-250 wet tons/day, was closed because of unsatisfactory geologic conditions. Soil investigations of a 150-acre site selected for the new municipal landfill indicated a shortage of silt and sand for leachate attentuation. The papermill sludges, which were to be disposed of on a 33-acre site, were composed of 54% Kaolin clay and 45% paper fiber with small quantities of alum, activated silica, and polymers. Linings of the municipal landfill with the fairly impermeable papermill sludge would save an estimated $0.5 million over 7 yrs for material transport and liner construction. Full-scale and laboratory tests are currently being conducted to assess the feasibility of papermill sludge as a liner; natural clay is currently the only acceptable lining material. Studies on capping the landfill with the sludge to reduce infiltration have projected a leachate production of 1.19 million gal/yr with an impermeable cap, compared to 2.75 million gal/yr leachate produced by a landfill capped with the available on-site soils. An estimated $100,000 savings has been projected with the use of papermill sludge as a cap rather than imported natural clay; the reduction in leachate from the landfill will also reduce the transportation costs associated with leachate treatment at the waste water treatment plants. Approval of the sludge lining and cap by the Wisconsin Department of Natural Resources is pending the final results of the full-scale tests. (Lisk-FIRL)
W78-09565

THE DEGRADATION OF AN AZO DYE IN AQUEOUS SOLUTIONS BY HIGH-INTENSITY ELECTRON-BEAM IRRADIATION,
Japan Atomic Energy Research, Takasaki. Takasaki Radiation Chemistry Research Establishment.
N. Suzuki, T. Miyata, A. Sakumoto, S. Hashimoto, and W. Kawakami.
International Journal of Applied Radiation and Isotopes, Vol. 29, No. 2, p 103-108, 1978. 10 fig, 2 tab, 8 ref.

Descriptors: *Dyes, *Irradiation, *Spectrophotometry, *Absorption, *Oxygen, Color reactions, Aqueous solutions, Textiles, Salts, Acids, Waste water treatment, Municipal wastes, Analytical techniques, Degradation(Decompositon).

The degradation of Acid Red 265, and azo dye found in textile wastes, by high-intensity electron beam irradiation, was measured under variations in dye concentration, irradiation dose, solution flow rate, and oxygen bubbling rate. Solutions containing 30-240 ppm azo dye were aerated with oxygen before being introduced into the reaction vessel. The reaction vessel was equipped with five reaction cells and a resonance transformer accelerator. Oxygen flow rates during irradiation ranged 0.5-3.0 liters/min; decoloration of the dye was measured by a spectrophotometer at 542 nanometers. At an irradiation dose of 280,000 rads, 100% of the color was removed from a 60 ppm dye solution; decoloration of solutions increased linearly by about 40% with increasing irradiation dose. The oxygen and solution flow rates did not affect the degree of color removal. When nitrogen was bubbled through the solution in place of oxygen, decoloration decreased slightly. The reduction in optical density at 230 nanometers of a 60 ppm solution indicated that 0.5 liter 02/min was insufficient to destroy substituted aromatic rings. An oxygen flow rate of at least 1 liter/min was required to destroy the skeleton of the azo dye molecule. The pH of 30-240 ppm Acid Red 265 solutions decreased with increasing irradiation doses up to 50,000 rad and with oxygen bubbling rather than nitrogen bubbling. (Lisk-FIRL)
W78-09566

RESPIRATORY INHIBITION OF ACTIVATED SLUDGE BY DYES (SENRYO NI YORU KASSEIODEI NO KOKYUSOGAI),
Gifu Univ. (Japan). Dept. of Engineering.
T. Ogawa, Y. Yamada, and E. Idaka.
Seni Gakkai Shi, (Journal of the Socity of Fiber Technology, Japan), Vol. 34, No. 4, p 75-80, 1978. 5 fig, 3 tab, 13 ref.

Descriptors: *Dyes, *Toxicity, *Respiration, *Oxygen demand, *Activated sludge, Microorganisms, Textiles, Inhibition, Alkalis(Bases), Acidity, Alkalinity, Ion exchange, Biochemical oxygen demand, Waste water treatment, Industrial wastes.

The toxicity of textile dye wastes present in municipal treatment plants to microorganisms in activated sludge was evaluated by respiratory inhibition as measured by oxygen uptake rates. Activated sludge microorganisms were incubated at 37C over a 25-hr period in a glucose culture medium having 300 ppm BOD, 100 ppm mixed liquor suspended solids, and a pH of 7.5. Commercial acid, basic, disperse, and direct dyes were added to the cultures at a concentration of 250 ppm and pH 7.5 or 3.6. Basic violet 3 and 7 exhibited the highest toxicity at pH 7.5, inhibiting respiration by 68% and 45%, respectively. The greater respiratory inhibition induced by the basic dyes was alleviated by mixing basic with acid dyes. Little inhibition was evident with disperse dyes at either pH; direct dye inhibition was weaker than acid dye inhibition, which ranged from 2.0-17.0% at pH 7.5. Inhibition by direct dyes averaged 4%. Respiratory inhibition by the dyes was attributed to the ionic interaction of the microorganisms with the dyes. (Lisk-FIRL)
W78-09567

TREATMENT OF WASTEWATER CONTAINING SURFACTANTS (II) - REMOVAL OF SURFACTANTS BY COAGULATION (KAIMENKASSEIZAI GANYU HAISUI NO SHORI (DAI NI HO) - KAKUSHU KAIMENKASSEIZAI NO GYOSHI NI YORU JOKYO),
S. Honda.
Osaka Kogyogijutsu Shikensho Kiho, (Bulletin of the Government Industrial Research Institute, Osaka) Vol. 29, No. 1, p 53-59, 1978. 18 fig, 1 tab, 5 ref.

Descriptors: *Surfactants, *Coagulation, *Chemical precipitation, *Chemical wastes, *Analytical techniques, Anions, Cations, Carbon, Salts, Chemical reactions, Waste water treatment, Industrial wastes.

Aluminum sulfate coagulation of anionic, cationic, nonionic, and amphoteric surfactants was evaluated for optimum pH and in the presence of salts. Surfactants, analyzed, singularly or with co-existing ions, included laurylbetaine, lauryl trimethylammonium chloride, sodium laurylsulfonate, and polyoxyethylene octylphenolether. Following aluminum sulfate coagulation and pH adjustment of the surfactant-bearing waste water, the precipitate was filtered and the uncoagulated surfactant was measured according to the total organic carbon concentration of the filtrate. The optimum pH for coagulation ranged from 5-6; the ratio of coagulant to total organic carbon in solution was 3:10. Coagulation of anionic surfactants by aluminum sulfate removed 70-80% of the surfactants; removal of cationic, nonionic, and amphoteric surfactants by coagulation averaged less than 30%. Binary mixtures of anionic surfactants were reduced by 50-80% in the presence of a co-existing cationic, nonionic, or amphoteric surfactant. Coagulation of surfactants co-existing with salts was tested using NH4Cl, CaCl2, Na2Si03, and (NH4)2HPO4. At the appropriate pH, all co-existing salts except NH4Cl influenced coagulation. (Lisk-FIRL)
W78-09568

HYGIENIC PROBLEMS OF ENVIRONMENTAL PROTECTION FROM THE WASTES OF LIVESTOCK COMPLEXES AND POULTRY FARMS (IN RUSSIAN),
For primary bibliographic entry see Field 5G.
W78-09581

UPGRADING STABILIZATION POND EFFLUENT BY WATER HYACINTH CULTURE,
Texas Dept. of Health, Austin.
R. Dinges.
Journal Water Pollution Control Federation, Vol. 50, No. 5, May, 1978, p 833-845, 6 fig, 10 tab, 15 ref.

Descriptors: *Water pollution treatment, *Waste water treatment, Biological treatment, Oxidation lagoons, *Alage removal, Dissolved solids.

Experiments showed that controlled culture of water hyacinths, Eichhornia crassipes, in shallow basins was effective in removing algae, other suspended particles, and dissolved impurities from stabilization pond effluent. Effluent from the system was low in nitrogen and fecal coliform bacteria. Reduction of BOD5 through the plant and experimental system was 97%, total suspended solids was more than 95%, and COD was about 90%. Hyacinth tissues accumulated chloride, potassium, phosphorus, arsenic, chromium, mercury, iron, lead, nickel, zinc, copper, magnesium and manganese from the basin waters. (Chilton-ORNL)
W78-09594

STORM WATER MANAGEMENT MODEL DEVELOPED BY CIVIL ENGINEERS.
For primary bibliographic entry see Field 5B.
W78-09709

NEW FACILITY HELPS CLEAN UP BOSTON HARBOR.
Water and Sewage Works, Vol. 125, No. 4, p 62-63, April, 1978. 1 fig.

Descriptors: *Storm runoff, *Combined sewers, *Disinfection, *Pumping plants, *Screens, Floods, Storm water, Urban runoff, Pump turbines, Hydraulic equipment, Centrifugal pumps, Channels, Waste water treatment, Municipal wastes.

The $6.7 million Pollution Abatement and Flood Control Facility, constructed by the Boston, Massachusetts, Redevelopment Authority, provides screening and disinfection of storm runoff and combined waste water before discharge into Boston Harbor. The facility contains three, 48-inch, variable speed turbine pumps that are pneumtically controlled and rated at 65,000 gpm each. A 30-inch, electric motor-driven pump and the turbine pumps consist of vertica centrifuge, mixed flow, single-stage, and suction, dry pit-type units. The 1200 hp rated turbines, operated at 600 hp by Saturn turbine units, can accomodate solids up to 7 inches in diameter; the motor-driven pump can accomodate diameters up to 5 inches. The 32-ft vertical shaft speeds of the turbines are reduced to 1,000 rpm followed by a reduction to 395 rpm by Solar and Philadelphia gearboxes. During storm conditions, the electric motor-driven pump is activated when the lvel in the wet well increases to a specified height, followed by the turbines in sequential order. The pumps are equipped with manual override; the fuel oil-powered turbines are still operable in the event of a power failure. Future additions planned for the pumping plant include six detention tanks for solids settling and removal; the water is discharged through the Fort Point Channel to Boston Harbor. (Lisk-FIRL)
W78-09791

5E. Ultimate Disposal Of Wastes

RECLAMATION OF ACIDIC DREDGE SOILS WITH SEWAGE SLUDGE AND LIME AT THE CHESAPEAKE AND DELAWARE CANAL,
Cold Regions and Research and Engineering Lab., Hanover, NH.
A. J. Palazzo.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 636, Price codes: A03 in paper copy, A01 in microfiche. Special Report CRREL-SR-77-19, June 1977. 28 p, 6 fig, 9 tab, 29 ref.

Descriptors: *Soil ammendments, *Sewage sludge, *Lime, *Dredging, *Canals, Grasses, Soil treatment, Metals, Kentucky bluegrass, Fescues, Acidity, Soil chemical properties, Pyrite, Waste water disposal, Sludge disposal, Municipal wastes.

The impact of sewage sludge and lime enrichment of pyritic, acidic dredge soils from the Chesapeake and Delaware Canal was investigated in field studies examining the growth of 29 grasses on the reclaimed soils. A 17-acre area was treated with 45 tons/acre sewage sludge and 10 tons/acre lime applied to a depth of 8 inches. Soil samples at depths of 0-8, 8-16, and 16-24 inches were obtained 20 months after sewage sludge and lime application. The upper soil layer sample had higher pH, cation exchange, exchangeable Ca and Mg, organic C, and P levels when compared to untreated control areas. Total and extractable metals also increased within the 0-8 inch depth. Parameters measured in the lower strata were similar in the control area; Ca and Mg levels were elevated in the lower layer samples. Most of the Zn, Cr, Pb, and Hg was not in a plant-available form; 50% of the Ni and Cd were available to plants and extractable at a concentration of 30.2 ppm. Good growth was observed in Kentucky bluegrass, red fescue, and K-31 tall fescue; the dense groundcover growth of ryegrass hindered the growth of other perennial grasses. Of the seven plant species analyzed for mineral uptake, two types contained Ni concentrations approaching toxicity. (Lisk-FIRL)
W78-09369

USER ACCEPTANCE OF WASTEWATER SLUDGE COMPOST,
Culp/Wesner/Culp, Clean Water Consultants, El Dorado Hills, CA.
W. F. Ettlich, and A. E. Lewis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 095, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-096, August 1977.

Descriptors: *Sludge treatment, *Sludge disposal, *Surveys, *User rates, *Fertilization, *Transport, Sewage sludge, Financing, Data collections, Cities, Waste water treatment, Municipal wastes.

An investigation of consumer attitudes toward waste water sludge compost utilization and past and current distribution practices was conducted. Interviews were performed with compost users in areas which produce and distribute composted waste water sludge. Usage interviews wer conducted in Placerville, California; Colorado Springs, Colorado; Fort Worth, Texas; Washington, D. C.; Los Angeles, California; and Chicago, Illinois. Results of the interviews indicated a willingness by users to accept composted sludge providing it cost no more than current products and could be tested prior to use. Sludge transportation costs, based on data collected from the Chicago composting operations, were $2.50/cu yd sludge for 28 miles, one way, and $1.30/cu yd for 8 miles, one way. Expected user pick-up of composted sludge in the interviewed areas ranged from 75-100% of the sludge volume produced. (Lisk-FIRL)
W78-09370

STORM SEWAGE: SEPARATION AND DISPOSAL,
For primary bibliographic entry see Field 5D.
W78-09371

OCEAN BAN BUOYS SLUDGE PROCESSES.
Chemical Week, Vol. 122, No. 10, p 38, March, 1978.

Descriptors: *Sludge treatment, *Sludge disposal, *Dewatering, *Drying, *Sewage sludge, Filtration, Centrifugation, Outfall sewers, Waste water treatment, California, Municipal wastes.

The Garver-Greenfield sludge treatment process is being considered for the disposal of sludge by the Los Angeles/Orange County Metropolitan Area Commission. Other alternatives to ocean disposal of sludge, which has been banned by the Environmental Protection Agency, are: transporting sludge to the desert for drying and composting, mechanical dewatering and composting, mechanical dewatering, pyrolyzing, and ocean disposal in deeper trenches. The Garver-Greenfield process is capable of generating fuel; it requires 300 Btus to dewater 1 lb of liquid in sludge, compared to 1,600 Btus/lb of water required by an Organic Recycling recovery process. In the Garver-Greenfield process, sludge is dewatered to 20% solids content on a filter press or centrifuge and mixed with vegetable oil if the sludge will be used as a food supplement or with fuel oil if it is to be incinerated. The sludge with an oil-to-solids ratio of 10:1 undergoes evaporation in multiple-effect units and is separated into solids and oil by settling or centrifuging. More than 90% of the oil is recovered and the liquid fraction is returned to the treatment plant. A 100 ton/day Garver-Greenfield system will cost an estimated $4.5 million or $10.4 million with energy generation for producing electricity. (Lisk-FIRL)
W78-09373

SOME TESTS ON THE MEMBRANE FILTER PLATE,
Severn-Trent Water Authority, Birmingham (England).
B. R. Edmondson, and D. R. Brooks.
Water Pollution Control, Vol. 77, No. 1, p 117-137, 1978. 8 fig, 13 tab.

Descriptors: *Membrane processes, *Filtration, *Sludge treatment, *Membranes, *Drying, *Dewatering, Automation, Optimization, Sewage sludge, Separation techniques, Waste water treatment, Municipal wastes.

A full-scale membrane filter plate press, equipped with two inflatable cloth membrane plates, was tested with sludge from five treatment facilities to

valuate the increased solids output potential of embrane filter plates over conventional recess late presses. Under manual operation, the membrane filter plate, producing a 35% dry solids udge cake that was 32 mm thick, increased the utput of three of the treatment plants by 69%, 4%, and 24% for a 24-hr, 5-day/week operation. utomatic operation of the membrane filter plate creased output by 129%, 141%, and 68%. The embrane filter plate reduced the press cycle to 45 in for easily dewatered sludges and controlled e dry solids content by the squeeze time. The embrane filter plate was more adaptable to autoation, significantly increasing the output of olids. (Lisk-FIRL)
W78-09380

ENTRAL PIVOT SPRAY SYSTEM CONTROL TORM LAKE POLLUTION,
or primary bibliographic entry see Field 5D.
W78-09382

OME REMEDY HELPS FIGHT SLUDGE ULKING,
or primary bibliographic entry see Field 5D.
W78-09385

VAUSAU SOLVES DUAL PROBLEM BY USING ILTER PRESS,
echer-Hoppe Engineers, Inc., Schofield, WI.
or primary bibliographic entry see Field 5D.
W78-09387

NIQUE SLUDGE HANDLING SYSTEM HOSEN IN DUBUQUE,
Henningson, Durham, and Richardson, Omaha NE. Environmental Engineering Dept.
. T. Walker.
Water and Wastes Engineering, Vol. 15, No. 2, p 0-23, February, 1978. 1 fig, 2 tab, 7 ref.

Descriptors: *Sludge treatment, *Centrifugation, Drying, *Dewatering, *Incineration, Boilers, Sludge disposal, Anaerobic digestion, Landfills, Waste disposal, Trickling filters, Activated sludge, Waste water treatment, Municipal wastes.

A sludge treatment system combining centrifugation, thermal conditioning, vacuum filtration, incineration, and landfill disposal of ash was elected for the Dubuque, Iowa, waste water treatment facility. The system was chosen over six alternatives employing centrifugation, anaerobic igestion, thermal conditioning, vacuum filtration, ncinceration, landfill disposal or land application f sludge. Secondary sludge is expected to have a 0% solids content after vacuum filration and thermal conditioning. About 20% of the primary sludge vill receive thermal conditioning and vacuum filration followed by incineration. Although the dewatered secondary sludge will not require supplementary fuel for incineration, thermal conditioning will use 1.8 million BTU/hr of power. Waste eat operated boilers and coal-fired boilers are cing considered as alternatives to gas-fired burers. Effluent is treated by the plant with aerated rease and grit removal, primary settlement, trickng filtration, oxygen activated sludge, final larification, and chlorination. Primary sludge is acuum filtered and incinerated in a fluidized bed. econdary sludge is pumped to an aerated holding ank, certrifuged, thickened, thermally treated vith primary sludge, vacuum filtered, and inerated in a fluidized bed. The plant capacity will e 15 mgd by 1990. (Lisk-FIRL)
W78-09390

CO-DISPOSAL OF SEWAGE SLUDGE USING REFUSE-DERIVED FUEL,
Clinton Bogert Associates, Fort Lee, NJ.
I. L. Kaufman, and L. M. Grillo.
nstitute of Environmental Sciences, Technical Meeting, Proceedings, p 204-208, 1978. 4 ref.

Descriptors: *Sewage sludge, *Solid wastes, *Ultimate disposal, *Incineration, *Drying, Energy conservation, Fossil fuels, Biodegradation, Evaporation, Waste water treatment, Sludge treatment, Sludge disposa, Waste disposal, Municipal wastes.

Co-disposal of sewage sludge and refuse-derived fuel (RDF) is considered an economical means of recovering inherent energy in the waste products and reducing the need for fossil fuels. RDF from municipal solid wastes contains as estimated 6,500-7,000 BTU's/lb, compared to raw and digested sludges which have heat values of 12,000 and 10,000 BTU's/lb, repsectively. RDF as a supplementary or primary fuel source costs less than fuel oil and low sulfur coals but produces more ash after incineration of sewage sludge. Thermal disposal of sewage sludge by dewatering and incineration may employ RDF as a supplementary fuel source. RDF can assist in the incineration of sewage sludge in the middle combustion stage of multiple hearth incinerators; co-pyrolysis has also been investigated. Small modifications to the fluidized bed may be made to the allow the use of fossil fuels instead of RDF for combustion of wet sludges. Refuse incinerators may provide hot air for flash-drying sludge at 1,300F to a moisture content of 10-15%. Steam for multiple-effect sludge moisture evaporation in the Carver-Greenfield process may be generated by RDF. Sewage sludge composting with wood chips and suction aeration has been tested at the USDA Agricultural Experimental Station in Beltsville, Maryland; the use of RDF rather than wood chips or other bulking materials would eliminate the final compost-wood chip separation stage because of RDF's biodegradability. (Lisk-FIRL)
W78-09392

THE COMPARISON OF ACTIVATED AND DIGESTED SLUDGE APPLIED TO FLOWERING CHINESE CABBAGE, BRASSICA PARACHINESIS BAILEY,
Chinese Univ. of Hong Kong. Dept. of Biology.
M. H. Wong, and S. W. Yip.
Journal of Environmental Sciences and Health, Vol. A13, No. 3 p, 241-251, 1978. 1 fig, 3 tab, 22 ref.

Descriptors: *Activated sludge, *Sludge digestion, *Vegetable crops, *Heavy metals, *Growth rates, Crop response, Analytical techniques, Soil amendments, Plant growth regulators, Plant tissues, Sludge disposal, Municipal wastes.

Flowering white Chinese cabbage (Brassica parachinensis) was cultivated in activated sludge and digested sludge mixed with garden soil and in garden soil alone. The cabbage seedlings, averaging 2 cm in height, were grown under sludge-to-sandy clay loam ratios of 1:500 and 2:500 dry weight; pH was mantained at 7 by liming. Heavy metal contents in the garden soil and amended soils were measured with atomic absorption spectrophotometry after one week; heavy metal uptake by plant tissues was measured at the end of the growing period. The flowering cabbage exhibited the highest growth rate in the 1:500 activated sludge-soil mixture, reaching a total dry weight after harvesting of 50 g. Plants grown in soil amended with digested sludge achieved a total dry weight growth of 40 g. Higher additions of digested sludge activated sludge did not enhance cabbage growth. At the 1:500 sludge-soil ratio, the edible portion of the plant tissues contained significant levels of Cd, Mn, and Mg when cultivated with activated sludge and high levels of Cd, Mn, and Mg when grown with digested sludge. Plant grown at the 2:500 sludge-to-soil ratio had significant levels of Cd, Cr, Cu, Pb, Mn, and Mg after activated sludge amendements, and significant concentrations of Cd, Pb, Mn, and Mg with digested sludge addition. Although the plants did not exhibit symptoms of heavy metal toxicity, the significant heavy metal uptake by the plants grown with higher ratios of sludge was considered the reason for lower growth. (Lisk-FIRL)
W78-09394

RECLAIMED SEWAGE WATER: A HYDROPONIC GROWTH MEDIUM FOR PLANTS,
California Univ., Los Angeles.
A. Wallace, P. M. Patel, W. L. Berry, and O. R. Lunt.
Resource Recovery and Conservation, Vol. 3, No. 2, p 191-199, May, 1978. 1 fig, 6 tab, 7 ref.

Descriptors: *Crop response, *Hydroponics, *Sewage treatment, *Soil-water-plant relationships, Plant growth regulators, Iron, Trace elements, Nutrient requirements, Greenhouses, Ultimate disposal, Waste water treatment, Municipal wastes, Tomatoes, Lettuce.

Greenhouse crops of chrysanthemum, tomato, egg plant, bell pepper, and lettuce plants were sustained by a hydroponic growth medium of secondary effluent waste water when insoluble iron oxide was applied to the plant roots during transplanting. The test plants were grown hydroponically for 7 weeks in processed and chlorinated-dechlorinated municipal waste water. Plants grown only in the sewage water were iron deficient; tests groups received foliar applications of 4 g/liter iron sulfate or direct root addition of 2-4 g/plant of insoluble iron oxide. The latter treatment produced growth equivalent to plants grown in complete nutrient solutions. An adequate supply of the major nutrients was available to the plants in the waste water; manganese was near the deficiency level in some test plants. Root retention of heavy metals did not cause toxicity to the plant or present a consumer health hazard potential. Acidification of the hydroponic media to pH 7.8, 6.5, 6.0, and 5.0 with sulfuric acid demonstrated that chrysanthemums and tomatoes overcame the iron deficiency problem at pH 5-6; lettuce growth was reduced at pH 5. Acidification increased the trace metal contents in the plants. Results of tests on mature crop response to waste water were comparable to those of greenhouse tests. Flow-through water from the mature crops was used to grow a cucumber crop in the greenhouse study. A two- to six-fold reduction in waste water trace metal concentrations by the mature plants was apparent; it was suggested that this higher quality water could be used for crop irrigation or algae production for cattle feed. (Lisk-FIRL)
W78-09395

LAND TREATMENT: PRESENT STATUS, FUTURE PROSPECTS,
Metcalf and Eddy, Inc., Palo Alto, CA.
C. E. Pound, R. W. Crites, and S. C. Reed.
Civil Engineering-ASCE, Vol. 48, No. 6, p 98-102, June, 1978. 2 tab.

Descriptors: *Ultimate disposal, *Waste water treatment, *Irrigated land, *Soil amendments, *Land reclamation, Infiltration, Percolation, Crops, Operation and maintenance, Cost analysis, Energy conservation, Municipal wastes, Nutrient removal.

Land treatment of municipal waste water is recommended as a cost-effective method of fulfilling the pollution abatement and grant guidelines established by the 1977 Clean Water Act. The Act increased the construction grants to 85% for innovative forms of waste water treatment; an additional 15% of life-cycle costs for these treatment methods is considered competitive with alternative conventional processes. The Clean Water Act encourages energy saving processes; land application conserves about 38,000 kilowatt hrs more annually than an advanced waste water treatment plant. It also supplies nutrients and water to soils and crops. Although capital costs, which are partially funded by the Act, are similar for a 25 mgd advanced treatment plant and a comparable land treatment system, non-fundable operation and maintenance costs are about $2 million/yr more for

advanced treatment than land applications. Operation and maintenance costs of land treatment have been offset by 8-128% in established systems where crops are grown with the waste water applications. Land treatment, such as slow rate irrigation, rapid infiltration, and overland flow, does not produce sludge which requires further treatment. (Lisk-FIRL)
W78-09396

FEED YOUR PLANT LIQUID FERTILIZER,
Bryant-Curington, Inc., Austin, TX.
For primary bibliographic entry see Field 5D.
W78-09401

DESIGN OF DRYING BEDS FOR SURPLUS ACTIVATED SLUDGE,
For primary bibliographic entry see Field 5D.
W78-09410

APPLICATION OF DIGESTED SLUDGE FOR IMPROVING ERODED SOIL CAUSED BY SO2,
Chinese Univ. of Hong Kong. Dept. of Biology.
M. H. Wong, and S. W. Yip.
Journal of Environmental Sciences and Health, Vol. A13, No. 1, p 23-31, 1978. 4 tab, 15 ref.

Descriptors: *Erosion, *Crop response, *Sulfur compounds, *Sewage sludge, *Growth rates, Grasses, Fertilization, Nutrients, Potassium, Phosphorus, Carbon, Red podzolic soils, Yellow podzolic soils, Zinc, Waste water treatment, Sludge disposal, Municipal wastes

Soils degraded by SO2 emissions from an acid manufacturing plant were conditioned with digested sewage sludge and planted with Agropyron smithii and Buchole dactyloides in a greenhouse trial test. The grasses were grown in: untreated SO2-degraded red-yellow podzol soil; degraded soil treated with 0.5, 1.0, and 1.5 cm digested sludge; and garden soil. The digested sludge had 29.02% organic carbon, 1.96 ppm phosphorus, 41 ppm exchangeable potassium, and a pH of 6.68; the eroded soil contained 1.30% organic carbon, 0.02 ppm phosphorus, and 2.4 ppm exchangeable potassium and had a pH of 4.7. A. smithii and B. dactyloides were grown for 80 days and then harvested. A. smithii cultivated in SO2-degraded soil with sludge applications of 0.5, 1.0, and 1.5 cm grew to heights of roughly 12.55, 15.17, and 17.77 cm/pot, respectively; the untreated SO2-degraded soil and the garden soil yielded growth of 2.12 and 38.25 cm/pot, respectively. B. dactyloides had heights of about 4.76, 9.07, and 14.50 cm/pot in the sludge amended soil, heights of 1.50 and 25.65 cm/pot were attained in the untreated soil and the garden soil, respectively. Grasses grown in the digested sludge treated soil were immature in comparison with the garden soil grown plants, but demonstrated improved growth over those grown in the untreated SO2-degraded sludge. Extractable zinc levels in the sludge were in excess of English agricultural standards. (Lisk-FIRL)
W78-09420

THE EFFECTS OF MADISON METROPOLITAN WASTEWATER EFFLUENT ON WATER QUALITY IN BADFISH CREEK, YAHARA AND ROCK RIVERS,
Texas Univ., Dallas.
For primary bibliographic entry see Field 5C.
W78-09422

REUSE, ENERGY, SLUDGE: IN WHAT DIRECTION ARE WE GOING,
For primary bibliographic entry see Field 5D
W78-09423

GROWTH AND METAL UPTAKE ON SNAP BEANS GROWN ON SEWAGE SLUDGE-AMENDED SOIL: A FOUR-YEAR STUDY,
Agricultural Research Service, St. Paul, MN.
R. H. Dowdy, W. E. Larson, J. M. Titrud, and J. J. Latterell.
Journal of Environmental Quality, Vol. 7, No. 2, p 252-257, April-June, 1978. 7 fig, 3 tab, 18 ref.

Descriptors: *Beans, *Soil amendements, *Sewage sludge, *Trace elements, *Vegetable crops, Heavy metals, Copper, Zinc, Cadmium, Sands, Soils, Waste water treatment, Anaerobic digestion, Sludge disposal, Municipal wastes.

A four-year study evaluated the trace metal uptake by snap beans (Phaseolus vulgaris) grown in sandy Udorthentic Haploboroll soil amended with anaerobically-digested sludge at total application rates of 350, 700, 1,400 metric tons/ha. Subsequent crops received a single sludge application of 112, 225, or 450 metric tons/ha. Sludge application increased soil pH from 5.3 to a maximum of 6.5; crop yields increased with sludge amendements and often surpassed yields of commercially fertilized control plants. Zn and Cr concentrations in the bean tissue increased with sludge application. An continued to accumulate after the second application and stabilized after the third and fourth applications; Cu uptake levelled off after the initial sludge application. While these concentrations stabilized in the tissue, they did not decrease after sludge treatment was terminated. The concentration of Cd in edible bean tissue never exceeded 0.09 micrograms/g, regardless of the sludge application rate or schedule. Zn and Cu concentrations also increased in the leaf portion of the plants after sludge application. (Lisk-FIRL)
W78-09439

ASSESSMENT AND SIGNIFICANCE OF SEDIMENT-ASSOCIATED OIL AND GREASE IN AQUATIC ENVIRONMENTS,
Naval Biosciences Lab., Oakland, CA.
L. H. DiSalvo, H. E. Guard, N. D. Hirsch, and J. Ng.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A050 044, Price codes: A08 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-26, November 1977. 148 p, 35 tab, 8 fig, 1 append, 173 ref.

Descriptors: *Aquatic environments, *Oil, *Wastes, Sediments, *Bibliographies, *Dredged material disposal, *Greases, Reviews.

A review of the literature suggests that the term 'oil and grease', as used in descriptive and regulatory context for dredged material disposal, is a broadly based term defined by the methodology used in its determination. Oil and grease contains numerous natural and petroleum derived hydrocarbons, plus fats, oil, and waxes of both natural and anthropogenic origin. Also included in oil and grease are trace quantities of fat-soluble materials such as DDT and PCB. Elemental sulfur is a contaminant often included in oil and grease determinations by virtue of its solubility in some organic solvents. Experimental studies using dredged material contaminated with oil and grease show low toxicity for mussels, clams, crabs, and snails. Minor uptake of hydrocarbons into organism tissues occurred, compared with levels of contaminants in the dredged material tested. In test periods lasting up to 30 days, very little biodegradation of oily residues occurred, suggesting the oil and grease value to be of little use in the prediction of BOD loading. Evaluation of the standard elutriate test with regard to oil and grease suggested this test to be of little value as the small amounts of oil released from the sediments were rapidly absorbed to the walls of the test vessels. (WES)
W78-09468

FIELD STUDY OF THE EFFECTS OF STORMS ON THE STABILITY AND FATE OF DREDGED MATERIAL IN SUBAQUEOUS DISPOSAL AREAS,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
H. J. Bokuniewicz.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-22, November 1977. 87 p, 32 fig, 1 append, 2 tab, 2 ref.

Descriptors: *Estuaries, *Storms, On-site investigations, Sediments, New York, *Long Island Sound(NY), *Dredged material disposal, *Waste disposal sites, *Subaqueous disposal areas.

Long Island Sound is a large estuary. Dredged sediment placed on the bottom of the Sound is subject to dispersion by the tidal stream, estuarine circulaton, waves, and disturbances of the hydraulic flow field by storms. Repeated bathymetric surveys of a deposit of dredged material at the New Haven disposal site show that after initial self-consolidation of the mound, no significant changes in pile configuration occurred over a three-year period; erosion of the deposit is not detected. The data obtained show that to best contain silt-clay dredged material, the disposal site should be on a naturally accreting mud bottom, the disposal operation should emplace a large volume of material on the site expeditiously, and the deposit should be built to an optimum configuration. The capacity of the disposal site is limited by the maximum height of the disposal mound and the maximum slope of the pile sides which present minimum disturbance of the natural hydraulic regime. The capacity of the New Haven site is estimated to be up to 1.7 x 10 to the 6th power yd3 of unarmored, silty, dredged material. Larger volumes may be contained if the surface of the deposit is armored with coarser material. (WES)
W78-09471

AN ASSESSMENT OF PROBLEMS ASSOCIATED WITH EVALUATING THE PHYSICAL, CHEMICAL AND BIOLOGICAL IMPACTS OF DISCHARGING FILL MATERIAL,
Oklahoma Univ., Normal. School of Civil Engineering and Environmental Science.
L. W. Canter.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A05 519, Price codes: A11 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-29, December 1977. 236 p, 7 append, 36 tab, 83 ref, 3 fig.

Descriptors: *Dredged material, *Environmental effects, Evaluation, *Chemicals, *Biological impact, *Fill materials, Waste disposal.

Fill materials can be natural (soil, rock, or sand) or man-altered (dredged material, solid wastes, or residues), with projects involving usage including property protection, causeway/roadfills, and site development. Potential environmental impacts are regulated by permits based on Section 404 of PL 92-500. This study focused on problems associated with evaluating environmental changes resulting from fill material discharges. A weighted-ranking technique was used to establish priorities of permitting (administrative) concerns and technical deficiencies. A literature survey was conducted to determine technical deficiencies. Potential physical impacts found include changes in infiltration and flow regimes, destruction/alternation of natural or man-made habitats, and creation of habitat. Chemical impacts were found to result from the release of suspended solids, organics, nutrients and toxic substances. Biological impacts range from physical barriers to fish migration to complete 'smothering' of entire wetland areas. The effects of leachates on aquatic biota were found to be complex and diverse, ranging from non measurable changes to acute toxicity. (WES)
W78-09472

FIELD STUDY TO DETERMINE THE FEASIBILITY OF ELECTRO-OSMOTIC DEWATERING OF DREDGED MATERIAL,
Army Engineer District, Mobile, AL.
C. E. O'Bannon.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A048 666, Price codes: A04 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper D-77-2, November 1977. 65 p, 9 tab, 22 fig, 11 ref.

Descriptors: *Dewatering, *Electro-osmosis, On-site investigations, Waste treatment, *Dredged material, Waste disposa sites.

Removing water from in-place dredged material would increase the capacity of disposal sites for deposition of additional material and a variety of other purposes. To accomplish dewatering of in-place dredged material economically and within a reasonable period of time, research was conducted to determine the feasibility of using electro-osmosis. The process of electro-osmosis is used in soil stabilization work and entails passing low-level electrical energy through soil. Water associated with positive ions in a solution migrates to a negative electrode and is there removed from the soil mass. The test site was divided into four sections, each contaning a single cathode discharge well and two anodes. Coke-breeze with electrode inserts was used for anodes and cathodes in two of the sections and slotted steel casings with steel rods, pipes, or rails were used in the other two sections. Electrode spacing was 6.1 and 12.2 m. The section consisting of railroad rail and slotted steel pipe electrodes on the 6.1-m spacing was the most efficient. However, the cost per cubic meter of water removed for this best section was $21.20. Coke-breeze anodes and chlorine resistant electrodes and slotted steel pipe cathodes are recommended for future implementation. (WES)
W78-09473

FEASIBILITY OF PINTO ISLAND AS A LONG-TERM DREDGED MATERIAL DISPOSAL SITE,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
T. A. Haliburton, P. A. Douglas, and J. Fowler.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A050 331, Price codes: A04 in paper copy, A01 in microfiche. Miscellaneous Paper D-77-3, December 1977. 53 p, 2 tab, 1 append, 11 fig.

Descriptors: *Feasibility studies, *Alabama, *Dredged material disposal, *Pinto Island(Ala), *Waste disposal sites.

This study was a cooperative effort by the U. S. Army Engineer District, Mobile (MDO) and the U.S. Army Engineer Waterways Experiment Station (WES) to illustrate application of technology developed by the Dredged Material Research Program (DMRP), administered by WES, in solution of field element problems. The study sought to determine if a site on Pinto Island, near Mobile, Alabama, could be used as a long-term disposal facility to contain maintenance dredging material from the Mobile River. Survey data, foundation characterization, and background data were provided by MDO, while evaluation and assessment were conducted by WES. Using DMRP-developed concepts, plans were developed for optimum use of the site, including details of sequential construction, dredged material dewatering, and productive use of dewatered dredged material. Two alternate disposal area configurations to provide adequate capcity through the year 2007 and through the year 2019 are proposed for consideration by MDO. For each alternative, total costs of disposal area construction, operation, and maintenance are estimated to be approximately $0.40 per cubic yard of storage capacity. Appendix A presents a preliminary design for the Pinto Pass dikes. (WES)
W78-09474

AN EVALUATION OF PROGRESSIVE TRENCHING AS A TECHNIQUE FOR DEWATERING FINE-GRAINED DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
M. R. Palermo.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 687, Price codes: A09 in paper copy, A01 in microfiche. Miscellaneous Paper D-77-4, December 1977. 174 p, 5 append, 61 fig, 39 pl, 9 tab, 30 ref.

Descriptors: *Dewatering, *Dredging, *Surface drainage, Consolidation, *Alabama, *Trenching, *Dredged material, *Polecat Bay(Ala), Riverine utility craft, Waste disposal site, Fine grained soils.

The results of a study conducted within a confined disposal area concerning the effects of progressive trenching on dredged material dewatering and drying are documented. The study consisted of an initial field and laboratory testing program, construction of a surface drainage system within the disposal area using a progressive trenching approach, evaluation of trenching equipment, and a field instrumentation and monitoring program. Effects of the progressive trenching efforts were evaluated by monitoring dredged material surface elevations and dredged material groundwater elevations within the study area. Field data indicated that the surface drainage system was effective in lowering the dredged material groundwater table. An average surface settlement of approximately 0.75 ft was achieved throughout the study area. Economic evaluations indicated that progressive trenching operations were economically feasible with both comparatively low unit and favorable benefit/cost ratio. (WES)
W78-09476

AQUATIC DISPOSAL FIELD INVESTIGATION, GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE; APPENDIX A: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF SEDIMENTATION,
Moody Coll. of Marine Sciences and Maritime Research, Galveston, TX. Dept. of Marine Sciences.
E. L. Estes, and R. J. Scrudato.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-20, December 1977. 155 p, 1 append, 11 tab, 78 fig, 24 ref.

Descriptors: *Water quality, *Sedimentation, *Gulf of Mexico, On site investigation, Texas, Sediments, *Galveston Bay, *Dredged material disposal, *Hydraulic regimen, Waste disposal sites.

The results are presented of a multifaceted investigation of the geological processes of deposition, erosion, and transport of dredged material within the area of Galveston offshore Dredged Material Disposal Site (DMDS) during the period 6 March 1975-20 November 1976. This study involved two major phases: a pilot study designed to rapidly survey the DMDS and environs, and an experimental study to delineate natural changes in the physical and geological characteristics of the study area after disposal had occurred. The latter study involved the monitoring of dredged material disposal at selected locations to determine the physical-geological processes active. Control sites were also monitored for comparison. Hydrographic data were collected to delineate current and wave effects within the DMDS, and flume experiments were conducted to determine the hydrodynamic characteristics of dredged material placed in the area. Available data indicate that dredged material has been eroded from the shallow water portion of the DMDS and has been transported in a downcoast-offshore direction; little erosion was noted in the deeper, offshore disposal sites. (See also W78-09483) (WES)
W78-09482

AQUATIC DISPOSAL FIELD INVESTIGATION, GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE; APPENDIX B: INVESTIGATION OF WATER-QUALITY PARAMETERS AND PHYSICOCHEMICAL PARAMETERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
G. F. Lee.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-20, December 1977. 155 tab, 435 p, 51 fig, 55 ref.

Descriptors: Aquatic environment, Environmental effects, Water quality, *Gulf of Mexico, Sediments, Dredging, Texas, *Galveston Bay(Tex), *Dredged material disposal, Physicochemical parameters, Waste disposal sites.

A study has been conducted on the environmental impact of the chemical contaminants present in dredged sediments which were dumped at a site in the Gulf of Mexico approximately five miles offshore of Galveston, Texas. Sediments from the Galveston Bay Entrance Channel and the Texas City Channel Turning Basin were dredged with a hopper dredge and dumped at the offshore disposal site. A series of pre-disposal surveys was conducted to establish background data on the characteristics of the disposal site water column and sediments. Nine dumps of dredged sediments were monitored, with sampling sites generally located 100 to 200 meters downcurrent from the dump sites. Postdisposal surveys were conducted to determine if the chemical contaminants present in the disposed sediments had residual effects on the water quality. The heavy metals, copper, cadmium, mercury, lead, nickel, zinc, chromium, iron, manganese, and arsenic; aquatic plant nutrients, such as nitrogen and phosphorus compounds; toxicants; and other parameters, such as oxygen demand and sulfide were monitored before, during and after disposal. (See also W78-09482) (WES)
W78-09483

AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; APPENDIX A: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF BOTTOM SEDIMENTATION,
Washington Univ., Seattle. Dept. of Oceanography.
R. W. Sternberg, J. S. Creager, W. Glassley, and J. Johnson.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-30, December 1977. 400 p 69 ref, 133 fig, 2 pl, 2 append.

Descriptors: *Bottom sediments, On-site investigations, Sedimentation, Oregon, *Columbia River(Ore), *Hydraulic regimen, *Dredged material disposal, Waste disposal sites.

A two-part study was conducted in a region seaward of the Columbia River where disposal of large quantities of dredged material has occurred over the last several decades. The first part included repeated bathymetric surveys and sampling for distribution and seasonal variations of sediment texture and mineralogy throughout the study area, and especially at designated disposal sites. Near-bottom hydraulic conditions (waves, tides, currents, turbidity) were also measured at several sites and during all seasons. The second part was related to an experiment in which 600,000 cu yd of material dredged from the Columbia River estuary were dumped at a specially designated site, which was monitored before, during, and after disposal. The objectives of the sedimentological aspects of the study were to identify and map all deposits of dredged material and to recognize seasonal and long-term changes. The objectives of the hydraulic aspects were to document the ambient near-bot-

tom conditions, and their effect on the deposit at the experimental site. The coherent and complementary nature of the results emphasizes the value of combining both descriptive sedimentological techniques and measurements of oceanic processes for monitoring and predicting the fate of dredged material. (WES)
W78-09484

AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX C: EFFECTS OF DREDGED MATERIAL DISPOSAL ON THE CONCENTRATION OF MERCURY AND CHROMIUM IN SEVERAL SPECIES OF MARINE ANIMALS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
F. M. Teeny, and A. S. Hall.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-24, November 1977. 22 p, 8 tab, 22 ref.

Descriptors: *Chromium, Marine animals, *Mercury, Aquatic environment, *Environmental effects, Washington, Duwamish Waterway(Wash), *Puget Sound(Wash), *Dredged material disposal, Waste disposal sites.

Specimens of five species of marine organisms indigenous to Puget Sound were collected over a period of nine months for mercury and chromium analysis. The specimens were collected from two environmentally similar sites in Elliott Bay, the disposal site for 'polluted' dredged material from the Duwamish Waterway and a reference or control site. Mercury and chromium concentrations in English sole (Parophrys vetulus), Alaska and Oregon pink shrimp (Pandalus borealis and P. jordani), spot shrimp (Pandalus platyceros), sea cucumber (Parastichopus californicus), and mussel (Mytilus edulis) were not significantly different between the two sites. In all samples, the levels of mercury and chromium were low and did not exceed 0.10 ppm for mercury and 0.91 ppm for chromium. These data suggest that the disposal operation had no apparent effect upon the mercury and chromium concentrations in the five species of organisms studied. (WES)
W78-09485

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX B: WATER-QUALITY PARAMETERS AND PHYSICOCHEMICAL SEDIMENT PARAMETERS.
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-6, January 1978. 329 p, 2 append, 94 ref, 113 fig, 18 tab.

Descriptors: Water quality, Aquatic environment, *Sediments, *Waste disposal, On site investigations, New York, *Eaton's Neck(NY), *Long Island Sound(NY), *Sediment sampling, Waste disposal sites.

Seven oceanographic cruises and three sediment coring cruises, which took place between October 30, 1974, and May 29, 1975, were conducted in western Long Island Sound to assess the baseline water column and sediment properties near the Eatons Neck disposal site. The following points summarize our main findings: (1) Seasonal spatial distributions of NH4+ and NO3- show that both the East River as well as the lateral embayments are important nitrogen sources to the western portion of Long Island Sound. (2) Increased water column stability coincided with increased chlorophyll a concentration. (3) Seasonal depth and water column averages of NH4+ and NO3- showed nitrogen depletion in the surface layer. (4) Observed seasonal concentrations of NO3- were similar to those measured by Gordon Riley (1955), but higher concentrations occurred later in the year, as did the phytoplankton bloom. (5) Observed PO43- concentrations were seasonally elevated over those determined by Gordon Riley (1955) by about 1 micrometer. (See also W78-02782 thru W78-02785 and W78-09487) (WES)
W78-09486

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE. LONG ISLAND SOUND; APPENDIX C: PREDISPOSAL BASELINE CONDITIONS OF BENTHIC ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
D. K. Serafy, D. J. Hartzband, and M. Bowen.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-6, November 1977. 238 p, 11 tab, 4 append, 11 fig, 96 ref.

Descriptors: *Benthos, *Marine animals, On-site investigations, New York, *Eaton's Neck(NY), *Long Island Sound(NY), *Dredged material, *Waste disposal sites.

A baseline survey of macrobenthic and meiobenthic assemblages inhabiting the Eatons Neck Disposal Site and immediate vicinity of western Long Island Sound was conducted from October 1974 through June 1975. The data were used to describe the benthic assemblages of a disposal site that had received dredged material and other substances for a period of about 71 years, 1902 to 1973. No dumping had taken place at the site for about one year prior to collection of the baseline data. The mud assemblage generally had lower species diversity, biomass, and density of macroinvertebrates than the two sand assemblages. Deposit feeders were typically the most abundant species in all assemblages. Temporal changes occurred in benthic species composition and abundance. The meiobenthos was dominated by nematodes and harpacticoid copepods. (See also W78-02782 thru W78-02785 and W78-09486) (WES)
W78-09487

DEWATERING AND DISPOSAL OF BIOLOGICAL SLUDGE (ENTWAESSERUNG UND BESEITIGUNG VON BIOLOGISCHEM SCHLAMM),
Hannoversche Papierfabriken Alfeld (West Germany).
M. Hottmann.
Das Papier, Vol 31, No 10A, p V98-V101, V104-V108, November, 1977. 1 tab. English summary.

Descriptors: *Sludge treatment, *Sludge disposal, *Pulp wastes, *Biological treatment, Wastes, Industrial wastes, Water pollution sources, Sludge, Solid wastes, Dewatering, Recycling, Pulp and paper industry, Disposal, Waste disposal, Ultimate disposal, Oxidation.

Treatment and disposal of sludge resulting from paper-mill effluents are just as important as effluent purification itself. Biological sludges are harder to handle than mechanical-chemical sludges, but satisfactory dewatering is possible with adequate machines and proper conditions. The main problem is disposal of the sludge. Recycling into the production line or as a raw material for new products are possibilities in some plants, but usually it has been dumped. Antipollution standards and regulations are making this more difficult. New disposal methods must be found. High-pressure wet oxidation may make recycling of fillers possible. (Ward-IPC)
W78-09503

REUSE OF ASH FROM EFFLUENT SLUDGES (WIEDERVERWENDUNG DER ASCHE VON ABWASSERSCHLAEMMEN),
Technische Hochschule, Darmstadt (West Germany). Inst. fur Papierfabrikation.
L. Gottsching, G. Hennings, and H.-L. Dalpke.
Wochenblatt fur Papierfabrikation, Vol. 105, No. 23/24, p 953-960, December 15, 1977. 10 fig, 1 illus, 34 ref, 1 tab. English summary.

Descriptors: *Pulp wastes, *Sludge disposal, Sludge treatment, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Clays, Titanium, Calcium carbonate, Color, Pigments, Solid wastes, Abrasion, Reflectance, Sludge, Kaolin, Titanium dioxide, Ash, Talc, Blanc fixe.

Sludges from paper mill effluents contain appreciable amounts of fillers and clays which might possibly be recovered and reused. Laboratory tests involving industrial conditions of sludge combustion (800-1000 C) show that kaolin is irreversibly altered, precluding reuse after such recovery. Titanium dioxide is not altered, but is not readily separable. Ash rich in titanium might be used to replace ilmenite for producing titanium pigment. Laboratory tests involving wet oxidation at 275C and about 200-300 atmospheres pressure did not change reflectance, color, or abrasiveness of kaolin, coating clay, calcium carbonate, blanc fixe, or talc. Ash so recovered might possibly be reused as filler or paper coating pigment. (Ward-IPC)
W78-09515

TREATMENT OF PLATING WASTES FROM THE AUTOMOTIVE INDUSTRY,
For primary bibliographic entry see Field 5D.
W78-09559

LANDFILL RECYCLES WASTE PAPERMILL SLUDGE,
Ayres (Owen) and Associates, Inc., Eau Claire, WI.
For primary bibliographic entry see Field 5D.
W78-09565

A PRELIMINARY ASSESSMENT OF THE EFFECTS OF SUBSURFACE SEWAGE SLUDGE DISPOSAL ON GROUNDWATER QUALITY,
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Program.
For primary bibliographic entry see Field 5C.
W78-09572

HEAVY METALS CONTAINED IN RUNOFF FROM LAND RECEIVING WASTES,
Minnesota Agricultural Experiment Station, St. Paul.
For primary bibliographic entry see Field 5B.
W78-09573

THE DISPOSAL OF RADIOACTIVE WASTE IN ICE SHEETS,
K. Philbreth.
In: Symposium on Applied Glaciology; Proceedings of the Fourth Symposium on Glaciology, Cambridge (England), September 13-17, 1976. Journal of Glaciology, Vol. 19, No. 81, p 607-617, 1977. 3 fig, 34 ref.

Descriptors: *Radioactive waste disposal, *Antarctic, *Arctic, *Ice, Waste disposal, Waste storage, Radioactive wastes, Strontium, Cesium, Radioisotopes, Climates, Safety, Temperature, Mathematical models, Melting, *Greenland, Ice sheets, Isotope half life.

The waste containers should be retrievable for a few centuries until further research has solved all problems and 90Sr and 137Cs have decayed to less than 0.1%. Safe and fairly cheap retrievability can be guaranteed without container mooring. The paper presented an example: The high-level waste of the whole world for the next 30 years could be put into 3 x 10 to the 7th power spherical containers with 0.2 m radius and disposed of in an area

with 15 km radius and a depth range of 20-100 m under the surface of either the Antarctic or the Greenland ice sheet. The deposit does not affect the stability of the sheet. Even the most upsetting natural ice-sheet instabilities and/or climatic changes could not cause radioactive contamination. (See also W78-09603) (Humphreys-ISWS)
W78-09647

PREDICTING SOLUTE TRANSPORT IN SUBSURFACE WATERS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-09752

5F. Water Treatment and Quality Alteration

CHEMICAL AND PHYSICAL QUALITY OF SELECTED PUBLIC WATER SUPPLIES IN FLORIDA, AUGUST-SEPTEMBER 1976,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-09320

FILTERING SYSTEM FOR FISH-FARMING WATER,
Y. Kato.
U.S. Patent No. 4,067,809, 14 p, 19 fig, 10 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 2, p 669, January 10, 1978.

Descriptors: *Patents, *Fish farming, Aquiculture, Filters, *Filtration, Equipment, Water quality control, Aerobic bacteria, Aerobic conditions, Oxygen, *Water treatment.

A filtering system is disclosed for effectively filtering the water of aquariums for tropical or saltwater fish, the water of fish-farming ponds, and/or any other type of fish-farming water. The system comprises the partitioning of a filtration tank into a storage chamber and a filtration chamber and the provision within the filtration chamber of filters and vacancies which allow the water to pass through. An open space is provided above the filters and vacancies, and the water level of the storage chamber is maintained lower than the top of the filters within the filtration chamber. When the fish-farming water is supplied into the storage chamber via a lift pipe, droppings, leftover feed, and other dirt is allowed to enter but simultaneously oxygen from the atmosphere is admixed so as to prevent the inside from becoming anaerobic and to enhance the propagation of aerobic bacteria. Thus, the water in the storage tank is pre-purified by the deposition of activated sludge formed by means of the decomposition of the dirt by the aerobic bacteria. At the same time, dirt coming into the filtration chamber is controlled so as to reduce the causes for clogging. In the filtration chamber, a filter film of aerobic bacteria and activated sludge is formed upon the surfaces of the filters and effectively purifies the water passing through. The discharge chamber is equipped with a discharge pipe which has an opening directed along the surface of the water, and in this manner, the fish-farming water is purified in the storage chamber, further purified in the filtration chamber and discharged to uniformly circulated. (Sinha-OEIS)
W78-09427

METHOD OF DESTROYING PYROGENS,
American Sterilizer Co., Erie, PA. (Assignee).
D. A. Gunther.
U.S. Patent No. 4,069,153, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 3, p 1115, January 17, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Ultraviolet radiation, Filtration, Potable water, Viruses, Bacteria, *Pyrogens.

Pyrogens refer to microbial endotoxins capable of producing fever in mammals and are metabolic products of certain microorganisms chemically classified as lipopolysaccharides. Given a supply of suitable water, the disclosed system provides a totally safe system utilizing submicron filtration to remove bacteria, utilizes an intense source of high energy ultraviolet light in a specially designed flow cell to destroy pyrogenicity and organisms such as viruses, that are not retained by the filter. Asepsis of the drawoff point is maintained by ultraviolet radiation, enhanced by ozone produced by the ultraviolet source. Ultraviolet sources of appropriate energy and intensity are known to be available and are effective, since the noxious agents absorb this energy and are internally destroyed or inactivated; in addition, the high energy state produced in the water by its absorbtion and peroxide formation enhance inactivation. (Sinha-OEIS)
W78-09435

SOME PROBLEMS IN ORGANIZING THE ARTIFICIAL FLUORINATION OF DRINKING WATER IN THE FAR NORTH (IN RUSSIAN),
Sanitarno-Epidemiologicheskaya Stantaiya, Kandalaksha (USSR).
V. P. Chashchin, and T. A. Zemtsova.
Gig Sanit (4), p 81-83, 1977.

Descriptors: Fluorosis, Kandalaksha, Murmansk, Oblast, Pollution, Russian-SFSR, USSR, *Fluorination, *Water treatment, *Potable water.

Results of some studies conducted during the preliminary planning of drinking water fluorination in the city of Kandalaksha in the Murmansk Oblast (Russian SFSR, USSR) are presented. Analysis of the effect of F in the form of atmospheric pollution (aluminum plant) were done in a region of the city where the atmospheric concentration of inorganic F compounds was equivalent to or higher than optimal drinking water concentration (1-1.8 mg/l). The atmospheric F did not affect the overall incidence of caries (almost 100%) in the schoolchildren studied. The excess F resulted in increased F excretion, reduced intensity of caries per person and isolated cases of fluorosis. Water fluorination in such areas should be preceded by air pollution control measures. The water consumption levels and working conditions (moderate overheating of the body) of certain occupational groups must also be considered in the preliminary planning of water fluorination. Yet another problem is the sorption of F by water pipes as the distance from the fluorination source increases.--Copyright 1978, Biological Abstracts, Inc.
W78-09505

EXPERIENCE IN THE STUDY OF DENTAL CARIES AMONG THE POPULATION AND FLUORIDE CONTENT IN DRINKING WATER (IN RUSSIAN),
M. I. Kobrinskaya, M. S. Kobrinskii, R. M. Sevch, N. V. Zheleznyak, and M. S. Lesnoi.
Gig Sanit (5) p 91-92, 1977.

Descriptors: *Water quaity standards, *Dental caries, *Potable water, *Fluorides, Statistics, Water treatment.

Statistical analysis of the incidence of dental caries in 143 pre-school chlidren and 645 workers, and of fluoride content in 270 water samples from 19 separate population centers revealed that the incidence of caries fluctuated from 31-42% in 1971-75. The highest concentration of fluoride found in fresh drinking water was 0.67 mg/l, or 2 times lower than government standards. In the majority of drinking water samples the fluoride level fluctuated from 0 to 0.57 mg/l.--Copyright 1978, Biological Abstracts, INc.
W78-09513

THE USE OF ELECTROLYZED SOLUTIONS OF COMMON SALT FOR WATER DECONTAMINATION (IN RUSSIAN),
Saratovskii Gosudartsvennyi Meditsinskii Inst. (USSR).
E. V. Shtannikov, and Ya. M. Morozov.
Gig Sanit (8), p 15-19, 1977.

Descriptors: *Botulin, Chlorine oxides, Sodium chloride, Toxins, *Electrolysis, *Water treatment, Salts, Chlorination.

The effectiveness of botulin toxin inactivation in water by electrolyzed salt was studied. Toxin destruction processes produced by Cl compounds and the NaCl electrolysis products appeared to be similar. A method of increasing the activity of chlorine oxides by changing the electrolysis regimen with ionite membranes is suggested.--Copyright 1978, Biological Abstracts, Inc.
W78-09585

SOLE OR PRINCIPAL SOURCE AQUIFER AREAS.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
For primary bibliographic entry see Field 5G.
W78-09695

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, A SUMMARY OF WATER SOURCES, USE, TREATMENT, AND CAPACITY OF WATER-SUPPLY SYSTEMS,
Geological Survey, Raleigh, NC. Water Resources Div.
L. T. Mann, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 047, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 78-16, April 1978. 61 p, 2 fig, 3 tab, 6 ref.

Descriptors: *Water supply, *North Carolina, *Surface waters, *Groundwater, *Distribution systems, Water treatment, Water quality, Water sources, Water storage, Water utilization.

Data were collected during 1970-76 on 224 public water supply systems in North Carolina with 500 or more customers. This report summarizes these data that were previously published in five separate regional reports. The data are presented in order to Council of Government region, county, and water system name and include population served, average and maximum daily use, industrial use, water source, allowable draft of surface-water supplies, raw water pumping capacity, raw and finished water storage, type of water treatment, treatment plant capacity, and a summary of the chemical quality of finished water. Tables and maps provide cross references for system names, counties, Council of Government regions and water source. (Woodard-USGS)
W78-09753

5G. Water Quality Control

EFFECTS OF IRRIGATION ON WATER QUALITY IN THE SAND PLAIN OF CENTRAL WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-09306

RECLAMATION OF ACIDIC DREDGE SOILS WITH SEWAGE SLUDGE AND LIME AT THE CHESAPEAKE AND DELAWARE CANAL,
Cold Regions and Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 5E.
W78-09369

CHICAGO PIONEERS IN CORRECTING WATER POLLUTION, CONTROLLING FLOODS.
For primary bibliographic entry see Field 5D.
W78-09375

CONTROLLING IMPOUNDMENTS WHICH MAY POLLUTE GROUNDWATER,
Maryland Water Resources Commission, Annapolis. Permits Div.
A. Schiffman.
Water and Sewage Works, Vol. 125, No. 1, p 62-64, 66-67, January, 1978

Descriptors: *Oxidation lagoons, *Sewage, *Storage, *Linings, *Leakage, Industrial wastes, Plastics, Construction materials, Chloride, Nitrates, Waste water treatment, Municipal wastes.

Problems associated with groundwater contamination by impoundments storing municipal and industrial wastes are reviewed. A leak in one of two oxidation lagoons, lined with reinforced rubber on tar-impregnated fiber mats on top of rock, was undetected by a water level counter and was found only when lagoons were drained. Leakage from sewage oxidation lagoons, occupying 180 acres and receiving municipal wastes and sodium chloride pickling brine, contaminated groundwater within a 1,000 ft zone with chloride levels up to 220 mg/liter. Chloride levels near the pickling plant ranged up to 1,690 mg/liter in domestic drinking wells and 6,300 mg/liter in a plant well. Chloride was found at a depth of 75 ft, 400 ft from brine and pickling tanks. Leakage in two covered, polyvinyl chloride membrane-lined storage lagoons for liquid nitrogen increased nitrate-nitrogen concentrations to as high as 27 mg/liter at a distance 50 ft from the ponds. Plating waste leakage from a storage lagoon contaminated water 1000 ft from the site to a depth of 50 ft. Groundwater was not contaminated; chromium and other metals had coated sand, silt, and clay horizons at a depth between 20-45 ft. Phenolic wastes stored in a clay-lined lagoon leaked to a depth of 9 ft, producing stream and groundwater phenol concentrations of 2.1 mg/liter and 14.4 mg/liter, respectively. (Lisk-FIRL)
W78-09419

WATER REORGANIZATION--AIMS, ACHIEVEMENT AND THE FUTURE,
Thames Water Authority, London (England).
C. S. Sinnott.
Effluent and Water Treatment Journal, Vol. 18, No. 2, p 73, 76-77, 79, February, 1978.

Descriptors: *River basin development, *River basin commissions, *Watershed management, *Treatment facilities, *Comprehensive planning, Activated sludge, Rivers, Pumping plants, Nitrification, Water supply, Waste water treatment, Municipal wastes.

Improvements in waste water quality enacted by England's Thames Water Authority since its inauguration in 1974 are reviewed. An 8,300 million gallon reservoir, completed in 1976, and the Lambourn valley groundwater plan augmented the water supplies during a drought. A complete sewage treatment plant was constructed at Beckton to improve the quality of effluent flowing into the Thames River. Carrousel waste water treatment systems were installed in Ash Vale and Shroncote to assist the overloaded treatment plant in Farnborough, Hampshire. Secondary treatment operations were installed in the Long Reach works where treated effluent was polluting an estuary. High nitrate concentrations in the Lee River, supplying 7% of the water the Thames region, were reduced by constructing a denitrifying plant at Luton Sewage Treatment Works and converting an activated sludge plant to reduce nitrates at Rye Meads. A total of 19.25 million pounds sterling will be spent on treatment systems, pumping plants, and sewers in Southwark and Beckton to accommodate the increasing population in the redeveloped Docklands. The capacity of the Fobney Water Works on River Kennet will be increased by 10 mgd to accommodate developments and industries in the Basingstoke-Reading area. The Reading treatment plant will be expanded from 11 to 14 mgd with a two-stage activated sludge operation using pure oxygen injection and surface aeration for nitrification. (Lisk-FIRL)
W78-09424

APPARATUS FOR SEPARATING FLOATING POLLUTANTS,
L. E. Dallamore.
U.S. Patent No. 4,067,811, 4 p, 4 fig, 11 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 2, p 670, January 10, 1978.

Descriptors: *Patents, *Water pollution control, *Water quality control, Oil pollution, Oil spills, *Separation techniques, Equipment, Floating.

A sea-going apparatus is provided for separating floating pollutants from a body of water and particularly a vessel for use in clearing oil spills that is able to clear and recover large volumes of the oil from the sea. A vessel has an opening in at least one side to define an inlet for the pollutant and the top water layer. There are means within the vessel to impart a whirlpool motion to the admitted pollutant and water in which the pollutant forms a thickened upper layer. A nozzle is positioned at about the center to impart whirlpool motion. The nozzle projects upward. A separator is positioned beneath the nozzle so that floating pollutants can be removed from the top of the separator and water from the bottom of the separator. (Sinha-OEIS)
W78-09428

INFLUENCE OF TRICKLE AND SURFACE IRRIGATION ON RETURN FLOW QUALITY,
New Mexico State Univ., University Park. Dept. of Agronomy.
P. J. Wierenga.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 650, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-600/2-77-093, May, 1977. 158 p, 29 fig, 48 tab, 12 ref, 1 append.

Descriptors: *Surface irrigation, Irrigation systems, *Irrigation practices, *Return flow, Cotton, Salts, Salinity, Soil investigations, Irrigation efficiency, Soil water, Soil moisture, *Trickle irrigation, *Water quality control.

A field study was conducted to determine the effects of controlled surface irrigation and trickle irrigation on the quality and quantity of irrigation return flow. Trickle irrigation resulted in cotton yields (3-year averages) which were 8.2 percent higher than those from the surface-irrigated plots, and with trickle irrigation 24 percent less water was used than with surface irrigation. Data on soil salt accumulation in the surface-irrigated plots showed an increase in salt concentration with depth to the caly-sand interface. Below the clay-sand interface at 80-100 cm, a sharp decrease in salt concentration was observed. It appeared that a larger change in soil salinity was produced by altering irrigation frequency than by chanding irrigation efficiency. Irrigating when 50 percent of the soil water had been depleted was the irrigation frequency most conducive to salt retention by the soils. It appeared that trickle irrigation was quite effective in controlling the volume of return flow, while maintaining relatively low salinity levels in the soil around the trickle emitters. Accumulated salts were readily moved away from trickle lines by heavy preplant irrigations or intense rains. (Skogerboe-Colorado State)
W78-09443

ASSESSMENT OF IRRIGATION RETURN FLOW MODELS,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5B.
W78-09445

NITRATE IN EFFLUENTS FROM IRRIGATED LANDS (ANNUAL REPORT),
California Univ., Berkeley.
For primary bibliographic entry see Field 5B.
W78-09447

CONTROL OF SEDIMENTS, NUTRIENTS, AND ADSORBED BIOCIDES IN SURFACE IRRIGATION RETURN FLOWS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
D. L. Carter, and J. A. Bondurant.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 610, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-76-237, October 1976. 45 p, 2 fig, 7 tab, 49 ref.

Descriptors: Sediments, *Sedimentation, Nutrients, *Return flow, *Surface irrigation, *Sediment control, Erosion control, Runoff, Surface runoff, Technology, Irrigation, Soil conservation, Pesticides, Management.

The technology available for the control of sediments, nutrients, and adsorbed biocides in surface irrigation return flows has been reviewed and evaluated. Some of this technology could be applied immediately to reduce sediment and associated nutrient and biocide concentrations in surface irrigation return flows. Much of the available information needs to be integrated to develop improved control practices. New ideas and new control technology are needed. Economic incentive programs are needed to improve acceptance of control technology. The factors controlling erosion and subsequent sediment concentrations in surface irrigation return flows, and how these factors can be managed to reduce erosion and sediment concentrations are reviewed and discussed. (Skogerboe-Colorado State)
W78-09450

AN EVALUATION OF PROGRESSIVE TRENCHING AS A TECHNIQUE FOR DEWATERING FINE-GRAINED DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5E.
W78-09476

EFFECT OF ENVIRONMENTAL REGULATIONS ON WATER MANAGEMENT IN (CZECHOSLOVAKIAN) PULP AND PAPER MILLS (VLIV VODOPRAVNICH PREDIPISU NA VODNI HOSPODARSTVI PAPIREN A LEPENKAREN),
F. Nemec.
Papir a Celuloza, Vol. 32, No. 7/8, p 193-194, 198, 1977. 3 tab.

Descriptors: *Water pollution control, *Pulp and paper industry, *Legislation, Europe, Foreign countries, Biochemical oxygen demand, Chemical oxygen demand, Dissolved oxygen, Water management(Applied), Water pollution sources, Pulp wastes, Czechoslovakia, Sulfite pulp mills.

Czechoslovakian laws No. 138/73, 130/74, 25/75, and 49/75 covering water management and water pollution control are discussed. Pollution discharge limits for point sources are based on receiving water quality. The man pollution characteristics include the BOD, COD, and dissolved oxygen (D.O.) level. For example, depending on the type of stream, the maximum 5-day BOD of the water should range from 4 to 8 mg/liter, COD (permanganate) from 8 to 20 mg/liter, and minimum D.O. from 50 to 70% of saturation. The approach to water pollution abatement taken by the centrally controlled Czechoslovakian pulp and paper industry consists of a gradual shutdown of small sulfite mills and concentration of pulp production in large mills located on big rivers. (Trubacek-IPC)
W78-09511

EXPERIENCE IN THE STUDY OF DENTAL CARIES AMONG THE POPULATION AND FLUORIDE CONTENT IN DRINKING WATER (IN RUSSIAN),
For primary bibliographic entry see Field 5F.
W78-09513

INTEGRATED RESIDUALS MANAGEMENT: A REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT MODEL,
Resources for the Future, Inc., Washington, DC.
For primary bibliographic entry see Field 6A.
W78-09516

ENVIRONMENTAL ASSESSMENT--MANAGEMENT SYSTEM FOR LOCAL DEVELOPMENTAL PROJECT: CASES IN JAPAN,
Nagoya Univ. (Japan). Inst. of Earth Sciences.
For primary bibliographic entry see Field 6A.
W78-09517

DEVELOPMENT OF A MATHEMATICAL WATER QUALITY MODEL FOR GRAYS HARBOR AND THE CHEHALIS RIVER, WASHINGTON.
Battelle Pacific Northwest Lab., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-09518

SYSTEMS PROGRAM FOR THE ANALYSIS OF NONURBAN, NONPOINT SOURCE POLLUTANTS IN THE MISSOURI BASIN REGION,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5B.
W78-09519

SYSTEMS PROGRAMS FOR THE ANALYSIS OF NONURBAN, NONPOINT SOURCE POLLUTANTS IN THE MISSOURI BASIN REGION. SUPPLEMENT,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5B.
W78-09520

NATURAL REFORESTATION RECLAIMS A WATERSHED: A CASE HISTORY FROM WEST VIRGINIA,
Sao Paulo Univ. (Brazil). Dept. de Silvicultura.
For primary bibliographic entry see Field 4D.
W78-09525

ESTIMATES OF POPULATION SIZE AND SURVIVAL OF IMMATURE STAGES OF FOUR SPECIES OF AEDES (DIPTERA: CULICIDAE) IN A TEMPORARY POND,
Calgary Univ. (Alberta). Dept. of Biology.
M. A. Enfield, and G. Pritchard.
The Canadian Entomologist, Vol. 109, p 1425-1434, November 1977. 2 fig, 7 tab, 8 ref.

Descriptors: *Mosquitoes, *Aedes euedes, *Ponds, *Larvae, *Eggs, *Temporary pond stage, Aedes vexans, Aedes cinereus, Aedes mercurator, Canada, Alberta(Canada), Survival, Population, Culicidae, Pupae, Water level fluctuations, Predation.

A temporary pond near Calgary, Alberta, Canada was sampled in 1974 and 1975 for mosquito eggs, larvae, and pupae of the genus Aedes, and population and survival estimates were made of A. Vexans, A. Cinereus, A. Euedes, and A. Mercurator. Results were studied in relation to the history of the pond for the two years. During spring of the first year the pond filled to a much higher level than normal and did not dry and reflood until August. In the second year the pond contained water from mid-April to the beginning of June, and did not refill during summer. The first flooding in 1974 hatched eggs of A. euedes, A. cataphylla, A. excrucians, A. fitchii, A. flavescens, and A. mercurator; the second flooding hatched eggs of A. vexans and A. cinereus. Population estimates were made for the latter two species. Little larval mortality occurred until the pond was reduced to a few puddles and larvae were stranded. Of surviving A. vexans larvae, 50% attained instar II in 3.7 days, instar III in 6.6 days, and instar IV in 10.3 days. A. cinereus developed more slowly. In 1975 population estimates were made for larvae of A. euedes and A. mercurator, which preferred deeper water. A. euedes declined at nine per day and A. mercurator at seven per day. Larvae in the second instar survived for three days when the surface was covered with ice and snow, but A. euedes experienced a sharp drop in numbers at that time. Fifty-three percent of A. vexans eggs survived for one year in areas not flooded at appropriate temperatures for hatching. (Lynch-Wisconsin)
W78-09549

REPORT OF THE DANE COUNTY ADVISORY COUNCIL FOR LAKE QUALITY IMPROVEMENT, A FRAMEWORK FOR LAKE MANAGEMENT.
Wisconsin Lake Quality Improvement Advisory Council, Madison.
For primary bibliographic entry see Field 5C.
W78-09552

COOLING TOWER ENVIRONMENT--1978 (WITH SUPPLEMENT).
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W78-09570

A STUDY OF ESCHERICHIA COLI SURVIVAL IN HIGH LATITUDE WATERS (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Inst. (USSR).
For primary bibliographic entry see Field 5B.
W78-09577

HYGIENIC PROBLEMS OF ENVIRONMENTAL PROTECTION FROM THE WASTES OF LIVESTOCK COMPLEXES AND POULTRY FARMS (IN RUSSIAN),
D. P. Nikitin, and Yu. V. Novikov.
Gig Sanit (4), p 61-67, 1977.

Descriptors: Bacteria, Chemicals, Eggs, Helminth, Pollutants, USSR, Livestock, *Farm wastes, Public health, *Waste treatment, Water pollution.

Livestock complexes poultry farms are a potential source of soil, water and air pollution with noxious chemicals pathogenic bacteria and helminth eggs. Data from various studies on these problems in the USSR are reviewed, along with proposals for different systems for the purification of the animal wastes as organic fertilizer, the development of effective measures for their purification and utilization is important.--Copyright 1978, Biological Abstracts, Inc.
W78-09581

HYGIENIC ASSESSMENT OF THE EFFECTIVENESS OF MEASURES USED FOR PREVENTING CONTAMINATION OF THE TOMI RIVER (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny, Moscow (USSR).
V. A. Savelova, V. P. Kovtun, and I. I. Belozertsev.
Gig Sanit 8, p 19-22. 1977.

Descriptors: Russian-SFSR, *USSR(Tomi River), *Water pollution control, Water pollution sources.

Actual data on sanitary-laboratory control of the Tomi River (Russian SFSR, USSR) water contamination in the present consumption rate of its water and the mathematically estimated concentrations of contamination, prevailing from 1970-1975, made it possible to detect definite positive shifts in the sanitary state of the river due to measures taken for its protection. In the use of the calculation method more definite results were obtained that corresponded to the time of taking measures for improvement of sanitary conditions.--Copyright 1978, Biological Abstracts, Inc.
W78-09582

UPGRADING STABILIZATION POND EFFLUENT BY WATER HYACINTH CULTURE,
Texas Dept. of Health, Austin.
For primary bibliographic entry see Field 5D.
W78-09594

AN INTRODUCTION TO FOUR OVERVIEWS: ARID AND SEMI-ARID LANDS; SOIL LOSS; TROPICAL FORESTS AND WOODLANDS; WATER QUALITY,
United Nations Environment Program, New York.
For primary bibliographic entry see Field 6G.
W78-09657

SOIL CONSERVATION ON AGRICULTURAL LAND: THE CHALLENGE AHEAD,
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 3F.
W78-09659

NO SIMPLE ANSWERS ON SALINITY,
E. McNeill.
Irrigation Journal, Vol 26, No 6, p 16-18, November-December, 1977. 5 fig.

Descriptors: *Salinity, *Saline water, *Saline soils, Water quality, *Water quality control, Salts.

Salinity control is the most critical problem facing agricultural irrigation managers in the arid Western states, according to opinions of water specialists before a late September conference Salt and Salinity Management in Santa Barbara, California. To search for solutions on how to manage agricultural lands served by irrigation waters containing an increasing build-up of salts, some 150 professionals in the management, government and educational fields met at the two-day conference to hear and study the findings of an extensive group of authoritative speakers who have actively worked on the problem. (Skogerboe-Colorado State)
W78-09666

THE WELLTON-MOHAWK: WHERE NECESSITY IS TEACHING THEM TO SAVE WATER,
For primary bibliographic entry see Field 3B.
W78-09668

SAXON V. DIVISION OF STATE LANDS (DENIAL OF PERMIT APPLICATION TO FILL SALTMARSH).
For primary bibliographic entry see Field 6E.

W78-09685

PACIFIC LEGAL FOUNDATION V. QUARLES (POWER OF ENVIRONMENTAL PROTECTION AGENCY TO FORMULATE CONDITIONS FOR NATIONAL POLLUTANT DISCHARGE SYSTEM PERMIT).
For primary bibliographic entry see Field 6E.
W78-09694

SOLE OR PRINCIPAL SOURCE AQUIFER AREAS.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
Federal Register, Vol. 42, No. 189, p 51620-51625 (September 29, 1977).

Descriptors: *Aquifers, *Water supply, *Project planning, Development, Government financing, *Water quality control, Groundwater, Water sources, Reservoirs, Management, Recharge, Aquifer management, Loans, Grants, Project purposes, Planning, Alternate planning, Administration, Benefits, Water policy, Competing uses, Projects, Project benefits, Aquatic environment.

The Environmental Protection Agency (EPA) proposed regulations to implement aquifer requirements of the Safe Drinking Water Act (SDWA). The regulations established procedures for designating areas where an aquifer is the sole or principal source of drinking water. The Administrator may determine upon his own motion or upon receipt of a public petition, that 'an area has an aquifer which is the sole or principal drinking water source for that area and which, if contaminated, would create a significant hazard to public health.' Upon such a determination, no commitment for federal financial assistance may be entered into for any project which the Administrator determines may contaminate the aquifer through a recharge zone and create a significant hazard to public health. However, programs will be subject to EPA's project review authority only if an application for federal financial assistance has been submitted. Since some actions may have been subject to the provisions of the National Environmental Policy Act (NEPA) and thereby the subject of an environmental impact statement, the subject of project review under the SDWA will be integrated as fully as possible with the NEPA to avoid needless duplication. (Kastner-Florida)
W78-09695

CARBON BLACK MANUFACTURING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol. 43, No. 5, p 1343-47, January 9, 1978.

Descriptors: *Water pollution sources, *Permits, *Water pollution control, *Federal Water Pollution Control Act, Adoption of practices, Regulation, Administrative agencies, Federal government, Discharge(Water), Liquid wastes, Pollution abatement, Carbon.

The 1976 interim regulations and proposals promulgated by the Environmental Protection Agency (EPA) effluent limitations guidelines for the Carbon Black Manufacturing Point Source Category are herein issued in final form. With the exception of effluent limitations guidelines based upon the use of the best practicable control technology currently available for the furnace process subcategory, which have been withdrawn, they are identical to the interim form. The effluent limitations guidelines based upon the use of the best available technology economically achievable for the carbon black furnace process is instead being promulgated to require zero discharge of process waste water. The guidelines and new source performance standards, when applicable, will be incorporated in National Pollutant Discharge Elimination System (NPDES) permits issued by the EPA or by states with approved programs. However, dischargers will not be allowed to initiate a discharge or to increase the quantities or concentration of pollutants discharged without appropriate issuance of NPDES permits. (Rule-Florida)
W78-09696

IMPLEMENTATION OF SECTION 208 IS FINALLY UNDERWAY: ENVIRONMENTAL LAW INSTITUTE WILL ASSIST BY PREPARING HANDBOOK FOR DESIGNATED AGENCIES.
Environmental Law Reporter, Vol. 6, No. 1, p 10039-10040 (January, 1976).

Descriptors: *Water pollution control, *Federal Water Pollution Control Act, *Water management(Applied), *Water resources planning, Regional development, Social aspects, Programs, Management, Legislation, Governments, Decision making, Project planning, Water law, Water policy, Water pollution treatment, Water pollution sources, Administrative agencies, State governments, Permits.

The differences in the sources of pollution problems and in the legal and political environments across the country make it impossible to recommend a single, most-desirable solution for each water pollution problem. The Environmental Protection Agency, recognizing this, awarded the Environmental Law Institute (ELI) an eight-month contract to prepare a handbook which would assist local governments in the design of regulatory programs for the control of water pollution. The handbook should focus on the legal and institutional aspects of those regulatory programs and is intended to supplement other technical studies. Section 208 of the Federal Water Pollution Control Act Amendments of 1972 is considered to be the most significant of several of the Act's planning requirements; however, implementation of Section 208 was slow in getting underway. The ELI handbook would facilitate implementation by including examples of a variety of documented control techniques for the most difficult water pollution problems. It would also explore the choice of appropriate governmental bodies to enact and administer controls, and analyze in depth representative state and local statutes which appear to be the most practical solutions to particular problems. (Stump-Florida)
W78-09698

SECTION 1424 (E) OF THE SAFE DRINKING WATER ACT: AN EFFECTIVE MEASURE AGAINST GROUNDWATER POLLUTION,
J. B. Hemphill.
Environmental Law Reporter, Vol. 6, p 50121-50126 (January-December, 1976).

Descriptors: *Legislation, *Texas, *Water sources, *Water supply, *Aquifer management, Legal aspects, Municipal water, Administrative decisions, Governmental interrelations, Water law, Water utilization, Impaired water quality, Water pollution control, Water pollution sources, Water quality control, Aquifers, Reservoir storage, Water storage, Water pollution.

Much of the drinking water in use today has its source in underground reservoirs known as aquifers. Groundwater aquifers in 1974 received partial regulatory protection under Section 1424 (e) of the Safe Drinking Water Act. Section 1424 (e) prevents the federal government from sponsoring or encouraging activities which might result in contamination of groundwater drinking supplies. It also provides for the Administrator of the Environmental Protection Agency (EPA) to determine if an aquifer is in need of protection from contamination if the aquifer is the principal drinking water source for the area. Section 1424 (e) has been applied by the EPA in the single instance of the Edward's Aquifer near San Antonio, Texas. Because San Antonio receives its entire water supply from the Edward's Aquifer, the EPA took the position that since the sole source aquifer was vulnerable to contamination, there was a presumption that such contamination would create a significant health hazard. Because Section 1424 (e) reaches only sole or principal source aquifers threatened by contamination from federally funded projects, additional protection from groundwater contamination by non-federally sponsored activity must come from future legislation. (Curtis-Florida)
W78-09699

WATER POLLUTION CONTROL: AN OVERVIEW OF THE LAWS,
Environmental Protection Agency, Washington, DC. Water Planning and Standards.
E. C. Beck.
Park and Recreation, Vol. 12, No. 2, p 5a-14a (February, 1977).

Descriptors: *Water pollution control, *Pollution abatement, *Federal Water Pollution Control Act, *Planning, Agricultural runoff, Acid mine water, Local governments, Public health, Water law, Water quality control, Drainage water, Facilities, Recreation, Construction, Permits, Streams, Rivers, Lakes.

Although water pollution has been recognized as a problem since 1900, it was not until the 1970's that the scope and priority of water pollution control changed. First, the Federal Environmental Protection Agency was created, centralizing responsibility for water pollution control. Second, the Federal Water Pollution Control Act Amendments of 1972 were passed. Concern about non-point pollution sources also emerged at this time. The 1972 Act contains provisions that encourage public participation in pollution control. In addition, it calls for an annual assessment of statewide water quality problems and authorizes federal resources to solve the problems. The water quality management section of the Act, the most comprehensive part of the Act, provides information for sound decision making by state and local officials and is the only authority under federal law to control non-point source pollution. Section 303 of the Act establishes water quality goals and standards for water quality improvement; section 402 implements a rational permit program to control the discharge of pollutants into waterways from point sources. It also contains enforcement provisions. Section 404 authorizes the Corps of Engineers to issue permits for discharging dredged or fill material. (Maass-Florida)
W78-09707

A RESEARCH STRATEGY FOR SOCIAL ASSESSMENT OF LAKE RESTORATION PROGRAMS,
Oregon State Univ., Corvallis. Dept. of Anthropology.
W. D. Honey, and T. C. Hogg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 347, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/5-78-004, February 1978. 2 fig, 26 ref, 3 append. 1BA608, CC6991885-A.

Descriptors: *Lake restoration, *Social impact, *Methodology, *Water pollution control, *Clean Lakes Program, Lakes, Rehabilitation, Model studies, Social aspects, Ecology, Analytical techniques.

A methodology is provided for assessing the social impact of lake restoration programs, as part of the Clean Lakes Program established by the Federal Water Pollution Control Act Amendments of 1972. The methodology is based on a cultural ecological model, derived from work by Julian Steward (1955). The model relates human adaptation to cul-

tural development in evolutionary terms, and seeks to explain the origin of particular cultural features and patterns in an area. The 'cultural core,' or central environmental feature, is important to the model; its determination is largely dependent on empirical data. The model requires both spatial and temporal parameters: spatial parameters include primary and secondary zones of influence; temporal phases include planning, lake treatment, and restored lake conditions. Application of Steward's framework includes: (1) a historical emphasis which identifies and explains the central environmental feature and its interrelationship with cultural patterns; and (2) environmental-cultural system interplay which determines to what extent the environment will permit technological innovations and identifies special features of the cultural system on which human adaptation depends. All data are examined in terms of five instrumental cultural functions: (1) physical well-being of the population, (2) enhancement of livelihood, (3) community, (4) communication, and (5) innovation. The plan has not yet been field tested. (Lynch-Wisconsin)
W78-09710

FEDERAL LAW, IRRIGATION AND WATER POLLUTION,
T. Hertz.
South Dakota Law Review, Vol. 22, No. 3, p 553-590 (Summer, 1977).

Descriptors: *Dissolved solids, *Federal Water Pollution Control Act, *Irrigation effects, *Water pollution control, Administrative agencies, Agriculture, Federal government, Irrigable land, Irrigation, Irrigation practices, Irrigation water, Legal aspects, Water law, Water pollution, Water policy, History, Hydrologic cycle, Salinity, Soil water, Economics.

The Federal Water Pollution Control Act of 1972 (FWPCA) was written primarily for the kind of pollution that comes out of a factory pipe and runs into a stream. The Environmental Protection Agency (EPA) approaches irrigation-caused water pollution in the same way it approaches industrial pollution. The tool used for both is the FWPCA National Pollution Discharge Elimination System (NPDES) permitting program which controls effluent discharges from point sources. However, irrigation water does not reenter streams and rivers from a point source. The key to achieving a permanent irrigated agriculture system is to achieve water and salt balance. The amount of water and salt added by irrigation practices must not exceed that removed by consumptive use and by irrigation return flow. The FWPCA divides water pollution problems into two areas: point sources and nonpoint sources. Nonpoint source discharges, such as those that result from natural events such as precipitation runoff over large areas of land, are excluded from the NPDES permit program. The author notes that the problems of pollution do not go away by definition and that the EPA is charged with enforcing reduction and elimination of water pollution regardless of the source of that pollution. (Jordan-Florida)
W78-09724

TOWARD CLEAN WATER: A GUIDE TO CITIZEN ACTION.
Conservation Foundation, Washington, DC.
August, 1976, 316 p.

Descriptors: *Federal Water Pollution Control Act, *Water quality control, *Water management(Applied), *Water pollution treatment, Public benefits, Legislation, Water quality standards, Water policy, Law enforcement, Permits, Administrative agencies, Regulation.

In 1972, sweeping new amendments were added to the Federal Water Pollution Control Act (FWPCA). Minimum guidelines for public participation in the development and enforcement of programs established by the Environmental Protection Agency or state agencies were mandated. These guidelines included: timetables for the publication of program regulations and acceptance of public comments+ ground rules for the conduct of public hearings and meetings; and descriptions of the required makeup of advisory boards and other citizens' bodies. The agencies were also mandated to keep technical data accessible and to encourage citizens to report pollution regulations violations. The broad purpose of this book is to provide interested laypersons with the informational background and statutory understanding necessary for their use of the 1972 FWPCA Amendments. It is expected that the book will be useful to citizens, public officials, engineers, industry representatives and person interested in either enforcing, developing or complying with the FWPCA mandates. Several chapters and an appendix of specific regulations provide information on state and local assistance program grants, the National Pollutant Discharge Elimination System, dredge, spoil and fill regulations, and ocean-dumping permits. An extensive bibliography is included. (Baumbach-Florida)
W78-09727

CONTROL OF OIL TRANSPORT IN THE COASTAL ZONE: A LOOK AT PUGET SOUND,
Environmental Protection Agency, Seattle, WA. Region X.
R. A. Du Bey.
Oregon Law Rev., Vol. 56, No. 4, p 593-645 (1977).

Descriptors: *Coasts, *Water quality control, *Transportation, *Oil industry, *Federal-state water rights conflicts, Federal jurisdiction, State jurisdiction, Federal Water Pollution Control Act, Oil spills, Public benefits, Oil fields, Water law, Environment, Management, Governmental interrelations, Energy, Legal aspects, Judicial decisions, Legal review.

Since 1973, the transportation of Alaskan oil to the continental United States has become an issue of utmost national importance. Any attempt by a coastal state to influence the development and transportation of Alaskan crude oil, presumably based on the constitutional exercise of the state's police powers aimed at protecting the quality of its coastal waters, would raise a number of legal issues. The issues include: (1) what is the current jurisdictional framework of federal and state relations regarding the transportation of crude oil in the coastal zone; (2) what are the federal constraints upon the exercise of state power; (3) what bases exist for state control of the marine transport of oil; and (4) what effect will the national Coastal Zone Management Act of 1972 have on the balance between state and federal power in the coastal zone. Examined in this context are the Federal Water Pollution Control Act Amendments of 1972 and the Trans-Alaska Pipeline Authorization Act. The author concludes that the issue of defining the relative roles that state and federal governments should play in controlling oil transportation in the coastal zone has yet to be determined by the courts. (Easterbrook-Florida)
W78-09732

THE EVOLUTION AND IMPLEMENTATION OF EPA'S REGULATORY PROGRAM TO CONTROL THE DISCHARGE OF TOXIC POLLUTANTS TO THE NATION'S WATERS,
Environmental Protection Agency, Washington, DC.
R. M. Hall, Jr.
Natural Resources Lawyer, Vol. 10, No. 3, p 507-529 (1977).

Descriptors: *Federal Water Pollution Control Act, *Water quality, *Water pollution control, *Toxins, *Administration, Discharge(Water), Pollutants, Pollution abatement, Industrial wastes, Water policy, Legislation, Legal aspects, Water treatment, Industries, Priorities, Pretreatment(Water), Water pollution, Regulation, Legal review, Administrative agencies.

In June of 1976, a consent decree was issued by the United States District Court for the District of Columbia approving a comprehensive strategy for the regulation of the discharge of toxic pollutlants under the Federal Water Pollution Control Act (FWPCA). The author discusses the background of the decree and evaluates the progress that the Environmental Protection Agency (EPA) has made towards implementing toxic pollutant control. The statutory framework of the FWPCA is explored, and the EPA's initial efforts to control toxic pollutants is reviewed. The evolution of the integrated toxic strategy resulted in an industry approach implementing effluent limitations and pretreatment standards. The program following the consent decree has resulted in major steps forward in the implementation of the FWPCA, First, standards were finally promulgated under Section 307 (a). Second, the scope of regulation of toxic pollutants has broadened and become more effective since the EPA has begun to implement numerous sections of the FWPCA. Finally, the emphasis on regulation of toxic pollutants reflects the priorities stressed by Congress and President Carter. (Quarles-Florida)
W78-09733

MINERAL RIGHTS-CONVEYANCES AND LEASES IN MISSOURI,
P. N. Davis.
Missouri Bar Journal, Vol. 33, No. 4, June, 1977, p 248-56.

Descriptors: Mineralogy, *Mining, *Leases, *Missouri, *Mine drainage, Riparian rights, Groundwater, Surface waters, Water quality, *Acid mine water, Diversion, Surface runoff.

Mining can interfere with supplies in five ways. Among these methods of interference are draining and blasting. Missouri follows the law of riparian rights to govern water diversions. This law applies to the mineral transferee in his relationship with other riparians and with the transferor. The transferee would probably be treated as any nonriparian grantee by the courts. Three rules govern the alteration of percolating groundwater supplies by well diversion or drainage: the absolute ownership rule; the 'reasonable use' rule; and the 'correlative rights' rule. Missouri has adopted this third rule the mineral transferee, like any landowner, is subject to these rules. Diffused surface water is also controlled by three rules: the common enemy rule; the civil law rule; and the reasonable use rule. The common enemy rule applied in Missouri, and the transferee must adhere to it. Although water diversion laws were written in terms of adjoining landowners, they apply to mineral transferor and transferee. Mineral leases should specify terms regulating when blasting may occur and acceptable blasting damages. Ten common mining methods exist. The transferee may be required to compensate the surface owner for any crop destruction. (Spiegel-Florida)
W78-09734

ANNOTATED BIBLIOGRAHY FOR WATER QUALITY MANAGEMENT, (FOURTH EDITION).
Environmental Protection Agency, Washington, DC. Water Planning Div.
May 1977, 59 p.

Descriptors: *Bibliographies, *Water quaity, Water quality control, Waste management, Agriculture, Hydrology, Groundwater, Water Pollution, Pollution, Model studies, *Management.

This bibliography has been prepared to assist those who are engaged in 208 water quality management. References cited have been selected for their applicability to water quality management and for their availability. Each of the 226

references is followed by a short abstract and, whenever possible, by price and ordering information. Instructions for using the Government Printing Office, the National Technical Information Service, and for ordering books through the EPA Regional offices or the EPA Water Quality Management Information Center in Washington, D.C. are included. (Skogerboe-Colorado State)
W78-09760

SOIL AND WATER CONSERVATION PRACTICES FOR POLLUTION CONTROL,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
M. F. Walter, T. S. Steenhuis, and D. A. Haith.
Paper No. 77-2506 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 19 p, 6 tab, 42 ref.

Descriptors: *Soil conservation, *Water conservation, Water quality, *Water quality control, Pollutants, *Water pollution control.

Policy concerning best management practices (BMP) to control agricultural nonpoint source pollution has yet to be developed. There has been a tendency to equate BMP's with soil and water conservation practices. SWCP's are relatively well understood, are apparently productive, and have a delivery system. SWCP's must be capable of enhancing water quality if they are to be used as BMP's. The effect of SWCP's on water quality is discussed. (Skogerboe-Colorado State)
W78-09768

SOIL-SALT INTERACTIONS IN RELATION TO SALT CONTROL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
J. W. Biggar, and K. K. Tanji.
Transactions of the American Society of Agricultural Engineers, Special Edition, Vol 20SW, p 68-75, February 20, 1077. 1 tab, 50 ref, 9 equ.

Descriptors: Root zones, *Return flow, *Salts, Cation exchange, Ion exchange, Water management(Applied), Crop production, *Salt tolerance, Soils, *Forecasting.

An appraisal is made on the difficulties of predicting and evaluating mass emission of salts in irrigation return flows. The more important physicochemical processes that occur in the root zone are identified and the complexity and state-of-the-art knowledge of them is discussed. (Skogerboe-Colorado State)
W78-09771

RECLAIMING PARTIALLY CLOGGED TICKLE EMITTERS,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
F. S. Nakayama, D. A. Bucks, and O. F. French.
Transactions of the American Society of Agricultural Engineers, Special Edition, Vol. 20SW, p 278-280, April 20, 1977. 1 fig, 1 tab, 9 ref.

Descriptors: *Irrigation systems, *Trickle filters, *Clogging, Flow rate, Laboratory tests, Injection.

A trickle emitter system, which had become partially clogged after 2 years of operation even with extensive water filtration, was reclaimed successfully by treating the entire system with concentrated hypochlorite and acid solutions. Chemical cost per emitter was less than replacement cost for the emitter and supply tubing. Maintenance treatment with low levels of hypochlorite and acid prevented recurrence of emitter plugging. (Skogerboe-Colorado State)
W78-09774

CALLAHAN RESERVOIR: II. INFLOW AND OUTFLOW SUSPENDED SEDIMENT PHOSPHORUS RELATIONSHIPS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
J. D. Schreiber, D. L. Rausch, and L. L. McDowell.
Transactions of the American Society of Agricultural Engineers, Special Edition, Vol. 20SW, p 285-289, April 20, 1977. 5 fig, 4 tab, 23 ref.

Descriptors: *Missouri, Sediments, Flood control, Reservoirs, Downstream, Agricultural watersheds, *Phosphorus, *Callahan Reservoir(MO), *Suspended solids.

The inflow and outflow of Callahan Reservoir, located in an agricultural area near Columbia, Missouri, was studied for 1 year to understand the sediment and solution phosphorus (P) relationships. The solution phase was analyzed for dissolved organic, hydrolyzable, and ortho-P and the sediment was analyzed for total, inorganic, and organic P. The discharge weighted mean solution phase concentration of dissolved organic, hydrolyzable, and ortho-P for the inflow was 0.008, 0.002 and 0.059 mg/l, respectively, as compared with 0.011, 0.005, and 0.021 mg/l for the outflow. The outflow sediment had a larger concentration (millimicro-g/g) of total, inorganic, and organic P than did the inflow sediment. However, because of sediment deposition within the reservoir, there was a 4-fold decrease in outflow suspended sediment P volume concentrations (mg/l). Isotopic dilution techniques with 32P were used to estimate the portion of sediment-P31 in equilibrium with solution-P31. The quantities of isotopically exchangeable sediment-P31 in the inflow and outflow sediments were 30 and 41 millimicro-g/g, respectively. (See also W77-12149) (Skogerboe-Colorado State)
W78-09775

SOIL-ASPHALT MIXTURE FOR CANAL SEEPAGE CONTROL: LABORATORY STUDY,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 4A.
W78-09787

NEW FACILITY HELPS CLEAN UP BOSTON HARBOR.
For primary bibliographic entry see Field 5D.
W78-09791

COLORADO RIVER DESALINIZATION, WILD DUCK STUDY,
Colorado State Univ., Fort Collins, Dept. of Physiology and Biophysics.
D. H. Will, J. H. Abel, B. E. Russell, and K. E. Levine.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 681, Price codes: A03 in paper copy, A01 in microfiche. Final Project Report to Bureau of Reclamation, Denver, Colorado, U.S. Department of the Interior, June 1977, 21 p. 6 ref, 1 tab.

Descriptors: *Colorado River, Colorado basin, *Salinity, *Ducks(Wild), Mallard duck, Laboratory tests, Animal physiology, Animal pathology, *Animal behavior, Mortality, Bioassay, *Saline lakes, Saline water, Paradox Valley, Dolores River, Dehydration, Hypothermia.

The Paradox Valley drainage of the Dolores River in southwestern Colorado, is an important natural contributor of salts to the Colorado River. One proposed means of reducing salinity in the Colorado River is the diversion of the Paradox Valley drainage into large solar evaporation reservoirs where the salts could be retained. The present study was performed to determine the possible detrimental effects of concentrated salt water, simulated approximately 70 percent evaporation of the Paradox Valley drainage on a single waterfowl species, the wild mallard duck. Seven separate experiments were conducted using a total of 94 mallard ducks (47 males, 47 females). The study clearly demonstrated that highly concentrated salt or brine water can be lethal to wild waterfowl such as the mallard duck. Mortality in the ducks exposed to the salt water appeared to relate principally to dehydration and hypothermia. It was evident that when placed in the highly concentrated salt water the ducks soon showed discomfort and when given a choice preferred to leave the saline pool. This behavior suggests that in the wild, ducks landing on a brine pool would be probably soon choose to leave for surrounding lead or a fresh water source, particularly if one is close by.
W78-09799

EFFECTS OF PHOSPHATE MINERALIZATION AND THE PHOSPHATE INDUSTRY ON RADIUM-226 IN GROUND WATER OF CENTRAL FLORIDA,
Office of Radiation Programs, Las Vegas, NV.
R. F. Kaufman, and J. D. Bliss.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 116, Price codes: A07 in paper copy, A01 in microfiche. Report EPA 520-6-77-010, Oct. 1977, 115 p, 7 tab, 18 fig, 65 ref.

Descriptors: *Florida, Hydrology, Water pollution, Water quality, Public health, Groundwater, *Groundwater basins, Ground water resources, Hydrogeology, Phosphates, *Radium radioisotopes, On-site-investigations, Statistical methods, *Mining, Florida hydrology survey, *Phosphate mining, Radiation surveys, Environmental surveys.

Dissolved radium-226 data were statistically analyzed to characterize water quality in the water table, Upper Floridan and Lower Floridan aquifers in six counties of west central Florida where major strip mining and beneficiation of phosphate deposits is underway. Mineralization and mining have not significantly increased the dissolved radium content of native ground water, although locally elevated levels of radium in both mineralized and nonmineralized areas are naturally present. In Hillsborough, Polk, Hardee, and De Soto Counties, mean radium content of ground water beneath mined and unmined lands is 5 pCi/l or less, with maximum values on the order of 15 to 20 pCi/l occurring in unmined areas. For Sarasota and Manatee Counties, average radium content is 4 to 15 pCi/l in the water table and Floridan aquifers. Although portions of these latter two areas are mineralized, there has been no mining activity to date. (EIS-Katz)
W78-09800

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

INTEGRATED RESIDUALS MANAGEMENT: A REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT MODEL,
Resources for the Future, Inc., Washington, DC.
W. O. Spofford, Jr.
Reprint 130, Resources for the Future, Washington, D.C., 1976 (originally titled 'Total Environmental Quality Management Models,' reprinted from 'Models for Environmental Pollution Control,' R.A. Deininger (Ed), 36 p, 2 fig, 1 tab, 54 ref. $0.25.

Descriptors: *Environment, *Water quality, *Management, *Model studies, *Quality control, Wastes, Air pollution, Waste disposal, Regions, Systems analysis, *Simulation analysis, Optimization, Equations, *Residuals management, Environmental quality, Nonlinear programming.

The effort to integrate models of air and water pollution and solid waste disposal into an overall environmental quality model is described. The term 'total environmental quality management models' is defined as meaning 'regional residuals-environmental quality management models,' where these include only the impacts on environmental quality of residuals discharges to the air, water, and land environments. The term 'residual' is preferred here to that of 'waste'. The entire regional residuals management system is delineated, including the range of management options available to society for improving environmental quality; indicated is how all the system components may be expressed and ultimately linked together within the same computational framework. The residuals management model is discussed qualitatively and then formulated quantitatively; mathematical forms of the various environmental models are discussed, and computational schemes for selecting an optimal management strategy are suggested. Included are: residuals generation and discharge models; environmental modification and environmental quality models; a management model formulation and a procedure for optimizing a nonlinear objective function subject to a set of linear constraints; an atmospheric dispersion model; an aquatic ecosystem model; and more optimization procedures, including a heuristic approach. The regional residuals management model suggested herein is more complex than the classical management model approach, and it requires a substantial amount of computer resources. (Graf-Cornell)
W78-09516

ENVIRONMENTAL ASSESSMENT--MANAGEMENT SYSTEM FOR LOCAL DEVELOPMENTAL PROJECT: CASES IN JAPAN,
Nagoya Univ. (Japan). Inst. of Earth Sciences.
Y. Shimazu, and R. Harashima.
Journal of Environmental Management, Vol. 5, No. 3, p 243-258, July 1977. 4 fig, 4 tab.

Descriptors: *Environmental effects, *Assessment, *Inland projects, *Regional development, Management, Water resources, Monitoring, Decision making, Land use, Economics, Social aspects, *Japan.

Developmental projects in Japan are classified into two types: (1) coast types at a national-regional level; and (2) inland types at a regional-local level. Thoughtless deforestation and engineering works are major causes of environmental disruption in inland-type developmental projects, destroying the nature and culture of less-developed villages. A comprehensive environmental assessment system for a local, inland-type project has been developed and applied to several situations with success. This system consists of the following: (1) main subsystems which cover legislative procedure, document retrieval, grid analysis, wildlife surveys, vegetation, microbiological diversity, landslide monitoring, watersheds, flood monitoring, water quality irrigation and drainage, traffic monitoring, landscaping, community affairs, social response, conflict resolution land use, finance, cost/benefit analysis, and an information channel; (2) a monitoring system to check progress and provide early warnings to prevent disasters; and (3) a coordinating system to provide a link between the inhabitants and the developer. For (2) and (3), an environmental management center is established. The total system is interdisciplinary, but it does not require a large project team. (Bell-Cornell)
W78-09517

SYSTEMS PROGRAM FOR THE ANALYSIS OF NONURBAN, NONPOINT SOURCE POLLUTANTS IN THE MISSOURI BASIN REGION,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5B.
W78-09519

SYSTEMS PROGRAMS FOR THE ANALYSIS OF NONURBAN, NONPOINT SOURCE POLLUTANTS IN THE MISSOURI BASIN REGION. SUPPLEMENT,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5B.
W78-09520

PLAYER'S GUIDE. THE RIVER BASIN MODEL.
Washington Environmental Research Center, DC. Environmental Studies Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 276, Price codes: A14 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Office of Research and Monitoring, Environmental Studies Division, Washington, D.C., 1973. 290 p, 4 fig, append.

Descriptors: *River basin development, *Regions, *Planning, *Simulation analysis, *Human interaction, Decision making, Governments, Mathematical models, Agriculture, Income, Farms, Employment, Parks, Land use, Zoning, Computer programs, Federal budget, Maps, Economic development, Demography, Statistical data, Systems analysis.

The River Basin Model places an emphasis on 'River' as it leads one to believe that the model is primarily concerned with water management. The stress should be placed on 'River Basin', and that term should be interpreted in its broadest sense as meaning a geographic area of land. Through its two major components--human interaction and computer simulation--the model represents the economic, social and governmental activity that takes place within the geographical boundaries defined by a river basin. The model is unlike most other simulation or human interaction models. It was not designed to accomplish any one specific purpose. Rather, it was devised to let its users represent the major decision--making processes which cause a regional system to function and change on a year-to-year basis. Described is the model, the development of a data base and the initiation of a game play. After discussing the economic, governmental and social sectors, the report deals with the following departments: assessment; planning and zoning; utility; school; highway; and bus and rail companies. An appendix lists general program error messages. (Bell-Cornell)
W78-09522

THE CHANGING CONTEXT OF WATER RESOURCES PLANNING: THE NEXT 25 YEARS,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W78-09548

6B. Evaluation Process

USER ACCEPTANCE OF WASTEWATER SLUDGE COMPOST,
Culp/Wesner/Culp, Clean Water Consultants, El Dorado Hills, CA.
For primary bibliographic entry see Field 5E.
W78-09370

PLAYER'S GUIDE. THE RIVER BASIN MODEL.
Washington Environmental Research Center, DC. Environmental Studies Div.
For primary bibliographic entry see Field 6A
W78-09522

TURNPIKE PROPERTIES FOR THE OPTIMAL USE OF A NATURAL RESOURCE,
Ecole des Hautes Etudes Commerciales, Montreal (Quebec).
A. Haurine, and N. M. Hung.
Review of Economic Studies, Vol. 44, No. 137, p 329-336, June 1977. 23 ref.

Descriptors: *Resource use, *Optimization, *Economics, *Turnpike properties, *Model studies, *Natural resources, Exhaustible resources, Inexhaustible resources, Replenishable resources, Economic growth, Production, Capital.

This paper deals with fundamental mathematical problems arising from consideration of natural resources in the neoclassical framework of optimal economic growth. Two problems are: (1) precise formulation of the turnpike property; and (2) definition and characterization of the optimality when the time interval is infinite, and formulation of existence conditions for such an optimal solution. The two problems appear linked by the important role played in both by an optimal steady state. No formal proof has yet been given for an extension of the turnpike property to the case of an optimum growth model where both capital and natural resources enter into the production process. Differences between capital and resource assets include: (1) Capital enters as stock inputs in the production process while the latter are often flow inputs (2) Capital depreciates over time and is reproducible through investment, while a natural resource is depleted by use and, when replenishable, reproduces itself according to a natural law. In this paper this extended turnpike property is proven for a continuous time model and expressed as a bound for the measure of the time spent away from the Von Neumann Set of the Economy. Results show that the resource asset, when replenishable, plays essentially the role of capital; thus, the turnpike property exhibited is not surprising. (Lynch-Wisconsin)
W78-09540

POLITICAL RESOURCE ALLOCATION, CONTROLLED AGENDAS, AND THE STATUS QUO,
Carnagie-Melon Univ., Pittsburg, PA. Graduate School of Industrial Administration.
For primary bibliographic entry see Field 6E.
W78-09541

RECREATION AND INSTREAM FLOW. VOLUME 1, FLOW REQUIREMENTS, ANALYSIS OF BENEFITS, LEGAL AND INSTITUTIONAL CONSTRAINTS.
Cortell (Jason M.) and Associates, Inc., Waltham, MA.
For primary bibliographic entry see Field 6E.
W78-09543

THE CHANGING CONTEXT OF WATER RESOURCES PLANNING: THE NEXT 25 YEARS,
Victoria Univ. (British Columbia). Dept. of Geography.
W. R. D. Sewell
Natural Resources Journal, Vol. 16, p 791-805, October 1976. 2 fig.

Descriptors: *Future planning(Projected), *Water resources development, *Long-term planning, *Analytical techniques, Methodology, Model studies, Social aspects, Social needs, Technology, Institutions, Environmental effects, Water management(Applied), Canada, Conflict, Economic development, Resource allocation, International waters.

Successful water resource planning in the next 25 years will require a shift in perspective and improvements in analytical techniques to ensure that planning responds to the changing societal context. This paper describes a simple heuristic model of the social environment of water resources

planning, and relates concepts emerging from 50 years of planning to various social environments. The state of society model considers three factors: (1) needs, (2) technology, and (3) institutions. Social needs in primitive societies are defined largely in terms of biological survival, but with increasing societal complexity, material wants become progressively more important and finally psychological needs predominate. As societies progress from simple tools to sophisticated technology, basic biological needs can easily be satisfied but the institutionalization of science and technology tends to be geared to particular wants, and new needs may not be recognized or provided for. Technological innovations may therefore be increasingly out of phase with needs. Societal controls range from simple rules governing the individual's relationship to the group, to the complex institutions of modern society. As the locus of planning is scaled upward, these scales of these factors increase pressures on the resource base, cause growing conflicts in resource use, and disrupt the environment. Planners in the future must concentrate on improving: (1) assessment of demands, (2) assessment of alternatives, (3) institutional innovation, and (4) international cooperation. (Lynch-Wisconsin)
W78-09548

RECREATIONAL USE OF SOUTHERN MICHIGAN GAME AND RECREATION AREAS,
Michigan Dept. of Natural Resources, Lansing. Rose Lake Wildlife Research Center.
J. M. Lerg, and G. Y. Belyea.
The Michigan Academician, Vol. 10, No. 1, p 77-89, 1977. 4 fig, 2 tab, 10 ref. W-118-R.

Descriptors: *Michigan, *Recreation demand, *Hunting, *Wildlife management, *Surveys, *Competing uses, Recreation, Recreation facilities, Fishing, Public recreation areas, Boating, Multiple purpose, Camping, Sport fishing, Skiing, Hiking, Parks.

A questionnaire survey of users of state game and wildlife areas and state parks and recreation areas in southern Michigan December 1973-November 1974 showed that of 5.3 million man hours of recreation, 74% were devoted to nonhunting activities and only 26% to hunting. Fishing, the most common nonhunting use, took 29%. Hunting accounted for 62% in fall and 40% in winter. Recreational use of public lands in southern Michigan has approximately doubled since the mid-1960's but mostly in nonhunting activities which in turn may be competitively excluding, hunting. Hunters may be reluctant to compete with nonhunting recreationists since intrusions into hunting space are likely to result in reduced hunter satisfaction, reduced safety, or both. While recreation areas have traditionally emphasized nonhunting uses (though some are open to hunting), nearly all game areas are purchased and maintained with hunter-derived funds (hunting licenses, arms and ammunition taxes). As hunting is restricted mainly to fall and winter, the game areas are naturally available to other users the remainder of year, but resource managers must continue to provide hunting opportunities. To meet this objective, as well as to avoid overburdening the resource, future management efforts will probably include more intensive management of selected activities and increased efforts to exclude or limit undesirable activities. (Lynch-Wisconsin)
W78-09550

TOURISM, SUMMER SKI-ING, HYDROELECTRICITY AND PROTECTION OF THE PUBLIC IN THE FRENCH ALPINE GLACIAL AREA: THE DEVELOPMENT OF AN APPLIED GLACIOLOGY,
Grenoble-1 Univ. (France). Inst. de Geographie Alpine.
For primary bibliographic entry see Field 2C.
W78-09650

A RESEARCH STRATEGY FOR SOCIAL ASSESSMENT OF LAKE RESTORATION PROGRAMS,
Oregon State Univ., Corvallis. Dept. of Anthropology.
For primary bibliographic entry see Field 5G.
W78-09710

ANNOTATED BIBLIOGRAHY FOR WATER QUALITY MANAGEMENT, (FOURTH EDITION).
Environmental Protection Agency, Washington, DC. Water Planning Div.
For primary bibliographic entry see Field 5G.
W78-09760

U.S. RESERVOIR INVENTORY,
National Reservoir Research Program, Fayetteville, AR.
For primary bibliographic entry see Field 4A.
W78-09797

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE COST OF SUPPORTING RURAL WATER SYSTEMS,
Rural Water, Chicago, IL.
W. J. Molberg, Jr.
1976. 124 p, 12 fig, 20 tab, 2 append.

Descriptors: *Water supply, *Rural areas, *Water management(Applied), *Cost analysis, *Economics, *Operation and maintenance, Water policy, Forecasting, Costs, Water supply development, New Mexico, Florida, Virginia, Northern Rio Grande Development and Support Company(NM), Support costs, Planning, Model studies, National Demonstration Water Project.

This study of the costs of supporting rural water systems consists of a technical study of activities and associated costs and a discussion of policy implications. The study is part of the National Demonstration Water Project (NDWP). Results of extensive research in New Mexico and also in Virginia and Florida indicate that costs of operation and maintenance of rural water systems are increasing and may be beyond the means of local jurisdictions. Support of rural water facilities poses as serious a problem as development. This section provides a breakdown of operation and maintenance costs by activity, and a per-connection per-month cost figure is given for each unit. Total costs of the units is the minimum level for supporting a rural water system, found to be $4.50/connection/mo for a 700-connection system, and $7.50/connection/mo for a 45-connection system. These figures include field labor and nonlabor costs, administration and management labor and nonlabor costs, equipment reserves, and transportation. Data from various studies demonstrate that rural systems at present do not spend nearly what the model developed here requires to ensure long-term system survival. As support costs are likely to be high by urban standards, public policy must relieve this pressure through such measures as: (1) regional support organizations to service several small systems, and (2) reducing the debt service portion of the bill by economical system design and subsidies. (Lynch-Wisconsin)
W78-09542

6D. Water Demand

RECYCLING AND WATER QUALITY,
Geological Survey, Reston, VA. Water Resources Div.
H. R. Feltz.
In: Proceedings of the World Conference, Towards a Plan of Actions for Mankind, Vol 1, Long-Range Mineral Resources and Growth: Pergamon Press, New York, p 121-125, 1977. 3 tab, 3 ref.

Descriptors: *Water demand, *Water supply, *Water reuse, *Water quality, *Available water, Evaluation, *Water resources assessment, *World water supply.

The growing demands on the limited water supply of the world may be related directly to pressures created by an expanding global population and the consequent broadening industrial base and intensified agriculture. Wastes from these sources have degraded water quality and compound the problem of acceptable supply versus increasing demand. Evaluation of water-resources data in choosing the best courses of action consistent with judicious use and protection of the available water supply, has resulted in increased emphasis on recycling water. To fully assess the effects of recycling on water quality, for whatever water use, hydrologists will be obliged to consider the entire interdependent hydrologic system and to gather and evaluate truly comprehensive data. (Woodard-USGS)
W78-09316

RECREATIONAL USE OF SOUTHERN MICHIGAN GAME AND RECREATION AREAS,
Michigan Dept. of Natural Resources, Lansing. Rose Lake Wildlife Research Center.
For primary bibliographic entry see Field 6B.
W78-09550

CARRYING CAPACITY CONTROLS FOR RECREATION WATER USES,
Wisconsin Univ.-Madison.
J. A. Kusler.
Upper Great Lakes Regional Commission, Inland Lake Renewal and Shoreline Management Report, 1972. 71 p, 3 fig, 1 append.

Descriptors: *Recreation, *Lakes, *Regulation, *Carrying capacity, *Water management(Applied), *Wisconsin, Governments, Streams, Rivers, Conflict, Water sports, Administration, Legislation, Legal aspects, Judicial decisions, Shore protection, Multiple use, Ecology, Control, Planning.

As overcrowding of lakes and streams threatens public health and hampers recreational use, techniques are needed for limiting total water use to an assigned carrying capacity by means of water sport regulation and water access control devices. This paper discusses such measures, with special attention to problems of Wisconsin. State-wide programs are necessary, involving conjunctive action by state agencies and local governments, to plan and manage water and shoreland areas. Administrative and legal problems are considered, and a model statute designed to strengthen water and shoreland planning in Wisconsin is presented. Carrying capacity refers to the ability of a water body to accommodate various uses and numbers of users within defined levels of ecological disturbance and conflicts. Carrying capacities should be assigned for number of uses and users which would not seriously upset the ecological balance, or threaten users' safety and enjoyment. Limitation of surface water use has generally been a local function, involving surface time or zoning regulations. Many have been ineffective due to jurisdictional conflict, pressure from interest groups, or lack of money. The Wisconsin legislature should: (1) determine carrying capacity standards for particular uses, (2) prepare capability inventories and development plans, (3) modify zoning statutes, and (4) acquire shoreland properties for public management. (Lynch-Wisconsin)
W78-09551

WATER FOR INDUSTRIAL DEVELOPMENT IN GEORGE, HANCOCK, PEARL RIVER, AND STONE COUNTIES, MISSISSIPPI,
Geological Survey, Nashville, TN. Water Resources Div.; and Geological Survey, Jackson, MS. Water Resources Div.
J. V. Brahana, and G. J. Dalsin.
Mississippi Research and Development Center, Jackson, 1977. 70 p, 33 fig, 11 tab, 67 ref.

Descriptors: *Available water, *Surface waters, *Groundwater resources, *Water quality, *Mississippi, Water resources development, Planning, Industries, Water supply, Data collections, Streamflow, Aquifer characteristics, Water yield, Water analysis, Chemical analysis, *Industrial development, George County, Hancock County, Pearl River County, Stone County.

In southern Mississippi, George, Hancock, Pearl River, and Stone Counties have an abundant water supply. The water quality of the large streamflow and ground-water potential is very good, and little or no treatment is required for most industrial uses. Present water use is a small fraction of the total resource. In 1975, less than 8.5 million gallons per day was pumped from aquifers in the area, and there were virtually no known major withdrawals of surface water. The Pearl and Pascagoula Rivers could each supply at least 475 million gallons per day. The remaining eight streams in the area can supply at least 5 million gallons per day each without storage during a drought of 10-year recurrence interval. Miocene aquifers with aggregate freshwater sand thicknesses ranging from about 200 feet to more than 1,200 feet that underlie the entire four-county area are the most reliable sources of water. Large-diameter wells tapping the thicker sands should be capable of yielding several million gallons per day at many locations. The largest yield reported for a single well was 5,865 gallons per minute in Hancock County. (Woodard-USGS)
W78-09744

RATIONALISATION OF IRRIGATION RATES IN A DEVELOPING COUNTRY,
Central Water Commission, New Delhi (India).
For primary bibliographic entry see Field 3F.
W78-09761

6E. Water Law and Institutions

RECYCLING AND WATER QUALITY,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-09316

WATER REORGANIZATION--AIMS, ACHIEVEMENT AND THE FUTURE,
Thames Water Authority, London (England).
For primary bibliographic entry see Field 5G.
W78-09424

EFFECT OF ENVIRONMENTAL REGULATIONS ON WATER MANAGEMENT IN (CZECHOSLOVAKIAN) PULP AND PAPER MILLS (VLIV VODOPRAVNICH PREDIPISU NA VODNI HOSPODARSTVI PAPIREN A LEPENKAREN),
For primary bibliographic entry see Field 5G.
W78-09511

POLITICAL RESOURCE ALLOCATION, CONTROLLED AGENDAS, AND THE STATUS QUO,
Carnagie-Melon Univ., Pittsburg, PA. Graduate School of Industrial Administration.
T. Romer, and H. Rosenthal.
Working Paper No. 86-75-76, Graduate School of Industrial Administration, Carnagie-Melon University, August 1977. 27 p, 2 fig, 11 ref, append.

Descriptors: *Political aspects, *Resource allocation, Agendas, *Decision-making, *Model studies, Institutions, Governments, Budgeting, Economics, Controlled agendas, Monopoly, Voting, Status quo, Taxes, Referenda, Administration.

A simple model of collective expenditure determination is analyzed to study decision-making through controlled agendas. The model corresponds to a situation widespread in local jurisdictions where public expenditures are determined by vote of the citizenry on a budget proposal formulated by a committee or bureau of public services. The budget proposal typically is subject to simple approval or defeat in a referendum. This paper focuses on a single vote on a tax-expenditure decision. The voters' choic is between the agnda-setter's proposal and the status-quo or fall-back position, and therefore the outcome of such of political resource allocation process depends to a great degree on the status quo, and intitutional and historical background. The 'setter's paradox' is discussed, in which a relatively high status-quo level of expenditure implies a relatively low level of final approved expenditures. The results are illustrated with cases from educational finance, public works projects, and implications for zero-base budgeting. Zero-base review and zero-base budgeting may tend, paradoxically, to increase the monopoly power of agencies, particularly appropriations for activities for which a majority of voters are unwilling to have the budgets go to zero. In this study it is assumed that the setter has a preference for the largest feasible expenditure. (Lynch-Wisconsin)
W78-09541

RECREATION AND INSTREAM FLOW. VOLUME 1, FLOW REQUIREMENTS, ANALYSIS OF BENEFITS, LEGAL AND INSTITUTIONAL CONSTRAINTS.
Cortell (Jason M.) and Associates, Inc., Waltham, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 269, Price codes: A08 in paper copy, A01 in microfiche. Bureau of Outdoor Recreation, July 1977. 96 p, 5 fig, 108 ref, 2 append. BOR-5-14-07-7.

Descriptors: *Recreation, *Legal aspects, *Streamflow, *Institutional constraints, *Rivers, Instream flow, Recreation demand, Streams, Methodology, Planning, Forecasting, Economics, Dams, Reservoirs, Water resources development, Boise River(ID), Bibliographies, Optimization.

Water requirements for instream recreation use, a methodology for evaluating impact of flow increments, and leal institutional constraints on use of instream rates for recreation were investigated. Very few water projects in the U.S. (such as dams) control water release to increase instream flow specifically for recreational purposes. The few that do are mainly located in the East, while in the drier West such releases are usually to dilute contaminant and support fish and wildlife. While instream flows for recreation cannot be guaranteed in specific cases planners can accurately determine the amount of water required, its value, and obstacles to be encountered. Physical instream conditions needed for various types of recreation are specified, in terms of width, depth, and flow velocity. Auxiliary site and longitudinal considerations affecting desirability of the activity are discussed. A technique using hydrology, hydraulic geometry, and limited field observations was developed to permit specification of minimum or optimum flow, and was tested on seven rivers in various parts of the country. Insuring the recommended flow means that recreation must compete directly with other consumers of stream water. This problem is analyzed with reference to evaluation criteria imposed by the U.S. Water Resources Council's 'Principles and Standards.' An annotated bibliography is included. (Lynch-Wisconsin)
W78-09543

CARRYING CAPACITY CONTROLS FOR RECREATION WATER USES,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 6D.
W78-09551

CODIFIED AND UNCODIFIED STATE LAWS AND AGENCY RULES AND REGULATIONS BEARING ON WATER AND RELATED LAND RESOURCES IN MINNESOTA, VOLUME 1.
Minnesota Univ., St. Paul. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 103, Price codes: A99 in paper copy, A01 in microfiche. WRRC Bulletin 98, June 1978. 685 p. Compiled by A. W. LaChapelle. OWRT A-999-MINN(47), 14-34-0001-8025.

Descriptors: Legislation, Regulations(Law), Planning, Management, *Minnesota, *Water law, *Administration, Land resources.

This publication is a source reference for lawmakers, administrators, planners, lawyers, engineers, and others interested in water resource use, development, and management. It contains a compilation of all pertinent (1) codified state laws as of fiscal year 1977. The codified laws are contained entirely in Volume 1 along with an Analytical Table of Chapters of included statutory material while Volume 2 will contain the uncodified enactments and agency rules and regulations. And finally the entire work is intended to be self-contained. All textual material of Minnesota statutes, regulations or documents referred to in the text is incorporated into the bulletin as appropriate unless notated otherwise. Textual material of foregin or federal statutes, regulations, treaties or documents is not included as it is beyond the scope of this work. (Waelti-Minnesota)
W78-09571

AN INTRODUCTION TO FOUR OVERVIEWS: ARID AND SEMI-ARID LANDS; SOIL LOSS; TROPICAL FORESTS AND WOODLANDS; WATER QUALITY,
United Nations Environment Program, New York.
For primary bibliographic entry see Field 6G.
W78-09657

RAUSER V. TOSTON IRRIGATION DISTRICT (NO SHOWING OF NEGLIGENCE NECESSARY TO RECOVER FOR INVERSE CONDEMNATION).
565 P. 2d 632-642 (Mont., 1977).

Descriptors: *Montana, *Condemnation, *Irrigation effects, *Flooding, Irrigation districts, Drainage systems, Drainage effects, Irrigation water, Negligence, Seepage, Adjacent landowners, Legal aspects, Land tenure, Damages, Eminent domain, Land appraisal, Judicial decisions, Easements, Constitutional law, Real property.

Plaintiff landowners brought an inverse condemnation proceeding against defendant irrigation district. The plaintiffs claimed that construction of an irrigation project by the defendant had resulted in seepage which caused water to stand stagnant on 40 acres of their land and that this amounted to the taking of a flood easement. At trial, the plaintiffs received a $100,000 judgment. On appeal, the Montana supreme court decided that when damages are known or are ascertainable and are an inevitable result of a project, there is no need to show negligent design, construction, or operation to recover on inverse condemnation. In affirming the trial court, the supreme court ruled that five factors were to be considered in inverse condemnation suits: (1) property damage if reasonably foreseeable, and whether it would have entitled the property owner to compensation; (2) the likelihood of future public works projects not

being engaged in; (3) whether direct physical damage resulted from the project; (4) whether the cost of the damage can be borne easier by the taxpayers than by the private owner; (5) and whether the private owner would contribute more than his proper share to the undertaking if uncompensated. (Maass-Florida)
W78-09683

MELVILLE V. SALT LAKE COUNTY (LANDOWNER'S RIGHT TO APPROPRIATE SPRING WATER).
570 P. 2d 687-689 (Utah, 1977).

Descriptors: *Utah, *Water allocation(Policy), *Appropriation, *Percolating water, *Domestic use, Legal aspects, Water contracts, Water policy, Prior appropriation, Water law, Water rights, Beneficial use, Surface runoff, Subsurface waters, Bodies of water, Mine water, Spring waters, Zoning, Regulation, Springs.

Plaintiff landowners appealed from a judgement of the district court dismissing their complaint for writs of mandamus to compel the county to issue building permits, which had been denied on the grounds that the landowners did not have an adequate source of culinary water. Plaintiff's source of water was a spring on the land of a non-party plantiff which produced twenty gallons of water per minute. The flow was adequate to meet plaintiff which produced twenty gallons of water per minute. The flow was adequate to meet plaintiff's needs by county health standards. The state supreme court held that, in addition to proving that they had an adequate source of water, plaintiffs must further show that they have a right to use the water. Plaintiffs alleged that since the water in question was percolating water, it belonged to the owner of the land. The court held that the water did not fit into the definition of percolating water, and therefore was subject to appropriation. Since the plaintiffs could only establish that they had a right to 50 gallons of water per day per unit, the court found that they were not entitled to the permit because the board of health requirement of 400 gallons per day per unit was not met. (Beamer-Florida)
W78-09684

SAXON V. DIVISION OF STATE LANDS (DENIAL OF PERMIT APPLICATION TO FILL SALTMARSH).
31 Or. App. 511, 570 P.2d 1197-1201 (1977).

Descriptors: *Oregon, *Permits, *Landfills, *Environmental control, *Saltmarshes, Administrative decisions, Regulation, Administration, Land use, Non-structural alternatives, Water law, Real property, Water resources, Natural resources, Legal aspects, Judicial decisions, State governments, Protection, Legal review, Estuarine environment.

Plaintiff appealed a decision of the defendant state agency, reached after a hearing, denying him a permit to fill acres of salt marshland of the Siuslaw River Estuary in order to construct a campground, restaurant, and marina. The appellate court outlined the role of the saltmarsh in providing spawning grounds and habitat for fish. The court also noted the saltmarsh's important function in flood control and pollution assimilation. Denying the appeal, the court held that Oregon's Removal and Fill law provides for the protection, conservation, and best use of Oregon's water resources, and together with the defendant agency's rules sets forth ascertainable standards for allowance or denial of fill applications. In addition, the court held that there was substantial evidence in the record to support the defendant agency's conclusion that the public interest in the best use of its water resources was better served by retaining plaintiff's saltmarsh in its unimproved state. Finally, the court noted that the issue of inverse condemnation would have to be raised in a separate proceeding. (Hoofman-Florida)
W78-09685

BRUSCO TOWBOAT CO. V. STATE (VALIDITY OF LEASE PROGRAM FOR SUBMERGED LAND).
31 Or. App. 491, 570 P. 2d 996-998 (1977).

Descriptors: *Oregon, *Beds, *Navigable waters, *Leases, *Structures, Legislation, Bodies of water, Navigation, Ownership of beds, Riparian rights, Legal aspects, Rent, Permits, Riparian land, Land, Water law, State jurisdiction.

Three consolidated cases raised the issue of the validity of the State Land Board's program under which users were required to enter into leases and pay rent for the use of submerged and submersible lands underlying navigable waterways in the state. The circuit court upheld the program. The apellate court appeals reversed in part. On petition for reconsideration, the appellate court held that the riparian owners who had exercised the right to erect navigational structures on state-owned submerged and submersible lands prior to the effective date of the State Land Board's program were all, without regard to the public nature of some of them, entitled to the benefit of estoppel arising from exercised affirmative leases. The court limited the Board's power to revoke riparian licenses to erect navigation structures by the licensee's right to recover unrecouped investments. The court further held that the fact that some of the riparian owners were lessees under a prior similar program of the state might affect the cutoff period for recoupment for them and might therefore be relevant in computing their appropriate period of free rental. However, it would not affect the applicability of estoppel. (Beamer-Florida)
W78-09686

BRUSCO TOWBOAT CO. V. STATE, BY AND THROUGH STRAUB (AUTHORITY OF STATE TO REQUIRE THE PAYMENT OF RENT FOR USE OF SUBMERGED AND SUBMERSIBLE LAND UNDER NAVIGABLE WATERS).
30 Or. App. 509, 567 P. 2d 1037-1051 (1977).

Descriptors: *Oregon, *Leases, *Navigable waters, *Riparian rights, *Submerged Lands Act, Legal aspects, Land, Land use, Rent, Structures, State jurisdiction, Eminent domain, Legislation, Permits, State governments, Land resources, Riparian land, Riparian waters.

In three consolidated cases, plaintiffs, various tugboat and plywood companies, riparian landowners and several port districts, challenged the validity of Oregon's State Land Board's program requiring users to enter into leases for the use of state-owned submerged and submersible lands underlying navigable waterways throughout the state. Uses which are essentially navigational and wharfing privileges by riparian owners were exempted from the program. Plaintiffs contended that the program is beyond the Board's statutory authority and violates both the Oregon and United States Constitutions. Plaintiffs further contended that the state's proprietary interest in the land does not empower it to convey leasehold interests to private parties. Riparian land owners argued that the charging of rent on structures built on submerged land was an unlawful taking of property. Plaintiff port districts contended that due to legislative delegation of authority, the program should not apply to them. The Court of Appeals upheld the program as applied to all plaintiffs, but held that riparian owners were entitled to use structures built before the effective date of the program for as long as reasonably necessary to recoup expenses. (Quarles-Florida)
W78-09687

MORE V. JOHNSON (RIPARIAN OWNER'S RIGHT TO BED OF STREAM).
568 P. 2d 437-441 (Colo., 1977).

Descriptors: *Colorado, *Streams, *Riparian rights, *Non-navigable waters, *Boundaries(Property), Bodies of water, Riparian land, Water law, Legal aspects, State governments, Trespass, Beds, Adjacent landowners, Boundary disputes, Banks, Rivers.

Plaintiff riparian landowners filed suit against adjoining landowners and an engineer to quiet title to certain real estate and to obtain damages for trespass and conspiracy to commit trespass. Both plaintiff and defendant held title derived from a common grantor to land bordering a creek. The general rule of law followed by the state is that a deed conveying land bordered by a non-navigable stream includes the bed to the center or thread of the stream if the stream is described in the deed as a boundary or monument. The district court followed the general rule and quiet title to the center of the bed of the stream in the plaintiffs. A $15,000 judgement was rendered to the plaintiffs and attorneys' fees were awarded. The state supreme court held that the wording of the plaintiff's deed made the general rule of ownership inapplicable. The court held further that proof of an agreement to trespass between the engineer and the adjoining landowners would not be inferred; it would have to be proven. In addition, the statutory award of attorney's fees, without reciprocal rights for a successful defendant, was found to be a denial of equal protection. (Beamer-Florida)
W78-09688

MOE V. DIVISION OF STATE LANDS (RIGHT TO FILL SUBMERGED LAND).
31 Or. App. 3, 569 P. 2d 675-677 (1977).

Descriptors: *Oregon, *Landfills, *Permits, *Beds, *Conservation, Legal aspects, Administrative agencies, Legislation, State governments, Regulation, Aquatic life, Fish conservation, Water resources, Bodies of water, Fish, Freshwater fish, Aquatic habitats, Wildlife conservation, Dredging, Salmonids.

The petitioners sought a reversal of an order granting the Port of Hood River a permit to fill submerged land on the ground that, as a matter of law, the order granting the permit was contrary to the statutory standards set forth in the relevent state statute. The Port had acquired title to the submerged land in question and to adjacent lands to create an industrial park. The rest of the land was filled before a law requiring a permit to fill submerged land was passed. When the Port applied for the required permit for the land in question, the application was denied. The decision was contested and the Director of State Lands granted the permit. He found that there were 'special circumstances' which made this a unique situation. Although the previous fill operations had resulted in increased fishery values that needed environmental protection, the substantial commitment of time and money by the Port toward the project in 1967 and the fact that the fisheries were a result of the Port's work made this a unique situation. The appellate court reversed finding that the Director had gone beyond this authority in finding 'special circumstances.' (Beamer-Florida)
W78-09689

BOHN V. KUIPER (PROOF OF AUGMENTATION PLAN REQUIRED BEFORE PERMIT ISSUANCE).
575 P. 2d 402-403 (Colo., 1978) (rehearing denied March 13, 1978).

Descriptors: *Colorado, *Water allocation(Policy), *Well permits, *Prior appropriation, *Relative rights, Appropriation, Priorities, Preferences(Water rights), Water distribution(Applied), Competing uses, Irrigation practices, Legal aspects, Water control, Water demand, Water rights, Permits, Irrigation permits, Legislation, Administrative agencies, Control.

Applicant proposed to drill an irrigation well. The state engineer denied the well permit on the grounds that he was unable to find any available unappropriated water, and was unable to find that vested water rights of senior appropriators would not be materially damaged by use of water from the applicant's well. Applicant then applied to the water court for a conditional decree authorizing well construction. The water court granted a conditional right to well operation if the applicant would provide proof of an approved plan of augmentation as mandated by the amended rules and regulations of the state engineer. A 'plan for augmentation' means a detailed program to increase the supply of water available for beneficial use. The state engineer appealed the conditional decree. The appellate court found that the applicant had not submitted his own augmentation plan, nor shown that he had joined any organization which had an approved plan for augmentation. Reversing the conditional decree, the appellate court held that a plan of augmentation must be shown before any conditional decree could be awarded. Otherwise, anyone desiring to drill a well could obtain such a conditional decree. (Baumbach-Florida)
W78-09690

CITY OF THORNTON V. FARMERS RESERVOIR AND IRRIGATION COMMPANY (HOME RULE MUNICIPALITY'S POWER TO CONDEMN WATER RIGHTS).
575 P. 2d 382-395 (Colo., 1978) (Rehearing denied March 6, 1978).

Descriptors: *Colorado, *Cities, *Eminent domain, *Water rights, *Municipal water, Condemnation, Legal aspects, Water law, State governments, Constitutional law, Judicial decisions, Legislation, Competing uses, Compensation, Political aspects, Ditches, Regulation.

Plaintiff, a home rule municipality, sought to condemn certain water and water rights and ditches and ditch rights of defendant mutual ditch company. Plaintiff contended that it waa not subject to the provisions of the Water Rights Condemnation Act of 1975 which requires that necessity be determined before eminent domain proceedings can be exercised. Plaintiff relied on Article XX of the Colorado Constitution which provides that a home rule municipality shall have the power to condemn and purchase water works. Defendant argued that determination of necessity was a matter of statewide concern, and therefore, home rule municipalities were subject to statutory limitations provided in the Condemnation Act. Defendant further contended that the constitutional grant of power to condemn water works did not include water rights. The court held for the plaintiff, stating that the plaintiff could exercise its condemnation powers granted by the constitution and that the term 'water works' includes the water rights necessary to operate the works. Therefore, the condemnation of water rights by the home rule municipality was found not to be a matter of statewide concern, requiring statewide regulation. (Curtis-Florida)
W78-09691

COUNTY OF BUCKS V. .800 ACRES OF LAND IN TOWNSHIP OF MIDDLETOWN, COUNTY OF BUCKS (POSSESSION BY CONDEMNOR NECESSARY TO EFFECT A TAKING).
Pa. Cmwlth., 379 A. 2d 903 (1977).

Descriptors: *Pennsylvania, *Eminent domain, *Dam construction, *Spillways, Condemnation, Legal aspects, Value, Cost repayment, Payment, Easements, Right-of-way, Compensation, Water law, Alteration of flow, Artificial use, Flood control, Recreation, Legislation, Sites, Overflows.

In anticipation of constructing a recreation and flood control dam, the county acquired a perpetual right and easement to occasionally overflow, flood and submerge owners' lands. Such right was acquired by filing a 'declaration of taking', that is by condemning the owners' land. The lower court awarded delay compensation to the condemnees from the date of filing the declaration of taking and the county appealed. In reversing, the appellate court found that the lower court erred in holding that possession by the county was not necessary to effectuate a taking of the property involved. The court found that such possession was necessary, and that possession would occur through the flooding of appellees' property following construction of the dam. The fact that this flooding will take place only occasionally at undetermined future times was considered irrelevant. Since possession by county had not yet occurred, the owners were judged not entitled to delay compensation. (Baumbach-Florida)
W78-09692

ROBINSON V. ARIYOSHI (ENGLISH COMMON LAW DOCTRINE OF RIPARIAN RIGHTS FOUND NOT TO GOVERN THE USE OF HAWAII'S STREAM WATERS).
441 F. Supp. 559-587 (D. Hawaii, 1977).

Descriptors: *Riparian rights, *Alteration of flow, *Surface water availability, *Water allocation(Policy), Water rights, Legal aspects, Surface waters, Common law, Constitutional law, Irrigated land, Riparian land, Streamflow, River flow, Diversion, Streams, Water law, Compensation, Hawaii, Irrigation.

Plaintiffs, individuals and companies which had been party to state supreme court proceedings, brought action to enjoin state officials from interfering with transportation and use of river waters for irrigation purposes. Plaintiffs also moved for declaratory judgment that the prior decision was void to the extent that it adjudicated all flowing surface waters to be property of the state, subject only to appurtenant water rights, and adjudicated that rights to ancient appurtenant water cannot be separated from ownership of the land. Plaintiffs also sought declaratory judgment that water awarded to them could be transported out of the watershed, and that the English common law doctrine of riparian rights does not govern the use of Hawaii's stream waters. The district court held that there was no applicable federal common law regarding appurtenant water rights; that the decision of the Hawaii Supreme Court had denied procedural due process since the parties had no opportunity to argue the issues of the decision; and that the decision retroactively converted private property rights in water to public property rights, thus resulting in an unconstitutional taking of property without compensation. (Rule-Florida)
W78-09693

PACIFIC LEGAL FOUNDATION V. QUARLES (POWER OF ENVIRONMENTAL PROTECTION AGENCY TO FORMULATE CONDITIONS FOR NATIONAL POLLUTANT DISCHARGE SYSTEM PERMIT).
440 F. Supp. 316-328 (C.D. Cal., 1977).

Descriptors: *Waste water treatment, *Waste water disposal, *Sewage treatment, *Federal Water Pollution Control Act, Water law, Water purification, Sludge disposal, Waste water(Pollution), Waste disposal, Sewage effluents, Sewage sludge, Municipal wastes, Sewage, Landfills, Oceans, Permits.

Plaintiff legal foundation requested an injunction to stop implementation of wastewater treatment plant's interim sludge disposal project which called for de-watering of sludge and transportation to a sanitary landfill, on the ground that the project would result in substantial land-based environmental consequences. Plaintiff alleged that the Environmental Protection Agency (EPA) supported the project relying on the untested assumption that ocean disposal of sludge is more harmful than disposal on land. Plaintiff requested the injunction until preparation of two environmental impact statements; one for a contemplated EPA grant to fund the project, and another for the EPA's national policy against disposal of sludge into the ocean. Plaintiff also sought a declaration that the Federal Water Pollution Control Act does not prohibit ocean disposal of sludge and hence any impact statement for the project should consider ocean disposal. In denying the injunction, the district court held that as long as there existed a practical land disposal method, the EPA was not required to evaluate the alternative of ocean dumping when it formulated conditions for a national pollutant discharge elimination system, or when it authorized a grant to develop a project designed to achieve compliance with the Act. (Rule-Florida)
W78-09694

SOLE OR PRINCIPAL SOURCE AQUIFER AREAS.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
For primary bibliographic entry see Field 5G.
W78-09695

CARBON BLACK MANUFACTURING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-09696

DEEP OCEAN MINING.
National Oceanic and Atmospheric Administration, Washington, DC.
Federal Register, Vol. 42, No. 239, p 62521-23, December 13, 1977.

Descriptors: *Mining, *Beds under water, *Oceans, *Mineral industry, Industries, On-site investigations, Research development, Hydraulic mining, Toxins, Regulation, Manganese, Deepwater habitats.

These environmental guidelines concerning deep ocean mining are based on preliminary results of the National Oceanic and Atmospheric Administration's (NOAA) Deep Ocean Mining Environmental study (DOMES 1). The guidelines provide an early indication of key areas of environmental concern in the development of deep ocean mining for manganese nodules. Bills which would establish regulatory regimes for deep-sea mining are presently before Congress. Several multinational organizations are actively engaged in premining research and development activities. Testing of prototype mining systems has already begun. Two main types of mining systems are being developed: hydraulic and mechanical. The NOAA foresees creation of perhaps four to six mining operations. The guidelines for mining operations include: (1) creation of discharge methods that will minimize environmental impacts; (2) conduction mining activities which will allow preservation of benthic communities and habitats; (3) elimination of exogenous and indigenous materials identified as toxic or deleterious; (4) determination of mining sites based on potential impacts on humans and biota; and (5) conducting on-going environmental studies at every mining site. Environmental studies should include participation of both government and industry. (Spiegel-Florida)
W78-09697

IMPLEMENTATION OF SECTION 208 IS FINALLY UNDERWAY: ENVIRONMENTAL LAW INSTITUTE WILL ASSIST BY PREPARING HANDBOOK FOR DESIGNATED AGENCIES.
For primary bibliographic entry see Field 5G.
W78-09698

SECTION 1424 (E) OF THE SAFE DRINKING WATER ACT: AN EFFECTIVE MEASURE AGAINST GROUNDWATER POLLUTION,
For primary bibliographic entry see Field 5G.
W78-09699

STATE'S RIGHTS REVISITED: THE NINTH CIRCUIT LEADS THE BUREAU OF RECLAMATION TO WATER.
Environmental Law Reporter, Vol. 7, No. 7, p. 10127-10130 (July, 1977).

Descriptors: *Water resources development, *Federal Reclamation Law, *Federal-state water rights conflict, *Water allocation(Policy), Judicial decisions, Legal review, Federal government, State governments, Competing uses, Governmental interrelations, Water law, Planning, Prior appropriation, Permits, Dams, Rivers.

A substantial setback to state efforts to plan water allocation has resulted from a 1977 Ninth Circuit Court of Appeals decision. In United States v. California, the court held that the Federal Bureau of Reclamation need not comply with state water permit restrictions when it obtains unallocated waters. In effect, this will allow the federal government to obtain unallocated waters regardless of state conservation priorities. The author criticizes the court ruling as not properly considering the legislative intent behind the Reclamation Act of 1902, and feels that the court erred in relying on a United States Supreme Court ruling in Hancock v. Train, in which the Court held that Congress did not intend to include fedeal installations within a state's primary responsibility for assuring air quality in a region. The ninth circuit, applying this holding, ruled that although the federal government is supposed to proceed in conformity with state water laws, this duty is limited only to those laws that came into existence before passage of the Reclamation Act. The article concludes that it will require Supreme Cour clarification to rectify this case law application trend. (Stump-Florida)
W78-09700

POWER PLANT SITING ON WISCONSIN'S COASTS: A CASE STUDY OF DISPLACEABLE USE,
Wisconsin Univ.-Madison. Center for Resource Policy Studies and Programs.
For primary bibliographic entry see Field 6G.
W78-09701

CURRENT INTERNATIONAL ISSUES RELATING TO THE LAW OF THE SEA,
United Nations Permanent Mission of Cameroon, New York.
P. B. Engo.
Natural Resources Lawyer, Vol. 4, No. 3, p 622-628 (1971).

Descriptors: *Continental shelf, *International law, *Law of the sea, *United Nations, United States, Africa, Foreign countries, Foreign waters, Oceans, Oil industry, International waters, Political aspects, Canada, Coasts, Governments, Governmental interrelations, Jurisdiction, Regime, Beds under water, Boundary disputes.

This article is the text of a paper presented in 1971 in Houston, Texas in connection with the Offshore Technology Conference. Examined are problems then plaguing the United Nations Special Committee on the Sea Bed responsible for preparing materials for the 1973 Law of the Sea Conference. The author recommends that so-called 'big' countries like the United States must not reject the active participation of younger states, especially African states, in creating an international regime for governing use of the seabed. The author criticizes adherence to the anachronistic concept of absolute sovereignty, the 1958 Convention on the Continental Shelf which had included only a handful of African states, isolationist policies, and the use of industrial advancement rather than economic and technological potential as the basis for determining the relative strengths of nations. Joint cooperation through the United Nations could lessen the danger of war. The involvement of United States oil companies in the economic development of young states is a model for further cooperation. The author notes that neither developed nor less developed countries can do without each other, and suggests that opinions of scientific experts should guide the formation of an international regime. (Smith-Florida)
W78-09702

FEDERAL NAVIGATION SERVITUDE: SHOULD IT BE A TOOL FOR WETLANDS PROTECTION,
S. A. Fraser, IV.
Detroit College of Law Review, Vol. 1977. No. 1, p 111-133 (Spring, 1977).

Descriptors: *Navigable waters, *Wetlands, *Federal jurisdiction, *Constitutional law, *Protection, Watersheds(Basins), Water law, Rivers and Harbors Act, Federal Water Pollution Control Act, Navigable rivers, Navigation, Meanders, Natural streams, Coastal marshes, Compensation, High-water mark, Judicial decisions, Legal aspects, Regulation, State governments.

The need for protection of the nation's wetlands has been recognized by all branches of the federal government. The author believes that protection can best be obtained from the federal government. The United States Army Corps of Engineers has been the guardian of navigable waters under a doctrine labeled navigational servitude based on the Commerce Clause of the Constitution. Under this doctrine the federal government asserts a superior right to navigable waters and in some cases the underlying land. When operating pursuant to the doctrine, the federal government has historically not paid compensation for the taking of private property. The author examines the historical development of federal jurisdiction through the expansion of the doctrine from coverage of waters strictly navigable in fact to all wetlands up to and including marshlands above the mean high-water line. The author concludes that the doctrine of navigational servitude cannot reasonably be used to justify the extension of federal jurisdiction to regulate nonnavigable marshlands for environmental purposes without paying compensation to landowners whose property rights are affected. (Wright-Florida)
W78-09703

INDIAN PUEBLO WATER RIGHTS NOT SUBJECT TO STATE LAW PRIOR APPROPRIATION,
R. R. O'Brien.
Natural Resources Journal, Vol. 17, No. 2, p 341-344 (April, 1977).

Descriptors: *New Mexico, *Prior appropriation, *Indian reservations, *Reservation doctrine, *Pueblo water rights, State jurisdiction, Water rights, Preferences(Water rights), Water law, Riparian rights, Appropriation, Irrigation water, Water utilization, Competing uses, Beneficial use, Priorities, Civil law, Legal aspects, Federal jurisdiction, Public lands, Federal reservations, Political aspects.

In 1966, New Mexico brought suit to determine the rights to the use of water of the Nambe-Pojoague River system. The district court held that the Indians' rights to water use were controlled by the state law doctrine of prior appropriation, meaning that the individual with the greatest priority has the better right to the water. On appeal, the United States and the Indians argued that the Indians had a reserved right that was prior to those rights of non-Indians and that they had a reserved right to the use of as much water as they needed to irrigate their land. The state argued that whatever rights the Indians had were lost by the Pueblo Land Acts of 1924 and 1933 which quieted title to lands of uncertain ownership. The appellate court held that the Indians' right to the use of this water was not governed by state law based on the doctrine of prior appropriation since the U.S. had never surrendered its jurisdiction and control. The court found that the language of the public Land Acts indicated that the Indians had a reserved right to the use of the water. (Maass-Florida)
W78-09704

LAW OF THE SEA: BREAKING THE DEADLOCK,
Vanderbilt Univ., Nashville, TN. School of Law.
J. I. Charney.
Foreign Affairs, Vol. 55, No. 3, p 598-629 (April, 1977).

Descriptors: *International law, *Law of the Sea, *Oceans, *United Nations, *Resources, Water law, Water rights, Water conservation, Seas, Continental shelf, Jurisdiction, Political aspects, Legislation, Planning, Riparian rights, Water policy, Regulation, Mining, International waters.

The negotiations at the Third United Nations Law of the Sea Conference are aimed at preparing a comprehensive and universally acceptable Convention of the Law of the Sea. The negotiations are deadlocked over three critical issues: (1) the legal status of the agreed 200-mile economic zone; (2) a regime for exploiting the resources of the deep seabed; and (3) the rights of landlocked and geographically disadvantaged states. The economic issues have become increasingly linked to the broader objectives of the developing nations. On the seabed issue in particular, there is a marked developed nations against the developing nations character to the opposing sides. The greatest danger threatening the negotiations with failure comes from the United States, and specifically from the likelihood of congressional action asserting a United States right to exploit the deep seabed under congressionally set terms. Inescapably, these Law of the Sea negotiations pose the broader issue of world order. The problem of the oceans is only one of a number of universal issues that may require multilateral solutions. The author suggests that the failure of the Conference participants to reach an agreement will result in destabilizing, illegitimate unilateral actions detrimental to all in the long run. (Jordan-Florida)
W78-09705

WHO WILL OWN THE OCEANS,
J. T. Swing.
Foreign Affairs, Vol. 54, No. 3, p 527-546 (April, 1976).

Descriptors: *Oceans, *Law of the Sea, *International waters, *United Nations, *International law, Riparian rights, Continental shelf, Water law, Continental slope, Bodies of water, Seas, Navigation, Commercial fishing, Water pollution control, Foreign waters, Oil industry, Regulation, Resources, Foreign countries.

Competition for control over the oceans has increased dramatically in the twentieth century. Realizing in 1945 that offshore oil would become important, the United States unilaterally reserved exploration rights of the continental shelf. Other unilateral declarations followed and to reconcile the newly asserted rights the United Nations has held conferences to clarify the Law of the Sea. The major issues before the Third Conference are: a 12-mile territorial limit; an exclusive economic zone extending 188 miles beyond that; and whether the area beyond 200 miles, including the waters, the seabed and the resources, will be subject to the jurisdiction and control of an international organization not yet established. The conflict between freedom of navigation and protection of the marine environment and who will control the oil resources beneath the sea will also be con-

sidered. In these issues there is a conflict between the developing and industrial nations. The article concludes that the need for unhampered scientific research must be balanced against the strong drive for sovereignty in the 200 mile limit and that a treaty is necessary. (Maass-Florida)
W78-09706

WATER POLLUTION CONTROL: AN OVERVIEW OF THE LAWS,
Environmental Protection Agency, Washington, DC. Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W78-09707

U.S. OCEANS POLICY: THE TRUMAN PROCLAMATIONS,
Johns Hopkins Univ., Washington, DC. Ocean Policy Project.
A. L. Hollick.
Virginia Journal of International Law, Vol. 17, No. 1, p 23-55 (Fall, 1976).

Descriptors: *Continental shelf, *Oceans, *Boundary disputes, *International law, *Coasts, Continental slope, Continental margin, Marine geology, Political aspects, Resources, Political constraints, Federal government, Jurisdiction, Water law, Water rights, Legal aspects, Geomorphology, Foreign countries.

In 1945, the United States government issued two proclamations. One asserted jurisdiction and control over the natural resources of the continental shelf. The second declared the United States' right to establish conservation zones for the protection of fisheries in certain areas of the high sea contiguous to the United States. These proclamations were issued to expand United States control over offshore resources including fish and oil. The history of the proclamations is traced from their origins in the interior Department to the Justice Department where the Secretary of the Interior pressed the Attorney General to institute suit to determine the rights of the federal government against the coastal states. After numerous consultations, President Truman signed and issued the proclamations in spite of much opposition. After their issuance, several countries likewise extended their territorial waters. As a world power, the United States could have secured internation agreement to the substance of the proclamations and thereby strengthened its hand in dealing with those nations which might subsequently have pressed excessive offshore claims. (Maass-Florida)
W78-09708

FEDERAL LAW, IRRIGATION AND WATER POLLUTION,
For primary bibliographic entry see Field 5G.
W78-09724

FLOOD PLAIN MANAGEMENT, FOR OREGON CITIES AND COUNTIES.
Oregon Univ., Eugene. Bureau of Governmental Research and Service.
For primary bibliographic entry see Field 6F.
W78-09725

FEDERAL GROUNDWATER RIGHTS: A NOTE ON CAPPAERT V. UNITED STATES,
Stanford Univ., CA., School of Law.
For primary bibliographic entry see Field 4B.
W78-09726

TOWARD CLEAN WATER: A GUIDE TO CITIZEN ACTION.
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-09727

RELATION OF POLITICAL BOUNDARIES ON THE OCEAN FLOOR TO THE CONTINENTAL MARGIN,
Princeton Univ., NJ. Dept. of Geology.
H. D. Hedberg.
Virginia Journal of International Law, Vol. 17, No. 1, p 57-75 (Fall, 1976).

Descriptors: *Continental margin, *Boundaries(Property), Resources, *International law, *Oceans, Continental shelf, Structural geology, Boundary disputes, Jurisdiction, Political aspects, Government interrelations, Water law, Water rights, Legal aspects, Continental slope, Geologic mapping.

The continental margin, the outer edge of the partially submerged continental mass where it intersects the ocean floor, has political significance as does the continental shelf. Several unsatisfactory proposals have been put forth to determine the delimitation of the area. The most logical proposal is for a boundary zone extending from an agreed landward base proceeding oceanward for an internationally specified distance within which the precise boundary would be drawn. This allows for the uncertainty of the base of the continent, allows for the use of a zone, and allows the final designation of the boundary to be made by coastal states which may agree to stipulate the width of the margin. Agreement on the scope of this area is critical to the Law of the Sea Conference since it has been proposed as the controlling factor of the oceanward boundary of coastal states' rights over natural resources. The boundary zone should be determined by an International Marine Commission. The precise boundary line would be drawn by the coastal state itself subject to the Commission's approval, and would apply only to natural resources. (Maass-Florida)
W78-09728

DELIMITATION OF CONTINENTAL SHELF JURISDICTION BETWEEN STATES: THE EFFECT OF PHYSICAL IRREGULARITIES IN THE NATURAL CONTINENTAL SHELF,
G. R. Feulner.
Virginia Journal of International Law, Vol. 17, No. 1, p 77-105 (Fall, 1976).

Descriptors: *Continental shelf, *Oceans, *Coasts, *International law, *United Nations, Water resources development, Geology, Governmental interrelations, Boundaries(Property), Continental slope resources, Continental margin, Marine geology, Boundary disputes, Political aspects, Legal aspects, Water law, Water rights, State jurisdiction.

The evolution of continental shelf jurisdiction as a legal doctrine began with the 1945 Truman Proclamations which called for United States control over its continental shelf. Following the Truman Proclamations were the Convention on the Continental Shelf and the North Sea Continental Shelf Cases. A delimitation of the continental shelf involves the conflicting rights of two states where they are either adjacent or opposite neighbors. After analyzing the characteristics of the continental shelf beneath the Gulf of Maine and the East China Sea, it became apparent that an interpretation of the natural prolongation of the shelf which emphasizes its geologic character is most consistent with the historic justification for national jurisdiction over the continental shelf. However, in a case like the Gulf of Maine with its major irregularities, the concept of natural prolongation is impossible to apply. Delimitation would be best determined by reference to the historical use of the area by the parties or by merely setting a mileage limit. Also the definition in the negotiating text of the Law of the Sea Conference, which limits the shelf to 200 miles from the coast, should be subordinate to the natural prolongation concept. (Maass-Florida)
W78-09729

WATER CONFLICTS FROM THE VIEWPOINT OF A REGULATION,
Utah State Engineers' Office, Salt Lake City.
For primary bibliographic entry see Field 3E.
W78-09730

TIDELANDS: TRUSTS, EASEMENTS, CUSTOM AND IMPLIED DEDICATION,
A. N. Littman.
Natural Resource Lawyer, Vol. 10, No. 2, p 279-296 (1977).

Descriptors: *Tidal waters, *Easements, *Conservation, *Public rights, *Recreation, Submerged Lands Act, High water mark, Low water mark, Condemnation, Legal aspects, Water law, Legislation, Water policy, Beaches, Judicial decisions, Soil conservation, State governments, Competing uses, Reasonable use, Public access.

Tidelands are lands covered and uncovered by the ebb and flow of the tide. A widespread effort by the states to increase public use of some and to prevent public or private use of other tidelands has necessitated renewed interpretation and application of the doctrines of public easements, customs, and implied dedication. The leading case in this area is Shively v. Bowlby. In this case, the Supreme Court ruled that the states had the right to sell tidelands subject only to the paramount right of navigation inherent in the public. However, the doctrine of public trust easements, that a grantee of tidelands owns the soil subject to public uses of navigation and commerce, and to the right of the state to enter upon and possess for the preservation and advancement of the public uses, has not been uniformly interpreted by the states. The doctrine of custom and implied dedication, whereby, the right to use a coastal area for recreational purposes not inconsistent with other customs or laws held by the public, has also been subject to diverse interpretations. The article discusses these interpretations in light of various judicial decisions. (Curtis-Florida)
W78-09731

CONTROL OF OIL TRANSPORT IN THE COASTAL ZONE: A LOOK AT PUGET SOUND,
Environmental Protection Agency, Seattle, WA. Region X.
For primary bibliographic entry see Field 5G.
W78-09732

THE EVOLUTION AND IMPLEMENTATION OF EPA'S REGULATORY PROGRAM TO CONTROL THE DISCHARGE OF TOXIC POLLUTANTS TO THE NATION'S WATERS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-09733

MINERAL RIGHTS-CONVEYANCES AND LEASES IN MISSOURI,
For primary bibliographic entry see Field 5G.
W78-09734

WATER RESOURCES INVESTIGATIONS IN FLORIDA 1977-78.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 9D.
W78-09745

NEBRASKA'S GROUND WATER MANAGEMENT ACT,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
D. D. Axthelm.
Paper No. 77-2564 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 5 p, 4 ref.

Descriptors: *Nebraska, Groundwater, *Groundwater resources, Law enforcement, *Legislation, Water law, Regulations.

The Ground Water Management Act in Nebraska is becoming operational. It is being put into effect in a deliberate and orderly manner by the Natural Resources Districts of Nebraska as dictated by state statute. (Skogerboe-Colorado State)
W78-09763

6F. Nonstructural Alternatives

INTEGRATING ECOLOGICAL AND SOCIAL CONSIDERATIONS INTO URBAN FLOOD CONTROL PROGRAMS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6G.
W78-09460

FLOOD PLAIN MANAGEMENT, FOR OREGON CITIES AND COUNTIES.
Oregon Univ., Eugene. Bureau of Governmental Research and Service.
School of Community Service and Public Affairs, Planning Bulletin Number 10, Revised January, 1978. 41 p, 2 fig. $3.50.

Descriptors: *Flood plain zoning, *Land management, *Local governments, *Oregon, Flood plains, Flood plain insurance, Floods, Land tenure, Zoning, Permits, Management, Administrative agencies, Land development, Public health, Cities, Flood protection, Flood damage.

Land adjacent to inland and ocean waters generally has a special value because of the unique characteristics caused by the water. Some of this land has only limited use due to the possibility of flooding. This must be taken into account when installing improvements, although almost all flood-prone land can be utilized for some purpose. The prohibition of land uses that are especially vulnerable to damage, however, is good public policy. Private landowners cannot by themselves accomplish flood plain management. Governmental involvement is necessary. For example, most property owners will not have personal insight into flood conditions. Information about flood magnitude and flood frequency can be made available by government agencies. The local governmental entity responsible for issuing building permits and approving subdivisions should include hazard evaluation as part of its development review process. Because land development and flood issues are closely related, zoning ordinances should include special regulation of development in a flood plain. Local governments are in the best position to prevent flood damage because of their role in administering land development regulations. However, they will often need technical assistance. (Spiegel-Florida)
W78-09725

6G. Ecologic Impact Of Water Development

INTEGRATING ECOLOGICAL AND SOCIAL CONSIDERATIONS INTO URBAN FLOOD CONTROL PROGRAMS,
Utah Water Research Lab., Logan.
L. D. James, A. C. Benke, and H. L. Ragsdale.
Water Resource Research, Vol. 14, No. 2, p 177-184, April 1978. 3 fig, 4 tab, 15 ref. OWRT B-082-GA(3).

Descriptors: *Flood control, Programs, *Urban sociology, *Methodology, *Alternative planning, *Ecology, Environmental effects, Social aspects, Watersheds(Basins), Data collections, Decision making, Public participation, Hydrologic aspects, Engineering, Economics, Evaluation, Optimum development plans.

A well-planned flood control program requires integration of diverse sets of information to develop alternative remedial measures for public discussion and selection. Although procedures for the required hydrologic studies, engineering designs, and economic analyses are readily available, procedures for assessing effects on the natural environment and on social aspects are still being developed. This paper illustrates one approach to integrating all this information in comparing alternatives, using the Proctor Creek watershed in Atlanta, Georgia as an example. The illustration begins with a program such as might be formulated by available planning methodology from hydrologic, economic, and engineering data. The illustration continues with suggestions on how to collect meaningful social suitability data from a questionnaire designed to document public perceptions and preferences, ecological data from natural areas in the floodplain, and data relating the effects of the floodplain land use to the well-being of the community. A procedure for integrating these considerations with the established analyses into alternatives presented for public discussion and decision making is then illustrated. Suggestions are also made on how the selected flood control program can be most successfully implemented. (Bell-Cornell)
W78-09460

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 10, NONTECHNICAL SUMMARY OF PROJECT,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
D. C. Raney, D. L. Durham, and R. W. Whalin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A050 749, Price codes: A04 in paper copy, A01 in microfiche. Technical Report H-74-6, January 1978 (Report 10 of a series). 55 p, 17 fig, 13 ref.

Descriptors: *Airports, *Mathematical models, *Hydraulic models, *Feasibility studies, *Lake Erie, Jetports.

A nontechnical summary of the Waterways Experiment Station's (WES) efforts in a model feasibility investigation of a proposed jetport located in Lake Erie offshore Cleveland, Ohio, is presented in this report. This report is intended to present the basic concepts, procedures and results of the WES model feasibility study without technical details. The following items are some of those presented in a format suitable for the nonscientist: (1) scope and objectives of WES study; (2) factors involved in hydrodynamic modeling; (3) lake characteristics and other information required as input for the models; (4) methods for obtaining unavailable data; (5) numerical and physical model evaluation, selection and preliminary design procedures; (6) information obtained from the models; and (7) current status of WES modeling efforts. Detailed technical data and results from WES study were published by WES in a series of 12 reports. (WES)
W78-09467

AN ASSESSMENT OF PROBLEMS ASSOCIATED WITH EVALUATING THE PHYSICAL, CHEMICAL AND BIOLOGICAL IMPACTS OF DISCHARGING FILL MATERIAL,
Oklahoma Univ., Normal. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 5E.
W78-09472

INTEGRATED RESIDUALS MANAGEMENT: A REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT MODEL,
Resources for the Future, Inc., Washington, DC.
For primary bibliographic entry see Field 6A.
W78-09516

ENVIRONMENTAL ASSESSMENT--MANAGEMENT SYSTEM FOR LOCAL DEVELOPMENTAL PROJECT: CASES IN JAPAN,
Nagoya Univ. (Japan). Inst. of Earth Sciences.
For primary bibliographic entry see Field 6A.
W78-09517

COOLING TOWER ENVIRONMENT--1978 (WITH SUPPLEMENT).
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W78-09570

FOOD-CHAIN RELATIONSHIPS IN SUBTIDAL SILTY SAND MARINE SEDIMENTS AND THE ROLE OF MEIOFAUNA IN STIMULATING BACTERIAL PRODUCTIVITY,
Institut fur Meeresforschung, Bremerhaven (West Germany).
S. A. Gerlach.
Oecologia, Vol. 33, 1978, p 55-69, 3 tab, 77 ref.

Descriptors: *Ecology, Ecosystems, Biological communities, *Productivity, *Food chains, *Bacteria, *Sediments, Sands, Silts, *Marine microorganisms, Benthos, *Biomass.

With the use of bibliographic data, the biomass correlations for the subsurface layer of a hypothetical 30 m deep silty sand station are constructed. Meiofauna and Foraminifera contribute 30 and 12% to the living biomass in the sediment and to the food of deposit-feeding macrofauna. Productivity of bacteria is low, leading to the conclusion that sediment bacteria, generally, do not live under good environmental conditions. Meiofaunal animals induce a bacterial productivity which would not exist without them by their activities and by excreting metabolic end products. This specialized interaction between benthic animals and bacteria could be highly important in the benthic ecosystem. (Chilton-ORNL)
W78-09578

SEASONAL AND VERTICAL DISTRIBUTION AND GROWTH OF JUVENILE AND ADULT CAPELIN (MALLOTUS VILLOSUS) IN THE ST. LAWRENCE ESTUARY AND WESTERN GULF OF ST. LAWRENCE,
McGill Univ., Montreal (Quebec). Dept. of Biology.
R. F. J. Bailey, K. W. Able, and W. C. Leggett.
Journal of the Fisheries Research Board of Canada, Vol 34, 1977, p 2030-2040, 8 fig, 3 tab, 35 ref. Nat'l. Res. Council of Canada A6513.

Descriptors: *Ecology, *Distribution, *Seasonal, Growth rates, Fish, Juvenile growth stage, Mature growth stage, *St. Lawrence Estuary, *Gulf of St. Lawrence.

The ecology of juvenile and adult capelin in the study area was investigated in response to a concern over a recent increase in exploitation of the species. The western Gulf served as a nursery for larval and juvenile capelin in summer and early fall. In November, juvenile and adult capelin concentrated in dense schools and moved into the lower estuary to spawning areas. Postspawning mortality was high. Juvenile capelin were supported by zooplankton near the mouth of the Saguenay River throughout the year and in turn provided food for beluga whales in the area during the summer. Growth rates of capelin in the study area were similar to those of populations spawning in southern Newfoundland and on the Grand Banks but were significantly faster than those reported for northern Newfoundland and Labrador. (Chilton-ORNL)
W78-09597

ARID AND SEMI-ARID LANDS: PROBLEMS AND PROSPECTS,
Cairo Univ. Giza (Egypt).

M. Kassas.
Agro-Ecosystems, Vol. 3, No. 3, p 185-204, June, 1977. 23 ref.

Descriptors: *Deserts, *Arid lands, *Climates, Agriculture, *Semiarid climates, Population, *Surveys, Desertification.

A survey of the world's deserts and processes of desertification identifies those that are strictly due to physical factors and those that are anthropogenic. Areas of potential useful study are identified: Improved climate, climatic research and monitoring, improvement of arid zone cultivars, improved techniques of decision-making about land use. Warnings are given to the dangers of overintensification of agricultural systems and of increasing population density in arid zones. Research areas suitable for international cooperation are outlined. (Skogerboe-Colorado State)
W78-09655

AN INTRODUCTION TO FOUR OVERVIEWS: ARID AND SEMI-ARID LANDS; SOIL LOSS; TROPICAL FORESTS AND WOODLANDS; WATER QUALITY,
United Nations Environment Program, New York.
M. K. Tolba.
Agro-Ecosystems, Vol. 3, No. 3, p 183-184, June 1977.

Descriptors: Erosion, *Water quality, Watershed(Basins), Climates, *Arid lands, Arid climates, *Semiarid climates, Soils.

One of the major tasks assigned by the United Nations General Assembly to the Governing Council of the United Nations Environment Program, in the aftermath of recommendations made at the United Nations Conference on the Human Environment convened at Stockholm in 1972, was to 'keep under review the world environmental situation in order to ensure that emerging environmental problems of wide international significance receive appropriate and adequate consideration.' To assist in carrying out this task, the Executive Director was requested by the Governing Council of UNEP, at its second session in 1974, to prepare each year reviews of one or more of the priority subjet areas of the Environment Program, in addition to preparing an annual State of the Environment Report which summarizes the most important and the major emerging issues that affected the environment during the preceding year. (Skogerboe-Colorado State)
W78-09657

POWER PLANT SITING ON WISCONSIN'S COASTS: A CASE STUDY OF DISPLACEABLE USE,
Wisconsin Univ.-Madison. Center for Resource Policy Studies and Programs.
C. B. Bishop, and D. L. Vogel.
Coastal Zone Management Journal, Vol. 3, No. 4, p. 363-381 (1977).

Descriptors: *Wisconsin, *Power plants, *Sites, *Comparative costs, *Shore protection, Electric power plants, Great Lakes region, Planning, Future planning(Projected), Locating, Economic efficiency, Estimated costs, Regional development, Coastal structures, Coasts, Water law, Electric power costs.

If predictions are accurate, Wisconsin will have several new power plants by the year 2000. As many as three large baseload plants and two to five intermediate-load coal-fired plants will be considered. Whether lakeshore sites or inland sites are used will depend upon construction costs, fuel costs, and costs for required water quality equipment. The environmental issue raised by 'once-through' cooling at lakeshore sites may tip the scales in favor of inland sites. Damages to the water and its inhabitants due to the 'once-through' cooling source are not uncommon. Millions of fish have been killed in a single day. However, inland sites may also have adverse impacts on the environment. For instance, larger amounts of land would be necessary. Lakeshore and inland sitings are not the only choices. Alternatives dealing with coastal displacement should be explored. Unfortunately, very few studies dealing with the economic feasibility of this type of proposal have been conducted. Both the Wisconsin Department of Natural Resources and Wisconsin Public Services Commission are presently studying all alternatives to the problem. (Spiegel-Florida)
W78-09701

WHO WILL OWN THE OCEANS,
For primary bibliographic entry see Field 6E.
W78-09706

A RESEARCH STRATEGY FOR SOCIAL ASSESSMENT OF LAKE RESTORATION PROGRAMS,
Oregon State Univ., Corvallis. Dept. of Anthropology.
For primary bibliographic entry see Field 5G.
W78-09710

COLORADO RIVER DESALINIZATION, WILD DUCK STUDY,
Colorado State Univ., Fort Collins, Dept. of Physiology and Biophysics.
For primary bibliographic entry see Field 5G.
W78-09799

7. RESOURCES DATA

7A. Network Design

COLLECTION, STORAGE, RETRIEVAL, AND PUBLICATION OF WATER-RESOURCES DATA.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09323

7B. Data Acquisition

EVAPORATION AND RADIATION MEASUREMENTS AT SALTON SEA, CALIFORNIA,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 2D.
W78-09322

STANDARDIZATION OF HYDROLOGIC MEASUREMENTS,
Geological Survey, Reston, VA. Water Resources Div.
G. F. Smoot.
In: Collection, Storage, Retrieval, and Publication of Water-Resources Data: Geological Survey Circular 756, p 1-7, 1978. 2 fig, 4 ref.

Descriptors: *Hydrologic data, *Data collections, *Instrumentation, *Standards, Evaluation, Office of Water Data Coordination, American Society for Testing and Materials, International Organization for Standardization, World Meteorological Organization, International Electro-Technical Commission, International Current Meter Group, International Association of Scientific Hydrology.

The need for standardization of the methods and instruments used in measuring hydrologic data is discussed and the process by which standards are derived is described. The standardization efforts in the United States are reported including the activities of the Federal Interagency Work Group for the Designation of Standards for Water Data Acquisition and the activities within the American Society for Testing and Materials. On the international front, work being done by the various Technical Committees of the International Organization for Standardization, the World Meteorological Organization, and other international groups is described. Recognition of some duplication of effort is noted. The recommendation is made that better liaison and cooperation be established between the various standards writing organizations. (See also W78-09323) (Woodard-USGS)
W78-09324

USE OF EARTH SATELLITES FOR AUTOMATION OF HYDROLOGIC DATA COLLECTION,
Geological Survey, Reston, VA. Water Resources Div.
R. W. Paulson.
In: Collection, Storage, Retrieval, and Publication of Water-Resources Data: Geological Survey Circular 756, p 8-14, 1978. 2 fig, 1 tab.

Descriptors: *Hydrologic data, *Data collections, *Remote sensing, *Telemetry, *Remote control, Analytical techniques, Planning, Network design, Measurement, Automation, *Battery-operated radios.

The U.S. Geological Survey is evaluating a recently developed earth-satellite technology that is expected to provide a cost-effective technique for the automatic collection of data from hydrologic stations. The technology, which is referred to as satellite Data Collection Systems (DCS), prividesan opportunity to collect data from inexpensive battery-operated radios located at literally tens of thousands of hydrologic stations distributed over national or continental areas. The U.S. Geological Survey is evaluating the DCS on three series of earth satellites to forecast the costs and benefits of using earth satellite technology for a national operational system for the automatic collection of hydrologic data. (See also W78-09323) (Woodard-USGS)
W78-09325

OPERATIONAL HYDROMETEOROLOGICAL DATA COLLECTION SYSTEM FOR THE COLUMBIA RIVER,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09326

PROGRAM THE MANNING EQUATION,
Camp, Dresser, and McKee Inc., Boston, MA.
E. C. Hart.
Water and Wastes Engineering, Vol. 15, No. 5, p 72, 74, 76, May, 1978. 2 tab.

Descriptors: *Mannings equation, *Programs, *Instrumentation, *Flow rates, *Pipelines, Analytical techniques, Sewers, Sewerage, Channel flow, Discharge measurement, Mathematical studies, Equipment, Waste water treatment, Municipal wastes.

The Texas Instruments SR-52 calculator can be programmed with the Mannings Equation for rapid calculation of pipeline discharge, area, wetted perimeter, and velocity. The SR-52 calculator, which costs less than $200, is programmed on the Algebraic Operating System, permitting direct entry of the program from left to right, with the addition of parentheses as written. The calculator has an established hierarchy in which functions, powers and roots, multiplication and division, and addition and subtraction are solved sequentially. Two programs are available for solving the Mannings Equation when the depth of flow in the pipe is in the range of 0.5-1.0 and 0-0.5. The SR-52 retains all input parameters, which may also be easily changed, and is attachable to the PC-100 for printout copies of solved programs. (Lisk-FIRL)
W78-09376

A SYSTEM THAT MEASURES BLOWING SNOW,
Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.
For primary bibliographic entry see Field 2C.
W78-09527

SYMPOSIUM ON APPLIED GLACIOLOGY.
International Glaciological Society, Cambridge (England).
For primary bibliographic entry see Field 2C.
W78-09603

MEASURING THE UNIAXIAL COMPRESSIVE STRENGTH OF ICE,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-09615

FRICTION OF A STEEL BALL ON A SINGLE CRYSTAL OF ICE,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
For primary bibliographic entry see Field 2C.
W78-09616

CONCENTRATED LOADS ON A FLOATING ICE SHEET,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-09617

FLEXURAL STRENGTH OF ICE ON TEMPERATE LAKES,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-09618

INDENTATION TESTS TO INVESTIGATE ICE PRESSURES ON VERTICAL PIERS,
Imperial Oil Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 2C.
W78-09622

CONTINUOUS MONITORING OF METAMORPHIC CHANGES OF INTERNAL SNOW STRUCTURE AS A TOOL IN AVALANCHE STUDIES,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W78-09624

GRADIENT METAMORPHISM, ZONAL WEAKENING OF THE SNOWPACK AND AVALANCHE INITIATION,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2C.
W78-09625

PRELIMINARY OBSERVATIONS OF ACOUSTIC EMISSIONS PRECEDING AVALANCHES,
Rocky Mountain Forest and Range Experiment Station, Fort Collins.
For primary bibliographic entry see Field 2C.
W78-09631

STUDIES OF THE MOVEMENT OF COASTAL SEA ICE NEAR PRUDHOE BAY, ALASKA, U.S.A.,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-09641

THE FLEXURAL MOTIONS OF A FLOATING ICE SHEET INDUCED BY MOVING VEHICLES,
Saskatchewan Research Council, Saskatoon.
For primary bibliographic entry see Field 2C.
W78-09643

MARINE DYNAMICS AND ITS EFFECTS ON CURRENT MEASURING TRANSDUCERS,
National Oceanic and Atmospheric Administration, Sterling, VA.
T. Mero, G. Appe" [illegible]d R. S. McQuivey.
In: National [illegible]au of Standards Special Publication 484, Proceedings of the Symposium on Flow in Open Channels and Closed Conduits, Gaithersburg, Maryland, February 23-25, 1977. p 109-121, October 1977, 3 fig, 3 tab, 3 ref.

Descriptors: Velocity, *Flow measurement, *Currents(Water), Turbulence, *Turbulent flow, Estuaries, Coasts.

A growing interest in measuring current velocities in coastal zne and estuaries prompted the creation of a Dynamic Analysis Program. The dynamics of near-shore current flows are more severe than that of the deep ocean. Therefore, it is important to qualify the performance of current measuring transducers in a dynamic environment. A study was contracted to determine what scale and intensities of turbulence exist in the near-shore environment. The major effort of the study is concerned with turbulence from 1 to 20 Hz and scales up to 30 cm. Tests are being conducted to determine the response characteristics of several current measuring transducers including both rotor and electromagnetic instruments. These tests include grid-produced turbulence measurements as well as simulated mooring-line dynamics' tests. Measurements have revealed several transducers that have 10 to 20% sensitivity increases when turbulence intensities of 6 to 12% are present. Turbulence that exists in the marine environment is described along with dynamic response characteristics of several current measuring transducers. (Skogerboe-Colorado State)
W78-09651

A SELF-PROPELLED HIGH-CLEARANCE SOIL CORING MACHINE,
Texas A and M Univ. Lubbock. Agricultural Research and Extension Center.
W. Bausch, A. B. Onken, C. W. Wendt, and O. C. Wilke.
Agronomy Journal, Vol. 69, No. 1, p 122-124, January-February 1977. 4 fig, 1 tab, 6 ref.

Descriptors: *Sampling, Crop production, Soil investigations, Soils, Soil tests, Soil profiles, Soil properties, *Soil coring machines.

Mechanical soil sampling equipment currently available is suitable for sampling prior to crop establishment or in low growing crops but cannot be used without plant damage in some tall crops. A self-propelled high-clearance soil coring machine was designed and constructed to obtain soil samples in a tall standing crop at a range of lateral as well as vertical distances. The sampler is hydraulically operated and has vertical pressure and rotary drilling capabilities. This equipment has a lateral travel span of 152 cm and the capability of coring to a depth of 9 m with the mast in any lateral position on the track. Two operators can use the sampler without difficulty; however, three operators are desirable if a large number of samples are to be taken. As many as eighty 30-cm increment soil samples have been taken per hour when sampling a moist sandy soil to a depth of 2 m. (Skogerboe-Colorado State)
W78-09654

SCHEDULING AND MONITORING IRRIGATION WITH INFRA-RED PHOTOGRAPHY,
Crop Protection, Inc., Umatilla, OR.
For primary bibliographic entry see Field 3F.
W78-09680

TECHNIQUE FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-09737

CALIBRATION OF A MATHEMATICAL MODEL OF THE ANTELOPE VALLEY GROUND-WATER BASIN, CALIFORNIA,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-09741

7C. Evaluation, Processing and Publication

HYDROLOGIC DATA OF THE COASTAL DRAINAGE BASINS OF SOUTHEASTERN MASSACHUSETTS, PLYMOUTH TO WEWEANTIC RIVER, WAREHAM,
Geological Survey, Boston, MA. Water Resources Div.
J. R. Williams, G. D. Tasker, and R. E. Willey.
Massachusetts Hydrologic-Data Report No. 18, 1977. 31 p, 1 fig, 1 plate, 10 tab, 35 ref. Open File Report 77-186.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Massachusetts, Hydrologic data, River basins, Streamflow, Flow rates, Aquifers, Drillers logs, Stratigraphy, Water wells, Water yield, Available water, Water supply, Water analysis, Chemical analysis, *Southeastern Massachusetts.

The principal basins in this study in southeastern Massachusetts are those of Town Brook, Eel River, and Beaverdam Brook, all draining to Cape Cod Bay; Herring Brook draining to the Cape Cod Canal; and Red Brook, Agawam River, Wankinco River, and Weweantic River, all draining to Buzzards Bay. This report presents, in tabular form, selected records of wells, test wells, borings, and important springs; measurements of stream discharge, specific conductance, and temperature at partial-record stations; chemical analyses of ground water and surface water; and a summary of municipal water sources and additional sources available. The data were collected from 1969 to 1971 in cooperation with the Massachusetts Water Resources Commission. (Woodard-USGS)
W78-09304

HYDROLOGIC DATA OF THE CHARLES RIVER BASIN, MASSACHUSETTS,
Geological Survey, Boston, MA. Water Resources Div.
E. H. Walker, W. W. Caswell, and S. W. Wandle, Jr.
Massachusetts Hydrologic-Data Report No. 19, 1977. 53 p, 1 fig, 1 plate, 10 tab, 24 ref.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *Basic data collections, Streamflow, Flow rates, Aquifers, Water wells, Water yield, Well data, Water levels, Water analysis, Chemical analysis, Maps, Sites, Measurement, Sampling, Massachusetts, *Charles River basin(Mass).

The Charles River basin drains about 300 square miles in eastern and southeastern Massachusetts within Middlesex, Norfolk, Suffolk, and Worcester counties, into Boston Harbor. This report contains hydrologic data for the area above Waltham and includes all, or parts of, the cities or towns of Ashland, Bellingham, Boston, Brookline, Dedham, Dover, Foxboro, Franklin, Holliston, Hopedale, Hopkinton, Lexington, Lincoln, Med-

field, Medway, Mendon, Sherborn, Waltham, Walpole, Wayland, Wellesley, Weston, Westwood, and Wrentham. Data include information on wells, borings, water table, streamflow, and water quality. (Woodard-USGS)
W78-09305

A GUIDE TO OBTAINING INFORMATION FROM THE USGS 1978,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 10C.
W78-09309

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1977--VOLUME 2. LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
Water-Data Report NY-77-2, March 1978. 144 p, 8 fig, 1 tab.

Descriptors: *New York, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Long Island.

Water resources data for the 1977 water year for New York consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; water quality of precipitation; and water levels and water quality of ground water. This report (Volume 2) contains discharge records for 15 gaging stations; water quality for 13 gaging stations, 4 partial-record stations, 78 wells, and 2 precipitation stations; and water levels for 117 observation wells. Also included are 93 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey in cooperation with State, Federal, and other agencies in New York. (Woodard-USGS)
W78-09311

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1977.
Geological Survey, Champaign, IL. Water Resources Div.
Water-Data Report IL-77-1, March 1978. 436 p, 4 fig.

Descriptors: *Illinois, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Illinois consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 163 gaging stations; stage only records for 5 gaging stations; stage and contents for 3 lakes and reservoirs; stage only records for 5 lake stations; water quality for 46 gaging stations, 14 partial-record stations, 8 miscellaneous stations, and 35 wells; and water levels for 3 observation wells. Also included are data for 171 crest-stage partial-record stations and 60 flood-profile stations. Additional water data were collected at various sites, not involved in the systematic data collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Illinois. (Woodard-USGS)
W78-09312

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1977--VOLUME 1. NEW YORK EXCLUDING LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
Water-Data Report NY-77-1, May 1978. 566 p, 8 fig, 1 tab.

Descriptors: *New York, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for New York consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes; stage and contents of reservoirs; water quality of precipitation; and water levels and water quality of ground water. This report (Volume 1), which excludes Long Island, contains discharge records for 192 gaging stations; stage only records for 32 gaging stations (including 30 lakes and reservoir stations and 2 other river stations); stage and contents for 20 other lakes and reservoirs; water quality for 67 gaging stations (includes 4 lake stations), 17 partial-record stations, and 8 precipitation stations; and water levels for 40 observation wells. Also included are 140 crest-stage partial-record stations and 32 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey in cooperation with State, Federal, and other agencies in New York. (Woodard-USGS)
W78-09313

WATER-RESOURCES INVESTIGATIONS IN NORTH CAROLINA, 1977.
Geological Survey, Raleigh, NC. Water Resources Div.
Water-Resources Investigations in North Carolina Folder, 1978. 1 sheet.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, *North Carolina, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Groundwater, Water quality, On-site investigations, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps, *U.S. Geological Survey, *Cooperative water-studies program.

Water-resources studies and investigations in North Carolina in which the U.S. Geological Survey participates are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; groundwater observation wells; and water quality observation sites. Small State maps show flood-prone areas, mean annual precipitation, average annual rainfall, minimum flows of unregulated small streams, principal sources of groundwater, and dissolved solids in groundwater and surface waters. A larger map shows hydrologic-data stations and hydrologic investigations in North Carolina as of January 1977. (Woodard-USGS)
W78-09315

IDENTIFICATION CODES FOR ORGANIZATIONS LISTED IN COMPUTERIZED DATA SYSTEMS OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, VA. Water Resources Div.
M. D. Edwards, and M. O. Drilleau.
Open-file report 78-398, 1978. 66 p, 1 fig, 2 ref.

Descriptors: *Information retrieval, *Data storage and retrieval, *Information exchange, *Publications, *Water resources, Indexing, National Water Data Exchange(NAWDEX), National Water Data Storage and Retrieval System(WATSTORE), National Cartographic Information Center(NCIC), Office of Water Data Coordination(OWDC), *Organization identification codes, *Computerized data systems, *U.S. Geological Survey.

This report contains codes for the identification of public and private organizations listed in computerized data systems. These codes are used by the U.S. Geological Survey's National Water Data Exchange (NAWDEX), National Water Data Storage and Retrieval System (WATSTORE), National Cartographic Information Center (NCIC), and Office of Water Data Coordination (OWDC). The format structure of the codes is discussed and instructions are given for requesting new codes. (Woodard-USGS)
W78-09317

DEFINITIONS OF COMPONENTS OF THE WATER DATA SOURCES DIRECTORY MAINTAINED BY THE NATIONAL WATER DATA EXCHANGE,
CACI Inc., Reston, VA; and Geological Survey, Reston, VA. Water Resources Div.
W. A. Knecht, and M. D. Edwards.
Open-file report 77-775, 1978. 99 p, 3 fig, 8 ref.

Descriptors: *Information retrieval, *Data storage and retrieval, *Organizations, *Water sources, *Publications, Documentation, Surface waters, Groundwater, Water quality, *National Water Data Exchange(NAWDEX), *Dictionary use information, *Data definitions, *System 2000, *Data base management systems, Data dissemination.

This report contains a definition and description of each component of the Water Data Souces Directory data base maintained by the National Water Data Exchange (NAWDEX). It is intended, primarily, to assist those persons using the Water Data Sources Directory in understanding information obtained from the data base. The Water Data Sources Directory is a computerized data base maintained and operated using the System 2000 data base management system. It contains information about organizations that collect, store, and disseminate water data. (Woodard-USGS)
W78-09319

CHEMICAL AND PHYSICAL QUALITY OF SELECTED PUBLIC WATER SUPPLIES IN FLORIDA, AUGUST-SEPTEMBER 1976,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-09320

COLLECTION, STORAGE, RETRIEVAL, AND PUBLICATION OF WATER-RESOURCES DATA.
Geological Survey, Reston, VA. Water Resources Div.
Available from Branch of Distribution, USGS 1200 S. Eads St., Arlington, VA 22202. Circular 756, 1978. 39 p, 15 fig, 1 tab, 23 ref.

Descriptors: *Hydrologic data, *Data collections, *Data storage and retrieval, *Publications, *Information retrieval, Information exchange, Instrumentation, Standards, Remote sensing, Telemetry, Remote control, Methodology, Measurement, Planning, Network design, Costs, Computers, *U.S. Geological Survey, *Realtime data-collection system, National Water Data Storage and Retrieval System(WATSTORE).

This publication represents a series of papers devoted to the subject of collection, storage, retrieval, and publication of hydrologic data. The

papers were presented by members of the U.S. Geological Survey at the International Seminar on Organization and Operation of Hydrologic Services, Ottawa, Canada, July 15-16, 1976, sponsored by the World Meteorological Organization. The first paper, 'Standardization of Hydrologic Measurements,' by George F. Smoot discusses the need for standardization of the methods and instruments used in measuring hydrologic data. The second paper, 'Use of Earth Satellites for Automation of Hydrologic Data Collection,' by Richard W. Paulson discusses the use of inexpensive battery-operated radios to transmit realtime hydrologic data to earth satellites and back to ground receiving stations for computer processing. The third paper, 'Operation Hydrometeorological Data-Collection System for the Columbia River,' by Nicholas A. Kallio discusses the operation of a complex water-management system for a large river basin utilizing the latest automatic telemetry and processing devices. The fourth paper, 'Storage and Retrieval of Water-Resources Data,' by Charles R. Showen discusses the U.S. Geological Survey's National Water Data Storage and Retrieval System (WATSTORE) and its use in processing water resources data. The final paper, 'Publication of Water Resources Data,' by S. M. Lang and C. B. Ham discusses the requirement for publication of water-resources data to meet the needs of a widespread audience and for archival purposes. (See W78-09324 thru W78-09328) (Woodard-USGS)
W78-09323

STANDARDIZATION OF HYDROLOGIC MEASUREMENTS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7B.
W78-09324

USE OF EARTH SATELLITES FOR AUTOMATION OF HYDROLOGIC DATA COLLECTION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7B.
W78-09325

OPERATIONAL HYDROMETEOROLOGICAL DATA COLLECTION SYSTEM FOR THE COLUMBIA RIVER,
Geological Survey, Reston, VA. Water Resources Div.
N. A. Kallio.
In: Collection, Storage, Retrieval, and Publication of Water-Resources Data: Geological Survey Circular 756, p 15-19, 1978. 1 ref.

Descriptors: *Telemetry, *Data collections, *Hydrologic data, *Columbia River, Planning, Instrumentation, Network design, Methodology, Costs, *Realtime data-collection system, *Hydrometeorological data.

The Columbia River is a valuable source of energy and water supply to the Northwest region of the United States and the Southwest region of Canada. Operation of its complex water-management system requires reliable and timely information on the amount of water received by, flowing through, and stored in all parts of the basin. To provide this information, an interagency hydrometeorological data-collection system is being developed, utilizing latest telemetry and processing devices. The experience gained in developing this system may be helpful to planners of other similar systems. Pertinent considerations are: (1) A telemetry system should be chosen with care so as to avoid early obsolescence and costly maintenance. Satellite and meteor-burst systems seem to have greatest potential. (2) Data verification is very important in a realtime system. (3) The cost of operating a realtime system is dependent on data-accuracy requirements, but generally will be more than operation for collection of historical records. (See also W78-09323) (Woodard-USGS)
W78-09326

STORAGE AND RETRIEVAL OF WATER-RESOURCES DATA,
Geological Survey, Reston, VA. Water Resources Div.
C. R. Showen.
In: Collection, Storage, Retrieval, and Publication of Water-Resources Data: Geological Survey Circular 756, p 20-25, 1978. 2 fig, 11 ref.

Descriptors: *Data storage and retrieval, *Publications, *Hydrologic data, *Computers, Information retrieval, Information exchange, *U.S. Geological Survey, *National Water Data Storage and Retrieval System(WATSTORE).

The U.S. Geological Survey investigates the occurrence, quantity, quality, distribution, and movement of the surface and underground water that comprise the water resources of the United States. It is the principal Federal water-data agency and, as such, collects and disseminates about 70 percent of the water data currently being used by numerous State, local, private, and other Federal agencies to develop and manage the Nation's water resources. As part of the Geological Survey's program of releasing water data to the public, a large-scale computerized system has been developed for the processing, storage, and retrieval of water data collected through its activities. The U.S. Geological Survey's National Water Data Storage and Retrieval System (WATSTORE) was established in November 1971 to modernize water-data processing procedures and techniques and to provide for more effective and efficient management of data-releasing activities. The system is operated and maintained on the central computer facilities of the Survey at its National Center in Reston, Va. (See also W78-09323) (Woodard-USGS)
W78-09327

PUBLICATION OF WATER-RESOURCES DATA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 10C.
W78-09328

HYDROLOGICAL ASPECTS OF THE DROUGHT EVENT IN NIGERIA-1972/1973,
Lagos Univ. (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W78-09333

ANNUAL AMPLITUDE OF PRECIPITATION IN THE USSR,
For primary bibliographic entry see Field 2B.
W78-09337

UNBIASED PLOTTING POSITIONS-A REVIEW,
Ireland Office of Public Works, Dublin.
C. Cunnane.
Journal of Hydrology, Vol. 37, No. 3/4, p 205-222, May 1978. 4 fig, 2 tab, 37 ref.

Descriptors: *Graphical analysis, *Graphical methods, *Reviews, *Analytical techniques, Statistical methods, Mathematical studies, Data processing, Hydrologic data, Statistics, Distribution patterns, Unbiased data plotting.

The existing attitude that the criterion for choice of plotting position is arbitrary was rebuked, and it was shown that a worthwhile criterion can be based on desired statistical properties of the plot, rather than on comparison of plotting positions with estimates of probability for individual sample values. These properties are that any quantile estimate made from the plot should be unbiased and should have smallest mean square error among all such estimates. This leads to specification of plotting position, initially in terms of reduced variate rather than probability value. The unbiased plotting position the mean of the ith order statistic in samples from the reduced variate population, which differs from one distribution to another. A good approximation for each distribution is available in the probability domain. These take the general form (i-alpha)/(N + 1-2 alpha) with alpha = 3/8 in the normal case and a = 0.44 in the extreme-value type-1 (EV1) and exponential cases. The Weibull formula, alpha = 0, is correct for the uniform distribution alone and was shown to be biased for other distributions. Hazen's formula alpha = 1/2 shows up much better in terms of bias than many would expect. If a single simple distribution free formula were required, then alpha = 2/5 would be the best compromise. The plotting position postulates which have supported the Weibull formula for many years were examined, and some were seen to be unreasonable in view of statistical facts. (Humphreys-ISWS)
W78-09348

RAINFALL DEPTH-DURATION-FREQUENCY STUDIES FOR SRI LANKA,
Halcrow (William) and Partners, London (England).
For primary bibliographic entry see Field 2B.
W78-09349

TAKE THE PICK AND SHOVEL WORK OUT OF COMPUTATION,
T. H. Hablett.
Water and Wastes Engineering, Vol. 15, No. 4, p 52-54, April, 1978. 3 tab.

Descriptors: *Computer programs, *Mannings equation, *Analytical techniques, *Pipes, *Flow resistance, Fluid friction, Flow rates, Computers, Data processing, Sewerage, Model studies, Waste water disposal, Municipal wastes.

A computer program can adapt Manning's equation to calculate the diameter of gravity pipes when the pipe flow velocity and slope are known. Program 096, readily adaptable to programmable calculators, calculates the diameter and depth of the pipe as a function of water quantity discharged (Q(f)) and the velocity (V(f)) at a given friction. A chart relating diameter and depth to these calculated values is reproduced for a round corrugated-steel pipe having a Manning's coefficient for pipe interior roughness of 0.021. When Program 096 is used in conjunction with the chart, information on a specific gravity main is input in the following order: point number for beginning of gravity flow; gpm; difference between entry and discharge; horizontal length of pipe; slope; and Maning's coefficient. At this point, the nearest value correlating Q(f) to diameter and depth of flow is chosen from the chart and fed to the computer as follows: velocity; Q(f) from the chart; diameter; and water depth. The effectiveness of different pipe diameters can be compared by manual return to a specific stage within the program. (Lisk-FIRL)
W78-09372

AUTOMATIC CONTROL OF A DIFFUSED AIR TREATMENT PLANT,
For primary bibliographic entry see Field 5D.
W78-09397

METHODOLOGY FOR CALIBRATING STORMWATER MODELS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-09459

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-09477

SYSTEMS PROGRAM FOR THE ANALYSIS OF NONURBAN, NONPOINT SOURCE POLLUTANTS IN THE MISSOURI BASIN REGION,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5B.
W78-09519

SYSTEMS PROGRAMS FOR THE ANALYSIS OF NONURBAN, NONPOINT SOURCE POLLUTANTS IN THE MISSOURI BASIN REGION. SUPPLEMENT,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5B.
W78-09520

SYNOPTIC RAINFALL DATA ANALYSIS PROGRAM (SYNOP),
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5B.
W78-09521

CLIMATOLOGICAL DATA FROM THE BERTHOUD PASS AREA OF COLORADO,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
A. Judson.
Department of Agriculture, Forest Service, General Technical Report RM-42, 94 p, October, 1977. 1 fig, 7 illus, 11 ref, 150 tab.

Descriptors: *Meteorological data, *Colorado, *Mountains, Climates, *Weather data, *Berthoud Pass(Colo), Air temperature, Precipitation(Atmospheric), Snow cover, Depth, Winds, *Rocky Mountain Region.

Monthly, daily, and hourly meteorological data, collected irregularly from 1926 through 1977, are presented in tabular form. Complete year-long data on temperature, precipitation, snow depth, and wind from three mountain sites surrounding Berthoud Pass, Colorado, are analyzed for the period 1963 through 1975. (Witt-IPC)
W78-09526

METROPOLITAN WATER SYSTEMS OPERATION: CONTINUOUS MODELING OF FLOW QUANTITY AND QUALITY IN THE SUPPORTING RIVER BASIN,
Dallas Water Utilities Dept. TX. Operations Analysis Div.
For primary bibliographic entry see Field 5C.
W78-09569

SUSCEPTIBILITY OF COASTAL PLAIN AQUIFERS TO CONTAMINATION, FAIRFAX COUNTY, VIRGINIA, A COMPUTER COMPOSITE MAP,
Geological Survey, Reston, VA. Water Resources Div.
R. H. Johnson, and J. N. Van Driel.
Open-file map 78-265, 1978. 1 sheet, 9 ref.

Descriptors: *Aquifer characteristics, *Subsurface mapping, *Water pollution, *Virginia, *Coastal plains, Groundwater movement, Groundwater recharge, Leaching, Path of pollutants, *Fairfax County, *Potential groundwater pollution areas, Computer-generated composit map, *Computer mapping.

A map is presented that classifies the Coastal Plain of Fairfax County, Virginia according to the susceptibility of the principal sand aquifers to contamination from surface sources. The following classification is used: (1) areas where leachate can readily enter the principal sand aquifers, (2) areas offering great natural protection against migration of leachate into the aquifers, and, (3) areas where the contamination risk is uncertain and onsite investigations are needed. Approximately 20 percent of the area is in the high-risk category. The map is computer generated and was made by combining four source maps depicting those hydrogeologic factors related to movement of contaminants into the aquifers. These factors are (1) lithologic character of the upper 25 feet of sediments, (2) clay thickness above uppermost sand aquifer, (3) hydraulic gradient direction and head difference between water table and artesian head in principal aquifer, and (4) areal occurrence of moderate to high transmissiviry aquifers. The map is designed to be used by planners with little or no earth-science background, however, a technical discussion for hydrologists and geologists is also provided. (Woodard-USGS)
W78-09735

HYDROLOGIC DATA FOR LITTLE ELM CREEK, TRINITY RIVER BASIN, TEXAS, 1976,
Geological Survey, Austin, TX. Water Resources Div.
R. M. Slade, Jr., T. H. Hays, and C. T. Schoultz.
Open-file report 78-100, April 1978. 78 p, 2 fig, 4 tab.

Descriptors: *Rainfall-runoff relationships, *Storm runoff, *Small watersheds, *Soil conservation, *Texas, Control structures, Flood protection, Streamflow, Flow rates, Flood profiles, Peak discharge, Hydrologic data, Water quality, *Little Elm Creek, *Trinity River basin, Floodwalls.

This report contains rainfall, runoff, and storage data collected during the 1976 water year for a 75.5 sq mi area above the stream-gaging station Little Elm Creek near Aubrey, Texas. Floodflows from 35.7 sq mi of the area are regulated by 16 flood-water-retarding structures constructed by the Soil Conservation Service. During the 1976 water year, five storm periods were selected for detailed computations and analyses. Beginning with the 1975 water year, water-quality data is given for Little Elm Creek. Investigations in the Little Elm Creek watershed were terminated on September 30, 1976. (Woodard-USGS)
W78-09736

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1977--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
Water-Data Report OH-77-2, May 1978. 212 p, 2 fig.

Descriptors: *Ohio, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *St. Lawrence River basin.

Water resources data for the 1977 water year for Ohio consist of records of stage, discharge, and water quality of streams; stage, contents and water levels and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report in two volumes, contains discharge records for 164 gaging stations, stage and contents for 32 lakes and reservoirs; water quality for 157 gaging stations, 69 partial-record stations and 54 wells; and water levels for 54 observation wells. Also included are 67 crest-stage partial-record stations and 65 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Ohio. (Woodard-USGS)
W78-09738

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1977--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
Water-Data Report OH-77-1, May 1978. 518 p, 2 fig.

Descriptors: *Ohio, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Ohio River basin.

Water resources data for the 1977 water year for Ohio consist of records of stage discharge, and water quality of streams; stage, contents and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report in two volumes, contains discharge records for 164 gaging stations, stage and contents for 32 lakes and reservoirs; water quality for 157 gaging stations, 69 partial-record stations and 54 wells; and water levels for 54 observation wells. Also included are 67 crest-stage partial-record stations and 65 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Ohio. (Woodard-USGS)
W78-09739

WATER RESOURCES DATA FOR KANSAS, WATER YEAR 1977.
Geological Survey, Lawrence, KS. Water Resources Div.
Water-Data Report KS-77-1, January 1978. 618 p, 9 fig, 4tab.

Descriptors: *Kansas, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Kansas consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells. This report contains discharge for 149 gaging stations; stage and contents for 20 lakes and reservoirs; water quality for 77 gaging stations and 2 lakes; and water levels for 463 observation wells and water quality for 269 wells. Also included are data for 132 crest-stage partial-record stations and 23 low-flow partial-record stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Kansas. (Woodard-USGS)
W78-09740

GROUND-WATER BASIC DATA FOR DICKEY AND LA MOURE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
C. A. Armstrong, and S. P. Luttrell.
North Dakota State Water Commission, Bismarck, County Ground-Water Studies 28--Part II, and North Dakota Geological Survey Bulletin 70--Part II, 1978. 557 p, 2 fig, 1 plate, 7 tab, 25 ref.

Descriptors: *Groundwater, *Water wells, *Logging(Recording), *Water levels, *Water quality, Aquifers, Observation wells, Well data, Hydrologic data, *North Dakota, Dickey County, LaMoure County.

This report contains basic data for 1,473 wells and test holes. It includes 800 logs of test holes and wells, 442 chemical analyses of water samples, 9 chemical analyses of minor elements in ground water, water-level measurements in 174 observation wells, and 11 particle-size analyses. The data may be used for evaluating ground water and geological conditions in Dickey and LaMoure Counties, North Dakota. (Woodard-USGS)
W78-09743

WATER RESOURCES INVESTIGATIONS IN FLORIDA 1977-78.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 9D.
W78-09745

SUMMARY OF WATER RESOURCES FOR THE CAMPO, CUYAPAIPE, LA POSTA, AND MANZANITA INDIAN RESERVATIONS AND VICINITY, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
W. R. Moyle, Jr., and D. J. Downing.
Open-file report 77-684, March 1978. 43 p, 2 fig, 1 plate, 9 tab, 19 ref.

Descriptors: *Groundwater resources, *Indian reservations, *California, *Aquifer characteristics, *Water quality, Water wells, Water yield, Water levels, Streamflow, Runoff, Domestic water, Water supply, Water analysis, Chemical analysis, Well data, San Diego County, Campo, Cuyapaipe, La Posta, Manzanita.

Since 1945, precipitation and runoff in California on the Campo, Cuyapaipe, La Posta, and Manzanita Indian Reservations and surrounding areas generally have been below normal, and groundwater levels are declining. Most of the water is of excellent quality. The analysis of water from one well on the Campo Reservation indicates a concentration of nitrate that exceeds the recommended limit established in 1972 by the U.S. Environmental Protection Agency. Most wells and springs in the study area yield water for domestic purposes. The yields range from less than 1 gallon per minute to 210 gallons per minute. Most of the water is produced from shallow aluvial-filled channels or from consolidated rocks that are deeply weathered locally or highly fractured. The well data show that insufficient water is available on the four reservations for large-scale irrigation. (Woodard-USGS)
W78-09746

A DESCRIPTION OF THE INDEX OF ACTIVE FLORIDA WATER DATA COLLECTION STATIONS AND A USER'S GUIDE FOR STATION OR SITE INFORMATION RETRIEVAL COMPUTER PROGRAM FINDEX H578,
Geological Survey, Tallahassee, FL. Water Resources Div.
M. L. Merritt.
Open-file report 77-703, February 1978. 70 p, 10 fig, 3 tab.

Descriptors: *Information retrieval, *Computer programs, *Florida, *Hydrologic data, *Stations, Methodology, Data storage and retrieval, Water resources, Water quality, Surface waters, Groundwater, Indexing, *Computer program FINDEX.

A computerized index of water-data collection activities and retrieval software to generate publication list of this information was developed for Florida. This system serves a vital need in the administration of the many and diverse water-data collection activities. Previously, needed data was very difficult to assemble for use in program planning or project implementation. Largely descriptive, the report tells how a file of computer card images has been established which contains entries for all sites in Florida at which there is currently a water-data-collection activity. Entries include information such as identification number, station name, location, type of site, county, information about data collection, funding, and other pertinent details. The computer program FINDEX selectively retrieves entries and lists them in a format suitable for publication. Updating the index is done routinely. (Woodard-USGS)
W78-09747

SELECTED HYDROLOGIC DATA, YAMPA RIVER BASIN AND PARTS OF THE WHITE RIVER BASIN, NORTHWESTERN COLORADO AND SOUTH-CENTRAL WYOMING,
Geological Survey, Denver, CO. Water Resources Div.
T. F. Giles, and R. E. Brogden.
Available from the OFSS Branch of Distribution, USGS, Box 25425 Fed. Ctr. Denver, Colo. 80225.
Open-file report 78-23, January 1978. 91 p, 1 fig, 2 plates, 5 tab, 7 ref.

Descriptors: *Hydrologic data, *Water quality, *Surface waters, *Groundwater, *Data collections, Sites, Water analysis, Streamflow, Gaging stations, Climatic data, Snow surveys, Geological units, Coals, *Colorado, *Wyoming, *Yampa River basin(Colo-Wyo), *White River basin(Colo-Wyo).

Selected hydrologic data are presented from four energy-related projects conducted by the U.S. Geological Survey in the Yampa River basin and parts of the White River basin in northwestern Colorado and south-central Wyoming. Water-quality data during 1974 and 1975 and parts of 1976 for 129 ground-water sites and 119 surface-water sites are tabulated. For most samples, major cations, anions, and trace metals were analyzed. For the same time period, field measurements of specific conductance, temperature, and pH were made on 252 springs and wells. These samplings sites, as well as the locations of 20 climatological stations, 18 snow-course sites, and 43 surface-water gaging stations, are shown on maps. Geologic units that contain coal deposits or supply much of the water used for stock and domestic purposes in the area also are shown on a map. (Woodard-USGS)
W78-09748

IDENTIFICATION, INDEXING AND EXCHANGE OF DATA ON ENVIRONMENTAL POLLUTANTS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-09749

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1976,
Geological Survey, Austin, TX. Water Resources Div.
H. D. Buckner.
Open-file report 77-800, April 1978. 20 p, 1 fig.

Descriptors: *Hydrologic data, *Water quality, *Streamflow, *Runoff, *Reservoir storage, Drainage area, Gaging stations, Flow rates, Chemical analysis, *Texas, *Mountain Creek, *Trinity River basin(Tex).

The total drainage area of Mountain Creek, Texas, is 304 sq mi. The stream-gaging stations on Mountain Creek near Cedar Hill and Walnut Creek near Mansfield provide hydrologic data to define runoff characteristics from small drainage basins. They also serve as index stations for inflow into the reservoir and provide operational data for the reservoir. In addition, the station Walnut Creek near Mansfield is equipped with a recording rain gage. The stage station near Duncanville provides data pertinent to operation of the gates in the Mountain Creek Lake Dam. The reservoir-content station at the dam provides records of reservoir state and contents. The stream-gaging station Mountain Creek at Grand Prairie provides records of outflow from Mountain Creek Lake and the basin. Basin outflow for the 1976 water year was 78,660 acre-feet which is only 1,140 acre-feet above the 16-year (1960-76) average of 77,520 acre-feet. Storage in Mountain Creek Lake showed a net gain of 760 acre-feet during the water year. Rainfall over the study area for the 1976 water year was about 32 inches, which is about 2 inches below the long-term mean rainfall (1960-75) for the area. (Woodard-USGS)
W78-09751

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, A SUMMARY OF WATER SOURCES, USE, TREATMENT, AND CAPACITY OF WATER-SUPPLY SYSTEMS,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 5F.
W78-09753

GEOCHEMICAL AND HYDROLOGIC DATA FOR WELLS AND SPRINGS IN THERMAL-SPRING AREA OF THE APPALACHIANS,
Geological Survey, Reston, VA. Water Resources Div.
W. A. Hobba, Jr., J. C. Chemerys, D. W. Fisher, and F. J. Pearson, Jr.

Descriptors: *Thermal springs, *Water quality, *Geochemistry, *Cold springs, *Appalachian Mountain Region, Water wells, Water yield, Water levels, Hydrogeology, Water analysis, Chemical analysis, Radioisotopes, Stable isotopes, Gases.

Data were collected during a one-year reconnaissance of 9 thermal spring areas of the Appalachians from New York to Georgia. Maps show locations of selected wells, warm springs, and cold springs. Physical tables list hydrologic and geologic information on the springs and wells. The chemical tables include dissolved gas concentrations (oxygen, nitrogen, argon, methane, carbon dioxide and helium), isotope contents (tritium, carbon-13, and oxygen-18), some trace and minor element chemical data, and concentrations of the major chemical constituents. Methods of collection and analysis are described. (Woodard-USGS)
W78-09754

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN WYOMING, FISCAL YEAR 1978,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 9D.
W78-09756

PENNSYLVANIA, ANNUAL PROGRESS REPORT 1977, (USGS-WRD).
Geological Survey, Harrisburg, PA. Water Resources Div.
Pennsylvania District report, 1977. 87 p.

Descriptors: *Water resources, *Projects, *Pennsylvania, Surface waters, Groundwater, Water quality, Streamflow, Gaging stations, Water analysis, Reservoirs, Mapping, Measurement, Sampling, Sites, Bibliographies, Publications, *U.S. Geological Survey, Annual summary report.

This report describes the projects, the accomplishments, and the activities of the Water Resources

Division of the U.S. Geological Survey resources programs over the 1977 fiscal year in the Commonwealth of Pennsylvania. The diversification of the projects reflects the growth and the national interests of the United States. They show the problems and challenges that present day managers, developers, and users of water face in these times of natural resources conflicts. (Woodard-USGS)
W78-09758

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY, WATER RESOURCES DIVISION, OKLAHOMA DISTRICT.
Geological Survey, Oklahoma City. OK. Water Resources Div.
For primary bibliographic entry see Field 9D.
W78-09759

U.S. RESERVOIR INVENTORY,
National Reservoir Research Program, Fayetteville, AR.
For primary bibliographic entry see Field 4A.
W78-09797

8. ENGINEERING WORKS

8B. Hydraulics

TESTS OF LOW-DENSITY MARINE LIMESTONE FOR USE IN BREAKWATERS,
Coastal Engineering Research, Center, Fort Belvoir, VA.
D. M. Allison, and R. P. Savage.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 344, Price codes: A03 in paper copy, A01 in microfiche. Technical Paper No. 76-4, May 1976. 43 p, 9 fig, 8 tab, 6 ref, 2 append.

Descriptors: *Coastal structures, *Breakwaters, *North Carolina, *Riprap, *Waves(Water), *Limestones, Stabilization, Stability, Jetties, Rocks, Limestones, *Armor, *New Bern(NC), *Fort Macon(NC), Rubble mound.

A porous, low-density limestone (Cemented shell stone) available from a quarry in New Bern, North Carolina, was tested in a wave tank as a possible armor layer in coastal structures. Tests were conducted with various wave periods and wave heights. Stones were weighed before and after the stability tests. The stability coefficients were determined for all the tests. It was observed that the stones lost an average of 5.5% of their original weights at the end of the tests. Some of the stones also were placed near a jetty in Fort Macon, North Carolina. At the end of 18 months, the stones near the jetty lost an average of 45-65% of their original weights. It was recommended that these stones should not be used either as a cover or underlayers of rubble-mound coastal structures. (Bhowmik-ISWS)
W78-09360

TAKE THE PICK AND SHOVEL WORK OUT OF COMPUTATION,
For primary bibliographic entry see Field 7C.
W78-09372

CHICAGO PIONEERS IN CORRECTING WATER POLLUTION, CONTROLLING FLOODS.
For primary bibliographic entry see Field 5D.
W78-09375

FLOAT TETHER TERMINATOR,
N. W. Lane, Jr.
U.S. Patent No. 4,068,479, 6 p, 9 fig, 16 p; Official Gazette of the United States Patent Office, Vol. 966, No. 3, p 894, January 17, 1978.

Descriptors: *Patents, *Engineering structures, *Breakwaters, Floating, Coastal structures, Waves(Water), Shore protection, Stress, Tether lines.

Floating breakwater units utilize a series of tethered floats connected to a submerged ballast to dimminish the force and size of waves generated in the water. It is essential that the tether line length for the unit be consistent throughout the floats in order to provide the uniform and most efficient operation in the absorption of wave energy to diminish the size and force of waves. The criticality of the length of the tether lines is of such importance that the tolerance is very small and the uniform length must be specifically maintained throughout the breakwater unit. This invention is a terminator unit having a flexible central neck portion which acts as the pendulum pivot area for the relative motion between the floats and ballast, reducing or substantially eliminating the fatigue which is normally exerted upon the tether line. The terminator has a head junction and a base junction connected or integrally formed on the respective ends of the center neck portion. The head junction is designed to receive one end of the tether line in a unique wrapping configuration through the head junction, so that the tether line is in axial alignment with the central neck portion so as to transfer tension of the tether line in a straight line to the central neck portion. (Sinha-OEIS)
W78-09429

MARYSVILLE LAKE HYDROTHERMAL STUDY; REPORT 2, 2250-MW PROJECT; HYDRAULIC AND MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
M. S. Dortch.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 655, Price codes: A03 in paper copy, A01 in microfiche. Technical Report H-77-5, February 1978 (Report 2 of a series). 40 p, 7 tab, 12 pl.

Descriptors: *Hydrothermal studies, *Hydroelectric plants, *Mathematical models, *Hydraulic models, *Pumped storage, Water temperature, California, *Marysville Lake(Calif).

This study was conducted to determine the effect that the proposed Marysville Lake pump-storage hydropower (2250-mw power plant) project would have on downstream water temperatures. A one-dimensional numerical model was used for simulation and prediction of temperatures within and downstream of Marysville Lake. Two physical hydraulic models were used for study and description of the hydrodynamic response of the project. Information from the physical models was necessary to determine coefficients used by algorithms within the mathematical model. The mathematical model allowed simulation of the heat exchange characteristics so the thermal regimes within and downstream of the lake could be determined for various hydrologic and meteorologic conditions and various pumped-storage hydropower operations. Results of the study indicate that the temperatures should be within the objective band desired downstream during years with average or wetter than average hydrologic conditions. (WES)
W78-09466

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 10, NONTECHNICAL SUMMARY OF PROJECT,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 6G.
W78-09467

BREAKWATER STABILITY STUDY, IMPERIAL BEACH, CALIFORNIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
D. G. Markle, and R. D. Carver.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A048 036, Price codes: A07 in paper copy, A01 in microfiche. Technical Report H-77-22, December 1977. 130 p, 21 pl, 2 tab, 82 photo, 7 ref.

Descriptors: *Breakwaters, *Groins(Structures), *Hydraulic models, California, *Beach nourishment, *Armor units(Hydraulics), *Imperial Beach(Calif), *Rubble-mound breakwaters, High-sill structures, Low-sill structures, Overtopping.

A hydraulic model investigation was conducted at a geometrically undistorted scale of 1:16, model to prototype, to desgin stable rubble-mound breakwater sections to protect a beach nourishment area at Imperial Beach, California. Both the -5.0 ft mllw contour (shallow-water location) and -10.0 ft mllw contour (deeper water location) were given as proposed construction sites. Twenty-one plans were tested, resulting in two adequate breakwater designs for each of the two proposed sites. A constant high-sill structure, using 3-ton graded armor stone, and an alternative high- and low-sill structure, using 5- and 0.5-ton armor stone, were stable for the design conditions at the shallow-water location. Two alternating high- and low-sill structures proved adequate for the design condition at the deeper water location. One used 5- and 3-ton graded armor stone on the breakwater trunks and 7-ton cap-stone on the ends of the breakwater system on 1V-on-3H side slopes while the other design used trunk sections of 7- and 5-ton graded armor stone on 1V-on-2H side slopes and 7-ton capstone on the head section with 1V-on-3H side slopes. (WES)
W78-09469

DOLOS ARMOR UNITS USED ON RUBBLE-MOUND BREAKWATER TRUNKS SUBJECTED TO NONBREAKING WAVES WITH NO OVERTOPPING,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. D. Carver, and D. D. Davidson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A048 434, Price codes: A05 in paper copy, A01 in microfiche. Technical Report H-77-19, November 1977. 63 p, 4 tab, 22 photos, 18 pl, 1 append, 11 ref, 5 fig.

Descriptors: *Breakwaters, *Waves(Water), Design criteria, *Dolosse, *Rubble-mound breakwaters, *Armor units(Hydraulics), *Wave runup.

This investigation describes a portion of a research effort to provide fundamental data for the design of rubble-mound breakwaters. This report addresses the use of dolos armor on breakwater trunks subjected to nonbreaking waves and with no overtopping. The majority of the tests reported herein were designed to determine the stability coefficient, K, and runup and rundown values for the above conditions. Additional limited tests were conducted to show what effects (1) varying the first underlayer stone material from 1/5 to 1/20 of the armor weight (Wr) would have on armor stability, wave runup, and wave rundown; (2) placing the dolosse in selected geometric patterns would have on stability; and (3) reducing the number of dolosse used in the cover layer would have on stability. Test results show that a stability coefficient, k = 31, is reasonable for nonbreaking waves on breakwater trunks if the density of units per given areas is equal to or greater than 0.83V-2/3, i.e., n 2, K delta = 0.94, P = 56%. (WES)
W78-09470

PORT ONTARIO HARBOR, NEW YORK, DESIGN FOR WAVE PROTECTION AND PREVENTION OF SHOALING; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. R. Bottin, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A049 246, Price codes: A07 in paper copy. Technical Report H-77-20, November 1977. 128 p, 16 tab, 65 photos, 12 pl, 1 append, 20 ref.

Descriptors: *Breakwaters, Harbors, *Hydraulic models, Waves(Water), New York, *Port Ontario Harbor(NY), *Shoaling, *Wave protection.

A 1:75-scale undistorted hydraulic model of Port Ontario Harbor, New York, which included the lower 5,700 ft of the Salmon River, approximately 4,300 ft of shoreline on each side of the river mouth, Selkirk Lake, and sufficient offshore area in Lake Ontario to permit generation of required test waves, was used to shoaling, wave protection, and riverflow conditions. Proposed improvement plans consisted of (1) breakwaters in Lake Ontario at the mouth of the Salmon River; (2) an entrance channel; (3) an inner channel; (4) a harbor basin; and (5) recreational facilities. A 60-ft-long wave generator, a model circulation system, crushed coal tracer material, and an automated data acquisition and control system (ADACS) were utilized in model operation. It was concluded from model test results that: Wave heights in the harbor were within the established wave-height criteria (2.0 ft at the river mouth and 0.5 ft in the mooring area) for all major improvement plans tested. Of the improvements plans involving the first breakwater configuration and channel alignment tested (Plans 2-5), Plan 4 was selected as the optimum with respect to shoaling protection and construction cost. (WES)
W78-09475

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA; APPENDIX 1: FIXED-BED HYDRAULIC MODEL RESULTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2L.
W78-09477

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA; APPENDIX 1: FIXED-BED HYDRAULIC MODEL RESULTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2L.
W78-09478

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA; APPENDIX 2, NUMERICAL SIMULATION OF HYDRODYNAMICS (WRE),
Water Resources Engineers, Inc., Austin, TX.
For primary bibliographic entry see Field 2L.
W78-09479

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA: APPENDIX 3, NUMERICAL SIMULATION OF HYDRODYNAMICS (TRACOR),
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-09480

COMPARISON OF NUMERICAL AND PHYSICAL HYDRAULIC MODELS, MASONBORO INLET, NORTH CAROLINA; APPENDIX 4, SIMPLIFIED NUMERICAL (LUMPED PARAMETER) SIMULATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2L.
W78-09481

8C. Hydraulic Machinery

U-TUBE CONNECTIONS FOR WASTEWATER PONDS,
Tenneco Chemicals, Pasadena, TX.
R. Churchwell, and A. Fox.
Chemical Engineering, Vol. 85, No. 11, p 212, May, 1978. 3 fig.

Descriptors: *Pipes, *Tubes, *Gravity, *Conveyance structures, *Conduits, Water conveyance, Iron, Storage tanks, Water levels, Oily water, Skimming, Waste water treatment, Municipal wastes.

A U-shaped tube for returning floating solids from a holding pond to a skimmer-equipped pond is readily adjustable to varying heights. The ends of the U-tube pipe apparatus are equipped with angle irons located at 120 degree intervals around the pipe's circumference. The angle irons support additional pipe rings for increasing the height of the U-tube. Surface scum and floating materials are transferred from the feed pond to the skimmer pond by adjusting the height of the U-tube with the pipe rings to the required level in the feed pond. The back-bevelled pipe rings, which are hung on the angle irons when not in use, are easily assembled and alleviate leakage. Gravity flow through the U-tube can be sustained in either direction. (Lisk-FIRL)
W78-09374

COMPUTER-CONTROLLED PLANT FEATURES ADVANCED TREATMENT.
For primary bibliographic entry see Field 5D.
W78-09389

AUTOMATIC CONTROL OF A DIFFUSED AIR TREATMENT PLANT,
For primary bibliographic entry see Field 5D.
W78-09397

AUTOMATIC CONTROLS PREVENT CHLORINE SPILL HAZARDS,
For primary bibliographic entry see Field 5D.
W78-09399

ENSURING CLARITY AND ACCURACY IN TORQUE DETERMINATIONS,
W. H. Boyle
Water and Sewage Works, Vol. 125, No. 3, p 76-77, March, 1978. 1 fig, 1 tab.

Descriptors: *Structural design, *Flow characteristics, *Settling basins, *Hydraulic systems, *Hydrodynamics, Analytical techniques, Equipment, Design criteria, Sludge treatment, Rotors, Waste water treatment, Municipal wastes.

Methods were developed to calculate running, alarm, shut-off, and peak torques for circular clarifiers. Torque may be represented as the squared product of the uniform sludge load and the radius of the clarifier. The drive unit of the clarifier usually operates at a single running torque for 90% of the time. Alarm torque, set at 120% of the running torque, warns of loads in excess of the design clarifier parameters, provides additional running torque, and protects the drive unit in the presence of excessive loads. Shut-off torque automatically stops operation of the clarifier under adverse or abnormal conditions and may be set at 140% of the running torque. Peak torque, determined by the manufacturer to be the absolute capacity of the drive unit, accommodates excessive loads for a duration of about 3 sec when torque increases too rapidly for the shut-off torque to respond; peak torque is usually twice the running torque. Torque values were calculated for a municipal primary clarifier with an 80-ft diameter and a uniform sludge load of 8 lbs/ft. From the initial torque equation and the modes of torque operation, torque values were calculated as 132,800 ft lbs for running, 15,360 ft lbs for alarm, 17,920 ft lbs for shut-off, and 25,600 ft lbs for peak torque. (Lisk-FIRL)
W78-09413

FACTORS INFLUENCING LOW SPEED SURFACE AERATION SELECTION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-09414

INSURING TROUBLE-FREE PUMP OPERATION,
Allis-Chalmers Corps., Milwaukee, WS. Industrial Pump Div.
A. LaFarge.
Water and Sewage Works, Vol. 125, No. 5, p 60-63, May, 1978. 6 fig.

Descriptors: *Pumps, *Piping systems(Mechanical), *Foundations, *Pumping plants, *Cement grouting, Construction materials, Operation and maintenance, Pipelines, Waste water treatment, Transport, Municipal wastes.

Recommendations are reviewed for improving the installation and operation of pumps used in waste water treatment facilities. Flooding of pumps installed in low-lying areas requires cleaning and greasing of the bearings, stuffing box, mechanical seals, couplings, impeller, and pipes. Location, foundation, alignment, and piping are considered in the installation of pumps. It is recommended that pumps be located near the inlet and below the liquid flow, especially when suction lift pumps are used, to facilitate priming and flow rate. Alignment of the pump by placement on a founcation of blocks and shims is important during installation to prevent uneven wear and ensure proper operation. Grouting around the steel or cast iron base plates stabilizes the alignment and compensates for an uneven foundation beneath the pump. Pipes should have air-tight joints and be installed in the most direct route to the pump. Suction and discharge pipes require supports or anchors to prevent stress. A length of suction pipe 4-5 times the pipe diameter should be installed upstream of the pump to maintain proper flow. Suggestions are made for proper pump maintenance. (Lisk-FIRL)
W78-09441

PROCEEDINGS OF THE SOLAR IRRIGATION WORKSHOP, (1977).
Energy Research and Development, Albuquerque, NM. Sandia Labs.
For primary bibliographic entry see Field 3F.
W78-09448

MARYSVILLE LAKE HYDROTHERMAL STUDY; REPORT 2, 2250-MW PROJECT; HYDRAULIC AND MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-09466

8D. Soil Mechanics

EROSION PROCESSES ON STEEP GRANITIC ROAD FILLS IN CENTRAL IDAHO,
Forest Service (USDA) Boise, ID. Intermountain Forest and Range Experimental Station.

For primary bibliographic entry see Field 2J.
W78-09330

CONSTRUCTION OF FROZEN FILL DAMS IN ARCTIC COASTAL REGIONS,
P. A. Grishin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 248, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 624, July 1977. 14 p, 6 fig. Translated from Trudy IV Soveshchaniya-Seminara po Obmenu Opytom Stroitel'stva v Surovykh Klimaticheskikh Usloviyakh (USSR), Vol 10, 14 p, 1976.

Descriptors: *Dam construction, *Coasts, *Cold regions, *Frozen soils, Dams, Cold weather construction, Earthworks, Earth dams, Dam design, Arctic, Temperature, *USSR, Frozen-fill dams.

Expansion of industrial and public construction in the Arctic resulted in an increase in the demand for drinking and industrial water and necessitated the construction of dams and reservoirs. The severe weather and complex geocryological-geological conditions require the construction of frozen-fill type dams as the most economical and technologically justified hydroengineering installations for that region. Plans have been developed for different designs of frozen dams for the Arctic coastal regions. Some of the dams have been built and are operating successfully, while others are not yet complete and are under observation. This article set forth the results of observations, analysis of deviations from plans during the construction of installations, and experience in their operations. (Humphreys-ISWS)
W78-09363

SHORELINE EROSION IN SOUTHEASTERN WISCONSIN,
Wisconsin Geological and Natural History Survey, Madison.
For primary bibliographic entry see Field 2J.
W78-09547

8G. Materials

PROGRAM THE MANNING EQUATION,
Camp, Dresser, and McKee Inc., Boston, MA.
For primary bibliographic entry see Field 7B.
W78-09376

KNOW-HOW IMPORTANT IN REHABILITATING FLOODED SEWER LINES,
Pennsylvania Dept. of Public Works, Johnstown.
R. W. Malysko.
Public Works, Vol. 109, No. 5, p 62-64, May, 1978.

Descriptors: *Cleaning, *Sewers, *Flood damage, *Storm drains, *Debris avalanches, Historic floods, Pipelines, Equipment, Concrete pipes, Clogging, Conduits, Jets, Pumps, Sewerage, Municipal wastes.

Water jetting, bucket machines, rodding, and scrapers were utilized by Robinson Pipe Cleaning, Co., of Canonsburg, Pennsylvania, to remove debris from sewer lines in Johnstown, Pennsylvania, after the July 1977 flood. Water and debris were cleared from basements and elevator shafts by trash pumps and water jetting; water was discharged to open sewer lines or transported by 3,000 gal tank trucks to the Conemaugh River. Main sewer lines leading to the 25 mgd sewage treatment plant were initially cleared to restore the flow in 145 miles of municipal sewers. The concrete or terra cotta pipes, with diameters ranging over 8-60 inches, were cleaned with bucket machines and high-velocity water jetting, in sections averaging the distance between 2-3 manholes. More than 80 miles of brick, stone or concrete storm sewers with diameters ranging from 18-96 inches were cleared by rodding scrapers attached bucket winches. Debris removed from the lines, such as tree limbs, mud, rock, road base materials, telephone poles, railroad ties, and auto parts, were deposited in dump trucks by clamshell equipment or tractor shovels for subsequent disposal. (Lisk-FIRL)
W78-09377

EFFLUENT TREATMENT PROCESS USES FILAMENT-WOUND GLASS FIBER/EPOXY.
Reinforced Plastics, Vol. 22, No. 2, p 52-53, February, 1978.

Descriptors: *Plastic pipes, *Epoxy resins, *Construction materials, *Shafts(Excavations), *Pipes, Tensile strength, Chlorides, Corrosion control, Industrial wastes, Waste water treatment, Steel pipes, Aeration, Municipal wastes/

Glass-reinforced plastic was selected as piping material for the installation of a deep shaft effluent treatment system at the Marsh Farm Sewage Works in Tilbury, Essex, England. Because the combined municipal and industrial waste water treated at the plant had a high chloride level, the deep shaft equipment had to be resistant to corrosion for a period of 30 yrs. The 132-m long filament-wound fiberglass epoxy downcomer, with a 1,200 mm diameter, hangs freely in a 130-m deep shaft with a 2-m diameter. The fiberglass epoxy pipe was delivered in 10-m sections and joined with a locking system and resin injection to insure tensile strength and rigidity. Effluent is passed through a bell-mounted T-piece to the downcomer, equipped with stainless steel aeration pipes. The fiberglass reinforced plastic pipes are manufactured by Wavin Plastics Ltd. of Hayes, Middlesex, England. (Lisk-FIRL)
W78-09383

SYMPOSIUM ON APPLIED GLACIOLOGY.
International Glaciological Society, Cambridge (England).
For primary bibliographic entry see Field 2C.
W78-09603

ENGINEERING PROPERTIES OF SNOW,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-09604

SNOW FORCES,
Eidgenossisches Inst. fuer Schnee- und Lawinenforschung, Davos (Switzerland).
For primary bibliographic entry see Field 2C.
W78-09605

DIRECT SIMPLE SHEAR TESTS ON SNOW AND THEIR RELATION TO SLAB AVALANCHE FORMATION,
Norwegian Geotechnical Inst., Oslo.
For primary bibliographic entry see Field 2C.
W78-09606

A FRACTURE CRITERION FOR SNOW,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2C.
W78-09607

THE KINETIC FRICTION ON SNOW AND ICE,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
For primary bibliographic entry see Field 2C.
W78-09609

ICE FORCES,
Technical Univ. of Denmark, Lyngby (Denmark). Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 2C.
W78-09619

ICE-STRUCTURE INTERACTION WITH ARTIFICIALLY GENERATED FORCE RECORDS,
Memorial Univ. of Newfoundland, St. John's. Faculty of Engineering and Applied Science.
For primary bibliographic entry see Field 2C.
W78-09620

MECHANISMS AND THEORY OF IDENTATION OF ICE PLATES,
Laval Univ., Quebec. Lab. of Ice Mechanics.
For primary bibliographic entry see Field 2C.
W78-09621

ICE ACCRETIONS ON STRUCTURES,
Toronto Univ. (Ontario). Dept. of physics.
For primary bibliographic entry see Field 2C.
W78-09636

DE-ICING OF RADOMES AND LOCK WALLS USING PNEUMATIC DEVICES,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-09637

SNOW ACCRETION ON ELECTRIC WIRES AND ITS PREVENTION,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
For primary bibliographic entry see Field 2C.
W78-09638

ENGINEERING PROPERTIES OF SEA ICE,
Hamburgische Schiffbau-Versuchsanstalt (West Germany).
For primary bibliographic entry see Field 2C.
W78-09640

8I. Fisheries Engineering

ASSESSMENT OF DAMAGE TO FISH LARVAE BY ENTRAINMENT SAMPLING WITH SUBMERSIBLE PUMPS,
Wisconsin Electric Power Co., Milwaukee.
J. J. Ney, and P. D. Schumacher.
Environmental Science and Technology, Vol. 12, No. 6, p 715-716, 1978. 1 tab, 5 ref.

Descriptors: *Entrainment, *Larval growth stage, Larvae, *Sampling, *Suckers, Plankton, *Fry, *Monitoring, *Pumps, *Cooling water, *Intakes, *Fish eggs, Data collections, Testing procedures, *Ichthyoplankton.

White sucker larvae were passed through a submersible pump-plankton net system to assess the physical effects of this sampling devise on ichthyoplankton. Larvae destruction was negligible, and incidence of maiming was very low in the collection process. Prolonged (6 h) pumping of water and debris into a plankton net containing larvae resulted in a mean apparent recapture loss of 18%. Approximately half of the sucker fry recovered after prolonged pumping were maimed. The submersible pump-plankton net combination appears to be an effective device to monitor ichthyoplankton entrainment, although frequent removal of collected material may be warranted. (EIS-Deal)
W78-09302

FILTERING SYSTEM FOR FISH-FARMING WATER,
For primary bibliographic entry see Field 5F.
W78-09427

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES INVESTIGATIONS IN FLORIDA 1977-78.
Geological Survey, Tallahassee, FL. Water Resources Div.
Florida District report, March 1978. 146 p.

Descriptors: *Water resources development, *Florida, Reviews, *Projects, *Publications, Bibliographies, U.S. Geological Survey, Participating agencies.

Summary statements for water-resources investigations in Florida conducted by the Water Resources Division of the U.S. Geological Survey in cooperation with State, Federal, and local agencies during 1977-78 are contained in this report. These investigations are part of the Federal program of appraising the Nation's water resources. Water resource investigations in Florida range from basic descriptive water-availability studies for areas of low-intensity water development and management to sophisticated cause and effect studies in areas of high-intensity water development. The interpretative reports and records that are products of the investigations are a principal hydrologic foundation upon which the plans and development of Florida's water resources may be based. Reports released during 1977 are listed. Preceding the investigative summaries is a map showing location of areal investigations; a list classifying investigations by hydrologic topics, and a numerical list of investigations. A list of agencies which cooperated in the statewide water resources program is included. (Woodard-USGS)
W78-09745

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN WYOMING, FISCAL YEAR 1978,
Geological Survey, Cheyenne, WY. Water Resources Div.
F. C. Boner.
Open-file report 78-239, February 1978. 106 p, 9 fig, 5 tab, 8 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Wyoming, Hydrologic data, Water supply, Streamflow, Flow rates, Sediment transport, Reservoirs, Observation wells, Projects, Publications, Annual, Reviews.

This report contains lists of streamflow and reservoir stations, peak-flow partial-record stations, chemical-quality stations, sediment stations, and observation wells where water levels are measured in Wyoming. The locations of the basic-data sites are shown on maps. Thirty-two water-resources appraisal projects in Wyoming are also described, including many that are related to the development of energy resources. The general locations of the projects are shown on maps. The report serves as an annual progress report to cooperators and the public (Woodard-USGS)
W78-09756

PENNSYLVANIA, ANNUAL PROGRESS REPORT 1977, (USGS-WRD).
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09758

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY, WATER RESOURCES DIVISION, OKLAHOMA DISTRICT.
Geological Survey, Oklahoma City. OK. Water Resources Div.
Oklahoma District report, January 1978. 91 p, 6 fig, 2 tab, 114 ref.

Descriptors: *Water resources, *Projects, *Oklahoma, Surface waters, Groundwater, Water quality, Streamflow, Gaging stations, Water analysis, Reservoirs, Maps, Measurement, Sampling, Sites, Bibliographies, Publications, *U.S. Geological Survey, Annual summary report.

This report is a summary of the 1978 program of the U.S. Geological Survey, Water Resources Division, Oklahoma District. It contains brief descriptions of all active projects and the current status of each. A list of all published reports related to the water resources of Oklahoma is given. It contains listings of all streamflow gaging stations, water quality stations, and reservoir stations which the Geological Survey operates or publishes through cooperation with other State, local, and Federal agencies. Included are discontinued surface water and water quality stations for which the Geological Survey has published records. Stations are listed by type and by cooperator and the number of stations funded by each cooperator is summarized. Maps show the locations of various types of stations, the locations of selected groundwater projects and an index of the two-degree sheets in Oklahoma for which hydrologic reconnaissance studies have been made. (Woodard-USGS)
W78-09759

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

COLLECTION, STORAGE, RETRIEVAL, AND PUBLICATION OF WATER-RESOURCES DATA.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09323

10C. Secondary Publication And Distribution

A GUIDE TO OBTAINING INFORMATION FROM THE USGS 1978,
Geological Survey, Reston, VA.
P. F. Clarke, H. E. Hodgson, and G. W. North.
Available from Branch of Distribution, USGS, 1200 S. Eads St. Arlington, VA 22202. Circular 777, 1978. 36 p.

Descriptors: *Information retrieval, *Publications, *Natural resources, *Water resources, *Indexing, *U.S. Geological Survey documents, *Information retrieval sources, Unpublished documents.

For almost 100 years, the USGS (U.S. Geological Survey) has served Federal, State, and local governments and the public by collecting, analyzing, and publishing detailed information about the Nation's mineral, land, and water resources. This information is released in a variety of map, book, and other formats and is available for free distribution or for sale from sources both within and outside the USGS. This guide has been prepared to assist in obtaining these information products and to aid in locating both general and specific unpublished information within the USGS. (Woodard-USGS)
W78-09309

IDENTIFICATION CODES FOR ORGANIZATIONS LISTED IN COMPUTERIZED DATA SYSTEMS OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09317

DEFINITIONS OF COMPONENTS OF THE WATER DATA SOURCES DIRECTORY MAINTAINED BY THE NATIONAL WATER DATA EXCHANGE,
CACI Inc., Reston, VA; and Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09319

STORAGE AND RETRIEVAL OF WATER-RESOURCES DATA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09327

PUBLICATION OF WATER-RESOURCES DATA,
Geological Survey, Reston, VA. Water Resources Div.
S. M. Lang, and C. B. Ham.
In: Collection, Storage, Retrieval, and Publication of Water-Resources Data: Geological Survey Circular 756, p 26-39, 1978. 9 fig, 7 ref.

Descriptors: *Hydrologic data, *Publications, *Documentation, *Information exchange, *Water resources, Data collections, Methodology, Evaluation, *Reports, *U.S. Geological Survey.

Water data are the raw materials used by scientists and engineers for determining the availability and accessibility of the water resources and for the design, development, and management of major water facilities. The principal responsibility of a hydrologic service is to furnish the scientists and engineers the data they need in a consistent and timely manner. The medium most frequently used for release of water data is the data report. It is the principal product of the major hydrologic services, even in this era of computers with their massive automated data storage and dissemination capabilities. Data publications meet the requirements of a widespread audience; they also provide archival capability that has not yet been equaled by automation techniques. (See also W78-09323) (Woodard-USGS)
W78-09328

ASSESSMENT AND SIGNIFICANCE OF SEDIMENT-ASSOCIATED OIL AND GREASE IN AQUATIC ENVIRONMENTS,
Naval Biosciences Lab., Oakland, CA.
For primary bibliographic entry see Field 5E.
W78-09468

A DESCRIPTION OF THE INDEX OF ACTIVE FLORIDA WATER DATA COLLECTION STATIONS AND A USER'S GUIDE FOR STATION OR SITE INFORMATION RETRIEVAL COMPUTER PROGRAM FINDEX H578,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-09747

ANNOTATED BIBLIOGRAHY FOR WATER QUALITY MANAGEMENT, (FOURTH EDITION).
Environmental Protection Agency, Washington, DC. Water Planning Div.
For primary bibliographic entry see Field 5G.
W78-09760

10F. Preparation Of Reviews

UNBIASED PLOTTING POSITIONS-A REVIEW,
Ireland Office of Public Works, Dublin.
For primary bibliographic entry see Field 7C.
W78-09348

SYMPOSIUM ON APPLIED GLACIOLOGY.
International Glaciological Society, Cambridge (England).
For primary bibliographic entry see Field 02C.
W78-09603

SNOW DRIFT,
Melbourne Univ., Parkville (Australia). Dept. of Meteorology.
For primary bibliographic entry see Field 02C.
W78-09608

ENGINEERING PROPERTIES OF FRESH-WATER ICE,
National Research Council of Canada, Ottawa (Canada). Div. of Building Research.
For primary bibliographic entry see Field 02C.
W78-09614

SNOW AVALANCHES: A REVIEW OF CURRENT RESEARCH AND APPLICATIONS,
Washington Univ., Seattle. Geophysics Program; and Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 02C.
W78-09623

ENGINEERING PROPERTIES OF SEA ICE,
Hamburgische Schiffbau-Versuchsanstalt (West Germany).
For primary bibliographic entry see Field 02C.
W78-09640

SHORT-TERM FORECASTING OF WATER RUN-OFF FROM SNOW AND ICE,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 02C.
W78-09645

FRAZIL-ICE NUCLEATION BY MASS-EXCHANGE PROCESSES AT THE AIR-WATER INTERFACE,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 02C.
W78-09648

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 21
NOVEMBER 1, 1978

W78-09801 -- W78-10500
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SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 21
NOVEMBER 1, 1978

W78-09801 -- W78-10500

he Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the ansaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication mats. The contents of these documents cover the water-ated aspects of the life, physical, and social sciences as ll as related engineering and legal aspects of the charac-istics, conservation, control, use, or management of water. ch abstract includes a full bibliographical citation and a set descriptors or identifiers which are listed in the **Water sources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-arch categories established by the Committee on Water sources Research of the Federal Council for Science and chnology.

RSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE OPIES OF DOCUMENTS ABSTRACTED IN THIS JOUR-AL. Sufficient bibliographic information is given to enable aders to order the desired documents from local libraries other sources.

lected Water Resources Abstracts is designed to serve e scientific and technical information needs of scientists, gineers, and managers as one of several planned services the Water Resources Scientific Information Center VRSIC). The Center was established by the Secretary of the terior and has been designated by the Federal Council for cience and Technology to serve the water resources com-unity by improving the communication of water-related search results. The Center is pursuing this objective by co-dinating and supplementing the existing scientific and tech-cal information activities associated with active research nd investigation program in water resources.

o provide WRSIC with input, selected organizations with ctive water resources research programs are supported as enters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

THERMODYNAMICS OF THE SULFUR DIOXIDE-SEAWATER SYSTEM,
California Univ., Berkeley. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2K.
W78-09990

2. WATER CYCLE

2A. General

SIMULATION OF SUMMER RAINFALL OCCURRENCE IN ARIZONA AND NEW MEXICO,
Agricultural Research Service, Tucson. Southwest Watershed Research Center; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2B.
W78-10020

A STATISTICAL ANALYSIS OF RAINFALL - RUNOFF RELATIONSHIP,
George Washington Univ., Washington, DC. School of Engineering and Applied Science.
V. P. Singh, and Y. K. Birsoy.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 345-363, 1978. 5 fig, 4 tab, 9 ref.

Descriptors: *Statistical methods, *Rainfall-runoff relationships, Hydrology, *Distribution, Annual, Reservoirs, Probability, Computer models, Hydrologic data, Simulation analysis, Water resources, Planning, Equations, Systems analysis.

Developed are statistical relationships between distribution parameters of annual rainfall and annual runoff. Three processes are involved: the input process (mean annual rainfall excess); the transformation process; and the output process (mean annual runoff). The input is assumed to be random with known statistical parameters. The transformation of rainfall-excess into runoff is characterized by a cascade of linear reservoirs. With these assumptions, equations are derived expressing some statistical parameters of the output in terms of those of the input and the length of the carryover. Past studies which considered this problem used a very simplified structure of the transformation process, often characterized by a single linear or nonlinear reservoir. This study employs a more realistic model of the transformation process. The relationships herein are compared with those available in the literature and can be utilized to describe the statistical distribution of runoff, given the distribution of rainfall. It is shown that for large carryover the distribution of runoff always tends to be normal, regardless of the distribution of rainfall. The validity of the derived relationships is examined by means of computer-simulated data. Finally, examples are given to illustrate the usefulness of these relationships in water planning. (See also W78-10094) (Bell-Cornell)
W78-10115

USER'S GUIDE FOR U.S. GEOLOGICAL SURVEY RAINFALL-RUNOFF-MODELS--REVISION OF OPEN-FILE REPORT 74-33,
Geological Survey, Reston, VA. Water Resources Div.
P. H. Carrigan, Jr., G. R. Dempster, Jr., and D. E. Bower.
Open-file report 77-884, 1977. 341 p, 11 fig, 3 tab, 8 ref.

Descriptors: *Data storage and retrieval, *Computer programs, *Flood frequency, *Rainfall-runoff relationships, *Computer models, Data processing, Hydrologic data, Statistical models, Methodology, *Computer-catalog procedures.

Modified versions of the rainfall-runoff model described by Dawdy, Lichty, and Bergmann (1972) (see W72-11754) are used in the U.S. Geological Survey as a means of synthesizing flood discharges for small drainage areas. Synthesized flood discharges derived through use of long-term (60-70 year) rainfall and evaporation data, provide a more representative time base than do short-term (5-15 year) discharge records obtained by conventional stream gaging techniques. The rainfall, discharge, and evaporation data for use with rainfall-runoff models are stored in the Unit and Daily Values Files. Any of these data which were collected during the current or immediately preceding water year are stored on direct access, online disk files. Older data are stored in sequential files on magnetic tapes. Both the disks and tapes contain short-term data collected by the U.S. Geological Survey for calibration of models and long-term data for use in synthesis of long-term flood records. Information in this report provides guidelines for the assembly, storage, and retrieval of data needed to use these models, and also provides description and documentation of computer programs for model calibration and flood-record synthesis. (See also W74-11234) (Woodard-USGS)
W78-10187

PRESERVATION OF THE RESCALED ADJUSTED RANGE 2. SIMULATED STUDIES USING BOX-JENKINS MODELS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
For primary bibliographic entry see Field 2E.
W78-10208

PRESERVATION OF THE RESCALED ADJUSTED RANGE 3. FRACTIONAL GAUSSIAN NOISE ALGORITHMS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
For primary bibliographic entry see Field 2E.
W78-10209

ESTIMATION OF DIRECT RUNOFF FROM URBAN WATERSHEDS,
Indiana State Board of Health, Indianapolis.
For primary bibliographic entry see Field 5B.
W78-10290

A MANUAL OF LAWS, REGULATIONS AND INSTITUTIONS FOR THE CONTROL OF GROUND WATER POLLUTION.
National Water Well Association, Worthington, OH. Model Law Task Force Committee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 808, Price codes: A19 in paper copy, A01 in microfiche. Report EPA-440/9-76-006, June, 1976. 416 p.

Descriptors: *Groundwater, *Federal Water Pollution Control Act, *Hydrologic cycle, *Water pollution, Aquifers, Administrative agencies, Management, Groundwater potential, Groundwater resources, Legislation, Water resources development, Water quality.

Groundwater is a vast natural resource that can be expected to become increasingly valuable as a water source throughout most states. Groundwater may become extensively polluted, but, unlike surface water, groundwater quality cannot be corrected by pollution controls after the polution has occurred. Groundwater can be contaminated by: (1) infiltration of polluted surface water; (2) land disposal of waste materials; (3) sewage treatment disposal; (4) salt spreading on highways; (5) pesticides; (6) septic tanks; (7) sanitary landfills; (8) leakage from storage tanks and pipelines; and (9) artificial recharge. There is no single, simple approach to prevent groundwater pollution. It can be controlled by: (1) surface water standards; (2) land use regulations; (3) control of waste disposal sites; (4) management of water levels; (5) control of well construction and operation; (6) air quality standards; (7) control of storage areas; (8) control of mining and quarrying; and (10) control of transporation and handling of fluids. There are a number of statutory provisions that will enable a state to protect groundwater are also available from the Environmental Protection Agency. (Jordan-Florida)
W78-10404

2B. Precipitation

INFILTRATION DURING AN UNSTEADY RAIN,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-09978

PROJECT SONORA: RAIN STIMULATION PROGRAM (PROYECTO SONORA: PROGRAMA DE ESTIMULACION DE LLUVIAS),
Departmento de Hidrometeorologia y Prediccion, Mexico City.
For primary bibliographic entry see Field 3B.
W78-10015

SIMULATION OF SUMMER RAINFALL OCCURRENCE IN ARIZONA AND NEW MEXICO,
Agricultural Research Service, Tucson. Southwest Watershed Research Center; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
H. B. Osborn, and D. R. Davis.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 7, Proceedings of the 1977 Meetings of the Arizona Section, American Water Resources Assn.; and the Hydrology Section, Academy of Science, April 15-16, Las Vegas, Nevada, p 153-162. 7 fig, 2 tab, 12 ref.

Descriptors: *Precipitation(Atmospheric), *Mathematical models, *Statistical models, *Simulated rainfall, *Runoff, Distribution studies, Flood forecasting, Summer, Maximum probable flood, Rainfall intensity, Impact(Rainfall), Forecasting, Thunderstorms, Rainfall disposition, Floods, Markov processes, *Arizona, *New Mexico.

Thunderstorms produce most of the annual rainfall and almost all runoff from arid and semiarid rangelands in the southwest U.S. A model was developed to be used for predicting runoff in river basins, flood plane zonings, estimating flood damage, erosion, and sediment transport, and estimating precipitation available for forage growth. This rainfall occurrence model has three parameters: elevation, latitude and longitude, and takes into account rainfall occurrence in 22 stations located in Arizona and New Mexico. From these variables, mathematical equations were developed in an effort to predict point rainfall occurrence. Estimates of the number of seasonal occurrences were used as a check of the equations within the model. (Paylore-Arizona)
W78-10020

REGIONAL MODELLING OF ANNUAL PRECIPITATION: LONG-TERM PERSISTENCE OR NON-CLIMATIC VARIABILITY.,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
K. W. Potter.

In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 196-207, 1978. 5 fig, 1 tab, 22 ref.

Descriptors: *Regional analysis, *Precipitation, *Climatic data *Hydrologic series, Annual, Homogeneity, Variability, Water resources, Mathematical models, Systems analysis.

The water resource planner is presently armed with numerous sophisticated techniques to model hydrologic time series and subsequently incorporate the models in the design process. Little attention, however, has been directed to the problem of non-climatic variability or non-homogeneity in hydrologic series. Operating under the assumption that long-period climatic variability is regionally homogeneous, nineteen 100-year annual precipitation series from the northeast United States are analyzed. It is found that statistics from most of these series are consistent wit lag-one autoregressive models, short memory stochastic processes. The statistics of three series, however, are anomolous, apparently due to non-climatic variability, or non-homogeneity. These results indicate that, at least for these data, the adjusted range is a sensitive indicator of non-climatic variability, rather than of long-period persistence. (See also W78-10094) (Bell-Cornell)
W78-10106

HAIL A PROBE TO THE CORE,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 3B.
W78-10244

SHAPES OF RAINDROP SIZE DISTRIBUTIONS,
Osservatorio Ticinese della Centrale Meteorologica Svizzera, Locarno-Monti (Switzerland).
J. Joss, and E. G. Gori.
Journal of Applied Meteorology, Vol. 17, No. 7, p 1054-1061, July 1978. 4 fig, 3 tab, 7 ref, 2 append.

Descriptors: *Raindrops, *Particle size, *Rainfall, Data processing, Analytical techniques, Rain, Cloud physics, Curves, Drops(Fluids), Weather, Precipitation(Atmospheric), Meteorology, *Raindrop size distributions, Distribution shapes.

The 'instant' shape of raindrop size distributions (measured during 1 min or less) usually differs from the exponential, generally in the direction of monodispersity. Experimental results were presented for both widespread and thunderstorm rain. It was shown that the measured shape depends significantly on the sample size, and that adding many 'instant' distributions from different conditions leads to an exponential distribution such as proposed by Marshall and Palmer. This transition as examined, as well as the sample size needed for a well-defined shape. (Sims-ISWS)
W78-10257

DROUGHT TO FLOOD-A SUDDEN MOISTURE REVERSAL IN CALIFORNIA,
California Univ., Davis. Dept. of Geography.
M. L. Shelton.
Weatherwise, Vol. 31, No. 3, p 92-100, June 1978. 5 fig, 2 tab, 3 ref.

Descriptors: *Droughts, *Floods, *California, Precipitation(Atmospheric), Rainfall, Snowfall, Moisture deficit, Water shortage, Historic floods, Precipitation excess, Watersheds(Basins), Surface waters, Groundwater, Streamflow, Climatology.

California endured its driest year of record in 1977, after experiencing its third driest year of record in 1976. The combination of these two dry years produced the most serious drought of this century in California. During the 25 months from November 1975 through November 1977, many stations in California received little more rainfall than would be expected during an average 12 months. Winter snowpack in the Sierra Nevada Mountains set new records for low snow accumulation, the flow of rivers and streams was reduced to record low amounts, and water storage reservoirs were drained to historic low levels. However, the adverse conditions associated with the drought were checked with surprising abruptness by heavy rainfall beginning in mid-December 1977. Within six weeks the attention of many residents shifted from the problem of drought to the problem of flooding. (Sims-ISWS)
W78-10259

RANK TESTS IN WEATHER MODIFICATION EXPERIMENTS,
Florida State Univ., Tallahassee. Dept. of Statistics.
For primary bibliographic entry see Field 3B.
W78-10265

METEOROLOGICAL ASPECTS OF THE BIG THOMPSON FLASH FLOOD OF 31 JULY 1976,
National Oceanic and Atmospheric Administration, Boulder, CO. Applied Physics and Chemistry Lab.
R. A. Maddox, F. Caracean, L. R. Hoxit, and C. F. Chappell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 191, Price codes: A05 in paper copy, A01 in microfiche. NOAA-TR-ERL 388-APCL 41, July 1977. 87 p, 54 fig, 3 tab, 13 ref.

Descriptors: *Flash floods, *Colorado, *Weather, Meteorology, Weather data, Analysis, Analytical techniques, Thunderstorms, Data collections, Weather patterns, Rocky mountain region, *Precipitation(Atmospheric), Rainfall deposition, Precipitation excess, Floods, Storms, Synoptic analysis, Charts, Maps, Fronts(Atmospheric), *Big Thompson River(Col).

Analyses and description of meteorological conditions that produced devastating flash flood in the Big Thompson Canyon on 31 July 1976 were presented. The storm developed when strong low-level easterly winds to the rear of a polar front pushed a moist, conditionally unstable air mass upslope into the Front Range of the Rocky Mountains. Orographic uplift released the convective instability, and light south-southeasterly winds at steering levels allowed the storm complex to remain nearly stationary over the foothills. Minimal entrainment of relatively moist air at middle and upper levels, very low cloud bases, and a slightly tilted updraft structure contributed to a high precipitation efficiency. Meteorological conditions that produced the Big Thompson and Rapid City flash floods were compared and were shown to have been very similar. A set of meteorological conditions were defined for the purpose of identifying the potential for flash floods in Front Range canyons. (Humphreys-ISWS)
W78-10271

SIMULATED PRECIPITATION REFERENCE MATERIALS, II,
National Bureau of Standards, Washington, DC.
J. K. Taylor, E. R. Deardorff, and T. C. Rains.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 945, Price codes: A03 in paper copy, A01 in microfiche. Report NBSIR 77-1315, September 1977. 25 p, 1 fig, 8 tab. EPA-IAG-D7-F1069.

Descriptors: *Chemistry of precipitation, *Water chemistry, *Chemical analysis, Aqueous solutions, Rainfall, Precipitation(Atmospheric), Chemistry, Acidity, Hydrogen ion concentration, Ions, Chemicals, Measurement, *Reference materials.

This report described the preparation of a series of reference materials for chemical analysis of natural precipitation. This was the second series of such materials prepared by NBS, under the sponsorship of EPA, and was distributed by the latter as a means to intercalibrate atmospheric monitoring stations. The materials consist of ampoules of concentrates which can be diluted to simulate natural rainwater. A separate reference sample, to be used undiluted, was provided for evaluation acidity measurements. The analytical measurements made to establish the composition of the samples also were described. (Sims-ISWS)
W78-10287

2C. Snow, Ice, and Frost

DYNAMIC BEHAVIOR OF ICE UNDER CYCLIC AXIAL LOADING,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
T. S. Vinson, and T. Chaichanavong.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 104, No. GT7, Proceedings Paper 13903, p 801-814, July 1978. 10 fig, 29 ref, 2 append. NSF ENG74-13506.

Descriptors: *Ice loads, *Loads(Forces), *Dynamics, *Mechanical properties, Youngs modulus, Laboratory tests, Testing procedures, Frequency, Permafrost, Frozen soils, Ice, Seismic waves, Temperature, Strain, Stress, Analysis, Velocity, Triaxial tests, Cyclic axial loading.

Dynamic Young's modulus and damping ratio were determined for axial strain amplitudes from 0.003% to 0.02%, temperatures from 30.2F to 14F, frequencies from 0.05 cps to 5.0 cps, and confining pressures from 0 to 200 psi. The value of dynamic Young's modulus over the range of test conditions was from 340,000 psi to 900,000 psi; the value of damping ration was from 0.02 to 0.11. The test results indicated that the dynamic Young's modulus of ice increases with increasing confining pressure and frequency and decreases with ascending temperature and strain amplitude. The damping ratio of ice appears to decrease as frequency increases from 0.05 cps to 1.0 cps, and increases as frequency increases from 1.0 cps to 5.0 cps. The damping ratio appears to decrease with descending temperature and increase with increasing strain amplitude. There appears to be no well-defined relationship between the damping ratio of ice and confining pressure. A comparison of dynamic properties of ice obtained in the present study to those obtained in previous studies indicated that: (1) The values of longitudinal and compressional wave velocities determined in the present study are lower than comparable wave velocities determined in previous laboratory field studies. It appears that this difference can be explained by differences in the test techniques employed in the present study compared to those in previous studies. (2) The values of damping ratio determined in the present study are close to the values obtained in previous studies. (Humphreys-ISWS)
W78-09992

ICE ENGINEERING: A NATIONAL NEED.
Army Terrestrial Sciences Center, Hanover, NH.
1975, 29 p, 1 fig.

Descriptors: *Ice, *Engineering, *Research facilities, *Research and development, Research equipment, Model studies, Specifications, Channels, Programs.

An Ice Engineering Facility is sorely needed to help solve ice problems on the waterways of the United States. The facility would aid basic and applied research on ice as it is encountered in such important waterways as the Great Lakes, Mississippi River, St. Lawrence Seaway and other cold regions like the North Slope of Alaska. To solve

problems already evident and yet to be flexible enough to adapt to solving problems not yet recognized, a facility with three basic sections is envisioned. These are a test basin for large scale ice force, ice suppression and ship studies; a flume for basic hydraulic studies of scour, frazil ice, ice jams, etc.; and a large test area for model studies of specific area or river reaches to determine optimum location of structures and effects of channel changes. The urgency to build it now is based upon the rationale that necessary experimentation should be completed before large scale engineering efforts are made in the field, which could be very costly and ineffective if not optimized by model studies. Physical requirements and general specifications for the proposed facility were enumerated. (Humphreys-ISWS)
W78-09999

SUBSEA PERMAFROST AT PRUDHOE BAY, ALASKA: DRILLING REPORT AND DATA ANALYSIS,
Alaska Univ., College. Geophysical Inst.
T. E. Osterkamp, and W. D. Harrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 462, Price codes: A08 in paper copy, A01 in microfiche. Report UAG R-225, May 1976. 158 p, 24 fig, 4 tab, 14 ref, 6 append. NOAA SG 04-5-158-35,OCS 03-5-022-55.

Descriptors: *Permafrost, *Drillers logs, *Coasts, *Alaska, Sampling, Drilling, Drilling samples, Soils, Temperature, Ice, Boreholes, Boreholes geophyiscs, Boreholes geophysics, Geology, Cold regions, *Subsea permafrost, *Prudhoe Bay(Alaska).

A subsea permafrost drilling program conducted near Prudhoe Bay, Alaska, was described. The drilling and sampling procedures, the techniques, analysis and results of the soil studies, temperature measurements, salt concentration measurements, permeability measurements, penetration tests, and the implication of the results for offshore resource development also were given. The results of the studies were included in the summary section of the report. (Sims-ISWS)
W78-10003

OXYGEN ISOTOPE COMPOSITION OF SUBGLACIALLY PRECIPITATED CALCITE: POSSIBLE PALEOCLIMATIC IMPLICATIONS,
Geological Survey, Reston, VA. Water Resources Div.; and Stanford Univ., CA. Dept. of Geology.
B. B. Hanshaw, and B. Hallet.
Science, Vol 200, No 4347, p 1267-1270, June 16, 1978. 1 fig, 1 tab, 25 ref.

Descriptors: *Glaciers, *Oxygen isotopes, *Calcite, *Ice, Isotope studies, Analytical techniques, Bedrock, Pleistocene oceans.

Thin calcite-rich coatings are widespread on calcareous bedrock exposed by actively retreating temperate glaciers. It is suggested in this paper that the oxygen isotope composition of calcite that formed under a glacier records the oxygen isotope composition of the bedrock. Analyses of calcite precipitated under Pleistocene ice sheets may therefore lead to an estimate of the oxygen isotope composition of the ice sheet. (Woodard-USGS)
W78-10047

WATER-HEAT REGIME OF EARTH CATCHWORK DAMS,
Akademiya Nauk SSSR, Yakutsk. Inst. Merzlotovedeniya.
For primary bibliographic entry see Field 8D.
W78-10266

THERMAL AND DYNAMIC CONDITIONS OF ICE FORMATION IN STREAMS, AS APPLIED TO NORWAY,
Norwegian School of Advanced Engineering Nidaros, Trondheim. Inst. of Physics.
O. Devik.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 019, Price codes: A06 in paper copy, A01 in microfiche. CRREL Draft Translation 513, March 1976. 121 p, 31 fig, 19 tab, 53 ref. Translated from Geofysiske Publikasjoner, Vol 9, No 1, 1931.

Descriptors: *Ice, *Freezing, *Heat transfer, Radiation, Solar radiation, Cooling, Evaporation, On-site investigations, Laboratory tests, Temperature, Water temperature, Ice cover, Physics, *Norway, *Ice formation.

Although in nature the process of ice formation has been the object of numerous studies over the years, the quantitative analysis of this quite complex process is still very incomplete. In 1928, a Norwegian study commission began to study, from the physical viewpoint, several heavy ice-drifts which had occurred in the Glomma River during the winters of 1926-1927 and 1927-1928. It soon became evident that no quantitative treatment was possible without a comprehensive analysis of the individual components of the heat process and new studies of individual problems. This work gave the results of these studies in a form which on the one hand treats the problems of ice formation physically, and on the other hand applies the analysis top to practical examples, primarily to Norwegian conditions. (Sims-ISWS)
W78-10267

SOLVING PROBLEMS OF ICE-BLOCKED DRAINAGE FACILITIES,
Army Terrestrial Sciences Center, Hanover, NH.
K. L. Carey.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 994, Price codes: A02 in paper copy, A01 in microfiche. CRREL Special Report 77-25, August 1977. 23 p, 10 fig, 4 ref.

Descriptors: *Drainage systems, *Ice, *Flow control, Culverts, Ditches, Subsurface drainage, Control, Heating, Design, *Ice control, Ice blocked drainage, Ice formation, Ice prevention.

The report summarized several process for ice formation and blockage in culverts, ditches and subsurface drains. Solutions to ice blockage problems involve ice prevention and ice control, usualy the latter. In some cases, culverts can be maintained in culverts by heating them electrically, with steam, or with oil-burner heaters. Ditches also can be heated, but it is usually more effective to widen them to provide more storage space for ice, or to install insulating covers. Subsurface drain outlets can be heated, protected with insulating covers, or partially blocked to prevent cold air entry. Ground seepage that forms ice is controlled successfully using ice fences. Design changes, such as more and larger drainage structures, staggered culverts, and channel modifications, were discussed. Four CRREL publications were cited as sources of additional information. (See also also W74-00581, W74-07909, and W76-06193) (Hunphreys-ISWS)
W78-10269

A COMPUTER ROUTING OF UNSATURATED FLOW THROUGH SNOW,
Cold Regions Research and Engineering Lab., Hanover, NH.
W. B. Tucker, III, and S. C. Colbeck.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 121, Price codes: A03 in paper copy, A01 in microfiche. Special Report 77-10, May 1977. 43 p, 7 fig, 3 tab, 7 ref, 4 append.

Descriptors: *Snow, *Snowmelt, *Unsaturated flow, *Computer models, Model studies, Mathematical models, Computer programs, Runoff, Melt water, Forecasting, Flow, Snow cover.

Computer programs for routing the vertical movement of water through snow have been developed. Previously, manual graphical techniques were used, making calculation of the flow and shock front a very time-consuming procedure. The shock front is dependent on surface melt taking place now as well as the antecedent flow in the snow, usually a function of the nature of the flow for the previous day. One program, designed to accommodate actual surface melt data, has the ability to handle complicated input profiles such as when melt is erratic on a cloudy day, creating such complexities as intersecting shock fronts. Another program, designed for rapid simulation purposes, approximates a simple surface input with a function, in this case, a sine wave. This function is changed easily, allowing a variety of conditions to be assessed, although only one shock front is accommodated. Error analysis and some applications of the programs were presented. (Sims-ISWS)
W78-10275

THE INTERNAL STRUCTURE OF FAST ICE NEAR NARWHAL ISLAND, BEAUFORT SEA, ALASKA,
Army Terrestrial Sciences Center, Hanover, NH.
A. J. Gow, and W. F. Weeks.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 785, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 77-29, October 1977. 11 p, 4 fig, 13 ref.

Descriptors: Sea ice, *Structure, *Alaska, On-site investigations, Sampling, Ice, Methodology, Testing procedures, Drainage, Salinity, Crystals, Particle size, *Narwhal Island(Alaska), *Bering Sea(Alaska), Fast ice, Ice structure.

Results of measurements of salinity, grain size, substructure dimensions, and crystal fabrics of the undeformed 2.15-m-thick annual sea ice sheet near Narwhal Island, Alaska, were presented. A notable observation was the formation of a dominant c-axis horizontal structure in all ice below 14 cm, including transformation to a pronounced east-west alignment of the c-axis by a depth of 66 cm. This study confirmed earlier reports of the occurrence of very strong horizontal c-axis alignments in arctic fast ice. If such strong ice fabrics are typical at near coastal locations, it will prove necessary to take this factor into account in the design of offshore structures for ice covered waters. (Humphreys-ISWS)
W78-10281

TEMPERATURE REGIME IN LOW-HEAD EARTH DAMS IN CENTRAL YAKUTIA,
For primary bibliographic entry see Field 8D.
W78-10283

2D. Evaporation and Transpiration

THE DEPENDENCE OF BULK EVAPORATION COEFFICIENTS ON AIRWATER INTERFACIAL CONDITIONS AS DETERMINED BY THE ISOTOPIC METHOD,
CEA Centre d'Etudes de Saclay, Gif sur Yvette (France). Dept. de Recherche et Analyse.
For primary bibliographic entry see Field 2L.
W78-09960

POTENTIAL FOR REDUCING EVAPORATION DURING SUMMER FALLOW,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
T. W. Massee, and J. W. Cary.

Journal of Soil and Water Conservation, Vol. 33, No. 3, p 126-129, May-June 1978. 3 fig, 2 tab, 23 ref.

Descriptors: *Evaporation control, *Agriculture, *Farm management, *Great Plains, Mulching, Soil moisture, Soil water, Soil temperature, Evaporation, Fallowing, Soil management, Chemcontrol, Weed control, Dry farming, Water conservation, Arid lands, *Summer fallow.

Initial attempts by farmers to settle the dryland areas of the United States failed when they tried farming methods used in more humid areas. A stable agriculture developed only after summer fallowing was introduced. Even with modern tillage methods, no more than 30% of all precipitation is stored in most drylands soils during an entire fallow period-from fall, at harvest, through the summer fallow year, to the spring of the crop year. Evaporation accounts for most of the precipitation lost. Methods to suppress evaporation are needed. However, factors affecting evaporation are so interrelated under field conditions that changing one facet results in a complex and continually changing system. Therefore, applied field experiments have been used to interpret overall results. (Sims-ISWS)
W78-09961

MEASUREMENT OF EVAPOTRANSPIRATION FOR THE REPRESENTATIVE BASINS PROGRAM,
Australian Water Resources Council, Canberra. Dept. of National Resources.
Representative Basins Program Report No. 1, 1976. 19 p, 1 fig, 2 tab, 7 ref, 2 append.

Descriptors: *Evapotranspiration, *Australia, *Projects, Hydrologic cycle, Evaporation, Watersheds(Basins), Forests, Measurement, Runoff, Precipitation(Atmospheric), Water loss, Vegetation, Vegetation effects, Water balance, Model studies, Water resources.

About 70% of Australia's average annual precipitation is returned to the atmosphere by evaporation and transpiration; and, even though evapotranspiration dominates the hydrogic cycle, there is as yet comparatively little quantitative information on vapor losses in time and space. In 1966 the Australian Water Resources Council established an Advisory Panel on Evapotranspiration to evaluate techniques for estimating evapotranspiration. Following the Panel's report (AWRC 1970) the Council sponsored a research project - (AWRC Research Project 68/10) - which was carried out in the Department of Environmental Biology, Australian National University. Noting that this project was nearing completion, the Advisory Panel on the Operation of the Representative Basins Program selected a sub-committee, with the following terms of reference: (1) to consider the results arising from AWRC Research Project 68/10, (2) to undertake a review of similar studies in Australia, either completed or in progress, which are relevant to the evapotranspiration aspect of the Representative Basins Program, and (3) to recommend a course for future work in relation to the Representative Basins Program. (Sims-ISWS)
W78-10284

2E. Streamflow and Runoff

HYDROGRAPHY OF THE SANTEE RIVER DURING MODERATE DISCHARGE CONDITIONS,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 2L.
W78-09959

EVALUATION OF RIVER THERMAL REGIME MODELS,
Nalco Environmental Sciences, Northbrook, IL. Physical Science Div.
For primary bibliographic entry see Field 5B.
W78-09972

SURFACE WATER RESOURCES OF NORTHWEST FLORIDA,
Johnson (Bernard), Inc., Houston, TX.
For primary bibliographic entry see Field 4A.
W78-09973

HYDROLOGIC EFFECTS OF THE TONKAWA CREEK FLOOD ABATEMENT PROGRAM,
Agricultural Research Service, Chickasha, OK.
For primary bibliographic entry see Field 4A.
W78-09974

THE RANDOM COMPONENT IN STREAM MEANDERING,
Coldwell Connell Engineers, Melbourne (Australia).
I. G. Wallis.
Water Resources Bulletin, Vol 14, No 3, p 576-586, June 1978. 2 fig, 2 tab, 21 ref.

Descriptors: *Meanders, *Streamflow, *Rivers, Stochastic processes, Erosion, Sedimentation, Beds under water, Sediments, Laboratory tests, Model studies, Mathematical models, Frequency, Random components, Meander wavelength, Meander amplitute, Meandering, Bed slope, Bed material.

An experimental investigation of the random component in stream meandering was described. The results of 60 replicate experiments of meander initiation and development made using the same discharge, bed material, and bed slope were described and analyzed. It was demonstrated that the commencement of meandering is a random process. The random component in meander behavior is indicated by the size of the coefficients of variation of meander amplitude and wavelength of 0.45 and 0.22, respectively. A simple model was put forward to explain the observed deterministic and random components of meander behavior. (Sims-ISWS)
W78-09975

DISSIPATION AND FINE-SCALE STRUCTURE IN TURBULENT OPEN CHANNEL FLOW,
Department of Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 8B.
W78-09977

TURBULENT MASS TRANSFER RATES TO A WALL FOR LARGE SCHMIDT NUMBERS,
Illinois Univ. at Urbana-Champaign. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 8B.
W78-09991

SIMULATION OF FLOOD HYDROGRAPHS,
Technische Univ., Munich (West Germany). Inst. of Hydraulics and Hydrology.
R. P. Spiegel, Th. Leipold, and P. G. Franke.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 429-437, 1978. 5 fig, 1 tab, 3 ref.

Descriptors: *Floods, *Hydrographs, *Simulation analysis, *Probability, Flood peak, Flood discharge, Stochastic processes, Rivers, Reservoirs, Gaging stations, Equations, Mathematical models, Systems analysis, Linear regression analysis, Deterministic model, Peak flow, High water.

This study demonstrates problems in the application of deterministic and stochastic models to floods. The description of flood events by multi-dimensional probability distribution functions is very difficult. A simulation flood model is developed maintaining the interrelation between the flood hydrograph parameters discharge/volume, peak, duration and position of flood peak. The relationships between the flood parameters can be preserved with the help of linear regression analysis. Then a distribution function is estimated for simulating the flood parameters that represents the model input. The simulation of flood parameters, independent of the others, can be carried out separately and simultaneously. By means of two second-order-parabolas, the analytical flood hydrograph function which corresponds to the four parameters can be described. Along with the 'reservoir routing', statements can be made concerning the dimensioning of reservoirs and suitable reservoir strategies. (See also W78-10094) (Bell-Cornell)
W78-10120

ON RELIABILITY OF MATHEMATICAL MODELS FOR FLOOD LEVEL PREDICTION IN RIVERS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
D. B. Simons, N. Duong, R-M. Li, and G. O. Brown.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 438-450, 1978. 10 fig, 1 tab, 3 ref.

Descriptors: *Reliability, *Mathematical models, *Flood control, *Measurement, *Prediction, Simulation analysis, Probability, Mississippi, Risks, Rivers, Water resources, Planning, Regression analysis, Equations, Systems analysis, Flood level, Stage-discharge.

Herein, a concept of model reliability is presented and suggested for consideration as an integral part of the validation process of mathematical models for water resources planning. A measure of model reliability is derived based on the binomial distribution of the number of simulated values being rejected. The calculation of the probability of satisfactory simulation is done by using an empirical Bayes estimation scheme proposed by Lemon (1972). This approach is then applied to evaluate the dependability of two models used for flood-level prediction in rivers: a physical process mathematical model and a regression-analysis-type model. It is shown that, although the first model is more complex and therefore difficult to calibrate, it is more reliable to use in river system analysis, design, or long-term forecasting of system behavior under changing environmental conditions. (See also W78-10094) (Bell-Cornell)
W78-10121

INFORMATION ON FLOOD PEAKS IN DAILY FLOW SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich, and V. Taesombut.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo Waterloo, Ontario, Canada, June 26-28, 1978, p 451-470, 1978. 16 fig, 5 ref.

Descriptors: Flood peak, *Flow series, Daily, Annual, Flood magnitude, *Probability, Rivers, Equations, Simulation analysis, Gaging stations, Sampling, *Information exchange, Mathematical models, Systems analysis.

Hypothesis that the partial flood peak series, obtained from daily flow series, may contain more information on the highest annual flood peak of a given return period than the corresponding annual

flood peak series, is substantiated both by a theoretical and an experimental approach. The measure of information extracted on highest flood peaks is the variance of their estimates from each of the two series. The ratio of the two variances is the final measure of information content. When this ratio is greater than unity, the partial series has more information than the annual series, and the opposite for ratios less than unity. The theoretical determination of the ratio starts with the annual flood peaks distributed by the double-exponential function, and the partial series having the number of flood peaks Poissonian distributed and their magnitudes following the simple exponential distribution. An intermediate case is when the ratios parameters are estimated either from station daily flow time series or from generated samples of daily flow series. The experimental determination of ratios is based on generated samples of daily flow series of particular river gaging stations. Two examples are presented--the Boise River (Idaho) and the Powell River (Tennessee)--showing that ratios are either above or below unity. For small samples, large return periods, and large average numbers of floods per year of partial flood series, the general patterns are for the partial flood series to have more information on the highest annual flood peaks than the corresponding annual flood peak series. Using this ratio minimizes errors in modeling the structure of daily flow series; this modeling is briefly discussed. (See also W78-10094) (Bell-Cornell)
W78-10122

USER'S GUIDE FOR U.S. GEOLOGICAL SURVEY RAINFALL-RUNOFF-MODELS--REVISION OF OPEN-FILE REPORT 74-33,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2A.
W78-10187

PRESERVATION OF THE RESCALED ADJUSTED RANGE 2. SIMULATED STUDIES USING BOX-JENKINS MODELS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
K. W. Hipel, and A. I. McLeod.
Water Resources Research, Vol. 14, No. 3, p 509-516, June 1978. 6 tab, 34 ref.

Descriptors: *Model studies, *Mathematical models, *Hydrology, Stochastic processes, Mathematics, Mathematical studies, Monte Carlo method, Time series analysis, Analytical techniques, Simulation analysis, Synthetic hydrology, River flow, Streamflow, Dendrochronology, Geophysics, *Box-Jenkins models, *Rescaled adjusted range, Hurst coefficient.

It was demonstrated that autoregressive moving average (Arma) models do preserve the rescaled adjusted range (RAR), or equivalently the Hurst coefficient K. Arma models were fitted to 23 geophysical time series, and by using Monte Carlo techniques and a specified statistical test it was shown that the observed RAR or K is retained by the models. The empirical cumulative distribution function (ECDF) for these statistics can be calculated as closely as is required to the theoretical distribution. Furthermore, the distribution of the RAR is a function of the time series length N and the parameter values of the particular Arma process being considered. Various estimates for the Hurst coefficient were compared for the 23 geophysical data sets. (See also W78-10209) (Sims-ISWS)
W78-10208

PRESERVATION OF THE RESCALED ADJUSTED RANGE 3. FRACTIONAL GAUSSIAN NOISE ALGORITHMS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
K. W. Hipel, and A. I. McLeod.
Water Resources Research, Vol. 14, No. 3, p 517-518, June 1978. 14 ref.

Descriptors: *Computer models, *Mathematical models, *Hydrology, Model studies, Synthetic hydrology, River flow, Streamflow, Time series analysis, Simulation analysis, Stochastic processes, Monte Carlo method, Geophysics, *Fractional Gaussian noise algorithms, *Rescaled adjusted range, Hurst coefficient, Hurst phenomenon.

Improved modeling procedures are available for use with a discrete time fractional Gaussian noise (FGN) model. These advancements in FGN modeling consist of an exact simulation procedure, a maximum likelihood approach to obtain efficient stimates of the model parameters, and a technique for calculating the model residuals so that they can be subjected to rigorous diagnostic checks. The computer algorithms for the aforementioned modeling improvements are available on microfiche. The intention of this article was to summarize the essential ingredients of the complete paper, which appears on microfiche. (Sims-ISWS)
W78-10209

PRESERVATION OF THE RESCALE ADJUSTED RANGE 1. A REASSESSMENT OF THE HURST PHENOMENON,
University of Western Ontario, London. Dept. of Mathematics.
A. I. McLeod, and K. W. Hipel.
Water Resources Research, Vol. 14, No. 3, p 491-508, June 1978. 8 fig, 10 tab, 67 ref.

Descriptors: *Model studies, *Mathematical models, *Hydrology, Stochastic processes, Mathematics, Streamflow, Rivers, Flow, River flow, Storage, Time series analysis, Analytical techniques, Simulation analysis, Synthetic hydrology, *Rescaled adjusted range.

Previous research related to the controversial Hurst phenomenon was reviewed and evaluated. Because of the inherent statistical properties of the rescaled adjusted range (RAR) statistic, it was suggested that research primarily be devoted to this statistic rather than to the various definitions of the Hurst coefficient. Simulation studies revealed that for independently distributed random variables the RAR does not depend significantly on the underlying distribution of the random variables but is a function of the sample size. For modeling correlated data, the statistical attributes of a discrete fractional Gaussian noise (FGN) process were studied and also improved. An efficient maximum likelihood estimation technique was developed for the FGN model, and it was shown how the residuals of the fitted model can be calculated and then subjected to diagnostic checks. An exact simulation procedure was developed for simulating FGN in such a way that synthetic traces from the model lie outside the Brownian domain. The Akaike information criterion (AIC) was suggested as a method for choosing between a FGN and a Box-Jenkins model. For the six annual river flow series that were considered, the AIC selected the best Box-Jenkins model in preference to the FGN process for each data set. Because Box-Jenkins models can be shown to preserve the historical RAR, in many practical applications it may be advantageous to use a Box-Jenkins model instead of a FGN process. (Sims-ISWS)
W78-10258

FLOW METERING FLUMES MONITOR WATER IN COASTAL FOREST WATERSHED,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 4D.
W78-10260

CATCHMENT GEOMORPHOLOGY AND ITS HYDROLOGIC SIGNIFICANCE: A REVIEW,
New South Wales Univ., Kensington (Australia). School of Geography.
For primary bibliographic entry see Field 4D.
W78-10261

THE ADVECTION-DISPERSION EQUATION FOR AN AN-ISOTROPIC MEDIUM SOLVED BY FRACTIONAL-STEP METHODS,
Waterloopkundig Lab. Delft (Netherlands). Mathematics Branch.
G. K. Verboom.
Available from the National Technical Information Service, Springfield, Va 22161 as N76-27728, Price codes: A02 in paper copy, A01 in microfiche. Publication No. 157, December 1975. 15 p, 5 fig, 6 ref.

Descriptors: *Dispersion, Rivers, *Model studies, Mathematical models, *Diffusion, Turbulence, Flow, River flow, Mixing, Equations, Analytical techniques.

In this paper it was demonstrated that the fractional-step method is very suitable to solve the one- and more-dimensional advection-dispersion equation. One of the essential features of the method is that the numerical scheme used to solve a particular step must be independent of the schemes used for the other steps. As a consequence, the method can be used with great advantage if some coefficients are an order of magnitude larger than other coefficients, whereas the transport mechanism cannot be neglected. In the examples used, the explicit schemes are to be preferred to the implicit Crank-Nicolson formula because of accuracy only. The idea to use accuracy to select a particular scheme is well-known, but not as presented in this paper or in combination with the fractional-step method. (Sims-ISWS)
W78-10279

MISSOURI RIVER-GAVINS POINT TO OMAHA NEBRASKA HISTORICAL RECORDS RESEARCH.
Water and Environment Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 4A.
W78-10285

2F. Groundwater

AN EFFICIENT NUMERICAL METHOD OF TWO-DIMENSIONAL STEADY GROUNDWATER PROBLEMS,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
P. L.-F. Liu, and J. A. Liggett.
Water Resources Research, Vol. 14, No. 3, p 385-390, June 1978. 6 fig, 2 tab, 11 ref. NSF ENG77-01479.

Descriptors: *Groundwater movement, *Groundwater, *Model studies, Mathematical models, Seepage, Dams, Earth dams, Saline water intrusion, Saline water-freshwater interfaces, Aquifers, Computer programs, Computer models, Analytical techniques.

The boundary integral equation method (BIEM) was shown to be an efficient and accurate numerical technique for solving problems of Darcy flow in porous media. The BIEM was combined with conformal transformation to the complex potential plane to solve free surface problems without iteration and with relatively few nodal points. Since the BIEM reduces the effective dimensions of the problem by one, the computer time varies approximately as the inverse square of the point spacing; whereas in finite element or finite difference methods; the time varies approximately as the inverse of the 4th power of the point spacing. Two examples of the BIEM were presented: flow

through an underdrained dam, and a seawater intrusion problem. (Sims-ISWS)
W78-09952

A FINITE ELEMENT STUDY OF STEADY STATE FLOW IN AN UNCONFINED AQUIFER RESTING ON A SLOPING BED,
Hong Kong Univ. Dept. of Civil Engineering.
E. C. C. Choi.
Water Resources Research, Vol. 14, No. 3, p 391-394, June 1978. 5 fig, 3 tab, 12 ref.

Descriptors: *Aquifers, *Groundwater movement, *Model studies, Mathematical models, Finite element analysis, Beds, Boundary layers, Impervious soils, Groundwater, Seepage, Flow, Slopes, Hydrology, Impermeable beds.

A two-dimensional finite element method was used to study the problem of seepage over a sloping impermeable bed. Flow profile and seepage rates obtained from the analysis were compared with those solved from Pavlovsky's and Childs' equations. The latter equation was found to be more favorable, especially for large slopes. The effects on the flow profile due to a change in the upstream and downstream conditions and to a sudden change in the magnitude of the slope of the impermeable bed also were investigated. (Sims-ISWS)
W78-09953

STEADY PHREATIC FLOW OVER A SLOPING SEMIPERVIOUS LAYER,
Colorado State Univ., Fort Collins. Engineering Research Center.
Y. Mualem, and J. Bear.
Water Resources Research, Vol. 14, No. 3, p 403-408, June 1978. 7 fig, 10 ref. NSF ENG76-11542.

Descriptors: *Groundwater movement, *Groundwater, *Model studies, Mathematical models, Boundary layers, Impervious soils, Flow, Steady flow, Slopes, Equations, Aquifers, Porous media, Saline water-freshwater interfaces, Hydrology, Semipervious layers.

This work dealt with steady phreatic flow above a thin semipervious sloping layer located at some distance below ground surface and above the water table of an underlying phreatic aquifer. Cases of both upsloping and downsloping semipervious layers were studied. A uniform recharge of constant rate and a semipervious layer of finite length were considered, either with length of flow shorter than the semipervious layer with flow bypassing its edge. For each case, linearization was applied to the nonlinear continuity equation which governs the flow. Analytical solutions were derived then for the shape of the phreatic flow wedge, the length of the wedge, and the discharge rate. These results were compared with experimental ones obtained in a Hele-Shaw analog. A good agreement generally was found between computed and observed results. Because of the analogy which exists between a phreatic surface and an interface in a coastal aquifer, the same results also can be applied to the steady freshwater flow above an interface in an aquifer divided into two subaquifers by a sloping semipervious layer. (Sims-ISWS)
W78-09954

EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 3. OBTAINING CONTAMINANT ARRIVAL DISTRIBUTIONS FOR STEADY FLOW IN HETEROGENEOUS SYSTEMS,
BCS Richland, Inc., WA. Scientific Systems Dept.
For primary bibliographic entry see Field 5B.
W78-09957

EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 4. OBTAINING AND UTILIZING CONTAMINANT ARRIVAL DISTRIBUTIONS IN TRANSIENT FLOW SYSTEMS,
BCS Richland, Inc., WA. Scientific Systems Dept.
For primary bibliographic entry see Field 5B.
W78-09958

RESEARCH INTO THE EFFECTS OF ARTIFICIAL GROUNDWATER RECHARGE, LEA VALLEY, LONDON ENGLAND,
Water Research Centre, Medmenham (England). Resources Div.
For primary bibliographic entry see Field 4B.
W78-09976

SENSITIVITY OF GROUNDWATER MODELS WITH RESPECT TO VARIATIONS IN TRANSMISSIVITY AND STORAGE,
Geological Survey, Lawrence, KS.
C. D. McElwee, and M. A. Yukler.
Water Resources Research, Vol. 14, No. 3, p 451-459, June 1978. 14 fig, 15 ref.

Descriptors: *Aquifers, *Groundwater, *Groundwater movement, *Model studies, Mathematical models, Transmissivity, Storage coefficient, Drawdown, Wells, Water wells, Hydraulic conductivity, Analytical techniques, Sensitivity analysis, Sensitivity coefficient.

Sensitivity analysis is the study of a system's response to various disturbances. In this study, disturbances of aquifer parameters were considered. In the simulation of an aquifer, the investigator must establish tolerance within which the parameters of the physical system may vary without appreciably affecting the model results. By means of a first-order sensitivity formalism, it was shown how to evaluate the perturbed hydraulic head for a small change in aquifer parameter. An expression for the sensitivity coefficient was obtained in this study by taking the partial derivative of the flow equation with respect to a particular parameter. The sensitivity coefficient was evaluated either analytically or by numerical techniques for some common models. The sensitivity formalism was applied to the Theis equation to study the general behavior of sensitivity coefficients and to determine the range of validity of the first-order sensitivity formalism. The formalism also was applied to one-and two-dimensional numerical models to see the effect of barrier and constant head boundaries. The perturbed hydraulic head was obtained for a change of transmissivity (T) and storage coefficient (S) by applying the first-order sensitivity formalism. This procedure should be a valuable tool in calibrating models or establishing tolerances on T and S for a given acceptable error in hydraulic head. In general, a + or - 20% deviation in T or S may be handled adequately by the first-order formalism discussed in this work. (Sims-ISWS)
W78-09980

UNSTEADY FLOW TO A PUMPED WELL IN A FISSURED AQUIFER WITH A FREE SURFACE LEVEL MAINTAINED CONSTANT,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
N. S. Boulton, and T. D. Streltsova.
Water Resources Research, Vol. 14, No. 3, p 527-532, June 1978. 6 fig, 2 tab, 6 ref.

Descriptors: *Aquifers, *Pumping, *Drawdown, *Model studies, Mathematical models, Groundwater, Groundwater movement, Flow, Fissures(Geologic), Water levels, Equations, Curves, Wells, Water wells, Hydrology, Fissured aquifers.

New equations were derived for the drawdown in an aquifer consisting of two horizontal layers referred to as the block and the fissure, which have different hydraulic properties. The free water surface forming the upper aquifer boundary was located in the block. The water level was assumed to remain constant during pumping. The block and the fissure were compressible. The depth of the fissure was small in comparison with that of the block. The abstraction well, lined along the block, was pumped at a constant rate. The discharge per unit length of the unlined part in the fissure was constant, and the radius of the well was vanishingly small. Type curves for the drawdown in the fissure and the block were computed and plotted for some selected parameters involved. The effect of the block compressibility on the drawdown in the fissure was shown by comparing the type curves with the type A drawdown curves of Boulton. The influence of the free surface compared with that of an impervious top layer on the drawdown in the fissure and the block was estimated by comparing the type curves with those of Boulton and Streltsova found from the equations for a two-layered formation, the top and bottom surfaces of which were impermeable. (Sims-ISWS)
W78-09981

INTERPRETATION OF HYDROCHEMICAL FACIES BY FACTOR ANALYSIS,
University of South Florida, Tampa. Dept. of Geology.
M. G. Dalton, and S. B. Upchruch.
Ground Water, Vol. 16, No. 4, p 228-233, July-August 1978. 2 fig, 1 tab, 23 ref.

Descriptors: *Groundwater, *Water chemistry, *Data processing, *Analytical techniques, *Florida, Mathematics, Chemicals, Water temperature, Hydrogen ion concentration, Aquifers, Water quality, Groundwater movement, Heat flow, Hydrology, *Factor analysis, Hydrochemical facies.

Hydrochemical facies interpretations are useful tools for determining the flow patterns, origins, and chemical histories of groundwater masses. Factor analysis is advantageous for hydrochemical interpretations because it is independent of the number or type of variables used. Factor analysis also allows avoidance of problems of closed-number systems inherent in more traditional techniques, such as trilinear diagrams. This paper applied factor analysis to the interpretation of mixing between sulfate and bicarbonate groundwater masses. Whereas trilinear diagrams show one mixing trend (bicarbonate with sulfate waters), factor analysis allows interpretation of multiple mixing trends. These trends include the bicarbonate-sulfate trend; a sodium-, silica-, fluoride-, and temperature- mixing system that was interpreted as resulting from recharge; and a chloride-sodium system that appears to represent mixing with residual, connate water. The latter trends were identified as small-scale, chemical variations that result in dispersion of the data points about the dominant mixing trend on the trilinear diagram. Thus, factor analysis provided greater precision in identifying hydrochemical facies and interpreting their origins. (Sims-ISWS)
W78-09985

THE USE OF MULTIPLE LINEAR REGRESSION IN SIMULATING GROUND-WATER RESPONSES,
Orange Free State Univ., Bloemfontein (South Africa). Inst. for Groundwater Studies.
F. D. I. Hodgson.
Ground Water, Vol. 16, No. 4, p 249-253, July-August 1978. 5 fig, 12 ref.

Descriptors: *Groundwater, *Water levels, *Regression analysis, *Model studies, Mathematical models, Rainfall, Water table, Pumping, Discharge(Water), Aquifers, Groundwater movement, Recharge, Equations, Hydrology, *Multiple linear regression.

The simulation of water table responses was discussed, and the use of multiple linear regression as a modelling technique was considered. The

technique was calibrated and validated against actual field data from the Vryburg aquifer in South Africa. The model permits the consideration of changes in properties of recharge, discharge and aquifer parameters simultaneously. By use of such a model, water table responses in the Vryburg area can be simulated six years ahead of time, using rainfall and discharge through pumping as the only input parameters. This technique can be regarded as a rapid, first approximation and low-cost procedure which is unsurpassed as far as time and costs are concerned. (Sims-ISWS)
W78-09987

DETECTION OF PERMEABILITY VARIATIONS BY A SHALLOW GEOTHERMAL TECHNIQUE,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
E. S. Bair, and R. P. Parizek.
Ground Water, Vol. 16, No. 4, p 254-263, July-August 1978. 3 fig, 4 tab, 13 ref.

Descriptors: *Groundwater, *Soil temperature, *Geothermal studies, On-site investigations, On-site data collections, Data processing, Thermal conductivity, Heat flow, Heat transfer, Aquifers, Geology, Hydrology, Permeability, Groundwater movement, Temperature, Land use, Vegetation effects.

During a seven-month sampling period, surface water, groundwater, and shallow subsurface temperatures were measured at a well field in the Coastal Plain province in southeastern Pennsylvania in an attempt to delineate zones of relatively greater permeability in the underlying glacial outwash materials. Temperature measurements were made at monthly intervals using a tele-thermometer equipped with a thermistor. Subsurface temperatures were taken at a depth of six feet (183 cm) in a newwork of 66 access holes. In order to recognize perturbations in the subsurface thermal regime, theoretical conductive heat flow calculations of the temperature variation expected to occur at a depth of six feet (183 cm) were compared to the observed temperature variation measured in the network of access holes. Isothermal maps, contouring equal temperatures at a specific time, and isallothermal maps, contouring equal temperature changes in a specific time interval, were constructed from the access hole data. These maps facilitated the identification of areas not conforming to the predicted value of annual subsurface temperature variation. Anomalous areas were found to represent regions where differing land-use practices or groundwater movement perturbed the normal thermal regime. Access hole temperatures measured in areas not covered by a dense vegetative cover or a tree canopy were found to have greater temperature variation than predicted. Areas where the temperature variation in the access hole was less than predicted were found to overlie known zones of relatively greater permeability in the underlying materials. (Sims-ISWS)
W78-09988

PRINCIPLES OF SEARCH TECHNIQUES FOR HYDROGEOLOGY,
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
R. G. Thomas.
Ground Water, Vol. 16, No. 4, p 264-272, July-August, 1978. 5 fig, 1 tab, 15 ref.

Descriptors: *Hydrogeology, *Surveys, *On-site investigations, Groundwater, Locating, Exploration, Sites, Mapping, Methodology, Hydrology, *Search techniques.

The concepts of target size and the effective size of the detection device are basic to any search problem. The type of target in hydrogeologic studies may be either a distinct or discontinuous one or may be the optimum value in a continuum. Search patterns can be one-dimensional along a line or two-dimensional. For discontinuous targets, such as an abandoned well, some kind of grid pattern is necessary, although more effective search patterns exist if some property of the target, such as the geoelectric field, can be detected over a larger area. Search for an optimum valvue of a continuum, i.e. a bedrock surface, a water table surface, etc., can be economically shortened by using adaptive search techniques. Examples of adaptive search techniques along a line are the Golden Section, Fibonacci Search, Dichotomous Search and Interval Bisection methods. The first three are based on values (depth, etc.) and the last on direction of gradient. Two-dimenstional adaptive search methods include repeating lines or search using the line search methods. A completely different approach is the Sequential Simplex Search, a heuristic method which seems to be the most efficient available. (Sims-ISWS)
W78-09989

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, AND WELL HYDROGRAPHS,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10037

DEVELOPMENT OF GROUND WATER IN THE HOUSTON DISTRICT, TEXAS 1970-74,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10042

USE OF BOUNDING WELLS TO COUNTERACT THE EFFECTS OF PREEXISTING GROUNDWATER MOVEMENT,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 4B.
W78-10075

REGIONAL GEOLOGY SERIES: PART VI,
National Water Well Association, Worthington, OH.
H. W. Heiss.
Water Well Journal, Vol. 32, No. 7, p 72-75, July, 1978. 1 fig.

Descriptors: *Groundwater, *Aquifers, *Columbia Lava Plateau, Geology, Water wells, Drilling, Water quality.

The Columbia Lava Plateau is a large highland area formed by rocks extruded by volcanic eruptions and overlain by alluvium and lake sediments. Use of ground water for irrigation and industry is increasing due to decreased rainfall. The region's lavas receive vast quantities of ground water from infiltrating surface water in the spring and discharge by springs at a relatively constant rate throughout the summer. In the region's western section, interflow zones are most permeable and are natural targets for well drillers. Further east ground water is found in faults and fracture zones. Unconsolidated sand and gravel beds are important ground-water sources throughout the region. Nearly all wells are drilled by either cable tool or air rotary method, with a roller-cone bit used in gravel and fractured basalt and a downhole hammer for massive basalt. Well dimensions vary widely depending on the nature of the rock and the depth of the fracture zone. Domestic wells are 6 inches in diameter and irrigation wells are usually 16 inches. Both sizes produce more than adequate high quality water supplies. However, water quality is a problem in the Pine, Oregon area with high concentrations of iron and methane and extreme variations in pH. (See also W78-10078) (Purdin-NWWA)
W78-10077

REGIONAL GEOLOGY SERIES: PART V, ATLANTIC AND GULF COASTAL PLAIN REGION,
National Water Well Association, Worthington, OH.
H. W. Heiss.
Water Well Journal, Vol. 32, No. 6, p 46-48, June, 1978. 1 fig.

Descriptors: *Groundwater, *Aquifers, *Atlantic Coastal Plain, *Gulf Coastal Plain, Geology, Water wells, Drilling, Saline water intrusion, Subsidence, Water quality.

The Atlantic and Gulf Coastal Plain Region is one of the largest and most prolific ground water provinces in the U.S. It forms a thick wedge of clay silt, sand, gravel, and limestone strata. Most of the region is underlain by several aquifers capable of yielding over 50 gpm to individual wells of small diameter. A variety of well drilling techniques are employed ranging from reversed rotary for large diameter municipal wells to compressed air rotary for 10-12 inches irrigation wells to combined cable tool-rotary for 2 inch domestic wells. Major aquifers are unconsolidated sand, a sand and gravel. Some of the more notable aquifers are the Karitan and Magothy Formations of the northeast Atlantic Coastal Plain, the Floridian and Biscayne aquifers of Florida, the sand and sand and gravel aquifers of Louisiana, and the deep aquifers of Texas. Some of the problems encountered in these aquifers are salt water encroachment and land subsidence due to withdrawal of large volumes of ground water. Coastal Plain ground water quality is excellent with the exception of hardness in the limestone areas and light iron concentrations throughout the region. (See also W78-10077) (Purdin-NWWA)
W78-10078

THE USE OF MULTIPLE LINEAR REGRESSION IN SIMULATING GROUNDWATER LEVEL RESPONSES,
Orange Free State Univ., Bloemfontein (South Africa).
F. D. I. Hodgson.
Bulletin Institute Groundwater Studies. 3, (1976). 15 p, 5 fig, 3 tab, 14 ref.

Descriptors: *Groundwater recharge, *Model studies, *Regression analysis, Time effect, Drawdown, Aquifers, Rainfall, Discharge water, Water withdrawal, Pumping, *Simulation analysis, Vryburg aquifer, Cape Province, South Africa.

The simulation of water table responses on a time-drawdown basis is discussed and the use of multiple linear regression as a substitute modelling technique is considered. It is calibrated and validated against actual field data from the Vryburg Aquifer in the Northern Cape Province. The model allows the consideration of changes in several properties of recharge, discharge and aquifer parameters simultaneously. From this, it was established that water table responses in the Vryburg area can be simulated at least six years ahead of time, by using rainfall and discharge through pumping as the only input parameters into the calculated multiple linear regression model. This technique can be regarded as a rapid, first approximation and low-cost procedure which is unsurpassed as far as time and costs are concerned. (So Afr Water Info Center)
W78-10230

USE OF RADIOISOTOPES AS GROUNDWATER TRACERS TO DETERMINE EFFECTIVE POROSITY OF AQUIFERS,
Hydrological Research Inst., Pretoria (South Africa).
G. J. Du Toit, and D. B. Bredenkamp.
Hydrological Research Divisions - Technical Report, No. 55, 1977, 11 p, 4 tab, 7 fig, 17 ref.

Descriptors: *Radioisotopes, *Aquifers, *Groundwater flow, *Porosity, Physical properties, *Radioactive tracers, Boreholes, Pumping, Dispersion, Alluvial channels, River beds, South Africa, Dolomite, Dolerite.

A technique is discussed whereby the effective porosity of an aquifer can be determined by introducing a radioactive tracer into a borehole and subsequent recovery of the tracer at an adjacent pumping site. On account of the relatively large dispersion that the tracer undergoes, the choice of a reference point, on the recovery graph, is an important facotr. Reasons for the dispersion of the tracer are advanced. Two transformations of the recovery graph are necessary; firstly to make the graph independent of the pumping rate and, secondly, to restore the simmetry of the graph. The methods, whereby the tracer is introduced into a borehole as well as the later detection thereof, will be discussed. NaI-131 and Cr-51-EDTA are used as tracers in three field tests representative of characteristic aquifers. These were an alluvial river bed, a dolomitic aquifer and a dolerite dyke. The results obtained from these experiments indicate that this technique can be used successfully but it was found that the dispersion of the tracer is great and therefore the choice of the reference point should be more specific. (So Afr Water Info Center)
W78-10233

GROUND-WATER LAKE RELATIONSHIPS AND GROUND-WATER QUALITY IN THE SAND PLAIN PROVINCE OF WISCONSIN-NEPCO LAKE,
Warzyn Engineering Inc., Madison, WI.
R. J. Karnauskas, and M. P. Anderson.
Ground Water, Vol. 16, No. 4, p 273-281, July-August 1978. 4 fig, 3 tab, 18 ref.

Descriptors: *Groundwater, *Surface waters, *Water quality, *Wisconsin, Drainage, Groundwater movement, Reservoirs, Lakes, Rivers, Water balance, Hydrologic budget, Water levels, On-site investigations, Management, Water management(Applied), Watersheds(Basins), *Nepco Lake(Wis).

Nepco Lake is a 494-acre impoundment in the sand plain province of central Wisconsin, an area characterized by a close relationship between groundwater and surface water. A study of the groundwater flow pattern and groundwater quality in the vicinity of Nepco Lake was conducted for a 11-month period from June 1976 to April 1977. The groundwater flow system around Nepco Lake is different from systems for natural lakes previously reported in the literature in that there are no strong vertical head gradients in the nearshore areas. This phenomenon may be typical for impounded lakes. Other aspects of the study included a survey of the water quality within the watershed and the calculation of water budgets for the lake. Variations in water quality can be related to changes in the texture of the aquifer or the nature of the flow system or both. Water budget calculations indicate that direct groundwater discharge into the lake is relatively small compared to surface-water contributions. Nevertheless, groundwater is the Nepco Lake Watershed should be carefully managed because of the close relationship between groundwater and surface water in this area. (Sims-ISWS)
W78-10254

A MANUAL OF LAWS, REGULATIONS AND INSTITUTIONS FOR THE CONTROL OF GROUND WATER POLLUTION.
National Water Well Association, Worthington, OH. Model Law Task Force Committee.
For primary bibliographic entry see Field 2A.
W78-10404

2G. Water In Soils

ABIOLOGICAL METHYLATION OF MERCURY IN SOIL,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5B.
W78-09832

DISSOLUTION OF ARSENIC FROM WATERLOGGED AND AERATED SOIL,
California Univ., Riverside. Dept. of Soil Science.
R. E. Hess, and R. W. Blanchar.
Soil Science Society of America Journal, Vol. 41, No. 5, p 861-865, September-October 1977. 1 fig, 1 tab, 16 ref. OWRT A-068-MO(3).

Descriptors: *Arsenic, Soil chemistry, *Soil chemical properties, Soil water.

Sharpsburg and Menfro soils containing 320 and 160 micrograms As/g, respectively, were waterlogged with water or 1% dextrose. The Eh reached a minimum of -150 mV after 1 day of incubation and increased to about +300 mV after 12 days for both soils in 1% dextrose. The Eh remained constant in the Sharpsburg soil during incubation with water, but gradually decreased in the Menfro soil. In the 1% dextrose solution, As increased rapidly in both soils and became constant after 12 days. The As in solution increased more slowly when incubated with water, but also remained constant after 12 days. After freeze-drying and exposing the soil to the atmosphere, Eh increased and As decreased to initial levels. (Skogerboe-Colorado State)
W78-09909

DRAINAGE FLUX IN PERMEABLE SOIL UNDERLAIN BY A COARSE-TEXTURED LAYER,
Department of Scientific and Industrial Research, Palmerston North (New Zealand).
B. E. Clothier, D. R. Scotter, and J. P. Kerr.
Soil Science Society of America Journal, Vol. 41, No. 4, p 671-676, July-August 1977. 9 fig, 13 ref.

Descriptors: *Drainage, *Soil profiles, Model studies, *Soil water, Histeresis, Hydraulic conductivity, Lysimeters.

Drainage from a permeable soil underlain by a coarse-textured layer is investigated. Simplified theory is used to develop a model relating the drainage flux at the base of the soil to the water storage in the soil. Despite significant hysteresis in the water retentivity curve of the overlying soil and in the hydraulic conductivity-pressure potential relationship of the coarse layer, hysteresis had little effect on the storage-flux relation. The model fairly successfully simulated field drainage as measured by a lysimeter and field profile water storage as found by neutron moisture probe measurements. The decline in the drainage flux after the profile has been wetted depends on the depth and retentivity of the soil and the hydraulic conductivity of the underlying coarse layer. To use the model only simple field measurements to find the storage-flux relationships are needed. (Skogerboe-Colorado State)
W78-09911

ABSENCE OF LOCAL EQUILIBRIUM DURING AMMONIUM TRANSPORT IN A SOIL COLUMN,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
M. S. Ardakani, and A. D. McLaren.
Soil Science Society of America Journal, Vol. 41, No. 5, p 887-879, September-October 1977. 3 fig, 1 tab, 9 ref.

Descriptors: *Adsorption, *Ammonium compounds, Soil investigations, Soil tests, *Soil water movement, Sampling, Cation exchange.

Adsorption of HN4(+) from a stationary solution phase by a Hanford soil approached an equilibrium state exponentially after about 30 minutes. By contrast, a local equilibrium did not exist between NH4(+) in a moving solution phase and soil in a column while a 77-ppm NH4(+)-N solution was delivered at a constant flow rate for 26 days. Local equilibrium, however, was established when the downward solution flow was stopped by setting the column horizontally 1 hour before sampling. Thus, the generality of the assumption of instantaneous equilibrium for cations in moving soil solutions is questioned. (Skogerboe-Colorado State)
W78-09912

QUANTITATIVE RELATIONSHIPS AMONG NUTRIENTS LEACHED FROM SOILS,
Tennessee Valley Authority, Muscle Shoals, AL.
G. L. Terman.
Soil Science Society of America Journal, Vol. 41, No. 5, p 935-940, September-October 1977. 1 fig, 5 tab, 21 ref.

Descriptors: Nutrients, Fertilizers, *Leaching, *Soil chemistry, Anions, Cations, Lysimeters.

This study was undertaken in an attempt to quantify relationships among anions (An) and cations (Cat) leached from soils. Several sets of published data on leaching of ions from acid and nonacid soils were evaluated by linear regression calculations based on the chemical equivalency of summation of Cat and summation of An leached. Calcium, Mg, K, and Na comprised most of summation of Cat, and NO3, SO4, and Cl, most of summation of An. Bicarbonate is also leached from nonacid soils; H is assumed to account for most of the excess of summation of An over summation of Cat in leachates from acid soils. Amounts of ions leached were much more closely correlated with leachate volumes among soils and time periods than with leachate volumes from various treatments for a given time period. (Skogerboe-Colorado State)
W78-09915

LEAD ADSORPTION BY MONTMORILLONITE USING A COMPETITIVE LANGMUIR EQUATION,
Illinois State Geological Survey, Urbana.
R. A. Griffin, and A. K. Au.
Soil Science Society of America Journal, Vol. 41, No. 5, p 880-882, September-October, 1977. 4 fig, 10 ref.

Descriptors: *Adsorption, *Lead, Heavy metals, Clays, *Montmorillonite, Soil chemical properties.

The adsorption of Pb from pure Pb(NO3)2 solutions by Ca-montmorillonite at pH 5.00 and 25 degrees C was sensitive to the weight of the clay sample. This apparent sensitivity of the adsorption of Pb to the weight of the sample was attributed to Ca competition for exchange sites as determined from Pb/Ca ratios found in the solutions. Adsorption of Pb from 0.1M Ca(ClO4)2 solutions was substantially lower and was insensitive to the weight of the clay sample. This further supported the conclusion that adsorption of Pb was dependent on the Pb/Ca ratio. (Skogerboe-Colorado State)
W78-09916

HOMOVALENT AND HETEROVALENT CATION EXCHANGE EQUILIBRIA IN SOILS WITH VARIABLE SURFACE CHARGE,
Chile Univ., Santiago. Facultad de Ciencias Quimicas.
G. G. Galindo, and F. T. Bingham.
Soil Science Society of America Journal, Vol. 41, No. 5, p 883-886, September-October 1977. 3 fig, 2 tab, 28 ref.

Descriptors: *Cation exchange, Soil chemical properties, Sodium, Calcium, Potassium, Magnesium, Adsorption.

Cation-exchange equilibria involving K, Na, Ca, and Mg were studied with Chilean Dystrandepts. The K-Na exchange and the Ca-Mg exchange showed that K and Ca were preferentially adsorbed. Increased charge density through adsorption of phosphates resulted in a reduction in the selectivity for K in the K-Na system. Phosphate adsorption had no apparent effect on the selectivity for Ca in the Ca-Mg system. In heterovalent systems, these soils showed a preferential adsorption of the divalent cation. This selectivity was more pronounced at low equivalent concentration of the divalent cation. The selectivity for the divalent cation increased as the surface charge density was increased by phosphate adsorption. (Skogerboe-Colorado State)
W78-09917

HYDROLYSIS AND DECOMPOSITION OF CALCIUM MONTMORILLONITE,
Agricultural Research Service, Riverside, CA. Salinity Lab.
H. Frenkel, and D. L. Suarez.
Soil Science Society of America Journal, Vol. 41, No. 5, p 887-891, September-October, 1977. 3 fig, 2 tAb, 12 ref.

Descriptors: Calcium, *Montmorillonite, Clays, *Leaching, *Cation exchange, Hydrolysis.

The extent to which exchangeable calcium hydrolysis occurs during the preparation of homoionic calcium montmorillonite clay and the rate of the reaction in distilled water at various suspension concentrations and levels of CO2 was determined at 25 degrees C. The rate and extent of hydrolysis was comparable to that reported for sodium montmorillonite and increased with CO2 concentration. CEC was appreciably reduced during washing of residual salts while preparing calcium montmorillonite. The mechanism of hydrolysis is discussed. (Skogerboe-Colorado State)
W78-09918

NITRATE DISSIMILATION AND POPULATION DYNAMICS OF DENITRIFYING BACTERIA DURING SHORT TERM CONTINUOUS FLOW,
Connecticut Agricultural Experiment Station, New Haven. Dept. of Ecology and Climatology.
M. G. Volz, and J. L. Starr.
Soil Science Society of America Journal, Vol. 41, No. 5, p 891-896, September-October, 1977. 4 fig, 2 tab, 20 ref.

Descriptors: *Nitrates, *Denitrification, *Soil bacteria.

A solution containing 100 micrograms Ml(-1) of NO3(-)-N, 200 micrograms Ml(-1) of glucose-C, and 0.01N CaSO4 was supplied continuously to soil in acrylic plastic columns (6 cm inside diam. x 10 cm length) for up to 96 hours while N2 gas was passed through the system. Concentrations of NO3(-)-N in the effluent decreased to 20 micrograms ml(-1) after 60 hours. Simultaneously, NO2(-)-N concentrations increased from traces to 65 micrograms ml(-1) and more than 70% of applied C had been utilized after 60 hours. These results indicate that most C oxidation was coupled with NO3(-) reduction although nearly all applied NO3(-) was ultimately denitrified after 96 hours. (Skogerboe-Colorado State)
W78-09919

THE PRODUCTION OF PHYTOTOXINS FROM SURFACE CROP RESIDUES,
Agricultural Research Service, Pullman, WA. Western Region.
V. L. Cochran, L. F. Elliott, and R. I. Papendick.
Soil Science Society of America Journal, Vol. 41, No. 5, p 903-908, September-October, 1977. 6 fig, 1 tab, 20 ref.

Descriptors: Crop production, *Crop response, Washington, *Soil microbiology, Bluegrasses, Soils, Soil investigations, *Phytotoxicity, Winter wheat, No-till culture.

Experiments were conducted to determine if crop residues, common to eastern Washington, were likely to cause phytotoxicity problems with no-till planting of winter wheat. The possible role of microorganisms was assessed also. Mats of pea, wheat, barley, and bluegrass residues were spread over bare soil in September of 1975. Water extracts of the residues and soil beneath them were bioassayed weekly for wheat-seedling phytotoxins, and the residues were plated biweekly to determine the numbers of fungi, bacteria, and pseudomonads from September of 1975 through May 1976. All residues produced wheat-seedling root inhibitors, but only after conditions became favorable for microbial growth. (Skogerboe-Colorado State)
W78-09923

EFFICIENT AND INEFFICIENT USE OF PHOSPHORUS BY SORGHUM,
Agricultural Research Service, Beltsville, MD. Plant Stress Lab.
For primary bibliographic entry see Field 2I.
W78-09926

OXIDATION OF ELEMENTAL SULFUR IN SOILS,
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
Y. M. Nor, and M. A. Tabatabai.
Soil Science Society of America Journal, Vol. 41, No. 4, p 736-741, July-August, 1977. 5 fig, 4 tab, 25 ref.

Descriptors: *Oxidation, *Sulfur, Soil investigations, Soil chemistry.

Studies of oxidation of elemental S in soils showed that thiosulfate and tetrathionate are produced during S oxidation in soils. In this work, unamended and elemental S-amended soils were incubated (30 degrees C) under aerobic conditions for various times. The amounts of S2O3-, S4O6-, and SO4-S produced during incubation were determined. Results showed that S2O3(2-) was produced within the first few days of incubation and that S4O6(2-) accumulated in some soils. The rate of S oxidation increased with increasing incubation temperature (5, 15, and 30 degrees C) and with increasing the rate of S application (50, 100, and 200 micrograms S/gram soil). For 100 micrograms S/gram soil, the rates of oxidation of elemental S in 10 Iowa surface soils ranged from 39 to 75 micrograms S/gram soil after incubation at 30 degrees C for 70 days; rates were more rapid in alkaline soils than in acid soils. There was little change in pH of soils even when the S application rate was increased from 50 to 200 micrograms S/gram soil. The rate of S oxidation was lower in air-dried soils than in field-moist soils. (Skogerboe-Colorado State)
W78-09929

ADSORPTION OF ZN BY FE AND AL HYDROUS OXIDES AS INFLUENCED BY AGING AND PH,
Georgia Experiment Station, Experiment.
L. M. Shuman.
Soil Science Society of America Journal, Vol. 41, No. 4, p 703-706, July-August, 1977. 4 fig, 1 tab, 15 ref.

Descriptors: *Adsorption, *Zinc, *Iron, Aluminum oxide, *Soil chemical properties, Hydrogen ion concentration.

Zinc solutions were equilibrated with both fresh and aged Fe and Al hydrous oxides to measure Zn adsorption. The data conformed to the Langmuir isotherm and the Langmuir coefficients for Zn adsorption capacities and bonding energies were determined. The adsorption capacities for the aged Fe oxide (geothite) and the aged Al oxide (gibbsite) were the same. The adsorption capacities for both of the fresh oxides (amorphous) were about 10 times those for the aged oxides which corresponded to a 10-fold difference between their respective CEC's and surface areas. The bonding energies for Zn for the fresh Al oxide were three times that for the fresh Fe oxide but the bonding energies for the two aged oxides were the same. Bonding energies were directly related to adsorption capacities. The inflection points on the Zn adsorption vs. pH curves were between pH 5 and 6 for both oxides. (Skogerboe-Colorado State)
W78-09930

INFLUENCE OF EXCHANGEABLE CATION ON THE SORPTION OF TRACE AMOUNTS OF CADMIUM BY MONTMORILLONITE,
Instituto Veneszolano de Investigaciones Cientificas. Caracas. Centro de Ecologia.
For primary bibliographic entry see Field 2K.
W78-09931

ON THE USE OF THE LANGMUIR EQUATION IN THE INTERPRETATION OF 'ADSORPTION' PHENOMENA,
Freie Univ. Berlin (West Germany) Inst. Fuer Angewandte Chemie.
J. A. Veith, and G. Sposito.
Soil Science Society of America Journal, Vol 41, No 4, p 697-702, July-August, 1977. 5 fig, 29 ref.

Descriptors: Model studies, Simulation analysis, *Anions, Soil investigations, Phosphorus, *Adsorption, Langmuir equation, Soil chemical properties.

A theoretical discussion in terms of molecular theory and the results of model experiments are employed to demonstrate that the conventional analysis of 'anion fixation' data, through linear least squares regression of the points in a Langmuir plot, usually will not be sensitive enough to show the failure of the Langmuir equation whenever solubility product considerations are essential in the fixation reaction. The theoretical discussion points out that although the Langmuir equation is not restricted to two-dimensional phenomena (in other words, adsorption), it cannot apply if the reacting anions must be present at some threshold concentration before fixation occurs. An analysis of model experiments on the reactions of OH(-) with Al(-) or Fe-resin and of Cl(-) with Ag-resin shows that secondary precipitation phenomena always result in a statistically significant, linear correlation of the variables in a Langmuir plot if the concentration of the reacting anions is much larger than the threshold value needed to initiate precipitation of the secondary solid phase. This condition generally can be expected to be met when anions such as O-phosphate react with soils or soil constituents. (Skogerboe-Colorado State)
W78-09932

POTASSIUM ACCUMULATION AND MOVEMENT IN AN IRRIGATED SOIL TREATED WITH ANIMAL MANURES,
California Univ., Riverside. Dept. of Soil and Environmental Science.
P. F. Pratt, and A. E. Laag.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1130-1132, November-December, 1977. 3 fig, 3 tab, 9 ref.

Descriptors: Salinity, *Potassium, Soil chemical properties, Animal wastes, *Soil chemistry.

Data from a 4-year experiment with animal manures are reported. Soluble and exchangeable K and K/Cl ratios indicated that K moved into the 90- to 120-cm depth, but little if any moved below the 120-cm depth. Potassium/Cl ratios indicated that K moved down in a relatively abrupt front, that the 0- to 30-cm and 30- to 60-cm depths had nearly equilibrated with the K input, but that

deeper layers had not. Soluble K accumulated in the soil in proportion to the amount of manure added and reached a maximum of 36.5% of the total soluble cations in the saturation extract of the surface layer of the plots that received the highest rate of manure. The maximum exchangeable K was found in the 30- to 60-cm depth of the same plots. The K fixed in the soil appeared to be greater than the reduction in CEC. (Skogerboe-Colorado State)
W78-09935

DISTRIBUTION PATTERN OF INORGANIC NITROGEN FOLLOWING ANHYDROUS AMMONIA INJECTION INTO A VERTISOL,
Mahatma Phule Krishi Vidyapeeth, Rahuri (India). Dept. of Agricultural, Chemical and Soil Science.
S. T. Khengre, and N. K. Savant.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1139-1141, November-December, 1977. 3 fig, 1 tab, 20 ref.

Descriptors: *Nitrogen, Ammonia, Soil investigations, *Soil chemistry, Soil water.

Distribution patterns of inorganic forms of N and diffusion coefficients of NH4+ were studied after injection of 800 mg of anhydrous NH3-N per dish, each dish containing 1 kg of soil (density 1.20 g/cu cm) maintained at 1/3-bar moisture percentage and incubated for 120 days. Bell-shaped distribution patterns of NH4+ and undissociated NH3 (aq) were observed. Diffusion coefficients of NH4+ decreased with incubation time. (Skogerboe-Colorado State)
W78-09938

NATURE OF THE ORGANIC COATING ON SAND GRAINS OF NONWETTABLE GOLF GREENS,
Ohio State Univ., Columbus. Dept. of Agronomy.
R. H. Miller, and J. F. Wilkinson.
Soil Science Society of America Journal, Vol 41, No 6, p 1203-1204, November-December, 1977. 1 fig, 14 ref.

Descriptors: Sand, Soil texture, *Turf, *Soil profiles, Fulvic acid.

The organic coating of nonwettable sand grains from localized dry spots on sand golf greens was extracted with 5% NaOH. An infrared spectrum of resin purified, freezedried extract was similar to spectra of soil fulvic acids. All other supporting data such as solubility, color, failure to precipitate upon acidification, noncrystalline nature, and a high extinction coefficient were consistent with the conclusion that the organic coating was fulvic acid. The relationship of the synthesis of fulvic acids to basidiomycete hyphae in the affected soil layer is discussed. (Skogerboe-Colorado State)
W78-09942

EFFECT OF SELECTIVE DISSOLUTION, ELECTROLYTES, AERATION, AND STERILIZATION ON TECHNETIUM-99 SORPTION BY SOILS,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 2K.
W78-09945

THE NITROGEN ISOTOPE EFFECT ASSOCIATED WITH NITRATE AND NITRITE LOSS FROM WATELOGGED SOILS,
Washington Univ., St. Louis, MO. Center for the Biology of Natural Systems.
S. H. Chien, G. Shearer, and D. H. Kohl.
Soil Science Society of America Journal, Vol. 41, No. 1, p 63-69, January-February 1977. 8 fig, 3 tab, 11 ref.

Descriptors: *Nitrogen, *Isotopes, *Nitrates, *Nitrites, *Saturated soils, Illinois, Glucose, Denitrification, Soils, Soil investigations.

Changes in the isotopic composition of added NO3(-), during the course of its disappearance from two central Illinois soils are reported. The only known difference in the two soils is the cultural history of the fields from which they were taken. A large (approximately threefold) difference between the two soils was observed in the isotopic fractionation factor associated with NO3(-) loss. Large differences in the two soils with respect to both the rate of NO3(-) loss and the isotopic fractionation associated with it were apparently related to differences in the two fields rather than to temporal or spatial variation within the fields. Addition of glucose (1% with respect to dry soil weight) caused the difference between the two soils to disappear. It also appreciably reduced the apparent isotopic fractionation factor in both soils. (Skogerboe-Colorado State)
W78-09946

INFLUENCE OF PH ON THE SORPTION OF CO(2+), ZN(2+) AND CA(2+) BY A HYDROUS MANGANESE OXIDE,
Coconut Research Inst., Lunuwila (Sri Lanka).
For primary bibliographic entry see Field 2K.
W78-09947

FITTING SOLUTE BREAKTHROUGH EQUATIONS TO DATA USING TWO ADJUSTABLE PARAMETERS,
King Faisal Univ., Dammam (Saudi Arabia). Dept. of Soils and Agricultural Engineering.
A. M. Elprince, and P. R. Day.
Soil Science Society of America Journal, Vol. 41, No. 1, p 39-41, January-February 1977. 2 fig, 1 tab, 20 ref.

Descriptors: *Adsorption, *Anions, Soils, Soil investigations, Hydrodynamics, Soil chemistry, Soil chemical properties, *Equations(Solutes), *Solutes.

Negative adsorption of anions reduces the volume of liquid available for the transport of electrolytes in the soil, and hence affects the nature of the breakthrough curve. A similar problem arises when there are appreciable volumes of soil solution which are essentially stagnant, and thus do not contribute significantly to the convective flux. These effects can be taken into account by introducing a second adjustable parameter (the effective solution volume) into the transport equation, in addition to the dispersion coefficient. The calculations demonstrate in a given example that a least squares procedure, applied simultaneously to the two parameters during the curve-fitting process, resolves the apparent discrepancy between the theoretical breakthrough curve and the experimental data. (Skogerboe-Colorado State)
W78-09948

THERMODYNAMIC STABILITY AND SOLUBILITY OF MOLYBDENUM MINERALS IN SOILS,
International Fertilizer Development Center, Florence, AL.
P. L. G. Vlek, and W. L. Lindsay.
Soil Science Society of America Journal, Vol. 41, No. 1, p 42-46, January-February, 1977. 4 fig, 3 tab, 30 ref.

Descriptors: *Molybdenum, *Thermodynamics, Soil chemistry, Soil chemical properties, Soils, Soil investigations, Laboratory tests, *Solubility.

The chemical reactions of molybdenum in soils were studied in the laboratory. Solubility diagrams were constructed from thermodynamic data obtained from the literature and from measurements made on pure minerals. Included in these diagrams were solubility relationships for molybdenite, ilsemannite, ferrimolybdite, powellite, and wulfenite. From these diagrams it appears that wulfenite is one of the most stable Mo minerals likely to form in soils. Lack of thermodynamic data on other Mo minerals prevents their evaluation as possible reaction products. The solubility of Mo in selected Colorado soils in the pH range of 5.5 to 7.7 was plotted on the wulfenite solubility diagram. Of the 13 soils used in this study, only one showed equilibrium with respect to wulfenite. When wulfenite was added to several other soils, the molybdenum solubility increased 10 to 100 fold, confirming that wulfenite was not initially present. These wulfenite-amended soils showed a close correspondence between soluble Mo and the wulfenite solubility isotherm. In the absence of solid phase Mo compounds, the solubility of Mo in soils is controlled by specific adsorption. (Skogerboe-Colorado State)
W78-09949

MEASUREMENT OF ISOTOPIC EXCHANGEABLE SOIL PHOSPHORUS AND INTERRELATIONSHIP AMONG PARAMETERS OF QUANTITY, INTENSITY, AND CAPACITY FACTORS,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.
R. C. Dalal, and E. G. Hallsworth.
Soil Science Society of American Journal, Vol. 41, No. 1, p 81-86, January-February, 1977. 6 tab, 28 ref.

Descriptors: *Phosphorus, Soils, Soil investigations, Soil chemistry, Soil texture, Soil chemical properties, Measurement, *Isotope investigations.

The applicability of various techniques to measure isotopically exchangeable phosphorus for widely different soils was investigated. The E-values obtained in the laboratory by carrier-free (E-value) and carrier-methods (Ec value) were comparable to L-values obtained in the greenhouse in low-phosphorus fixing soils but were very much higher in high phosphorus fixing soils. In the latter group E-values obtained by inverse-dilution technique (E.I.D. value) were more comparable to L-values. (Skogerboe-Colorado State)
W78-09950

INFILTRATION DURING AN UNSTEADY RAIN,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu.
Water Resources Research, Vol 14, No 3, p 461-466, June 1978. 1 fig, 3 tab, 12 ref.

Descriptors: *Infiltration, *Rainfall, *Model studies, Mathematical models, Precipitation(Atmospheric), Soil water, Soil water movement, Rainfall intensity, Precipitation excess, Ponding, Soil moisture, Runoff, Unsteady rain.

Infiltration during a rainfall event can be divided into two distinct stages: a stage with surface ponding and a stage without surface ponding. Few of the infiltration models in current use are suitable to describe infiltration for both stages. In this paper the Green and Ampt equation was applied to determine the time that separates these two stages so that infiltration for the different stages can be treated separately. To obtain an integrated form of the Green and Ampt equation, it is traditionally assumed that the cumulative infiltration is zero at the time when surface ponding starts. But in a rainfall event, the cumulative infiltration equals the water infiltrated into the soil profile prior to the ponding time, which is usually not zero. Therefore, a modification in the traditional Green and Ampt equation is needed to describe infiltration during a rainfall event. It was shown that this modification is equivalent to a shift of the time scale by an amount which was referred to as the pseudotime. The modified version of the Green and Ampt equation was applied to determine rainfall excess and to predict total runoff for three major storms recorded by the Agricultural Research Service from 1957 to 1959 on a watershed near Oxford, Mississippi. A comparison of the prediction and

the measured total runoff appeared to be promising. (SimstISWS)
W78-09978

A PARAMETER-EFFICIENT HYDROLOGIC INFILTRATION MODEL,
Agricultural Research Service, Fort Collins, CO.
R. E. Smith, and J. Y. Parlange.
Water Resources Research, Vol. 14, No. 3, p 533-538, June 1978. 6 fig, 18 ref.

Descriptors: *Infiltration, *Ponding, *Model studies, Mathematical models, Rainfall, Hydraulic conductivity, Soil water, Soil water movement, Soils, Soil types, Equations, Infiltration rates, Hydrology, Infiltration models.

By adopting two extreme assumptions concerning the behavior of unsaturated soil hydraulic conductivity K near saturation, a two-branched model was derived for ponding time and infiltration rate decay for arbitrary rainfall rates. One assumption was that K varies slowly near saturation and leads to an expression for ponding time and infiltration decay. For initially ponded conditions, ponding time was zero, and with the rainfall rate approaching infinity, the familiar Green and Ampt expression results. The other, rather opposite assumption was that K varies rapidly, e.g., exponentially, near saturation. This model also holds for both rainfall and ponded surface conditions, and for ponded conditions the expression is identical to that of Parlange. Each model uses only two parameters, saturated soil conductivity K sub s and a parameter that is roughly related to sorptivity and responds nearly linearly to variations in initial saturation. Both parameters are physically related to measurable soil properties. Methods were presented to estimate parameters of either model from infiltrometer tests. The two models were compared with a precise numerical solution of the unsaturated soil water diffusion equations for three soils that represent a range of soil behaviors near saturation. Results showed that either assumption would be an excellent model for most hydrologic purposes, and the relative goodness of fit of each model is generally consistent with the appropriate behavior of K, as the water content approaches the saturated water content. (Sims-ISWS)
W78-09982

PERCOLATION RATES WITH SURFACE LAYERS OF GRAVEL OR CLAY FLOCS ON SOIL FED CLEAR AND TURBID WATERS,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 4B.
W78-09983

DETECTION OF PERMEABILITY VARIATIONS BY A SHALLOW GEOTHERMAL TECHNIQUE,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
For primary bibliographic entry see Field 2F.
W78-09988

POTASSIUM RELEASE IN SOME SALINE SOILS OF ISRAEL,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
S. Feigenbaum, and L. Rachel.
Geoderma, Vol. 19, No. 2, Oct. 1977, p 159-168, 4 tab, 3 fig, 30 ref.

Descriptors: *Israel, *Potassium, *Potassium compounds, *Saline soils, *Salinity, Loess, Calcareous soils, Sierozems, Soil chemical properties, Soil dynamics, Soil analysis, Saline water, Soil physical properties, Salts.

Two saline soils - a calcareous serozem and a red brown calcareous grumsol, two nonsaline soils of the same origin, and a loess derived soil from the lower Jordan Valley, the Bet She'an Valley, and the Northern Negev respectively were sampled to study factors affecting potassium release. Released potassium from the saline samples was measured both in 0.01 N CaCl2 and in deionized water extracts, whereas that from the nonsaline samples was measured only in 0.01 N CaCl2 extracts. The results indicated that potassium release was a function of salinity, total potassium content, and its distrit .tion in the size fractions. Comparisons of these three factors indicate that the distribution of potassium in the size fractions and its total content were major factors and that salinity is of only minor importance. These findings are of importance both for saline soils and for soils to be irrigated with saline water. (Tickes-Arizona)
W78-10006

TRANSIENT FLOW IN UNSATURATED POROUS MEDIA,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemical Engineering.
S. H. Lin.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings Paper 13886, p 975-982, July 1978. 4 fig, 12 ref.

Descriptors: *Porous media, *Unsaturated flow, *Diffusion, Hydraulic conductivity, Infiltration, Moisture content, Unsteady flow, Silts, Loam, Soil water movement, Mathematical models, Equations, Orthogonality.

Transient water movement in both horizontal and vertical unsaturated porous media was investigated. The nonlinear partial differential equation governing the one-dimensional flow was solved by the orthogonal collocation method. This method involves the approximation of the spatial derivative terms in the partial differential equation by an orthogonal polynomial and thus the partial differential equation is transformed into a set of ordinary differential equations which in turn can be integrated numerically. The present numerical solutions were found to be in excellent agreement with previous solutions for the cases under consideration. Because of its high accuracy, computational stability, and easy implementation, the orthogonal collocation method can be a very good alternative for tackling these nonlinear diffusion problems. (Visocky-ISWS)
W78-10255

AIR-WATER FLOW IN COARSE GRANULAR MEDIA,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-10256

2H. Lakes

HYDROLOGIC BUDGET OF THE LARGEST LAKES AND RESERVOIRS OF THE WORLD,
A. A. Vikulina, T. D. Kashinova, and A. A. Natrus.
Soviet Hydrology: Selected Papers, Vol. 15, No. 3, p 184-189, 1976. 2 tab, 12 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol. 5, p 63-72, 1975.

Descriptors: *Lakes, *Reservoirs, *Hydrologic budget, Data collections, Data processing, Runoff, Discharge(Water), Evaporation, Storage, Water levels, Precipitation(Atmospheric), Watersheds(Basins), Rivers, Freshwater, Hydrologic data, Hydrologic cycle, Water bodies, *Largest lakes, *Largest reservoirs.

Because of the increased economic development of lakes and particularly because of the creation of large reservoirs, hydrologic budget investigations in inland bodies of water were initiated in the last decades. These investigations, which were initially begun in economically developed countries, gradually spread to developing countries and acquired a particularly large scope during the Internationaal Hydrologic Decade (IHD). However, the results of these studies remained unpublished, as a rule, and unavailable for subsequent systematization and generalization. The collected data were investigated and analyzed at the State Hydrologic Institute and later generalized at the request of the Coordinating Committee of the IHD. This analysis lead to the following conclusions: (1) At the present time, the water resources of 55 of the largest lakes of the world covering a total area of about 1 million sq km, which is more than 90% of the total area of the largest lake of the world, each having a surface area exceeding 1000 sq km, have been assessed. (2) According to these data, a volume of water of 1790 cu km is involved in the hydrologic cycle of the largest lakes of the world, of which 600 cu km belong to salt and brackish lakes. About 2/3 of this volume (387 cu km) belongs to the Caspian Sea. (3) The freshwater lake resources of the world are distributed in the following manner by continents: 585 cu km in North America, 295 cu km in Africa, 162 cu km in Europe, 90 cu km in Asia, and 45 cu km in South America. (4) The contribution of the periodicaly drying salt lakes of Australia to the total hydrologic budget of the saline bodies of water of the world is slightly more than 1%. (5) Reservoirs increase the internal hydrologic cycle of the earth. With the creation of large reservoirs, the total hydrologic cycle of fresh bodies of water increased by a factor of 1.5 in Africa, 3.0 in Europe, and 4.5 in Asia. (Sims-ISWS)
W78-09962

NUMERICAL SOLUTION OF THE COMPLETE EQUATIONS FOR NEARLY HORIZONTAL FLOWS,
Manchester Univ. (England). Simon Engineering Labs.
For primary bibliographic entry see Field 2L.
W78-09971

PARTICULATE FORMATION DUE TO FREEZING HUMIC WATERS,
Savannah River Ecology Lab., Aiken, SC.
For primary bibliographic entry see Field 5B.
W78-09984

STUDIES ON FINITE AMPLITUDE WAVES IN BOUNDED WATER BODIES,
Princeton Univ., NJ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-09996

RESERVOIRS AND INDUCED SEISMICITY AT CORPS OF ENGINEERS PROJECTS,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
S. J. Johnson, E. L. Krinitzsky, and N. A. Dixon.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 309, Price codes: A02 in paper copy, A01 in microfiche. Miscellaneous Paper S-77-3, January 1977. 3 fig, 4 tab, 6 ref.

Descriptors: *Dams, *Reservoirs, *Seismic waves, *Georgia, *South Carolina, Earthquakes, Seismology, Reservoir operation, Water levels, Projects, Clark Hill Reservoir, Reservoir-induced earthquakes.

A review was made of major reservoirs of the Corps of Engineers with regard to their experiences with induced seismicity. The Corps has 24 large reservoirs, i.e., those with dams 60.96 m (200 ft) in height or greater, and with volumes of 1.2335 x 10 to 9th power cu m (1,000,000 acre-ft) or greater. There also are 10 dams that are 91.44 m (300 ft) high, or higher, but with reservoirs of less

than 1.2335 x 10 to 9th power cu m. Thirteen reservoirs have been instrumented for monitoring microearthquakes. They range from large to small and are located in aseismic to highly seismic areas. Only one Corps reservoir, Clark Hill in Georgia-South Carolina, has experienced a felt earthquake, but the 21-year interval between impoundment and the occurrence of the earthquake is not typical of reservoir-induced earthquakes; and a direct relationship appears improbable. (Lardner-ISWS)
W78-10004

MANAGEMENT PROGRAMS, RESEARCH AND EFFECTS OF PRESENT LAND USE ACTIVITIES ON WATER QUALITY OF THE GREAT LAKES. VOLUME I.
International Reference Group on Great Lakes Pollution from Land Use Activities. U.S. Section of Task Group A.
For primary bibliographic entry see Field 5B.
W78-10026

POPULATION ESTIMATES OF SOCKEYE SALMON (ONCORHYNCHUS NERKA) IN A FERTILIZED OLIGOTROPHIC LAKE,
Fisheries and Marine Service, Nanimo (British Columbia). Pacific Biological Station.
For primary bibliographic entry see Field 5C.
W78-10128

HYDROCARBONS IN THE WATER AND SEDIMENT OF WILDERNESS LAKE II,
Exxon Research and Engineering Co., Linden, NJ. Analytical and Information Div.
For primary bibliographic entry see Field 5B.
W78-10157

POPULATION STRUCTURE OF TWO LABEO SPECIES IN THE HENDRIK VERWOERD DAM AS DETERMINED BY GILL NET SAMPLING,
South African Div. of Nature and Environmental Conservation, Stellenbosch. Jonkershoek Nature Conservation Station.
N. Fairall, and K. C. Hamman.
Journal of the Limnological Society of South Africa, Vol. 3, No. 1, p 9-12, 1977. 9 ref, 6 fig.

Descriptors: Population dynamics, Gill nets, *Sampling, Fish age, body size, Biomass, Fecundity, Fork length, Scales, Length weight relationship, Frequency distribution, *Labeo, *Hendrik Verwoerd dam(South Africa).

A series of seven gill nets was used to sample populations of two Labeo species in the Hendrik Verwoerd Dam. Selection curves were computed for these nets and were used to define size and age structure of the two populations; these populations differ markedly, in that the moggel Labeo umbratus has a greater proportion of mature fish, while Labeo capensis (the Orange River Labeo) showed a more normal size and age distribution. Biomass curves closely follow the size distribution, while the fecundity of both species is highest in the large size groups. These data were used to speculate on a fish exploitation strategy for the dam. (So Afr Water Info Center)
W78-10217

ZOOPLANKTON IN A TROPICAL ENDORHEIC LAKE (LAKE CHILWA, MALAWI) DURING DRYING AND RECOVERY PHASES,
Lake Chilwa Coordinated Research Project, Limbe (Malawi).
M. J. Kalk, and C. M. Schulten-Senden.
Journal of the Limnological Society of Southern Africa, (Bloemfontein), Vol. 3, No. 1, p 1-7, 1977, 36 ref, 1 tab, 4 fig.

Descriptors: *Zooplankton, Tropical regions, Water level fluctuations, Diapause, *Dry seasons, Rotifera, Crustacea, Dominant organisms, Fish food organisms, Detritus, Food webs, Species abundance, Tropodiaptomus, Lakes, *Lake recovery(Drought), *Lake Chilwa(Malawi), Southern Africa, Diaphanosoma, Moina, Daphina, Mesocyclops, Ceriodaphina.

Lake Chilwa, which was a fishery of economic importance to Malawi, declined in water level from 1964-68 and dried up completely for a few months in 1968. It then regained its former depth of 2-3 metres in one wet season of five months. In the pre-drying period, zooplankters produced different diapause forms, in the drying period, zooplankton appeared to die out; in the refilling period rotifers predominated in the first year and crustacean populations were low; in the post-filling period crustaceans predominated. The same species occurred both before and after dryness. The conditions that possibly determined these responses are considered. After a lag of one year numbers of zooplankters were high, but decreased annually when the three dominant, largely planktivorous species of fishes recolonised the lake in succession over three years. A main detritus food web is postulated and evidence for it is discussed. A practical method for fish conservation in times of low lake level, using artificial 'lagoons' in the swamp, and boreholes, is suggested. (So Afr Water Info Center)
W78-10218

BREEDING STATUS OF WATERFOWL AT LARGE LAKES IN THE ORANGE FREE STATE,
Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
J. N. Geldenhuys.
Ostrich, Cape Town, Vol. 47, No. 2-3, p 137-139, 1976. 5 ref.

Descriptors: *Breeding status(Waterfowl), Lakes, Dams, *Water birds, Aquatic animals, Impoundments, Reservoirs, Ecology, *Orange Free State(South Africa).

A short article describing the significance of waterfowl breeding at nine large lakes in the Orange Free State, based on monthly counts during the period August 1972 to July 1973. Species noted were: Egyptian Goose, South African Shelduck, Spurwinged Goose, Yellowbilled duck, Cape Teal, Redbilled Teal, Cape Shorellen and Knob-billed duck. (So Afr Water Info Center)
W78-10235

SCIENCES LAST WORD ON FATE OF ST LUCIA,
University of the Witwatersrand, Johannesburg (South Africa).
T. C. Robertson.
Veldtrust, March 1977, p 4-8.

Descriptors: *Mathematical models, *Computer models, *Saline water intrusion, *Lakes, Rainfall runoff relationships, Aquatic ecosystems, Estuarine environment, *South Africa(Lake St. Lucia), Kwazulu, Mkuze river, Umfolozi river.

A computer was used to determine the effect of different engineering works or climatic changes on the hydrology of Lake St. Lucia. A number of alternative plans were submitted for final approval by decision-makers who would have to consider factors like the cost and organization of the works, which are outside the sphere of the hydrologists. The work was undertaken by the Hydrological Research Unit of the University of the Witwatersrand. The mathematical model of the lake, which was developed for computer anaysis is considered to be of such significance that the report has been made available to scientists all over the world. The computer is entering many fields in which conservationsits attempt to predict the consequences of man's manipulation of his physical environment. (So Afr Water Info Center)
W78-10240

HARTEBEESPOORT DAM-ASSET OR DISASTER, (IN AFRIKAANS),
E. Adler.
Veldtrust (Pretoria), p 14-15, March, 1977.

Descriptors: *Water hyacinth, Eutrophication, Aquatic weed control, Hartebeespoort dam, South Africa, Eichhornia.

A short article pointing out to what extent the Hartebeespoort dam has been overgrown with water Hyacinths. The author suggests that the time has arrived for appointing a full time project leader at the Water Research Commission who should, in cllaboration with all the scientists and officials of all the departments concerned, work out a properly co-ordinated integrated action and research plan for combating this and similar problems. (So Afr Water Info Center)
W78-10241

ALGAL GROWTH POTENTIAL AND THE SUCCESSION OF ALGAE IN A NITROGEN LIMITED IMPOUNDMENT,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
For primary bibliographic entry see Field 5C.
W78-10247

GROUND-WATER LAKE RELATIONSHIPS AND GROUND-WATER QUALITY IN THE SAND PLAIN PROVINCE OF WISCONSIN-NEPCO LAKE,
Warzyn Engineering Inc., Madison, WI.
For primary bibliographic entry see Field 2F.
W78-10254

FOURTH SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN IN THE STATES OF WISCONSIN, ILLINOIS, INDIANA, AND MICHIGAN, VOLUME 2.
Environmental Protection Agency, Chicago, IL.
For primary bibliographic entry see Field 5G.
W78-10414

2I. Water In Plants

INTERACTIVE EFFECT OF SALINITY AND PHOSPHORUS ON SESAME,
California Univ., Riverside. Dept. of Soil and Environmental Science.
A. Cerda, F. T. Bingham, and G. J. Hoffman.
Soil Science Society of America Journal, Vol. 41, No. 5, p 915-918, September-October 1977. 3 fig, 3 tab, 12 ref.

Descriptors: *Salinity, Phosphorus, *Crop response, Salts, *Sale tolerance, *Osmotic pressure, Sesame.

A solution culture experiment was conducted with a short-season sesame to observe interactive effects of osmotic potential, and P concentration on water relations, mineral nutrition, and yield characteristics. Salinity reduced yields linearly with a 50% decrease in pod yield at an osmotic potential of approximately -2.7 bars. Increasing P concentrations increased yields only at low salinity levels; at higher salinity levels, yields decreased progressively as P increased. Salt tolerance was reduced by the higher P additions. (Skogerboe-Colorado State)
W78-09913

EFFICIENT AND INEFFICIENT USE OF PHOSPHORUS BY SORGHUM,
Agricultural Research Service, Beltsville, MD. Plant Stress Lab.
J. C. Brown, R. B. Clark, and W. E. Jones.

Soil Science Society of America Journal, Vol. 41, No. 4, p 747-750, July-August, 1977. 3 fig, 5 tab, 22 ref.

Descriptors: *Phosphorus, *Sorghum, Nutrients, *Crop response, Fertilizers, Plant physiology.

Twelve genotypes were grown on acid-Bladen soil (pH 4.3, P stressed or Al toxic), on limed-Bladen soil (pH 5.2, Cu stressed), and on alkaline Quinlan soil (pH 7.5, Fe stressed) to determine the effect of P efficiency on use of these elements by the plants. Under P-stress or Al-toxicity conditions, the most P-efficient sorghum genotypes absorbed more 32P than the most P-inefficient lines and grew normally, while the P-inefficient plants developed P deficiency symptoms. Under Fe-stress conditions, the most P-efficient genotypes developed Fe chlorosis, while the most P inefficient plants remained green. Under Cu-stress conditions, one of six genotypes developed severe Cu-deficiency symptoms, characterized by the accumulation of higher P in the lower leaves, and by lower Fe and Ca in the upper leaves of Cu-stressed plants, as compared with Cu-sufficient plants. Thus, P efficiency in plants may be an asset when P availability limits growth, but it may be a liability when these same plants are subjected to Fe or Cu stress. (Skogerboe-Colorado State)
W78-09926

ASSESSING PHOSPHORUS FERTILIZER NEEDS BASED ON INTENSITY-CAPACITY RELATIONSHIPS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
Y. S. Lee, and R. J. Bartlett.
Soil Science Society of America Journal, Vol. 41, No. 4, p 710-712, July-August, 1977. 4 fig, 12 ref.

Descriptors: *Phosphorus, Fertilizers, Fertilization, Soil investigations, *Crop response, Nutrients, *Soil chemical properties.

Phosphorus in a pH 4.8 NH4OAc soil extract, through crop response correlation work, may indicate the degree to which a level of P in a given soil is the optimum. But, being an intensity measurement, this NH4OAc-P value does not indicate the amount of P fertilizer needed to bring a soil, which has a particular P sorption capacity, to its optimum level. The relationship between added P and the square root of the NH4OAc-P, measured after incubation of a given acid or limed soil, was a straight line with a characteristic slope for that soil. The value of this slope, termed the Phosphorus Fertilizer Index (PFI), showed a high correlation with the amount of Al extracted by pH 4.8 NH4OAc (sq r = 0.94). Inclusion of soil chemical characteristics other than Al in the calculation did not improve the P intensity-capacity relationships significantly. (Skogerboe-Colorado State)
W78-09927

INTERACTIONS OF LEAD AND CADMIUM ON METAL UPTAKE AND GROWTH OF CORN PLANTS,
Argonne National Lab., Argonne, IL.
For primary bibliographic entry see Field 3F.
W78-09943

THE RELEASE OF NANNOCYTES DURING THE GROWTH CYCLE OF MICROCYSTIS,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Botany.
J. A. Pretorius, G. H. Kruger, and J. N. Eloff.
Journal of the Limnological Society of Southern Africa, Vol. 3, No. 1, p 17-20, 1977. 12 ref, 4 fig.

Descriptors: *Growth phases, Light intensity, Stress, Reproduction, Algae growth, *Cyanophyta, *Nannocytes, *Microcystis.

The change in nanocyte number during the growth of Microcystis under two light intensities (9,5 and 21wEinsteins m-2 sec-1) over a period of 27 days were determined by a plating procedure. The nannocytes are released continuously over the growth period at both light intensities and not at high light intensity stress conditions only. It appears that nannocytes are not at high light intensity stress conditions only. It appears that nannocytes are not produced as a reaction to stress, but acts as a means of reproduction. A possible mechanism for the release of nannocytes from the cell is discussed. (So Afr Water Info Center)
W78-10215

THE ABSORPTION OF OXYGEN FROM LIQUID CULTURES OF BLUE-GREEN ALGAE BY ALKALINE PYROGALLOL,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Botany.
J. N. Eloff.
Journal of the Limnological Society of South Africa, Vol. 3, No. 1, p 13-16, 1977. 10 ref, 5 fig.

Descriptors: *Absorption, *Oxygen uptake, Algae cultures, Oxygen tension, Light intensity, Photooxidation, *Cyanophyta, Sodium carbonate, Microcystis, South Africa, *Pyrogallol, Synechococcus.

A mixture of pyrogallol with sodium hydroxide and sodium carbonate (2:1:1) in a separate container absorbed up to 75% of the oxygen in a bicarbonate-carbonate buffered medium with more or less no change in the pH of the medium. A system in which two test tubes were added to the culture vessel, one containing saturated sodium bicarbonate and the other pyrogallol plus sodium hydroxide gave similar results, but were not investigated further because of difficulties in handling. Optimal conditions for absorption of oxygen from 100ml of the growth medium was 1 mMole pyrogallol + 0,5 mMole sodium hydroxide + 0,5mMole sodium carbonate. The addition of this pyrogallil to alkali ratio to cultures of two Microcystis and on Synechococcus isolate in rubber stoppered flasks gave stoichiometric increases in yield which was not due to carbonate enrichment but to a lowering of oxygen tension. The data may mean that even under relatively low light intensities (1 - 4 x 10 to the 3rd power ergs cm-2 sec-1) photooxidation occurs). (So Afr Water Info Center)
W78-10216

2J. Erosion and Sedimentation

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. MATERIAL RELEASE. APPENDIX E,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5E.
W78-09824

EFFECT OF DISSOLVED OXYGEN ON CHEMICAL TRANSFORMATIONS OF HEAVY METALS, PHOSPHORUS, AND NITROGEN IN AN ESTUARINE SEDIMENT,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W78-09964

THE RANDOM COMPONENT IN STREAM MEANDERING,
Coldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 2E.
W78-09975

EROSION OF FINE-GRAINED MARINE SEDIMENTS: SEA-FLOOR AND LABORATORY EXPERIMENTS,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic Labs.; and National Oceanic and Atmospheric Administration, Miami, FL. Marine Geology and Geophysics Lab.
For primary bibliographic entry see Field 2L.
W78-09993

OXYGENATION OF DREDGED MATERIAL BY DIRECT INJECTION OF OXYGEN AND AIR DURING OPEN-WATER PIPELINE DISPOSAL,
JFB Scientific Corp., Wilmington, MA.
R. W. Neal, R. B. Pojasek, and J. C. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A046 482, Price codes: A10 in paper copy, A01 in microfiche. Technical Report D-77-15, October 1977. 208 p, 72 fig, 21 tab, 76 ref, 5 append. DACW39-75-C-0105.

Descriptors: *Air, *Dredging, *Oxygenation, *Oxygen, Injection, Disposal, Oxidation, Dissolved oxygen, Pipelines, Laboratory tests, *Dredged material, *Oxygen injection, Pipeline disposal, Anaerobic sediments.

A study was conducted to investigate the feasibility and effectiveness of injecting an oxidant into the discharge of a hydraulic dredge in order to reduce the depletion of dissolved oxygen during the disposal operations is caused by chemical oxidation of constituents, which are present in a reduced state in the anaerobic sediments. Oxygen also is consumed by the action of microorganisms that operate slowly and contributes little to the immediate demand for oxygen observed in open-water disposal. Two full-scale field demonstrations were conducted as a part of this study. In the first, pur oxygen was injected into the discharge line of a hydraulic dredge; in the second, compressed air was similarly injected. The report described the equipment and methods used to conduct the demonstrations and the results obtained. The laboratory study section described the chemical processes responsible for the oxygen depletion in the receiving water during the dredging and dredged material disposal operations. The final chapter examined the configuration and cost of injection systems for full-scale dredging operations. (Roberts-ISWS)
W78-10002

EARLY DIAGENESIS IN TRANSITIONAL SEDIMENTARY ENVIRONMENTS OF THE WHITE OAK RIVER ESTUARY, NORTH CAROLINA,
North Carolina Univ., Chapel Hill. Marine Sciences Program and Geological Survey, Denver, CO. Geologic Div.
C. S. Martens, and M. B. Goldhaber.
Limnology and Oceanography, Vol. 23, No. 3, p 428-441, May 1978. 8 fig, 3 tab, 53 ref.

Descriptors: *Diagenesis, *Sedimentology, *Estuaries, *Estuarine environment, *North Carolina, Evaluation, River beds, Cores, Sampling, Connate water, Water analysis, Geochemistry, Mineralogy, *White Oak River estuary(NC).

Changes in sedimentary diagenetic processes resulting from the transition from a terrestrial to a marine environment were studied through a series of riverbed cores collected from the White Oak River Estuary in North Carolina. Analyses of interstitial water and associated solid phases reveal systematic geochemical and mineralogical trends over an 18-km stretch of estuary and river channel related to the transition from a dominantly marine to a dominantly terrestrial setting. The most striking of these trends involves the nature of the metabolic pathways by which bacterial decomposition of organic matter occurs and probable differences in the composition of organic matter. In the riverbed stretches under periodic marine in-

fluence, sulfate reduction is a major process, owing to the availability of seawater sulfate. Upstream, however, methane generation becomes more important. Consistent with this trend is a decrease in sedimentary pyrite in methane-rich sediments. Total inorganic carbon decreases by nearly an order of magnitude upstream, and pH is significantly lower in the terrestrial environment. Chemically reactive products of organic decomposition, such as ammonia and phosphate, are considerably less concentrated in the cores taken farthest from marine influence. (Woodard-USGS)
W78-10043

INTERIM REPORT ON MASONBORO INLET, NORTH CAOLINA, MOVABLE-BED MODEL TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W78-10272

MATHEMATICAL MODELING OF SHORELINE EVOLUTION,
Tetra Tech, Inc., Pasadena, CA.
For primary bibliographic entry see Field 2L.
W78-10442

SHORELINE EROSION CONTROL ON VIRGINIA'S RIVERS AND BAYS,
Soil Conservation Service, Warsaw, VA.
For primary bibliographic entry see Field 8B.
W78-10461

2K. Chemical Processes

ANALYSIS BY FLAMELESS ATOMIC ABSORPTION,
New Orleans Univ., LA.
For primary bibliographic entry see Field 5A.
W78-09830

DISSOLUTION OF ARSENIC FROM WATER-LOGGED AND AERATED SOIL,
California Univ., Riverside. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-09909

A NEW APPROACH TO DETERMINATION OF CATION EXCHANGE CAPACITY,
California Univ., Davis.
For primary bibliographic entry see Field 7B.
W78-09910

QUANTITATIVE RELATIONSHIPS AMONG NUTRIENTS LEACHED FROM SOILS,
Tennessee Valley Authority, Muscle Shoals, AL.
For primary bibliographic entry see Field 2G.
W78-09915

LEAD ADSORPTION BY MONTMORILLONITE USING A COMPETITIVE LANGMUIR EQUATION,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 2G.
W78-09916

HOMOVALENT AND HETEROVALENT CATION EXCHANGE EQUILIBRIA IN SOILS WITH VARIABLE SURFACE CHARGE,
Chile Univ., Santiago. Facultad de Ciencias Quimicas.
For primary bibliographic entry see Field 2G.
W78-09917

HYDROLYSIS AND DECOMPOSITION OF CALCIUM MONTMORILLONITE,
Agricultural Research Service, Riverside, CA. Salinity Lab.
For primary bibliographic entry see Field 2G.
W78-09918

GAS CHROMATOGRAPHIC ANALYSIS OF SOIL ATMOSPHERES,
Iowa State Univ., Ames. Dept. of Agronomy.
A. M. Blackmer, and J. M. Bremner.
Soil Science Socity of America Journal, Vol. 41, No. 5, p 908-912, September-October 1977. 4 fig, 2 tab, 25 ref.

Descriptors: *Sampling, Soil environment, Soil properties, *Soil tests, *Gas chromatography.

A gas chromatographic procedure is described that permits rapid, specific, and precise determination of N2, O2, Ar, CO2, CH4, N20, and other gases in soil atmospheres. It involves use of an ultrasonic detector and two columns of Porapak Q at different temperatures, and it does not require temperature programming, column conditioning, stream splitting, column switching, or switching of recorder polarity. Unlike thermal conductivity and helium ionization detectors previously used for gas chromatographic analysis of soil atmospheres, the ultrasonic detector is not adversely affected by gases found in soil atmospheres. (Skogerboe-Colorado State)
W78-09922

CORRECTING TURBIDITY INTERFERENCE IN THE DETERMINATION OF PHOSPHORUS,
Texas Agricultural Experiment Station, College Station.
B. L. Folsom, Jr., H. D. Sunderman, and L. R. Hossner.
Soil Science Society of America Journal, Vol. 41, No. 4, p 823-824, July-August 1977. 2 fig, 11 ref.

Descriptors: *Phosphorus, Ammonium, *Turbidity, *Sampling, Laboratory tests, Soil chemical properties.

Turbidity caused severe interference in the presence of excess ammonium when determining phosphorus by the method of Murphy and Riley. The precipitated complex was isolated and found to be composed of NH4(+), antimony, P, and molybdenum in a ratio of 115.8:1.5:1.0:11.6. The combination of Sb and NH4(+) in solution during color development caused the turbidity interference. The turbidity could be eliminated by raising the pH above 8.2 with NaOH and boiling to drive off NH4(+) as NH3 gas prior to color development or by substituting heat for Sb to develop the characteristic molybdenum blue color. (Skogerboe-Colorado State)
W78-09924

ASSESSING PHOSPHORUS FERTILIZER NEEDS BASED ON INTENSITY-CAPACITY RELATIONSHIPS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2I.
W78-09927

OXIDATION OF ELEMENTAL SULFUR IN SOILS,
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
For primary bibliographic entry see Field 2G.
W78-09929

ADSORPTION OF ZN BY FE AND AL HYDROUS OXIDES AS INFLUENCED BY AGING AND PH,
Georgia Experiment Station, Experiment.
For primary bibliographic entry see Field 2G.
W78-09930

INFLUENCE OF EXCHANGEABLE CATION ON THE SORPTION OF TRACE AMOUNTS OF CADMIUM BY MONTMORILLONITE,
Instituto Veneszolano de Investigaciones Cientificas. Caracas. Centro de Ecologia.
J. Garcia-Miragaya, and A. L. Page.
Soil Science Society of America Journal, Vol 41, No 4, p 718-721, July-August, 1977. 2 fig, 2 tab, 20 ref.

Descriptors: *Cation exchange, *Sorption, *Cadmium, Clays, Soil water, Montmorillonite.

The effect of different exchangeable cations on the sorption of trace amounts of Cd by montmorillonite (clay fraction, Upton, Wyoming) was studied by equilibrating samples of homoionic clay suspensions with CdC12 solutions ranging from 15 to 120 micrograms Cd/liter. These Cd concentrations are similar to those found in natural and contaminated soil-water systems. The amount of Cd sorbed on the montmorillonite surfaces depended on the kind of exchangeable cation, descreasing in the order Na-montmorillonite > K-montmorillonite > Ca-montmorillonite > Al-montmorillonite. Exchangeable Al was particularly effective in reducing Cd sorption by high energy sites on montmorillonite. (Skogerboe-Colordo State)
W78-09931

ON THE USE OF THE LANGMUIR EQUATION IN THE INTERPRETATION OF 'ADSORPTION' PHENOMENA,
Freie Univ. Berlin (West Germany) Inst. Fuer Angewandte Chemie.
For primary bibliographic entry see Field 2G.
W78-09932

ESTIMATED ASSOCIATION CONSTANTS FOR SOME COMPLEXES OF TRACE METALS WITH INORGANIC LIGANDS,
California Univ., Riverside. Dept. of Soil and Environmental Science.
S. V. Mattigod, and G. Sposito.
Soil Science Society of America Journal, Vol 41, No 6, p 1092-1097, November-December, 1977. 3 fig, 3 tab, 60 ref, 9 equ.

Descriptors: Model studies, *Heavy metals, *Soil chemistry.

Chemical equilibrium studies of trace metals in soils by an ion-association model require reliable data on thermodynamic association constants for various metal-ligand complexes. Therefore, available experimental data at 25C were compiled for complexes of the transition metal cations Mn2+, Fe2+, Ni2+, Cu2+, and Zn2+ with the ligands C03(2-), HC03(-), S04(2-), HS04(-), P04(3-), HP04(2-), H2P04(-), Cl(-), and OH(-). However, experimental values of the thermodynamic association constants for many of the complexes were not available. This lack of information was alleviated by employing the theorectical model of Kester and Pykowicz and the semiempirical models of Nieboer and McBryde, and Van Panthaleon Van Eck to make estimates of the as yet unmeasured association constants. These estimated constants were tabulated in a compact form along with the experimental values. This compilation of 100 association constants, although provisional, should prove helpful in a variety of studies on trace metal equilibria in soils until more reliable experimental data become available. (Skogerboe-Colorado State)
W78-09933

SULFURIC ACID AS AN AMENDMENT FOR RECLAIMING SOILS HIGH IN BORON,
Agricultural Research Service, Riverside, CA. Salinity Lab.
R. J. Prather.
Soil Science Society of America Journal, Vol 41, No 6, p 1098-1101, November-December, 1977. 1 fig, 3 tab, 29 ref.

Descriptors: *Soil amendments, *Sulfuric acid, Adsorption, *Boron.

Laboratory results indicated that sulfuric acid can effectively aid in reclaiming soils high in boron. Results of a study, using 80-cm columns of a soil high in B, indicated that a surface application of 3.22 metric tons/ha of concentrated (96%) H204 followed by leaching with 3 pore volumes, p.v. of water was nearly as effective in reducing the level of water-soluble soil B as was leaching with 16 p.v. of water. A direct pH effect on B adsorption affinity can explain the enhanced reclamation effect at the soil surface but cannot account for the beneficial effect found at lower soil column depths. Data suggested that competition by silicate ion for adsorption sites may be contributing to the enhanced desorption of B at lower soil depths. (Skogerboe-Colorado State)
W78-09934

POTASSIUM ACCUMULATION AND MOVEMENT IN AN IRRIGATED SOIL TREATED WITH ANIMAL MANURES,
California Univ., Riverside. Dept. of Soil and Environmental Science.
For primary bibliographic entry see Field 2G.
W78-09935

A MECHANICALLY CONTROLLED VARIABLE RATE LEACHING DEVICE,
National Soil Survey, Lab., Lincoln, NE.
For primary bibliographic entry see Field 7B.
W78-09936

CORRECTION FOR DISSOLVED NITROUS OXIDE IN NITROGEN STUDIES,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 7B.
W78-09937

DISTRIBUTION PATTERN OF INORGANIC NITROGEN FOLLOWING ANHYDROUS AMMONIA INJECTION INTO A VERTISOL,
Mahatma Phule Krishi Vidyapeeth, Rahuri (India). Dept. of Agricultural, Chemical and Soil Science.
For primary bibliographic entry see Field 2G.
W78-09938

DESIGN AND TEST OF A FIELD SAMPLER FOR AMMONIA VOLATILIZATION,
Texas Agricultural Experiment Station, Temple.
For primary bibliographic entry see Field 7B.
W78-09939

MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
P. F. Pratt, S. Davis, and A. E. Laag.
Journal of Environmental Quality, Vol 6, No 4, p 397-402, October-December 1977. 7 fig, 2 tab, 10 ref.

Descriptors: *Leaching, *Cations, Root zone, Manure, Irrigation effects, Calcium, Magnesium, Potassium, Sodium, Salinity, Ground water.

The leaching of cations from the soil root zone as a function of rate of manure and irrigation treatments, which controlled the leaching fraction and the volume of leachate, was measured during a 4-year field experiment. Large amounts of Ca, Mg, and K were accumulated in the soil, but there was a net loss of Na. Practically no K moved beyond the 1.5 m depth, which was considered the bottom of the root zone. The percent leaching of the cations added in water and in manures decreased as the rate of manure increased. (Skogerboe-Colorado State)
W78-09941

NATURE OF THE ORGANIC COATING ON SAND GRAINS OF NONWETTABLE GOLF GREENS,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-09942

EFFECT OF SELECTIVE DISSOLUTION, ELECTROLYTES, AERATION, AND STERILIZATION ON TECHNETIUM-99 SORPTION BY SOILS,
Minnesota Univ., St. Paul. Dept. of Soil Science.
E. R. Landa, L. Thorvig, and R. G. Gast.
Journal of Environmental Quality, Vol. 6, No. 2, p 181-187, April-June 1977. 7 fig, 2 tab, 24 ref.

Descriptors: Soils, Soil investigations, *Sorption, *Soil chemistry, Soil chemistry properties, Anion exchange, Organic matter, *Electrolytes, Aeration, *Radioisotopes, *Technetium-99.

The objective was to determine the extent that technetium-99, a long-lived beta-emitting radionuclide, might be sorbed from aqueous solution by 11 well-characterized soils, and to elucidate the sorption mechanisms involved. About 98% of the added 99Tc was sorbed within a period of 2 to 5 weeks by 8 of the 11 soils. The slow kinetics observed and the removal of trace quantities of 99Tc from solution in the presence of large amounts of chloride and phosphate tend to rule out anion exchange as the sorption mechanism. The lack of sorption exhibited by the low organic matter soils, the reduction in sorption 99Tc on extraction with NaOH suggest a role for the living and/or nonliving organic fraction of the soil. Sterilization of previously sorbing soils eliminated the sorption ability, indicating a microbial role in the process. Results of aeration experiments were ambiguous but suggest that anaerobic conditions are not a prerequisite for 99Tc sorption by soils. (Skogerboe-Colorado State)
W78-09945

THE NITROGEN ISOTOPE EFFECT ASSOCIATED WITH NITRATE AND NITRITE LOSS FROM WATELOGGED SOILS,
Washington Univ., St. Louis, MO. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 2G.
W78-09946

INFLUENCE OF PH ON THE SORPTION OF CO(2+), ZN(2+) AND CA(2+) BY A HYDROUS MANGANESE OXIDE,
Coconut Research Inst., Lunuwila (Sri Lanka).
P. Loganathan, R. G. Burau, and D. W. Fuerstenau.
Soil Science Society of America Journal, Vol. 41, No. 1, p 57-62, January-February 1977. 7 fig, 1 tab, 15 ref.

Descriptors: *Sorption, Soil chemistry, Soil investigations, Soil chemistry properties, *Calcium, *Cations, Adsorption, Ion exchange, *Cobalt, *Zinc, Oxides, *Manganese oxide.

The uptake of Co(2+), and Ca(2+) by delta-MnO2 at 24.0 + or - 0.5C as a function of pH and salt concentration was investigated. At pH values <5, delta-MnO2 released structural Mn to solution phase during the sorption of Co(2+) and to a lesser extent during Zn(2+) sorption. Calcium sorption did not release any Mn to solution phase. In addition Co(2+), Zn(2+), and Ca(2+) were shown to adsorb specifically at the delta-MnO2 surface by exchange with bound H. The ph values had very little influence on the sorption of these cations. (Skogerboe-Colorado State)
W78-09947

THERMODYNAMIC STABILITY AND SOLUBILITY OF MOLYBDENUM MINERALS IN SOILS,
International Fertilizer Development Center, Florence, AL.
For primary bibliographic entry see Field 2G.
W78-09949

MEASUREMENT OF ISOTOPIC EXCHANGEABLE SOIL PHOSPHORUS AND INTERRELATIONSHIP AMONG PARAMETERS OF QUANTITY, INTENSITY, AND CAPACITY FACTORS,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 2G.
W78-09950

THE DEPENDENCE OF BULK EVAPORATION COEFFICIENTS ON AIRWATER INTERFACIAL CONDITIONS AS DETERMINED BY THE ISOTOPIC METHOD,
CEA Centre d'Etudes de Saclay, Gif sur Yvette (France). Dept. de Recherche et Analyse.
For primary bibliographic entry see Field 2L.
W78-09960

NITRATE DETERMINATION IN FRESH AND SOME ESTUARINE WATERS BY ULTRAVIOLET LIGHT ABSORPTION: A NEW PROPOSED METHOD,
Victoria Univ. of Manchester (England). Pollution Research Unit.
For primary bibliographic entry see Field 5A.
W78-09967

TRACE INORGANICS IN RURAL POTABLE WATER AND THEIR CORRELATION TO POSSIBLE SOURCES,
South Carolina State Coll., Orangeburg. Water Lab.
For primary bibliographic entry see Field 5A.
W78-09968

INTERPRETATION OF HYDROCHEMICAL FACIES BY FACTOR ANALYSIS,
University of South Florida, Tampa. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-09985

THERMODYNAMICS OF THE SULFUR DIOXIDE-SEAWATER SYSTEM,
California Univ., Berkeley. Dept. of Chemical Engineering.
A. H. Abdulsattar, S. Sridhar, and L. A. Bromley.
AIChE Journal, Vol. 23, No. 1, p 62-68, January 1977. 4 fig, 5 tab, 34 ref, 1 append.

Descriptors: *Sea water, *Solubility, *Sulfides, *Aqueous solutions, Water chemistry, Chemical properties, Sulfur compounds, Desalination, Thermodynamics, Saline water systems, Hydrogen ion concentration, Model studies, Mathematical models, Water treatment, Sulfur dioxide, Chemical model.

A chemical model based on thermodynamic principles was applied successfully to calculate the equilibrium solubility of sulfur dioxide in seawater over a temperature range of 10 to 25C and liquid phase sulfur dioxide concentrations from 0.00001 to 1 molal. The model predicts that at 25C, the equilibrium vapor pressure of sulfur dioxide over seawater remains negligible (less than 0.0000 atm) as long as the seawater pH is maintained above 3.7. Comparison of the predicted sulfur dioxide solubility in seawater with the solubility of sulfur dioxide in water indicated that sulfur dioxide is about two to three times more soluble in seawater than in freshwater. The results of this study could serve as design data for sizing sulfur dioxide absorbers for seawater pretreatment in desalination

plants or for flue gas absorbers used in air pollution control. (Humphreys-ISWS)
W78-09990

TURBULENT MASS TRANSFER RATES TO A WALL FOR LARGE SCHMIDT NUMBERS,
Illinois Univ. at Urbana-Champaign. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 8B.
W78-09991

POTASSIUM RELEASE IN SOME SALINE SOILS OF ISRAEL,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2G.
W78-10006

CHEMICAL ANALYSES OF SURFACE WATER IN ILLINOIS, 1958-74, VOLUME I, DES PLAINES RIVER BASIN AND LAKE MICHIGAN,
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-10034

CHEMICAL ANALYSES OF SURFACE WATER IN ILLINOIS, 1958-74, VOLUME II, ILLINOIS RIVER BASIN AND MISSISSIPPI RIVER TRIBUTARIES NORTH OF ILLINOIS RIVER BASIN,
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-10035

CHEMICAL ANALYSES OF SURFACE WATER IN ILLINOIS, 1958-74, VOLUME III, OHIO RIVER TRIBUTARIES AND MISSISSIPPI RIVER TRIBUTARIES SOUTH OF ILLINOIS RIVER BASIN,
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-10036

SELECTED DATA FROM THERMAL-SPRING AREAS, SOUTHWESTERN MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10046

GROUND-WATER RECORDS FOR EASTERN OKLAHOMA, PART 2 - WATER-QUALITY RECORDS FOR WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10056

SAMPLING FOR ORGANIC CHEMICALS AND MICROORGANISMS IN THE SUBSURFACE,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5A.
W78-10081

SPECTROPHOTOMETRIC AND CHELATOMETRIC DETERMINATION OF IRON (III) WITH 2,4,-DIHYDROXYVALEROPHENONE,
Dev Nagri Coll., Meerut (India). Chemical Labs.
For primary bibliographic entry see Field 5A.
W78-10227

2L. Estuaries

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. MATERIAL RELEASE. APPENDIX E,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5E.
W78-09824

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. MARSH DEVELOPMENT. APPENDIX K.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5E.
W78-09825

STUDIES OF CIRCULATION AND PRIMARY PRODUCTION IN DEEP INLET ENVIRONMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-09829

BIOLOGICAL ASPECTS OF TERRESTRIAL OIL SPILLS, USA CRREL OIL RESEARCH IN ALASKA, 1970-1974,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 5C.
W78-09831

HYDROGRAPHY OF THE SANTEE RIVER DURING MODERATE DISCHARGE CONDITIONS,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
B. Kjerfve, and J. E. Greer.
Estuaries, Vol. 1, No. 2, p 111-119, June 1978. 11 fig, 2 tab, 21 ref.

Descriptors: *Estuaries, *Rivers, *South Carolina, *Diversion, Hydrography, On-site investigations, Data collections, Salinity, Streamflow, Discharge(Water), Velocity, Water(Currents), Shell fish, Oysters, Clams, Environmental effects, Water temperature, Temperature distribution, Distribution patterns, Tidal waters, *Santee River(SC), *Cooper River(SC).

To harness hydroelectric power, most of the flow of the Santee River, South Carolina was diverted in 1942 into Charleston Harbor, where shoaling promptly became a major problem. For this reason, most of the diverted flow is scheduled to be rediverted to the Santee within the next decade, increasing the mean discharge of the Santee from 74 to 428 cu m/s. To assess the present hydrograhy of the Santee estuary under conditions of moderate discharge, the authors determined 226 vertical profiles of velocity, salinity, and temperature distributed over 17 stations in February 1975. It was found that 73 and 27% of the discharge reached the ocean via the North and South distributaries, respectively. The 1 ppt isohaline was found no further than 8 km upstream from the mouth, indicating the limited extent of the estuarine zone. The Santee is a partially mixed estuary classified as type 2b. The circulation parameter is approximately 3, and the stratification parameter is approximately 0.3. The bulk parameters indicate the importance of tidal mixing and a weakly developed gravitational circulation. When rediversion is completed, the net salinity in the lower Santee River can be expected to decrease drastically, which in turn is likely to terminate the lucrative oyster and clam fishery. (Humphreys-ISWS)
W78-09959

THE DEPENDENCE OF BULK EVAPORATION COEFFICIENTS ON AIRWATER INTERFACIAL CONDITIONS AS DETERMINED BY THE ISOTOPIC METHOD,
CEA Centre d'Etudes de Saclay, Gif sur Yvette (France). Dept. de Recherche et Analyse.
L. Merlivat.
Journal of Geophysical Research, Vol. 83, No. C6, p 2977-2980, June 20, 1978. 2 fig, 3 tab, 13 ref.

Descriptors: *Air-water interfaces, *Energy transfer, *Evaporation, *Turbulent boundary layers, Winds, Sea spray, Laboratory tests, Data processing, Mass transfer, Water vapor, Oceans, Atmosphere, Turbulence, Roughness(Hydraulic), Isotope studies, Oceanography, Meteorology.

The analysis of the natural distribution of deuterium and oxygen 18 in moisture inside the turbulent boundary layer developed above a water surface makes possible the investigation of the mechanism of evaporation. The distribution of isotopes in water vapor allows the calculation of the relative contributions of molecular and turbulent transfer to the total mass transport. This method was applied to assess the influence of the conditions at the liquid surface on the evaporation flux. In particular, the influence of wind waves and superposed artificially generated waves was studied. Experiments have been carried out at the Institut de Mecanique Statistique de la Turbulence air-water tunnel, specially designed for the simulation of ocean-atmosphere energy exchanges. Here the wind velocities could be varied from 0.7 to 6 m/s. Waves were generated by a motor-driven paddle. The wave frequency was 1 Hz, and the maximum height 12 cm, while the surface roughness Reynolds number varied from 0.02 to 2. Mean wind velocity profiles and isotopic profiles were measured. These observations allowed the calculation of the drag and bulk evaporation coefficients as a function of the surface roughness Reynolds number. Evaporation bulk transfer coefficients were given for near-neutral stability conditions of the atmosphere layer. (Sims-ISWS)
W78-09960

EFFECT OF DISSOLVED OXYGEN ON CHEMICAL TRANSFORMATIONS OF HEAVY METALS, PHOSPHORUS, AND NITROGEN IN AN ESTUARINE SEDIMENT,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W78-09964

NITRATE DETERMINATION IN FRESH AND SOME ESTUARINE WATERS BY ULTRAVIOLET LIGHT ABSORPTION: A NEW PROPOSED METHOD,
Victoria Univ. of Manchester (England). Pollution Research Unit.
For primary bibliographic entry see Field 5A.
W78-09967

BACKGROUND WATER TEMPERATURES AND POWER STATION DISCHARGES,
Central Electricity Generating Board, Leatherhead (England). Central Electricity Research Labs.
For primary bibliographic entry see Field 5B.
W78-09969

HARBOUR RESONANCE PROBLEMS USING FINITE ELEMENTS,
Southampton Univ. (England).
S. Walker, and C. A. Brebbia.
Advances in Water Resources, Vol 1, No 4, p 205-211, June 1978. 7 fig, 2 tab, 22 ref.

Descriptors: *Waves(Water), *Mathematical models, *Finite element analysis, *Harbors, Water level fluctuations, Resonance, Frequency, Analytical techniques, Analysis, Fourier analysis, Model studies, Mathematical studies, Numerical analysis, Vibrations, Water levels, Spectral analysis.

The problem of harbor resonance was discussed, and the probabilistic analysis of a harbor's response was carried out using a finite element technique. The results presented show the importance of considering two types of damping (radiation and friction) in the study of harbor resonance phenomena. The radiation, or energy transfer between the harbor and the open sea, was introduced using an expression similar to Sommerfeld's radiation condition, and appears as a boundary only damping term. The three analyses with or without damping and with or without radiation were compared, and it was shown that it is important to include both effects to avoid distortion of the response spectrum. The probability of exceedance for elevations was calculated for the Duncan Basin, South Africa, and a way of calculating the horizontal displacements was indicated. (Humphreys-ISWS)
W78-09970

NUMERICAL SOLUTION OF THE COMPLETE EQUATIONS FOR NEARLY HORIZONTAL FLOWS,
Manchester Univ. (England). Simon Engineering Labs.
C. G. Koutitas.
Advances in Water Resources, Vol 1, No 4, p 213-217, June 1978. 10 fig, 7 ref.

Descriptors: *Mathematical models, *Numerical analysis, *Water circulation, *Estuaries, Hydraulics, Analytical techniques, Mathematical studies, Velocity, Flow, Tidal effects, Tides, Lakes, Bays, Mathematics, Water levels, Numerical integration, Finite difference analysis.

The complete mathematical model for the nonsteady hydrodynamic circulation due to wind, waves, and density gradients in a coastal area or a lake was solved by the combined application of the weighted residuals-Galerkin method and the finite difference method. The computation of u and v velocity components in x,y,z,t space was achieved through expansion in series of base function times undetermined coefficients over the depth. The computation of these coefficients giving the vertical variation of the velocity was done by the Galerkin method. The rapid convergence of this procedure permits a quick and economic evaluation of 3-D flows on a 2-D grid (in x,y space). The capabilities of the method were demonstrated by applying it to a tidal flow in an estuary. (Humphreys-ISWS)
W78-09971

EROSION OF FINE-GRAINED MARINE SEDIMENTS: SEA-FLOOR AND LABORATORY EXPERIMENTS,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic Labs.; and National Oceanic and Atmospheric Administration, Miami, FL. Marine Geology and Geophysics Lab.
R. N. Young, and J. B. Southard.
Geological Society of America Bulletin, Vol. 89, No. 5, p 663-672. May 1978. 8 fig, 3 tab, 34 ref, 1 apend. NONR 4029 (00)NR 260-101,N00014-75-C-0291, NOAA 04-5-022-7.

Descriptors: *Bottom sediments, *Bays, *Erosion, *Massachusetts, Laboratory tests, On-site tests, Sediments, Bottom sampling, Physical properties, Erosion rates, Velocity, Flow measurement, Instrumentation, Laboratory equipment, Flumes, Methodology, Data collections, Testing procedures, Evaluation, Sampling, Estuaries, *Buzzards Bay(MA), Seafloor, Critical shear velocity, Marine sediments.

Estimates of threshold erosion velocities have been obtained in the field and in the laboratory for marine mud relatively rich in organic matter and having an active infauna. A seafloor flume was used to erode undisturbed sediments on the seafloor, and a laboratory flume was used to study the effects of sampling, redeposition, bioturbation, organic-matter content, and compaction time on erosion resistance. Critical shear velocity, u*, for erosion of muds in situ ranged from 0.32 to 0.84 cm/s, and u* apparently was independent of season or bulk physical properties. Erosion was often, but not always, initiated in biogenically disturbed parts of the bed. Lee drifts around small bed-roughness elements were the most common constructional bedforms observed during the seafloor experiments, and narrow and shallow longitudinal furrows were the most commonly observed erosional features. Tidal u* values measured at the field site were of the same magnitude as the u* values measured with the seafloor flume. Mean u* for muds redeposited and bioturbated for 1 to 60 days in the laboratory flume (0.92 cm/s) was greater by a factor of two than mean u* for muds eroded in situ)0.45 cm/s). As bioturbation time in the laboratory increased, u* decreased. Increases in sediment organic content were found to increase u* systematically in flat, nonbioturbated laboratory beds. (Humphreys-ISWS)
W78-09993

COASTAL CURRENTS AND AN ASSOCIATED SAND STREAM OFF VIRGINIA BEACH, VIRGINIA,
Old Dominion Univ., Norfolk, VA. Inst. of Oceanography.
J. C. Ludwick.
Journal of Geophysical Research, Vol. 83, No. C5, p 2365-2372, May 20, 1978. 3 fig, 8 tab, 24 ref.

Descriptors: *Ocean currents, *Currents(Water), *Sediment transport, *Coasts, *Virginia, Beaches, Current meters, On-site investigations, Sands, Sediments, Winds, Tides, Tidal effects, Data processing, Oceanography, *Virginia Beach(VA), Tidal currents, Coastal currents.

Synotpic data on near-surface and near-bottom currents for two 1-month periods were analyzed for 6 stations located 3.5-7 km offshore. Tidal currents are rotary with long ellipse axes approximately parallel to the shoreline and are nearly synchronous. On the basis of amplitude, the 7 largest cons tituents of the currents were identified as M sub 2, S sub 2, N sub 2, K sub 1, O sub 1, J sub 1, and SO sub 1. Maximum tidal current speed decreases with distance to the south away from the entrance to Chesapeake Bay. Near the bottom, tidal currents at spring stength decrease from 32.4 cm/s at the entrance to 8.2 cm/s at a point 22 km to the south. Near bottom tidal currents are incompetent by themselves to move fine sand except in the entrance area. Forty hour low-pass currents are generated by winds and by sea surface slopes. They reach peak speeds near the surface of 48 cm/s in events of up to 6 days' duration. In summer, a strong pycnocline inhibits downward propagation of these high-speed surface currents. In the fall, the surface currents penetrate more readily to the bottom. Winds to the south in summer generate variations in wind regimes and corresponding currents seem to require a strong south slope to the sea surface in summer and a very gentle slope to the north in the fall. Waves entrain the bed sediment 60-83% of the time in depths of 8-13 m. With a threshold taken at 20 cm/s, only the south-directed low-pass curents supplement the incompetent tidal currents so as to produce sediment transport. Threshold exceedence in 8-13 m occurs 1-2% of the time under south-flowing low-pass currents in summer and 3-5% of the time under southerly low-pass currents in the fall. At 15 m, the transport threshold was not reached during the observation period. A coastwise parallel stream of intermittent bed sediment transport thus is defined. The frequency of exceedance decreases to the south away from the entrance area. This decrease is consistent with the seaward bulging configuration of isobaths east of Cape Henry. (Sims-ISWS)
W78-09995

STUDIES ON FINITE AMPLITUDE WAVES IN BOUNDED WATER BODIES,
Princeton Univ., NJ. Dept. of Civil Engineering.
A. Askar, and A. S. Cakmak.
Advances in Water Resources, Vol. 1, No. 4, p 229-246, June 1978. 4 fig, 11 ref, 3 append.

Descriptors: *Waves(Water), *Mathematical models, *Harbors, *Inlet(Waterways), *Flow, Model studies, Mathematical studies, Equations, Analytical techniques, Discharge(Water), Wind tides, Tidal effects, Fourier analysis, Velocity, Dynamics.

The problem treated was the dynamics of a bay where water is driven through its opening periodically in time. The basic equations were expressed in the two horizontal coordinates and time, and they were obtained by an integration of the Navier-Stokes equations in the vertical coordinate. The equations are nonlinear because of the convective terms in the acceleration. The problem of harbor dynamics provides a natural parameter as the ratio of mass of water entering the bay through the waves to the total mass of water in the bay. This small parameter multiplies the nonlinear terms; and, thus, the problem is suited ideally for a perturbation analysis. The nonlinear terms are responsible for the generation of secondary flows and are particularly important near resonant frequences. The analysis further indicated the existence of a time-independent flow analogous to acoustic streaming known from solutions of the Navier-Stokes equations. The question of vorticity was studied and it was seen that: a constant dissipation coefficient precludes the generation of vorticity even for the nonlinear case; and that only a weak (second order) vorticity can exist in the case of a variable dissipation term expressed through the Chezy coefficient. The study suggested also a semi analytic-numerical scheme with savings of 0(10 sq) for irregular geometries through the separation of the various order harmonics as opposed to the usual integration in time. (Humphreys-ISWS)
W78-09996

SUBSEA PERMAFROST AT PRUDHOE BAY, ALASKA: DRILLING REPORT AND DATA ANALYSIS,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-10003

SALTWATER INTRUSION IN THE FLORIDAN AQUIFER, COASTAL CITRUS AND HERNANDO COUNTIES, FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-10039

DEVELOPMENT OF GROUND WATER IN THE HOUSTON DISTRICT, TEXAS 1970-74,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10042

EARLY DIAGENESIS IN TRANSITIONAL SEDIMENTARY ENVIRONMENTS OF THE WHITE OAK RIVER ESTUARY, NORTH CAROLINA,
North Carolina Univ., Chapel Hill. Marine Sciences Program and Geological Survey, Denver, CO. Geologic Div.
For primary bibliographic entry see Field 2J.
W78-10043

A TRACER STUDY OF THE FLUSHING TIME OF THE SAMPIT RIVER ESTUARY, GEORGETOWN, SOUTH CAROLINA,
Geological Survey, Columbia, SC. Water Resources Div.
For primary bibliographic entry see Field 5B.

W78-10053

SYNERGISTIC EFFECTS OF ENVIRONMENTAL VARIABLES ON THE METABOLISM OF THE COPEPOD EUTERPINA ACUTIFRONS FROM TWO DIFFERENT AREAS OFF THE COAST OF THE STATE OF SAO PAULA, BRAZIL,
Sao Paulo Univ. (Brazil) Dept. of Physiology.
For primary bibliographic entry see Field 5C.
W78-10059

THE TOXICITY OF OILS AND PETROLEUM HYDROCARBONS TO ESTUARINE CRUSTACEANS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W78-10061

EFFECT OF EXPERIMENTALLY APPLIED CHLORINATED HYDROCARBONS ON THE BIOMASS OF THE FIDDLER CRAB, UCA PUGNAX (SMITH),
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W78-10062

REGIONAL GEOLOGY SERIES: PART V, ATLANTIC AND GULF COASTAL PLAIN REGION,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-10078

EFFECTS OF SALINITY AND TEMPERATURE ON THE ACUTE TOXICITY OF CADMIUM TO THE ESTUARINE CRAB PARAGRAPSUS GAIMARDII (MILNE EDWARDS),
Rostock Univ. (East Germany). Dept. of Animal Physiology.
For primary bibliographic entry see Field 5C.
W78-10144

FLORIDA OIL SPILL IMPACT ON THE BUZZARDS BAY BENTHIC FAUNA: WEST FALMOUTH,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-10180

PERSISTENCE OF AROCLOR 1254 IN A CONTAMINATED ESTUARY,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-10184

SOME NOTES ON THE SANDVLEI FISH FAUNA MUIZENBERG CAPE,
G. W. Begg
Piscator (Cape Town), Vol. 96, p 5-14, 1976, 2 fig, 11 ref.

Descriptors: *Estuarine environment, *Estuarine fish, Ecosystem ecology, Environment aspects, Human activity, Fishkills, South Africa, Sandvlie, Marina da Gama, Cyprinade, Glaxiidae, Gobiidae, Pomatomidae, Atherinidae, Stolephoridae, Carangidae, Sparidae, Mugilidae, Tetradontidae, Clinidae.

Sandvlei, near Muizenburg in the Cape has in the past been regarded as a most productive angling water, but since the turn of the century the activities of man has caused considerable changes, such as the building of a promenade, the construction of weirs and sluices, the building of bridges, draining, dredging and lately the building of the multi-million rand Marina da Gama. This is a reassessment of the States of the fish population in Sandvlei. A netting programme was undertaken in 1974 and 1975 some of the results of which are reported. Mention is also made to the 'Fish Death' crisis of 1973 when thousands of fish in Sandvlie died within a few days. (So Afr Water Info Center)
W78-10226

THE NPES RESEARCH ACTIVITIES OF ENVIRONMENTAL SCIENCES,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W78-10239

SCIENCES LAST WORD ON FATE OF ST LUCIA,
University of the Witwatersrand, Johannesburg (South Africa).
For primary bibliographic entry see Field 2H.
W78-10240

ISCOR COOLING WATER NO THREAT TO SALDANHA BAY, (IN AFRIKAANS).
For primary bibliographic entry see Field 5G.
W78-10245

MASS MORTALITY OF CAPE CORMORANTS CAUSED BY FISH OIL IN THE WALVIS BAY REGION OF SOUTH WEST AFRICA,
For primary bibliographic entry see Field 5C.
W78-10249

AIR-WATER FLOW IN COARSE GRANULAR MEDIA,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-10256

INTERIM REPORT ON MASONBORO INLET, NORTH CAOLINA, MOVABLE-BED MODEL TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W78-10272

CALCULATING USEFUL PRODUCTS FROM AN OCEANOGRAPHIC DATA BASE,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
D. B. Rao.
Manuscript Report Series No. 45, 1977. 35 p, 3 fig, 51 ref.

Descriptors: *Oceans, *Atmosphere, *Model studies, Data processing, Mathematical models, Temperature, Water temperature, Air temperature, Climates, Heat transfer, Solar radiation, Winds, Currents(Water), Oil spills, Salinity, Air-water interfaces, Climatology, Oceanography.

Some well-known methods were described for an analysis of available temperature and other data to obtain useful products; the importance of each of these products was pointed out. Also presented were an objective analysis technique that can resolve frontal characteristics and a procedure to predict the movement of oil slicks under the influence of random wind fields. (Sims-ISWS)
W78-10274

FLORIDA COASTAL ZONE MANAGEMENT PROGRAM (SECTION 305) STATUS REPORT TO THE GOVERNOR AND CABINET.
Florida Dept. of Natural Resources, Tallahassee. Div. of Resource Management.
For primary bibliographic entry see Field 6E.
W78-10383

PUBLIC USE OF COASTAL BEACHES,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 6E.
W78-10390

POWERS AND RESPONSIBILITIES OF LOCAL GOVERNMENTS, REGIONAL PLANNING COUNCILS AND THE DIVISION OF STATE PLANNING RELATIVE TO COASTAL ZONE MANAGEMENT.
Florida Div. of State Planning, Tallahassee.
For primary bibliographic entry see Field 6E.
W78-10407

FLORIDA'S COASTAL MANAGEMENT PROGRAM: THE NO NEW NOTHING ACT EXAMINED,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W78-10412

BARIUM CONTENT OF MARINE SEDIMENTS NEAR DRILLING SITES: A POTENTIAL POLLUTANT INDICATOR,
Scripps Institution of Oceanography, La Jolla, CA.; and Science Application Inc., La Jolla, CA.
For primary bibliographic entry see Field 5B.
W78-10432

ENVIRONMENTAL ANALYSIS FOR DEVELOPMENT PLANNING IN CHAMBERS COUNTY, TEXAS. VOL 3: COASTAL ZONE MANAGEMENT: A PROPOSED INCREMENTAL CHANGE SYSTEM FOR TEXAS,
Houston Univ., TX. Bates Coll. of Law.
For primary bibliographic entry see Field 6E.
W78-10438

MATHEMATICAL MODELING OF SHORELINE EVOLUTION,
Tetra Tech, Inc., Pasadena, CA.
B. Le Mehaute, and M. Soldate.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 641, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Coastal Engineering Research Center Miscellaneous Report No. CERC-MR-77-10, Oct 1977. 59 p, 21 fig, 2 tab, 33 ref. DACW72-7T-C-0002.

Descriptors: *Shore protection, *Mathematical models, *Resouces development, Coasts, Baseline studies, Environmental effects, Outer Continental Shelf.

A critical literature survey on mathematical modeling of shoreline evolution is presented. The emphasis is on long-term evolution rather than seasonal or evolution taking place during a storm. The one-line theory of Pelnard-Considere (1956) is developed along with a number of applications. Refinements to the theory are introduced by considering changes of beach slope, wave diffraction effects, wave variation, and variation of sea level. The case of hooked bays is also reviewed. It is concluded that a finite-difference mathematical scheme could be developed for engineering purposes for a small wave angle. For the large wave angle, shoreline instability does not permit use of a reliable mathematical model at this time. (Sinha-OEIS)
W78-10442

RESPONSE OF COASTAL WATERS OF ATMOSPHERIC FRONTAL PASSAGE IN THE MISSISSIPPI DELTA REGION,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
E. Daddio.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 108, Price codes: A03 in paper copy, A01 in

microfiche. Technical Report No. 234, May 1977. 48 p, 11 fig, 3 tab, 33 ref. N00014-75-C-0192.

Descriptors: *Currents, *Winds, *Coasts, *Environmental effects, Deltas, Baseline studies, Resources development, Mississippi, Outer Continental Shelf, Wind stress, Frontal passage, Severe storms.

Two current vector time series obtained in the Mississippi Bight exhibit clockwise polarized currents of near-inertial frequency that are closely associated with shifting winds. Because of the closeness of the local inertial period and the diurnal tidal period, it is difficult at first glance to determine the true nature of the observed rotary currents. However, complex demodulation at the inertial frequency reveals a strong signal accompanying wind shifts that are usually associated with the passage of atmospheric fronts. Spectral analysis for clockwise and counterclockwise frequencies indicates a highly energetic peak in the inertial-diurnal frequency band for the clockwise spectrum. The rotary coefficient is computed from the autospectra and quadrature spectrum of the vector components. A model using wind stress as a forcing function is highly effective in reproducing sinusoidal oscillations seen in the observed current. These oscillations occur in conjunction with shifts in the wind direction. Because of the close association of the near-inertial oscillations with local wind effects, it is concluded that inertial currents are locally induced by wind stress. Furthermore, wind stress not only initiates the rotary currents but is also highly effective in destroying them. (Sinha-OEIS)
W78-10444

MOBILE BAY MODEL STUDY. REPORT I: EFFECTS OF PROPOSED THEODORE SHIP CHANNEL AND DISPOSAL AREAS ON TIDES, CURRENTS, SALINITIES, AND DYE DISPERSION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W78-10445

THE MARINE RESOURCES OF ANAHEIM BAY,
Department of the Environment, Edmonton (Alberta).; and California State Univ., Long Beach. Dept. of Biology.
E. D. Lane, and C. W. Hill.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 163, Price codes: A09 in paper copy, A01 in microfiche. California Department of Fish and Game, Fish Bulletin 165, 1975. 199 p, 56 fig, 35 tab, 212 ref.

Descriptors: *Baseline studies, *California, *Coasts, *Aquatic life, Ecosystems, Bays, Water resources, Outer Continental Shelf, *Anaheim Bay(CA).

Four years of marine research in Anaheim Bay, Orange County, California is described. The history and oceanographic studies describe the background for biological work on marsh plants, invertebrates and fishes. This bulletin attempts to describe what species were present during the study period, their relative abundances, and in some cases a more detailed account of their life histories and population dynamics. There are 51 species of marsh plants and alage reported. The invertebrates are noted in annotated checklists, with most attention being centered on the polychaetes and parasitic crustaceans. Some detailed data is given and discussed on polychaete distribution and abundances. Comparisons are given of polychaete populations in pristine Anaheim Bay and developed Huntington Harbour. Forty-five species of fish are recorded from the inner portion of the bay and 42 species from the outer harbor. Information is given on the abundances, food, and capture of these species. More detailed accounts of the life histories of six of the more common fish species are described. Life histories include discussions on the numbers, age, growth, food and feeding, and behavior in Anaheim Bay. Where applicable comparisons are drawn with populations elsewhere, such comparisons tend to indicate that the Anaheim Bay salt marsh is an area of very high growth rates and productivity. (Sinha-OEIS)
W78-10446

PHYSICAL AND BIOLOGICAL MEASUREMENTS, JULY 29 - AUGUST 5, 1973, (CRUISE Y7307D),
Inter-American Tropical Tuna Commission, La Jolla, CA., and Oregon State Univ., Corvallis. School of Oceanography.
M. Stevenson, and L. Small.
International Decade of Ocean Exploration, Coastal Upwelling Ecosystems Analysis, Technical Report CUEA-34, July 1977. 53 p, 30 fig, 2 tab, 6 ref. NSF-GX 41561; OCE76-82834.

Descriptors: *Ecosystems, *Upwelling, *Nutrients, *Orgeon, *Water quality, Baseline studies, Resources development, Outer Continental Shelf, Oceanographic data.

Physical and biological information corresponding to cruise Y7307D is given. The methods and procedures used at sea and in the laboratory to process the drouge, STD and biological measurements are reviewed. The data are divided into physical and biological measurements are reviewed. The data are divided into physical and biological measurements, and drogue measurements and are presented in both graphic and tablar formats. Emphasis is given to the drifing (Lagrangian) time series of physical and biological measurements data and their time changes. (Sinha-OEIS)
W78-10447

APPLICATION OF REMOTE SENSING TO THE CHESAPEAKE BAY REGION. VOLUME 2-PROCEEDINGS,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 5A.
W78-10448

WILL WE SAVE OUR COASTS,
Senate, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-10450

PROMISED LANDS: AN ANALYSIS OF WETLAND SUBDIVISIONS IN FLORIDA,
INFORM Inc., New York.
For primary bibliographic entry see Field 6G.
W78-10460

SHORELINE EROSION CONTROL ON VIRGINIA'S RIVERS AND BAYS,
Soil Conservation Service, Warsaw, VA.
For primary bibliographic entry see Field 8B
W78-10461

AUTHORITY OF COASTAL SUBSIDENCE DISTRICT CHALLENGED,
Harris-Galveston Coastal Subsidence District, Houston, TX.
For primary bibliographic entry see Field 6E.
W78-10483

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

MANUALLY OPERABLE REVERSE OSMOSIS APPARATUS,
Desalination Systems, Inc., Escondido, CA. (Assignee).
D. T. Bray.
U.S. Patent No. 4,070,280, 7 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office. Vol. 966, No. 4, p 1490, January 24, 1978.

Descriptors: *Patents, Water purification, *Water quality control, *Reverse osmosis, Membrane processes, Semipermeable membranes, Equipment, Feed water, Water treatment.

The apparatus and method of this invention, for purifying water by reverse osmosis, comprises a tubular pressure resistant container housing a semipermeable membrane cartridge having generally longitudinal, that is from end to end, internal channels for passage of feed water; a pump for introducing feed water under elevated pressure into the pressure resistant container near one end and means for actuating the pump; means for collecting water purified by transport through the semipermeable membrane in the semipermeable membrane cartridge, and means for releasing the feed water as brine from the pressure resistant container near the other end while maintaining operating pressure by a conventional restrictor or back pressure control valve. (Sinha-OEIS)
W78-09834

POWER GENERATION AND POTABLE WATER RECOVERY FROM SALINOUS WATER,
Universal Oil Products Inc., Des Plaines, IL. (Assignee).
D. B. Carson.
U.S. Patent No. 4,072,579, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 967, No. 1, p 230, February 7, 1978.

Descriptors: *Patents, *Desalination, *Electric power production, *Potable water, Solar radiation, *Flash distillation, Separation techniques, Desalination apparatus, Sea water, Water treatment, *Vacuum flash zones.

Sea water, at a temperature of about 85F, is introduced into the solar pond where the temperature is increased to a level in the range of about 135F (56.8 deg C) to about 200F (93 deg C). The heated sea water passes into the storage pond, or sump, from which it is charged to the unit at the designed hourly rate. Power will be generated, and potable water recovered as a result of a temperature increase of as little as 50F; however, it is readily apparent that the higher the temperature, the more efficient the process and the greater the generation of power and recovery of potable water. The invention involves the use of three individual vacuum flash zones. The resulting three vaporous phases are passed through separate turbines, functioning in tandem, from which the power is generated. The last salinous liquid phase is employed as the heat-exchange medium in a closed-loop hydrocarbon vaporizaton cycle, the vapors being used to drive a separate turbine and thus increase the quantity of generated power. The vapors exiting from the turbines are cooled and/or condensed to recover potable water. (Sinha-OEIS)
W78-09849

THERMODYNAMICS OF THE SULFUR DIOXIDE-SEAWATER SYSTEM,
California Univ., Berkeley. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2K.

W78-09990

NEAR EAST DESALTING - THE CONSERVATIVE APPROACH,
Ministry of Electricity and Water, Kuwait.
Y. K. Shuhaibar.
Desalination, Aug. 1975, Vol. 17, No. 1, p 69-73.

Descriptors: *Kuwait, *Desalination processes, *Desalination plants, *Desalination apparatus, Saline water, Flash distillation, Evaporators.

Historically the arid countries of Arabia have relied upon shallow underground wells to supply their needed water; as small settlements have grown to become trade and economic centers, however, the governments of those countries have begun to develop alternate sources. In 1953 the government of Kuwait commissioned its first desalting operation, a ten triple-effect submerged tube evaporator plant of a total capacity of 1,000,000 Imp. g.p.d. Kuwait has since come to depend solely upon desalinization for its fresh water. In 1955 ten 100,000 Imp. gpd. units of a similar type were installed and between 1957-1958 four flash type evaporation plants were constructed. Around this time the multi-stage flash (MSF) desalination process was developed and has since proven to be the most reliable, efficient, and economic method of desalting not only in Kuwait but worldwide. At present there are 3 such desalination centers in Kuwait with a fourth under construction. From the beginning of its desalination program Kuwait has adopted a dual purpose system; electric power is generated in steam driven turbo generator units and the low pressure steam exhaust from the turbines is the heat energy source for sea water desalting evaporators. Over the years the government of Kuwait has continued to improve and expand its desalination program and has become an international leader in the field. (Tickes-Arizona)
W78-10014

ARIZONA WELLS TO HELP SUPPLY WATER TO MEXICO,
Universal Oil Products Inc., Fresno, CA. Johnson Div.
G. H. Lesch.
Johnson Drillers Journal, March-April, 1978, p 1-3, 3 fig, 2 tab.

Descriptors: *Mexican Water Treaty, *Colorado River desalination, Water wells, Specific capacity, Drilling fluids, Water well development, Arizona, Mexico.

In a treaty with Mexico, the U. S. agreed to supply water of a specified quantity and quality from the Colorado River. Water in the Colorado river becomes progressively more mineralized as it moves downstream. Return-flow seepage from irrigation picks up mineral salts from the soil. In order to meet the terms of the treaty, a desalting plan to treat 109 mgpd is the key factor. However, operation of this plant cannot start before 1981. A second factor is the construction of 30 or more high capacity wells located just north of the border in Arizona which will pump 160 acre feet per year into the Colorado river. The results of step drawdown tests for the first four wells were less than expected. A fifth well was drilled using a 'Revert' drilling fluid. This reduced the fuel consumption of the mud pump and increased the specific capacity of the well. (Purdin-NWWA)
W78-10088

TREATMENT OF EFFLUENT FROM THE ATHLONE SEWERAGE PLANT BY THE DESAL PROCESS,
National Inst. of Metallurgy, Johannesburg (South Africa).
For primary bibliographic entry see Field 5D.
W78-10232

AN ION-EXCHANGE PROCESS WITH THERMAL REGENERATION - XII. DESALTING OF SEWAGE EFFLUENTS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
For primary bibliographic entry see Field 5D.
W78-10396

3B. Water Yield Improvement

DUAL STANDPIPE ARRANGEMENT SUPPLEMENTING A WATER SUPPLY SYSTEM,
J. D. Wittenmyer.
U.S. Patent No. 4,072,168, 7 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 967, No 1, p 97, February 7, 1978.

Descriptors: *Patents, *Water supply, *Water supply development, *Water storage, Water delivery, Water demand, *Standpipes.

This invention provides a dual standpipe construction and arrangement which can serve as an adjunct to and standby installation for a water supply system. The use of it insures that the consumers in a community depending on the water supply system will be furnished with an adequate supply of water under a desired level of pressure at all times, even during peak demand periods. The standpipe structure comprises an outer tank and a second inner standpipe. The arrangement is such that the inner or small diameter standpipe serves as a medium through which water may be directed from the source to fill the outer standpipe. Suitable control means are provided to terminate the flow of water from the source when the water reaches a certain level within the outer standpipe. The distribution line which connects directly into the bottom of the outer standpipe serves as a medium through which water from the tank may be delivered into the related main in the event the pressure head, dependent on the level of water in the tank, is greater than the pressure in the related main. A check valve is provided in the distribution line which is arranged to normally be closed when the pressure in the main is at an adequate level.
W78-09847

PROJECT SONORA: RAIN STIMULATION PROGRAM (PROYECTO SONORA: PROGRAMA DE ESTIMULACION DE LLUVIAS),
Departmento de Hidrometeorologia y Prediccion, Mexico City.
D. Kraemer Malinowsky, C. Latorre Diez, and O. Cervantes Sanchez.
Recursos Hidraulicos, Vol. 6, No. 2, 1977, p 104-125. 8 fig.

Descriptors: *Cloud seeding, *Weather modification, Meteorology, Mexico, Water storage, Precipitation(Atmospheric), Sonora, River basins.

In response to the drought suffered recently in the State of Sonora, Mexico, the Secretary of Hydraulic Resources of that state promoted the application of rain stimulation techniques in the Yaqui, Mayo and Sonora river basins from July 7 to October 4, 1976. Clouds were seeded simultaneously from the ground and from the air. Silver iodide generators were installed at ground level where ascending air currents could carry the nuclei to altitudes at which they could affect the colloidal instability of the clouds. Aerial cloud-seeding was carried out by depositing liquid nuclifying material on the cloud base. A preliminary analysis of the results indicates that on 91% of the operating days, precipitation was measured by at least one hydrometric station, while on 83% of those days rain was detected by three or more [illegible]in stations. After seeding was completed, the volume of water stored in five dams (La Angostura, P. Elias Calles, Alvaro Obregon, A. Ruiz Cortines and Abelardo Rodriguez) had increased from 21% to 41% of total capacity. (Russell-Arizona)
W78-10015

HOW TO PREVENT BIG LOSSES THROUGH WATER SHORTAGES,
J. Whillier.
South African Mining and Engineering Journal (Johannesburg) Vol. 88, No. 4131, p 67, 71, 75, 1977. 2 fig, 2 tab.

Descriptors: *Reticulation system, Water supply, *Water shortage, Underground, *Gold mines, Intake systems, Pipe flow, Hydraulic head, *Water conservation, *South Africa.

Each South African goldmine loses the equivalent of at least one production shift a year because of water shortages - and it may well be more. This is equivalent to 2,300 kilograms of gold, worth about R9,000,000 per annum. Alternatively, the shifts lost can be regarded as an increase in costs, grossing some R6,000,000, another contributor to cost inflation on a national scale. The author outlines a proposed reticulation system aimed at overcoming costly water shortages underground. (So Afr Water Info Center)
W78-10219

HAIL A PROBE TO THE CORE,
Council for Scientific and Industrial Research, Pretoria (South Africa).
A. E. Carte.
Scientiae, Pretoria, Vol. 17, No. 2, p 5-10, 1976.

Descriptors: *Hail, *Cloud seeding, *Weather modification, Clouds, Climatology, Damage, Deuterium, Nelspruit, South Africa.

Results of a hail research project in the Pretoria - Witwatersrand area are reviewed. Detailed knowledge of the hail climatology has been built up and differences in hail frequency between urban and rural areas were revealed. Studies of thunderstorm structure with a weather radar have shown differences between the types of storms found here and those in the northern hemisphere. Investigations of the structures of hailstones have provided insight into their mode of growth and have revealed the complexity of airflow patterns in storms. It was concluded that further basic knowledge is needed before effective hail suppression operations are possible. (So Afr Water Info Center)
W78-10244

RANK TESTS IN WEATHER MODIFICATION EXPERIMENTS,
Florida State Univ., Tallahassee. Dept. of Statistics.
M. A. Hanson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A-042 051 Price codes: A02 in paper copy, A01 in microfiche. FSU-Statistics Report No. 420, TR-119-ONR, May 1977. 14 p, 3 fig, 6 ref. ONR N00014-76-C-0394.

Descriptors: *Weather modification, *Cloud seeding, *Evaluation, Mathematics, Statistics, Analytical techniques, Precipitation(Atmospheric), Rainfall, Meteorology, *Rank tests.

Rank tests frequently are used in the comparison of seeded and unseeded responses or of control and target responses in weather modification experiments. One of the more frequently used tests is the sum of squared ranks test, which under certain questionable assumptions has been shown to have a higher asymptotic efficiency relative to the more conventional Wilcoxon test, that is the sum of (first power) ranks test. This paper investigated the pertinence to reality of the underlying assumption in the analysis of weather modification experiments by rank methods. It was shown that the squared rank test is not uniformly more efficient than the Wilcoxon test. (Sims-ISWS)
W78-10265

3C. Use Of Water Of Impaired Quality

PREDICTING EFFECTS OF SULFURIC ACID ON QUALITIES OF IRRIGATION AND DRAINAGE WATERS IN CALCAREOUS SOILS,
Texas A and M Univ. Agricultural Research Station El Paso.
For primary bibliographic entry see Field 5G.
W78-09944

POTASSIUM RELEASE IN SOME SALINE SOILS OF ISRAEL,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2G.
W78-10006

MIDDLE EAST - CANALS AND IRRIGATION PROBLEMS,
Gibb (Alexander) and Partners, Reading (England).
For primary bibliographic entry see Field 3F.
W78-10007

A LOW-SALT DIET FOR THE COLORADO RIVER,
Soil Conservation Service, Phoenix, AZ.
For primary bibliographic entry see Field 5G.
W78-10013

REHABILITATION OF COPPER MINE TAILING SLOPES USING MUNICIPAL SEWAGE EFFLUENT,
Arizona Univ., Tucson. School of Renewable Natural Resources; and Cyprus Pima Mining Co., Tucson.
For primary bibliographic entry see Field 5G.
W78-10024

3D. Conservation In Domestic and Municipal Use

MANAGEMENT OF WATER QUANTITY AND QUALITY IN AN ARID URBAN ENVIRONMENT: A STUDY OF LAS VEGAS VALLEY, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-09826

RISK ANALYSES FOR A WATER-SUPPLY SYSTEM--OCCOQUAN RESERVOIR, FAIRFAX AND PRINCE WILLIAM COUNTIES, VIRGINIA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-10048

3E. Conservation In Industry

PROPERTY RIGHTS TO GEOTHERMAL RESOURCES (PART TWO),
California Univ., Berkeley. School of Law.
For primary bibliographic entry see Field 6B.
W78-09881

HYDROLOGIC DATA FOR THE COPPER BASIN AREA, A POTENTIAL MINING AREA IN YAVAPAI COUNTY, ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10040

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN BOLIVAR, CARROLL, LEFLORE, SUNFLOWER, AND TALLAHATCHIE COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, MS. Water Resources Div.
G. J. Dalsin.
Mississippi Research and Development Center, Jackson 1978. 67 p, 31 fig, 10 tab, 56 ref.

Descriptors: *Water resources development, *Industries, *Agriculture, *Surface waters, *Groundwater, Water demand, Water supply, Available water, Water quality, Hydrologic data, Streamflow, Flow rates, Aquifer characteristics, Water wells, Water yield, Water levels, Well data, Water analysis, Chemical analysis, Mississippi, *Bolivar County, *Carroll County, *Leflore County, *Sunflower County, *Tallahatchie County.

Ground water is the present major source of public and industrial water supplies in Bolivar, Carroll, Leflore, Sunflower, and Tallahatchie Counties, Mississippi. In 1975, 442 Mgal/d (million gallons per day) were pumped from aquifers, and 72 Mgal/d were withdrawn from streams in the area. Average runoff to river basins is 2,000 Mgal/d. Principal streams are the Mississippi, Yazoo, Tallahatchie, Yalobusha, Big Sunflower, and Big Black Rivers. The estimated minimum flow of the Mississippi River is 57,000 Mgal/d. The low flow of the Yazoo River is more than 465 Mgal/d and the Sunflower River more than 90 Mgal/d during a drought of 10-year recurrence interval. Surface-water quality problems may include organic pollution, and high suspended-sediment concentrations. The fresh-ground-water section if 600 to 2,000 feet thick. Tertiary aquifers, the major source of public, industrial, and domestic water supplies, are capable of supplying 1 Mgal/d or more to well fields in most places. The Mississippi River valley alluvial aquifer supplies water for irrigations, cooling, and industrial uses. Well fields can supply several Mgal/d. Ground water is highly mineralized in downdip areas of the Tertiary aquifers. Iron and low pH cause problems locally in water supplies. Water in the Mississippi River valley alluvial aquifer is hard and contains excessive iron. (Woodard-USGS)
W78-10041

ADSORPTION ON ACTIVATED CARBON: A SOLUTION TO DYE WASTE PROBLEMS,
Chemviron Ltd., Basingstoke (England).
For primary bibliographic entry see Field 5D.
W78-10201

HOW TO PREVENT BIG LOSSES THROUGH WATER SHORTAGES,
For primary bibliographic entry see Field 3B.
W78-10219

THE ELUTION OF GOLD FROM ACTIVATED CARBON USING DEIONIZED WATER,
Anglo American Research Lab., Johannesburg (South Africa).
R. J. Davidson, and D. Duncanson.
Journal of the South African Institute of Mining and Metallurgy (Johannesburg), Vol. 77, No. 12, p 254-261, 1977. 8 ref, 10 fig, 6 tab.

Descriptors: *Elution, *Activated carbon, *Deionized water, Separation techniques, Pretreatment, Sodium cyanide, Calcium cations, Hydroxyl anions, Adsorption, *Metals recovery, Ionic strength, Water quality, Base metals, Metal complexes, *South Africa, *Gold, Silver.

The pretreatment of gold-loaded activated carbon with a relatively strong sodium cyanide solution prior to elution with deionized water at 90 to 125 degrees centigrade has been shown to have a most beneficial effect on the elution of gold. The findings emphasize the important role played by the calcium cation and the hydroxyl anion in effecting efficient elution of gold. The elution of the relatively unstable complexes of silver and base metals with cyanide was also significantly affected by the ratio of the sodium cyanide to sodium hydroxide in the reagents used in the pretreatment stage. It was demonstrated that the use of 0.5 bed volume of a pretreatment reagent comprising 10 per cent sodium cyanide stabilized with 1 per cent sodium hydroxide for safety reasons resulted in a virtually 100 per cent recovery of adsorbed gold, silver, and base metals on subsequent elution with deionized water. The elution procedure takes a relatively short time, about 14 hours at 90 degrees centigrade (7 bed volumes) or 3 hours if pressure elution at 125 degrees centigrade (4 to 5 bed volumes) is used. Because the mechanism of elution after pretreatment entails the shifting of a physical rather than a chemical equilibrium, the higher the gold loading of the activated carbon, the more efficient is the elution procedure. When compared with other elution procedures, the proposed method appears to have several economic advantages. (So Afr Water Info Center)
W78-10221

GROOTVLEI GETS SECOND DRY COOLING TOWER.
Construction in Southern Africa (Johannesburg), Vol. 22, No. 4, p 32-33, 35, 1977. 2 fig.

Descriptors: *Dry cooling towers, *Cooling towers, Water saving, Thermal powerplants, Thermal pollution, *South Africa(Grootvlei Power station).

Escom's engineers have extended their experience of dry cooling towers with the installation of the second one at the Grootvlei power station. These towers hold considerable water saving advantages and it is expected they will become standard equipment later this century when South Africa's water conservation needs become more pressing. (So Afr Water Info Center)
W78-10222

SOLAR ENERGY, WATER, AND INDUSTRIAL SYSTEMS IN ARID LANDS, TECHNOECOLOGICAL OVERVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6B.
W78-10288

3F. Conservation In Agriculture

ANALYSIS OF WATER REQUIREMENTS FOR AGRICULTURAL IRRIGATION IN PENNSYLVANIA,
Pennsylvania State University, University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6D.
W78-09827

DRAINAGE MANUAL, A GUIDE TO INTEGRATING PLANT, SOIL, AND WATER RELATIONSHIPS FOR DRAINAGE OF IRRIGATED LANDS.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W78-09828

ADJUSTABLE IRRIGATION DAM,
K. Jarvis.
U.S. Patent No. 4,070,864, 5 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 5, p 1682, January 31, 1978.

Descriptors: *Patents, *Irrigation dams, *Irrigation practices, *Irrigation efficiency, Irrigation ditches, Flow control, Barriers, Obstruction to flow, *Portable irrigation dam.

An adjustable portable irrigation dam for use in an irrigation ditch selectively raises the water level upstream of the dam thereby permitting removal of water for irrigation of crops. The dam includes an elongated sheet support member extending transversely across the irrigation ditch. It is rotatably supported by members selectively positioned on opposite sides of the ditch so that rotation of the support member will selectively raise and lower one end portion of a sheet of flexible material into and out of blocking relation to the irrigation ditch. Retaining mechanism is connected to the sheet support member for retaining the support member and the flexible sheet in a selected position. (Sinha-OEIS)
W78-09840

IRRIGATION SYSTEM,
Crown American Irrigation, Inc., Eugene, OR. (Assignee).
P. E. Batson.
U.S. Patent No. 4,072,205, 4 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 967, No. 1, p 110, February 7, 1978.

Descriptors: *Patents, Irrigation, *Irrigation systems, *Irrigation efficiency, Application equipment, *Movable irrigation line.

A new and improved drive for a movable irrigation line is described. A vertical shaft engine is mounted by a bracket on the side of a cart beam serving as a hydraulic reservoir. The engine drives a pump which is selectively connected by a manual valve to drive positive displacement hydraulic motors in series to rotate a bull gear. The bull gear turns a torque tube to rotate an irrigation pipe and wheels keyed to the pipe. The torque tube also drives sprockets to rotate wheels of a cart supporting the beam. (Sinha-OEIS)
W78-09848

EFFECT OF IRRIGATION SYSTEMS ON THE WATER REQUIREMENTS OF SWEET CORN,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
C. W. Wendt, A. B. Onken, O. C. Wilke, R. Hargrove, and W. Bausch.
Soil Science Society of America Journal, Vol. 41, No. 4, p 785-788, July-August 1977. 3 fig, 2 tab, 14 ref.

Descriptors: Irrigation systems, *Sprinkler irrigation, Furrow irrigation, Subsurface irrigation, *Corn, Evapotranspiration, Tensiometers, Soil moisture, Irrigation efficiency.

A field study was conducted to determine the influence of sprinkler irrigation (Sp), furrow irrigation (F), subirrigation (Su), and automated subirrigation (ASu) on the water requirements of sweet corn. Irrigation water was applied to the SP, F, and Su plots when the soil water potential at the 30-cm depth in the row reached -40 cbars potential. The time and amount of water applied was based on a combination of leaf area index (LAI) and potential evapotranspiration (ET(p)). Water application to the ASu plots was controlled by a switching tensiometer 30 cm deep set at -40 cbars potential. Soil water content changes were determined by gravimetrically sampling the surface 15 cm and obtaining neutron probe measurements of water in the deeper depths. Significant differences existed in the irrigation water requirement of the sweet corn irrigated by the different systems (F = 351 mm, SP = 248 mm, Su = 248 mm, Asu = 142 mm). However, little difference in consumptive use occurred between systems (F = 361 mm, Sp = 346 mm, Su = 346 mm, ASu = 310 mm) due to differences in soil water utilization. Automation of irrigation systems offers the possibility of significantly enhancing irrigation water use efficiency in supplementally irrigated areas. (Skogerboe-Colorado State)
W78-09925

INTERACTIONS OF LEAD AND CADMIUM ON METAL UPTAKE AND GROWTH OF CORN PLANTS,
Argonne National Lab., Argonne, IL.
J. E. Miller, J. J. Hassett, and D. E. Koeppe.
Journal of Environmental Quality, Vol 6, No 1, p 18-20, January-March 1977. 4 tab, 21 ref.

Descriptors: *Lead, *Cadmium, Heavy metals, *Crop response, *Corn(Field), Crop production, Greenhouses, *Absorption, *Plant growth.

Short term plant accumulation and growth effects of Pb and Cd added to soil separately and in combination were investigated with corn grown in a loamy sand under greenhouse conditions. A tendency for soil Pb to increase both the plant Cd concentration and the total Cd uptake of the corn shoots was observed. Conversely, soil Cd reduced the total Pb uptake and in some cases the Pb concenration in the corn shoots. Both (125 and 250 micro/g soil) and Cd (2.5 and 5 micro/g soil) reduced the vegetative growth of the corn shoots, and a positive interaction of the two metals on growth was noted. (Skogerboe-Colorado State)
W78-09943

WHEAT CANOPY TEMPERATURE: A PRACTICAL TOOL FOR EVALUATING WATER REQUIREMENTS,
Agricultural Research Service, Phoenix, AR. Water Conservation Lab.
R. D. Jackson, R. J. Reginato, and S. B. Idso.
Water Resources Research, Vol. 13, No. 3, p 651-656, June 1977. 6 fig, 27 ref.

Descriptors: *Wheat, *Temperature, Crop response, Irrigation, Soil water, Soil moisture, Lysimeters, Evapotranspiration, Irrigation efficiency, *Water requirements.

Canopy temperatures were measured on durum wheat grown in six differentially irrigated plots. Soil water content was measured by using a neutron-scattering technique at two locations within each plot. Water contents, in 20-cm increments to 160 cm, were determined two to five times per week. A sliding cubic smoothing technique was used to calculate daily water contents and thus water depletion rates for the entire growing season. Canopy temperatures were measured daily between 1330 and 1440 hours. Air temperatures measured at 150 cm above the soil surface were subtracted from the canopy temperatures to form the difference Tc - Ta. The summation of Tc - Ta over time yielded a factor termed the 'stress degree day' (SDD). The SDD concept shows promise as an indicator for determining the times and amounts of irrigations. An expression relating evapotranspiration (ET) to net radiation and Tc - Ta was simplified and tested by using ET measurements with a lysimeter. The expression was used to predict water use by wheat in the six plots. Predicted ET and measured water used agreed reasonably well. The expression may be useful in determining amounts of irrigation water to apply. (Skogerboe-Colorado State)
W78-09951

POTENTIAL FOR REDUCING EVAPORATION DURING SUMMER FALLOW,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 2D.
W78-09961

MIDDLE EAST - CANALS AND IRRIGATION PROBLEMS,
Gibb (Alexander) and Partners, Reading (England).
C. H. Swan.
The Quarterly Journal of Engineering Geology, 1978, Vol. 11, No. 1, 1 tab, 8 fig, 8 ref.

Descriptors: *Irrigation effects, *Irrigation canals, *Water loss, Gypsum, *Irrigation practices, Water table, Irrigation design, Irrigated land, Irrigation efficiency, Irrigation engineering, Water injury, Soil chemical properties, Soil physical properties, Water management, Soil conservation, Water distribution, Drainage systems, Salinity, Sedimentation, Seepage, Saline soils, Saline water, Deposition, Syria, Sudan, Middle East, Winds, Sands, Clays.

This study deals with universal problems of irrigated agriculture in arid lands based upon experiences in the Middle East. Three types of problems are analyzed: (1) water losses, (2) rising groundwater table, and (3) properties of soil/rock. Loss of irrigation water is discussed in three categories: Transmission losses, field losses, and regulation losses (the latter not discussed here). Transmission losses are variable but can be as high as 60% depending upon soil texture, depth of water in the canal and the relationship between the water level in the canal and the water table. There are several methods of reducing this loss. The usual method is lining the canals with various materials, but piped distribution schemes, elevated flumes and various methods of continuous watering such as trickle are also promising. Rising groundwater is a serious problem especially in the Middle East. The mechanics of the problem are well known and the resultant salinization has put hugh areas of land out of production all over the Middle East. Problems with clay and gypsum are also common in this area of the world. Clays cause problems with cracking or infiltration and gypsum frequently breaks down the soil structure. Problems with wind blown sand are also well documented. (Tickes-Arizona)
W78-10007

EVALUATION OF THE BENEFITS OF RURAL WATER SUPPLY PROJECTS IN TANZANIAN VILLAGES,
Duke Univ., Durham, NC. Dept. of Civil Engineering.
D. Warner.
Journal American Water Works Association, Vol. 67, June 1975, p 318-321. 3 tab, 6 ref.

Descriptors: *Project post-evaluation, *Tanzania, *Rural areas, *Project planning, *Water supply development, Planning, Water management, Water utilization, Water supply, Water allocation, Distribution, Efficiencies, Potential water supply, Water quality, Public health, Social aspects, Surveys.

The scarcity of money and manpower and the importance of rural water supplies in agriculturally based Tanzania, led the government to initiate this study into the efficiency of its rural water supply projects. A two-year field study from 1968-1970 collected empirical data from 15 villages and evaluated it to determine the effects of improved water supplies. Data was collected by students from the University of Dar-es-Salaam with the aid of a standardized questionnaire administered to randomly selected households as well as through field measurements of walking distances and water qualities, conversations with local officials, government reports and records, and observations of local conditions. Two similar surveys with an interval from 4 1/2 to 7 months were carried out in each village. By this time of the second survey, seven of the fifteen villages had begun using improved water supplies and seven continued to use traditional sources. The study examined six categories of potential benefits: (1) health, (2) productivity, (3) socialism, (4) self reliance, (5) modernization and (6) education. The results are presented in percentage form for both groups of villages. When all villages are considered together, the health category has the largest proportion of benefit occurrences (31) followed by self reliance (23), socialism (22), productivity (13), and modernization (9). The villages with improved supplies achieved benefits at twice the rate of villages

without improvement. This study uses a complex system of several variables in formulating priority rankings. Rankings are based upon the relationship between the benefits and the basic development policies of the country. Priority is given to benefits with proven success and low risk. (Tickes-Arizona)
W78-10008

A LOW-SALT DIET FOR THE COLORADO RIVER,
Soil Conservation Service, Phoenix, AZ.
For primary bibliographic entry see Field 5G.
W78-10013

A LAND IMPRINTER FOR REVEGETATION OF BARREN LAND AREAS THROUGH INFILTRATION CONTROL,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
For primary bibliographic entry see Field 4C.
W78-10025

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN BOLIVAR, CARROLL, LEFLORE, SUNFLOWER, AND TALLAHATCHIE COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 3E.
W78-10041

THE WINTERS DOCTRINE: HISTORICAL PERSPECTIVE AND FUTURE APPLICATIONS OF RESERVED WATER RIGHTS IN ARIZONA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6E.
W78-10074

CAUTION: RURAL WATER DISTRICTS,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 6E.
W78-10086

INTERACTIVE MULTIOBJECTIVE WATER RESOURCES PLANNING: AN APPLICATION AND SOME EXTENSIONS,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-10097

RISK AND RELIABILITY IN THE DEVELOPMENT OF WATER RESOURCES FOR AGRICULTURE,
Food and Agriculture Organization of the United Nations, Rome (Italy).
H. W. Underhill, and J. A. Sagardoy.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 306-313, 1978. 1 fig, 1 ref.

Descriptors: *Risks, *Reliability, *Water resources development, *Agriculture, *Crop response, *Failures, Frequency analysis, Effects, Timing, Water quality, Project planning, Insurance, System vulnerability, *Non-physical factors.

Agriculture requires water to be available to crops within certain limits of quantity, quality and time. If these requirements are not met, a partial or total failure of the crop will result. Further research is needed to quantify these risks, particularly in regard to crop response to variations in water quality and the timing of water shortages. However, recent experiences of water developments for agriculture suggest that the risk of poor performance is greater than is indicated by the variability of physical inputs alone. It appears that non-physical--social, economic, and political--factors play an important and sometimes dominant role. These factors are discussed herein, and it is argued that risk analysis for water developments in agriculture may be incomplete and misleading if they are neglected in project planning. (See also W78-10094) (Bell-Cornell)
W78-10112

IRRIGATION OF FRUIT TREES (IN AFRIKAANS AND ENGLISH),
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Horticulture.
I. Levin.
Deciduous Fruit Grower, Cape Town, Vol. 26, No. 8, p 314-322, 1976. 4 ref.

Descriptors: *Irrigation, *Fruit trees, *Soil water movement, Agriculture, *Soil moisture content, Plant growth, Agricultural production, Drip irrigation, Microirrigation, Surface irrigation, Spray irrigation, Comparisons, Soil water plant relationships, Israel, South Africa.

In this article the author discusses the purpose of irrigation, factors to consider when planning an irrigation regime, the influence of climatic conditions and how to evaluate them for irrigation requirement purposes, the contribution of the plant to the rate of water loss, the soil factor in the total water loss by the process of evapotranspiration and how to plan an optimal irrigation regime. The latter is done with special reference to sandy soils without a high water table, and is based on his experience in Israel. Modifications will have to be applied for shallow sandy soils on a clay layer, soils with a high water table and heavier oil types. The main point he wants to stress is that during the period of fruit development, the trees should suffer no water stress. When sufficient water is available this procedure can be followed, but if the water supply is limited, the producer must try to go for the maximum economic yield per unit of water applied. (So Afr Water Info Center)
W78-10237

COMPILATION OF FEDERAL, STATE AND LOCAL LAWS CONTROLLING NONPOINT POLLUTANTS. AN ANALYSIS OF THE LAW AFFECTING AGRICULTURE, CONSTRUCTION, MINING AND SILVICULTURE ACTIVITY.
Aspens Systems Corp., Germantown, MD.
For primary bibliographic entry see Field 5G.
W78-10387

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

MANAGEMENT OF WATER QUANTITY AND QUALITY IN AN ARID URBAN ENVIRONMENT: A STUDY OF LAS VEGAS VALLEY, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-09826

DRAINAGE MANUAL, A GUIDE TO INTEGRATING PLANT, SOIL, AND WATER RELATIONSHIPS FOR DRAINAGE OF IRRIGATED LANDS.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W78-09828

FLOATING APPARATUS FOR WEEDING AND DREDGING WATERWAYS,
D. P. Virgilio.
U.S. Patent No. 4,070,978, 6 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 966, No. 5, p 1719, January 31, 1978.

Descriptors: *Patents, Channels, Channel improvement, *Dredging, Cleaning, Weeds, *Weed control, Barges, Equipment.

A floating apparatus is described that is equipped with an articulated boom which can be used to remove weeds and other debris from waterways in an efficient and economical manner. The floating apparatus comprises a barge member having an articulated boom device equipped with a number of instrumentalities for clearing the waterway. The barge has a number of stabilizing members which are used to position the barge in a given location. In a preferred embodiment a motor means is provided to move the barge and its apparatus from one location to another. (Sinha-OEIS)
W78-09841

DUAL STANDPIPE ARRANGEMENT SUPPLEMENTING A WATER SUPPLY SYSTEM,
For primary bibliographic entry see Field 3B.
W78-09847

SURFACE WATER RESOURCES OF NORTHWEST FLORIDA,
Johnson (Bernard), Inc., Houston, TX.
Z. Qureshi.
Water Resources Bulletin, Vol 14, No 3, p 710-718, June 1978. 2 fig, 2 tab, 8 ref.

Descriptors: *Basins, *Surface waters, *Florida, Precipitation(Atmospheric), Water, Evapotranspiration, Surface water availability, Runoff, Hydrology, Water management(Applied), *Basin water yields, Basin water budget.

Of the 1,700 streams located in the state of Florida, the northwest area contains approximately 1,000 streams and three of the five largest rivers, namely the Apalachicola, the Choctawhatchee, and the Escambia. This 11,200 sq mi area contains 11 drainage basins and receives an average annual rainfall which ranges from 53 inches in the east to 67 inches in the west. Basin water yields range from a high of 3,376 cfs (2,180 mgd) to a low of 672 cfs (434 mgd). Individual basin outflows range from a high of 25,743 cfs (16,630 mgd) to a low of 844 cfs (545 mgd). Approximately 67% of the total northwest Florida basin outflows to the Gulf of Mexico, or 36,805 cfs (23,766 mgd), are received in the form of surface water inflows from Alabama and Georgia. In the absence of any interstate mechanism for water management between Alabama, Florida, and Georgia, the upstream usage in the neighboring states. The establishment of a tri-state water management program could eliminate the uncertainty involved in predicting water availability in northwest Florida and ensure sufficient quantities of flows in the streams. (Lee-ISWS)
W78-09973

HYDROLOGIC EFFECTS OF THE TONKAWA CREEK FLOOD ABATEMENT PROGRAM,
Agricultural Research Service, Chickasha, OK.
R. R. Schoof, J. W. Naney, and W. M. Boxley.
Water Resources Bulletin, Vol 14, No 3, p 629-639, June 1978. 6 fig, 1 tab, 4 ref.

Descriptors: *Flood control, *Impoundments, *Streamflow, *Oklahoma, On-site investigations, Dams, Effects, Water control, Channelization, Flow control, River basin development, River regulation, Watersheds(Basins), Watershed management, Flow, Water yield, Hydrology, *Tonkawa Creek(OK).

Floodwater-retarding impoundments, controlling 68% of the drainage area of Tonkawa Creek, a Washita River Tributary in southwestern Oklahoma, have reduced the total flow volume about 36% over a 5-year period. Analyses showed the reduction occurred primarily in the less-than-2.5-cfs flow range, indicating the base flow regime has been altered. However, channelizing the downstream, mild-sloped, 3.6 miles of Tonkawa Creek that flows across a Washita River terrace, increased the flow volume fourfold at the outlet. A double-mass-curve analysis of water yield from a 1,127-sq-mi Washita basin segment versus an untreated tributary showed the yield has not changed after 25% of the tributary area had been treated. Therefore, the flow reduction caused by structures is being offset by increased yields from channelization. (Sims-ISWS)
W78-09974

FORMULAS AND METHODS FOR CALCULATING CONCENTRATION AND LOADS AT ANY POINT ON A STREAM,
Northern Illinois Univ., DeKalb, IL. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-09998

WATER-SUPPLY DAM FOR ABHA TOWN,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia). Project Execution Dept.
A. H. Shaikh.
Journal of American Water Works Association, Vol. 67, June 1975, p 310-311.

Descriptors: *Dam construction, *Saudi Arabia, *Detention reservoirs, *Reservoir design, Engineering structures, Water resources development, Flood routing, Reservoir operation, Reservoir storage, Water supply development, Project planning, Flood control, Watershed management.

The Government of Saudi Arabia has been using some of its large capital from oil to initiate water supply projects throughout its largely arid country. One such project is the construction of a dam in the small southwestern town of Abha located approx. 80 km from the Red Sea where average rainfall is 370 mm. Abha Dam, located upstream of the town, is constructed across wadi Abha which, through flowing through the village, provides highly irregular flows because it is not a major wadi. A headwater tributary of wadi Bishah, it has a catchment area of 58.5 sq. km. above the damsite. Two exploratory trenches and 22 boreholes 10-55 mm deep were dug, indicating a geology of primarily anatexis granites. The dam is solid concrete, gravity operated, and 350 m long. Maximum storage level of the reservoir is 2.13 million cubic meters. It has an infiltration gallery, intake tower, inspection gallery, and inspection shafts. Control and measurement devices are located in and around the structure. Because projected population of Abha by 1980 is 43,000, dam reservoir withdrawal will fall short of supplying the required water, and the balance will come from 20 shallow wells 20 km east of the village. (Tickes-Arizona)
W78-10010

AN APPLICATION OF MULTIDISCIPLINARY WATER RESOURCES PLANNING FOR THE SAN CARLOS APACHE INDIAN RESERVATION: GILA RIVER CASE,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6B.
W78-10017

SIMULATION OF SUMMER RAINFALL OCCURRENCE IN ARIZONA AND NEW MEXICO,
Agricultural Research Service, Tucson. Southwest Watershed Research Center; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2B.
W78-10020

AREAS SUBJECT TO INUNDATION BY THE 100-YEAR FLOOD IN AVRA VALLEY, PIMA COUNTY, ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10038

RISK ANALYSES FOR A WATER-SUPPLY SYSTEM--OCCOQUAN RESERVOIR, FAIRFAX AND PRINCE WILLIAM COUNTIES, VIRGINIA,
Geological Survey, Reston, VA. Water Resources Div.
R. M. Hirsch.
Open-file report 78-452, 1978. 48 p, 15 fig, 12 tab, 9 ref, append.

Descriptors: *Forecasting, *Water supply, *Reservoirs, *Droughts, *Analytical techniques, Probability, Model studies, Water storage, Available water, Hydrologic data, Planning, Virginia, *Occoquan Reservoir, *Risk analyses.

Two techniques for evaluation risks in the operation of a water-supply system are demonstrated. Both rely on reconstructed historical streamflow data to develop estimates of the probabilities of certain specific events occurring in the future. These techniques are applied to the Occoquan Reservoir in Fairfax and Prince William Counties, Va., which was experiencing an unprecedented low level of storage in the autumn of 1977. In the first technique, the general risk analysis model (GRAM), simulations of the reservoir's contents are carried out under a set of assumptions about withdrawal rates and emergency procedures. The results of the GRAM simulation for the Occoquan Reservoir are in the form of estimates of the probabilities that in any year certain emergency procedures will have to be invoked. These estimates are given for a range of rates of withdrawals and for four different stages of emergency actions. The second technique is position analysis. In this procedure probability distributions of future storages are estimated under existing storage conditions and an assumed rate of withdrawal from the reservoir. The position analysis which was initialized at the October 1, 1977, conditions indicates that the probability of entering a Stage III emergency (the prohibition of all uses of water nonessential to life, health, and safety) in the autumn of 1977 or winter of 1978 was 10 percent at that time. (Woodard-USGS)
W78-10048

HYDROLOGICAL APPLICATION OF LANDSAT IMAGERY USED IN THE STUDY OF THE 1973 INDUS RIVER FLOOD, PAKISTAN,
Geological Survey, Reston, VA. Geography Program; and Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7B.
W78-10051

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1977.
Geological Survey, Iowa City, IA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10055

GROUND WATER LEVELS RISING IN LOUISVILLE.
For primary bibliographic entry see Field 4B.
W78-10089

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-10094

REGIONAL ASSESSMENT OF WATER RESOURCES,
Thames Water Authority, Reading (England).
For primary bibliographic entry see Field 6B.
W78-10099

WAITING TIME TO FIRST ACHIEVEMENT OF SPECIFIED LEVELS IN RESERVOIRS SUBJECT TO SEASONAL MARKOVIAN INFLOWS,
Lancaster Univ. (England).
E. H. Lloyd, and S. D. Saleem.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 72-118. 14 ref.

Descriptors: *Reservoir storage, *Markov processes, *Stochastic processes, *Water level, Seasonal, Reservoir releases, Inflow, Outflow, Algorithms, Equations, Passage times, Absorbing states, Parametric model, Systems analysis.

This paper considers the fluctuations in the water level in a reservoir subject to given inflow and outflow processes. The authors simplify the problem without serious loss of accuracy by using a discrete-state and discrete-time approximation in which the inflow process is represented as a seasonally varying Markov Chain, for which a tractable parametric model is provided. In the basic version, the outflow is assumed to be determined by the latest inflow and storage values. (In more elaborate versions, earlier inflow and storage values are allowed to influence the outflow). Denoting the storage by Zt and the inflow rate at time t by Xt, it is shown that (in the basic version) the sequence of pairs Zt,Xt form a seasonally varying vector Markov Chain (with appropriate generalizations for more elaborate outflow policies). (See also W78-10094) (Bell-Cornell)
W78-10100

A METHOD TO INCLUDE RISK EXPLICITLY IN OPTIMAL RIVER BASIN PLANNING,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-10101

THE UNRELIABILITY OF RELIABILITY ESTIMATES OF STORAGE RESERVOIR PERFORMANCE BASED ON SHORT STREAMFLOW RECORDS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
V. Klemes.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 127-136. 2 fig, 1 tab, 15 ref.

Descriptors: *Reliability analysis, *Reservoir storage, *Streamflow, *Performance, *Risks, Estimating, Failures, Effects, Assessment, Hydrology, Numerical analysis, Equations, Systems analysis.

A split-sample experiment involving the computation of the risk of failure for a reservoir with a given storage capacity and draft, and based on four 25-year segments of a 100-year historic series of mean annual flows, has been carried out and the effect of flow parameter errors has been evaluated. The results indicate that the value of the stationary risk of failure corresponding to the so-called long-term storage capacity may easily be wrong by an order of magnitude and is thus unfit for use as a design parameter. Three legitimate uses of reservoir performance reliability analysis

have been identified as (1) education of engineers and planners in the appreciation of the extent of design uncertainties, (2) development of continent-wide insurance policies against reservoir performance related losses, and (3) one of the possible aids for standardization of design practices. (See also W78-10094) (Bell-Cornell)
W78-10102

ON THE RELIABILITY OF RELIABILITY CONSTRAINTS,
IBM Thomas J. Watson Research Center, Yorktown Heights, NY.
M. Sniedovich.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 137-155, 1978. 3 fig, 1 tab, 10 ref.

Descriptors: *Reliability, *Constraints, *Reservoir operation, *Dynamic programming, *Decision making, *Stochastic processes, Optimization, Evaluation, Water resources, Failures, Reservoir storage, Reservoir releases, Strategies, Lagrange multiplier, Methodology, Equations, Mathematical models, Systems analysis.

A systematic approach to modeling, analysis and solution of reliability constrained reservoir control problems is presented. Five reliability constraints are investigated and the structure of the optimal strategies resulting from their imposition is studied. It is shown that the dynamic programming framework is suitable for the analysis and evaluation of a variety of reliability constraints. Fundamental questions regarding the potential use and misuse of reliability constraints in water resources systems are raised in the context of reservoir control problems. The systematic approach presented indicates that contrary to statements made in the water resources literature, probabilistic type constraints can be incorporated in a dynamic programming formulation. It is concluded that before making the decision regarding the specific reliability constraint to be imposed on the particular system in question, consideration should be given to the structure of the optimal strategies resulting from the imposition of the constraints and to the fact that the stochastic process under consideration is to be observed only once. (See also W78-10094) (Bell-Cornell)
W78-10103

RISK IN RESERVOIR DESIGN AND OPERATION: A STATE-OF-THE-ART REVIEW,
Iowa Univ., Iowa City. Iowa Inst. of Hydraulic Research.
T. E. Croley, II.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 156-178, 1978. 82 ref.

Descriptors: *Risks, *Reservoir operation, *Design, *Analytical techniques, *Probability, Failures, Stochastic processes, Optimization, Inflow, Uncertainties, Simulation analysis, Constraints, Linear programming, Dynamic programming, Chance-constrained programming, Worth of data, Bayesian decision theory, Mathematical models, Equations, Systems analysis.

The state-of-the-art and recent history of the development of methods that consider risk in the determination of operating rules or reservoir capacities are reviewed. Uncertainties and the definition and measurement of system failure and risk of system failure are first discussed. Then early stochastic optimization techniques which consider random inflows are classified into implicit and explicit methods and general examples are given. Techniques that consider uncertainty related to sample size and worth of data are listed in a general review. Other methods which transform inflow probabilities into risk are generally discussed and techniques which involve explicit consideration of risk are discussed in detail with simplified examples given. The latter involve mathematical programming and simulation techniques. The attributes of the various techniques are used as a guide for the suggestion of a new approach for considering risk in reservoir design and operation: The logical extension appears to be a technique which considers expected net benefit and probability of failure as two objectives in a multiobjective problem that utilizes stochastic dynamic programming and the e-constraint approach. (See also W78-10094) (Bell-Cornell)
W78-10104

A STATISTICAL ANALYSIS OF RAINFALL - RUNOFF RELATIONSHIP,
George Washington Univ., Washington, DC. School of Engineering and Applied Science.
For primary bibliographic entry see Field 2A.
W78-10115

THE RELIABILITY OF PUMPED STORAGE YIELD INVESTIGATED BY SYNTHETIC DATA GENERATION FOR SIX BRITISH RIVERS,
Water Research Centre, Marlow (Bucks). Medmenham Lab.
J. A. Cole, P. E. O'Connell, and K. Woods.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 375-389, 1978. 7 fig, 3 tab, 7 ref.

Descriptors: *Reliability, *Pumped storage, *Reservoirs, *Rivers, *Great Britain, Synthetic hydrology, Water supply, Performance, *Variability, Simulation analysis, Streamflow, Yield, Histograms, Hydrologic data, Evaluation, Systems analysis.

Off-channel pumped-storage water supply reservoirs are considered for a wide range of input pump capacity, output demand, reservoir volume and residual (or 'hands off') river flow, on the basis of six British rivers (River Wye in Wales, Swincombe Stream in Devon, River Nene in East Anglia, and three of the Nene's tributaries). To investigate variability of the system performance, for different possible data sets, most results have been derived by 20 or more simulation runs, each run being as long as the historic gauging records (24 to 34 years). As daily river flows and pumped quantities were required, it was decided to use a two-stage autoregressive model, in which monthly flows were generated from a series of zero mean and unit variance. These then have a daily flow pattern superimposed on a similar basis. Yield reliability is expressed in terms of the occurrence-based duration-based and water quantity-based frequency of meeting the full demand. The ratio of pumped to available water is also evaluated. Specimen results are presented as families of iso-reliability graphs, for normalized values of demand reservoir size, 'hands off' flow, and pump capacity. These reveal general similarities of form, though rivers of greater variability inevitably lead to lesser reliabilities. Histograms indicate the range of reliability estimate produced by repeated simulation results. (See also W78-10094) (Bell-Cornell)
W78-10117

UNCERTAINTIES IN DETERMINATION OF FLOOD PROFILES,
Dames and Moore, Washington, DC.
For primary bibliographic entry see Field 6F.
W78-10119

SIMULATION OF FLOOD HYDROGRAPHS,
Technische Univ., Munich (West Germany). Inst. of Hydraulics and Hydrology.
For primary bibliographic entry see Field 2E.
W78-10120

ON RELIABILITY OF MATHEMATICAL MODELS FOR FLOOD LEVEL PREDICTION IN RIVERS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-10121

INFORMATION ON FLOOD PEAKS IN DAILY FLOW SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-10122

ON THE RELIABILITY STUDIES FOR OPERATION OF WATER RESOURCES SYSTEMS,
Universidade Federal do Rio de Janeiro, (Brazil). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W78-10123

DROUGHT TO FLOOD-A SUDDEN MOISTURE REVERSAL IN CALIFORNIA,
California Univ., Davis. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W78-10259

REVIEW OF AUSTRALIA'S WATER RESOURCES 1975.
Australian Water Resources Council, Canberra. Dept. of National Resources.
For primary bibliographic entry see Field 7C.
W78-10262

RETRANSMISSION OF HYDROMETRIC DATA IN CANADA,
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
For primary bibliographic entry see Field 7B.
W78-10277

APPRAISAL REPORT, WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING, KERN RIVER BASIN, CALIFORNIA.
Federal Power Commission, Washington, DC. Bureau of Power.
For primary bibliographic entry see Field 8C.
W78-10278

STREAM GAUGING INFORMATION, AUSTRALIA-DECEMBER 1974.
Australian Water Resources Council, Canberra. Dept. of National Resources.
For primary bibliographic entry see Field 7C.
W78-10280

MISSOURI RIVER-GAVINS POINT TO OMAHA NEBRASKA HISTORICAL RECORDS RESEARCH.
Water and Environment Consultants, Inc., Fort Collins, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 718, Price codes: A04 in paper copy, A01 in microfiche. Potamology Investigation, May 1976. 52 p, 6 fig, 26 tab, 5 ref. DACW45-75-D-0003.

Descriptors: *Missouri River, *Data collections, *Hydrographs, *Beds under water, Potamology, Discharge(Water), Dams, Construction, Flow, Floods, Water temperature, Beds, Channels, Rivers, Suspended solids, Sediments, Hydrology, Channels cross sections.

An historical data search and compilation was made to determine some of the major physical impacts which have occurred on the reach of Missouri River between Gavins Point Dam and Omaha, Nebraska, since 1950. The chronological records of discharge ratings, channel slopes, sediment discharges, flood discharges, etc., were displayed to show their relationship to channel modifications and other physical changes made in the past 25 years. Appendixes of the original data also were displayed for present and future reference. (Sims-ISWS)
W78-10285

NATIONWIDE EVALUATION OF COMBINED SEWER OVERFLOWS AND URBAN STORMWATER DISCHARGES. VOL. III: CHARACTERIZATION OF DISCHARGE,
American Public Works Association, Chicago, IL. Research Foundation.
For primary bibliographic entry see Field 5B.
W78-10397

THE MISSOURI RIVER BASIN WATER RESOURCES PLAN.
Missouri River Basin Commission, Omaha, NE.
For primary bibliographic entry see Field 6B.
W78-10406

MISSOURI STATE LAWS PERTAINING TO WATER AND RELATED LAND RESOURCES,
Missouri Dept. of Natural Resources Jefferson City. Clean Water Commission.
T. E. Lauer, P. N. Davis, and J. Cunningham.
(1977), 120 p.

Descriptors: *Conservation, *Missouri, *Land resources, *Water resources development, Groundwater resources, Land management, Land use, Planning, Riparian rights, Water supply development, Water pollution control, Legislation.

Water is needed for domestic, manufacturing, power, agricultural, and recreational uses. Although Missouri has been blessed with an ample supply of water, shortages of water are beginning to be felt. The available water supply can be regulated by law, both to facilitate conservation, and to determine which uses shall be given priority and which persons shall have rights to use available water. An understanding of existing Missouri water law must precede any future attempts to forge new legal doctrines. Missouri common law covers: (1) classification of water; (2) riparian rights in watercourses and lakes; (3) groundwater; (4) diffused surface water; (5) the impact of federal law on state law; and (6) interstate and international limitations on state law. Missouri statutory law pertains to: (1) pollution control; (2) water supply and sewage disposal; (3) private dams and drainage rights; (4) drainage and levee districts; (5) conservation disticts; and (6) state agencies. In Missouri, there is an absence of comprehensive judicial determination respecting the use of water. (Jordan-Florida)
W78-10408

RELATIONSHIPS BETWEEN WATER QUALITY MANAGEMENT PLANNING AND LAND USE PLANNING,
Bartholomew (Harland) and Associates, St. Louis, MO.
For primary bibliographic entry see Field 5G.
W78-10418

STATE COURT ADJUDICATION OF FEDERAL RESERVED WATER RIGHTS,
For primary bibliographic entry see Field 6E.
W78-10452

FEDERAL RESERVED RIGHTS IN WATER: THE PROBLEM OF QUANTIFICATION,
For primary bibliographic entry see Field 6E.
W78-10453

MONTANA WATER USE ACT.
For primary bibliographic entry see Field 6E.
W78-10489

4B. Groundwater Management

WELL CONSTRUCTION,
Aufschlager (Ferdinand) KG., Munich (West Germany), (Assignee).
For primary bibliographic entry see Field 8B.
W78-09842

IMPLIED RESERVATION OF WATER RIGHTS IN THE AFTERMATH OF CAPPAERT V. UNITED STATES,
Western New England Coll., Springfield, MA. School of Law.
For primary bibliographic entry see Field 6E.
W78-09863

THOMPSON V. COLORADO GROUND WATER COMMISSION (PERMITS FOR GROUNDWATER APPROPRIATION).
For primary bibliographic entry see Field 6E.
W78-09890

MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2K.
W78-09941

EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 1. AN OVERVIEW OF CONTAMINANT ARRIVAL DISTRIBUTIONS AS GENERAL EVALUATION REQUIREMENTS,
BCS Richland, Inc., WA. Scientific Systems Dept.
For primary bibliographic entry see Field 5B.
W78-09955

EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 3. OBTAINING CONTAMINANT ARRIVAL DISTRIBUTIONS FOR STEADY FLOW IN HETEROGENEOUS SYSTEMS,
BCS Richland, Inc., WA. Scientific Systems Dept.
For primary bibliographic entry see Field 5B.
W78-09957

EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 4. OBTAINING AND UTILIZING CONTAMINANT ARRIVAL DISTRIBUTIONS IN TRANSIENT FLOW SYSTEMS,
BCS Richland, Inc., WA. Scientific Systems Dept.
For primary bibliographic entry see Field 5B.
W78-09958

RESEARCH INTO THE EFFECTS OF ARTIFICIAL GROUNDWATER RECHARGE, LEA VALLEY, LONDON ENGLAND,
Water Research Centre, Medmenham (England). Resources Div.
K. J. Edworthy, D. A. Stott, and W. B. Wilkinson.
Water Resources Bulletin, Vol 14, No 3, p 554-575, June 1978. 11 fig, 2 tab, 9 ref.

Descriptors: *Groundwater, *Artificial recharge, *Recharge wells, Aquifers, Chalk, Sands, Wells, On-site investigations, Model studies, Mathematical models, Water supply, Water quality, Laboratory tests, Geology, Water resources, Rivers, *Lea Valley(England), *London Basin(England).

Large-scale groundwater abstraction from the Cretaceous Chalk/Lower Tertiary Basal Sands aquifer system of the London Basin in the last 150 years has developed storage of more than 1,000,000 cu m. Limited operational recharge was undertaken in the 1950's encouraging further detailed study of the wider possibilities. Following a comprehensive hydrogeological reappraisal, an economic and engineering study, and pilot-scale experiments, the Lea Valley was shown to have the greatest potential for recharge. Artificial recharge into the Chalk at a rate of 9,000 cu m/d appears possible, through acidized 900 mm diameter boreholes. An understanding of the degree of interconnection between the Chalk and Basal Sands and of the causes of changes in quality of recharged water during storage was shown to be of particular importance to the succesful operation of any recharge scheme using this system. A two-layer numerical groundwater model of the 800 sq km area and a surface/groundwater simulation model was used to assist with the design of the 84,000 cu m/d prototype scheme, and also will help in assessing its efficiency. The models ultimately will be used to manage the operation of the first stage development, now coming into use. (Sims-ISWS)
W78-09976

SENSITIVITY OF GROUNDWATER MODELS WITH RESPECT TO VARIATIONS IN TRANSMISSIVITY AND STORAGE,
Geological Survey, Lawrence, KS.
For primary bibliographic entry see Field 2F.
W78-09980

UNSTEADY FLOW TO A PUMPED WELL IN A FISSURED AQUIFER WITH A FREE SURFACE LEVEL MAINTAINED CONSTANT,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 2F.
W78-09981

PERCOLATION RATES WITH SURFACE LAYERS OF GRAVEL OR CLAY FLOCS ON SOIL FED CLEAR AND TURBID WATERS,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
Water Resources Research, Vol. 14, No. 3, p 539-541, June 1978. 2 fig, 1 tab, 5 ref.

Descriptors: *Artificial recharge, *Recharge ponds, *Surface sealing, Recharge, Perclation, Water treatment, Flocculation, Gravels, Soil surfaces, Permeameters, Laboratory tests, Permeability, Turbidity, Suspended solids, Clays, Groundwater, Groundwater recharge, Surface layers, Clay flocs, Percolation rates.

Suspended solids in water can plug the surfaces of aquifer recharge basins, and they are often chemically flocculated and removed in costly separate floc-settling basins. This work evauated floc and gravel filters on recharge surfaces as substitutes for settling basins. Disturbed soil in permeameters were treated with layers of small gravel and constant feedwater heads of either clear tapwater, untreated turbid runoff water, or turbid runoff water treated to form and retain flocs. Untreated turbid water reduced percolation rates more than the other feedwaters, and gravel layers markedly reduced percolation of all feedwaters. The percolation rate of water with flocs was only slightly less than that of tapwater. These results suggested that untreated turbid water or gravel layers are unacceptabel for recharge surfaces. However, combinations of soil, gravel, and clay may have considerable potential for reducing percolation in water retention basins. Flocculation and settling seldom remove all fine particles from turbid water;

thus a filter layer of flocs may extend the effective life of a recharge surface and eliminate costly separate floc-settling basins. (Sims-ISWS)
W78-09983

AQUIFER STORAGE OF HEATED WATER: PART I - FIELD EXPERIMENT,
Auburn Univ., AL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-09986

LINEAMENTS ON SKYLAB PHOTOGRAPHS-DETECTION, MAPPING, AND HYDROLOGIC SIGNIFICANCE IN CENTRAL TENNESSEE,
Geological Survey, Reston, VA.
G. K. Moore.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-25625, Price codes: A05 in paper copy, A01 in microfiche. Open-File Report 76-196, March 1976. 15 fig, 10 tab, 30 ref, 1 append.

Descriptors: *Tennessee, *Aerial photography, *Remote sensing, Groundwater potential, Hydrogeology, Water yield, Mapping, Test wells, Geology, LANDSAT, SKYLAB, Lineaments.

Lineaments were detected on SKYLAB photographs by stereo viewing, projection viewing, and composite viewing. Large well yields of 25 gal/min or more can be obtained in the study area by locating future wells on SKYLAB lineaments rather than on lineaments detected on either high-altitude aerial photographs, LANDSAT images, or by random drilling. Larger savings might be achieved by locating wells on lineaments detected by both stereo viewing and projection. The test site is underlain by dense, fractured, flat-lying limestones. Soil cover averages 4 ft thick in the Central Basin and about 40 ft thick on the Eastern Highland rim. Groundwater occurs mostly in horizontal, sheet-like solution cavities, and the trends of these cavities are controlled by joints. (Lardner-ISWS)
W78-10000

EFFECT OF ILLUVIATED DEPOSITS ON INFILTRATION RATES AND DENITRIFICATION DURING SEWAGE EFFLUENT RECHARGE,
For primary bibliographic entry see Field 5C.
W78-10023

WATER QUALITY WATER SUPPLY STUDY, ARKANSAS RIVER BASIN, JOHN MARTIN DAM, COLORADO TO GREAT BEND, KANSAS. DRAFT.
Environmental Protection Agency, Dallas, TX. Region VI.
For primary bibliographic entry see Field 5G.
W78-10031

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, AND WELL HYDROGRAPHS,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10037

SALTWATER INTRUSION IN THE FLORIDAN AQUIFER, COASTAL CITRUS AND HERNANDO COUNTIES, FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-10039

DEVELOPMENT OF GROUND WATER IN THE HOUSTON DISTRICT, TEXAS 1970-74,
Geological Survey, Austin, TX. Water Resources Div.
R. K. Gabrysch.
Open-file report 77-413, June 1977. 44 p, 22 fig, 6 tab, 22 ref.

Descriptors: *Groundwater, *Withdrawal, *Water supply, *Water level fluctuations, *Drawdown, Water quality, Saline water intrusion, Water resources development, Aquifer characteristics, Texas, *Houston district(Tex), Chicot aquifer, Evangeline aquifer, Harris County, Galveston County.

Total withdrawals of ground water in the Houston district, Texas, increased 9 percent from about 488 million gallons per day in 1970 to about 532 million gallons per day in 1974. The average annual rate of increase from 1960 to 1969 was about 6.3 percent. During 1970-74, increases in pumpage occurred in the Houston, Katy, and NASA areas; decreases occurred in the Pasadena and Alta Loma areas; and the pumpage in the Baytown-La Porte and Texas City areas remained almost constant. Water levels continued to decline throughout the district during 1970-74, but the rate of decline generally was not as great as in previous years. The greatest declines in the past several years were in the Houston area, but the center of decline is still in the Pasadena and Baytown-La Porte areas. The decrease in the rate of decline suggests that the aquifers in the Houston district could support the amount of pumping during 1970-74 with little, if any, further decline. Although saltwater encroachment has probably occurred in the district, particularly in Galveston County, no large increases in chloride were measured at the monitoring points. (Woodard-USGS)
W78-10042

ANNUAL WATER-RESOURCES REVIEW WHITE SANDS MISSILE RANGE, NEW MEXICO, 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10049

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1977.
Geological Survey, Iowa City, IA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10055

GROUND-WATER RECORDS FOR EASTERN OKLAHOMA, PART 2 - WATER-QUALITY RECORDS FOR WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10056

USE OF BOUNDING WELLS TO COUNTERACT THE EFFECTS OF PREEXISTING GROUNDWATER MOVEMENT,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
W. R. Whitehead, and E. J. Langhetee.
Water Resources Research, Vol. 14, No. 2, p 273-280, April, 1978. 8 fig, 5 ref.

Descriptors: *Salaquifers, *Bounding wells, *Water storage, *Injection wells, *Underground storage, Groundwater movement, Potentiometric level, Least squares method, Computer programs.

Underground storage of freshwater in salaquifers is feasible under natural or man-made conditions. Since recovery efficiency is inversely proportional to the rate of ground-water flow, reducing the potentiometric gradient reduces fresh-water loss. This can be done by installing injection and producing bounding wells. A desired balanced potentiometric level was selected, then the required rates of the bounding wells were computed using a Fortran IV computer program which employed a least squares solution. The results of the computer runs indicated that bounding well flow rates vary directly with the magnitude of ground-water movement, inversely with the number of bounding wells, and directly with the distance the wells are placed from the boundaries. The only limitations are that the distance should not be less than 30 degrees of the radius of the storage area, there should be at least one bounding well in each quadrant of the storage area, and the sum of the production rates must equal the sum of the injection rates. The latter limitation ensures that the environmental impact of the system is negligible. A cost comparison chart indicated that the in-place water cost at which a bounding well system will become economically attractive decreases as the volume stored increases. (Purdin-NWWA)
W78-10075

CASING DEPTHS AND SOLUTE TRAVEL TIMES TO WELLS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-10076

REGIONAL GEOLOGY SERIES: PART VI,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-10077

REGIONAL GEOLOGY SERIES: PART V, ATLANTIC AND GULF COASTAL PLAIN REGION,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-10078

HOW TO MEET WELL PROJECT GOALS, PART 2,
For primary bibliographic entry see Field 8B.
W78-10079

AQUIFER STORAGE OF HEATED WATER: PART II - NUMERICAL SIMULATION OF FIELD RESULTS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-10080

SAMPLING FOR ORGANIC CHEMICALS AND MICROORGANISMS IN THE SUBSURFACE,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5A.
W78-10081

A MODEL AQUIFER SYSTEM FOR BIOLOGICAL COMPATIBILITY STUDIES OF PROPOSED DEEP WELL DISPOSAL SYSTEMS,
North Carolina Agricultural Experiment Station, Raleigh.
For primary bibliographic entry see Field 5E.
W78-10082

DRILLING FOR HEAT: THE COMING OF THE GEOTHERMAL AGE,
For primary bibliographic entry see Field 8B.
W78-10087

ARIZONA WELLS TO HELP SUPPLY WATER TO MEXICO,
Universal Oil Products Inc., Fresno, CA. Johnson Div.
For primary bibliographic entry see Field 3A.
W78-10088

GROUND WATER LEVELS RISING IN LOUISVILLE.
Johnson Drillers Journal, March-April, 1978, p 6-7, 1 fig.

Descriptors: *Water levels, *Kentucky, Ohio river, Flood control, Water utilization, Groundwater, Water table, *Louisville(Ky).

The static water level in the Louisville Kentucky area has risen as much as 32 feet during the last five years due to ground-water conservation measures and raising the level of the Ohio River by constructing navigational dams and locks. If the water table continues the rise at the present rate, basement flooding and structural damage could be incurred by 1982. The solution lies not in artificial dewatering but in making use of the larger than ever quantities of ground water now available in the alluvium of the Ohio River Valley. (Purdin-NWWA)
W78-10089

NEWER TECHNIQUES AID SEARCH FOR GROUND WATER,
For primary bibliographic entry see Field 7B.
W78-10090

SYSTEM USES INTERNAL COPPER TUBING,
Down-hole Communications Co., Richardson, TX.
For primary bibliographic entry see Field 8G.
W78-10093

PUMPING OF WATER FROM DEFUNCT MINES: A CASE STUDY.
For primary bibliographic entry see Field 5G.
W78-10228

THE USE OF MULTIPLE LINEAR REGRESSION IN SIMULATING GROUNDWATER LEVEL RESPONSES,
Orange Free State Univ., Bloemfontein (South Africa).
For primary bibliographic entry see Field 2F.
W78-10230

USE OF RADIOISOTOPES AS GROUNDWATER TRACERS TO DETERMINE EFFECTIVE POROSITY OF AQUIFERS,
Hydrological Research Inst., Pretoria (South Africa).
For primary bibliographic entry see Field 2F.
W78-10233

AN IMPROVED FORMAT FOR THE ROUTINE DOCUMENTATION OF WATER-WELL DATA IN SOUTHERN AFRICA,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
P. F. Worthington, and E. Martinelli.
Civil Engineer in South Africa, (Johannesburg), Vol. 19, No. 7, p 147-153, 1977. 6 ref, 2 tab.

Descriptors: Documentation, Data processing, *Water wells, Groundwater, Hydrogeology, Boreholes, Pumping tests, Water quality, Information, *Data collections, *Southern Africa.

The first stage of any investigation of groundwater conditions involves an appraisal of existing data. It is therefore important that procedures for the routine recording of borehole information be sufficiently comprehensive for the archives to constitute a meaningful basis for subsequent investigations. Unfortunately this prerequisite is not satisfied in Southern Africa. This causes much duplication of work with consequent increases in time and expense. In this paper practical recommendations are formulated for the economic documentation of water-well data to a format which would largely rectify this shortcoming. The recommended procedures are reflected in a suggested borehole report document which would furnish comprehensive basic data for any future hydrogeological study. The merits of this improved format are evident from a brief consideration of selected problems encountered in the fields of engineering geology and groundwater hydrology. (So Afr Water Info Center)
W78-10252

REVIEW OF AUSTRALIA'S WATER RESOURCES 1975.
Australian Water Resources Council, Canberra. Dept. of National Resources.
For primary bibliographic entry see Field 7C.
W78-10262

LAND TREATMENT OF WASTEWATER MAY BE KEY TO POLLUTION CONTROL,
For primary bibliographic entry see Field 5E.
W78-10306

THE STATUS OF GROUNDWATER IN SOUTH DAKOTA,
For primary bibliographic entry see Field 6E.
W78-10464

SOUTH DAKOTA'S ARTESIAN PRESSURE--SHOULD IT BE A PROTECTED MEANS OF DIVERSION,
For primary bibliographic entry see Field 6E.
W78-10473

4C. Effects On Water Of Man's Non-Water Activities

A LAND IMPRINTER FOR REVEGETATION OF BARREN LAND AREAS THROUGH INFILTRATION CONTROL,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
R. M. Dixon, and J. R. Simanton.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings of the 1977 Meetings of the Arizona Section, American Water Resources Assn.; and the Hydrology Section, Arizona Academy of Science, April 15-16, Las Vegas, Nevada, p 79-88. 5 fig, 12 ref.

Descriptors: *Cultivation, *Revegetation, *Infiltration, *Farm equipment, Arizona, Design data, Vegetation establishment, Seed treatment, *Land imprinter.

Because the soil, water, and vegetal resources of arid and semiarid regions are sparsely and diffusely distributed, a tillage implement called the land imprinter has been designed to insure vegetation establishment by creating alternating strips of land with runoff-enhancing and infiltration-enhancing surface geometries that form interconnected downslope and cross-slope corrugations that shed water and infiltrate it precisely where vegetative growth is to be encouraged. This controlled short-distance routing of water via minute waterways into minute reservoirs makes more rainwater available for seed germination and establishment, and less water available for loss by surface runoff and evaporation. Various imprint capsules are illustrated by patterns produced, and results of initial testing of the imprinter at an experimental area south of Tucson, Arizona, are given along with suggestions for improvement in the use of the implement under varying circumstances. (Paylore-Arizona)
W78-10025

MANAGEMENT PROGRAMS, RESEARCH AND EFFECTS OF PRESENT LAND USE ACTIVITIES ON WATER QUALITY OF THE GREAT LAKES. VOLUME I.
International Reference Group on Great Lakes Pollution from Land Use Activities. U.S. Section of Task Group A.
For primary bibliographic entry see Field 5B.
W78-10026

MANAGEMENT PROGRAMS, EFFECTS OF RESEARCH AND PRESENT LAND USE ACTIVITIES ON WATER QUALITY OF THE GREAT LAKES. VOLUME II.
International Reference Group on Great Lakes Pollution from Land use Activities. U.S. Section of Task Group A.
For primary bibliographic entry see Field 5B.
W78-10027

SOME NOTES ON THE SANDVLEI FISH FAUNA MUIZENBERG CAPE,
For primary bibliographic entry see Field 2L.
W78-10226

SOLAR ENERGY, WATER, AND INDUSTRIAL SYSTEMS IN ARID LANDS, TECHNOECOLOGICAL OVERVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6B.
W78-10288

ECONOMIC LAW ENFORCEMENT. VOLUME IV. STRENGTHENING ENVIRONMENTAL LAW ENFORCEMENT: ILLEGAL FILLING.
Connecticut Dept. of Environmental Protection, Hartford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 532, Price codes: A06 in paper copy, A01 in microfiche. September, 1975. 114 p.

Descriptors: *Environmental engineering, *Regulation, *Coasts, *Connecticut, *State governments, Landfills, Tidal waters, Navigable waters, Docks, Penalties(Legal), Permits, Breakwaters, Structures, Law enforcement, Excavation, Standards, Economic justification.

This report provides a brief overview of the Water Resources Connecticut Enforcement Project Program designed to effectively control and regulate commercial and institutional filling in coastal and tidal areas along navigable waterways in the state. In light of the ineffectiveness and unenforceability of a standard permitting system, the proposed new regulations authorize a set of civil assessments that would allow the starte's Water Resources Unit to apply concrete, immediate incentives as large as any benefits of non-compliance to induce prompt compliance. The incentives can be adjusted to meet any level of resistance or cooperation, and at most the penalty to a violator would not exceed the cost of meeting his environment regulations to those that create the most harm, the commercial and institutional fills, and because of its limited resources and small staff, the Unit is concentrating on illegal coastal filling because of its more permanent and frequently serious harmful environmental impact. The economic enforcement tools developed for coastal filling, however, can be applied to any illegal fill on land or in water. (See also W78-10399) (Easterbrook-Florida)
W78-10402

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY.
Environmental Protection Agency, Washington, DC. Office of Air and Water Programs.
For primary bibliographic entry see Field 5G.
W78-10403

4D. Watershed Protection

LOSS OF SPRAY AND PELLETED PICLORAM IN SURFACE RUNOFF WATER,
Agricultural Research Service, College Station, TX.; and Agricultural Research Service, Temple, TX.
For primary bibliographic entry see Field 5B.
W78-09965

ARSENIC CONCENTRATIONS IN SURFACE RUNOFF FROM SMALL WATERSHEDS IN TEXAS,
Agricultural Research Service, Temple, TX.
For primary bibliographic entry see Field 5B.
W78-09997

NONPOINT-SOURCE POLLUTANTS TO DETERMINE RUNOFF SOURCE AREAS,
Agricultural Research Service, Tucson, AZ.
For primary bibliographic entry see Field 5B.
W78-10021

WATER-QUALITY DATA FOR THE VILLAGE CREEK WATERSHED, NORTHEAST ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10050

FLOW METERING FLUMES MONITOR WATER IN COASTAL FOREST WATERSHED,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
J. A. Replogle, H. Riekerk, and B. F. Swindel.
Water and Sewage Works, Vol 125, No 7, p 64-67, July 1978. 6 fig, 1 tab, 10 ref.

Descriptors: *Watersheds(Basins), *Flumes, *Runoff, *Measurement, *Florida, Instrumentation, Design, Channels, Hydraulic structures, Concrete structures, Water measurement, Streamflow, Forests, Forest watersheds, Water levels, Flow, Monitoring.

Flow metering flumes have been applied successfully to three experimental forest watersheds near Gainesville, Florida. Data obtained from the study included measurements of nutrient losses and water quality changes due to forest management practices, especially harvesting; site preparation with machines, fire, and chemicals; and planting. As the preliminary surveys of the Gainesville watersheds were completed, it became obvious that the flat topography could not accomodate the required elevation drop needed for triangular (V-notch) weirs. Therefore, flume designs were considered. The new designs are called long-throated flumes because the throats are usually required to be twice as long as the flow depth to assure nearly parallel flow, a necessary condition for mathematical programming. Because of the long throats, they can tolerate relatively high backwater conditions, on the order of 80% to 90% of the upstream depth measured from the throat floor elevation. Thus, a flume with the configuration of a broad-crested weir and a high sill might pass 50 cfs at a flow depth over the sill of ten in. and be able to tolerate over eight in. of backwater. (Sims-ISWS)
W78-10260

CATCHMENT GEOMORPHOLOGY AND ITS HYDROLOGIC SIGNIFICANCE: A REVIEW,
New South Wales Univ., Kensington (Australia). School of Geography.
P. Vorst, and F. C. Bell.
Representative Basins Program Report No. 2, 1977. 24 p, 2 tab, 91 ref.

Descriptors: *Watersheds(Basins), *Geomorphology, *Parametric hydrology, *Reviews, Model studies, Mathematical models, Synthetic hydrology, Channels, Erosion, Streamflow, Runoff, Regression analysis, Drainage, Roughness(Hydraulic), Hydrology, Geomorphic parameters, Hydrologic parameters.

Reports of investigations into the relationships between catchment geomorphology and hydrologic characteristics, and the manner in which these relationships have been utilized for various hydrologic purposes, were reviewed in this paper. Although many geomorphic parameters have been used in statistical correlations with hydrologic variables, only three appear to be consistently significant for the prediction of either the volume of runoff or the shape of the hydrograph, namely, catchment area, catchment length, anc catchment slope. Regression equations derived from these studies have had only limited success in the explanation of hydrologic variability between catchments in different regional setting. The use of geomorphic parameters in catchment prediction models currently appears to be limited by (1) the lack of geomorphic data in a form suitable for use in such models, and (2) the structure and operation of the models themselves. Recent studies of hydrologic processes have pointed to the spatial and temporal variation in runoff production within catchments, the successful modelling of which requires quantitative information ion the spatial variability of catchment characteristics. (Sims-ISWS)
W78-10261

ESTIMATION OF DIRECT RUNOFF FROM URBAN WATERSHEDS,
Indiana State Board of Health, Indianapolis.
For primary bibliographic entry see Field 5B.
W78-10290

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

OIL-IN-WATER MONITORING ABOARD TANKERS,
For primary bibliographic entry see Field 5G.
W78-09814

SYSTEMS FOR MONITORING AND CONTROL OF DISCHARGED OIL--OIL CONTENT METERS,
Societe S.E.R.E.S. (France). Technical Div.
For primary bibliographic entry see Field 5G.
W78-09815

ANALYSIS BY FLAMELESS ATOMIC ABSORPTION,
New Orleans Univ., LA.
C. L. Yuan, J. V. Chauvin, J. F. Molina, M. H. West, and D. G. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 016, Price codes: A06 in paper copy, A01 in microfiche. Report to 22 Oct. 1976, 119 p. 27 tab, 31 fig, 45 ref.

Descriptors: *Methodology, *Metals, Zinc, Iron, Chromium, Silver, Manganese, Cadmium, Copper, Lead, Water quality, Analytical techniques, Laboratory tests, *Chemical analysis, *Pollutant identification, *Flameless atomic absorption.

Techniques for the analysis of trace metals in natural waters as well as other samples of biological and environmental content by flameless atomic absorption spectrometry have been developed. Aqueous standard and unknown solutions are applied to a tungsten-rhenium wire loop atomizer which can be electrically heated. Employing pure aqueous standards peak height absorbance was utilized as a measure of transient atomic absorption signal in order to establish calibration curves for zinc, iron, chromium, silver, manganese, cadmium, copper and lead. (EIS-Katz)
W78-09830

DETERMINATION OF TRACE AMOUNTS OF BUTYLTIN COMPOUNDS IN AQUEOUS SYSTEMS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY,
Institute for Organic Chemistry TNO, Utrecht (Netherlands).
H. A. Meinema, T. Burger-Wiersma, G. Versluis-de Haan, and E. C. Gevers.
Environmental Science and Technology, Vol. 12, No. 3, p 288-293, March, 1978. 2 fig, 4 tab, 18 ref.

Descriptors: *Chemical analysis, *Organic compounds, *Analytical techniques, *Gas chromatography, *Mass spectrometry, *Pollutant identification, Analysis, Chemistry, Instrumentation, Agricultural chemicals, Miticides, Insect control, Organic pesticides, Aqueous solutions, Chemical properties, Water pollution sources, Fungicides, *Butyltin compounds.

A sensitive, reproducible, and interference-free method was presented for simultaneous determination of tri, di, and monobutyltin species present in aqueous systems at tin concentrations of 0.01-5.0 ppm. The butyltin species are concentrated from HBr acidified aqueous solutions into an organic solvent by solvent extraction in the presence of a metal coordinating ligand. Almost quantitative recoveries are achieved by solvent extraction using benzene, chloroform, or methylene chloride in the presence of 0.05% of tropolone. The butyltin species present in the organic extract are transformed into the corresponding butylmethyltin compounds, Bu sub n Sn-Me sub (4-n), and analyzed as such by a GC/MS procedure. By this procedure, the solubilities of (Bu3Sn)20, Bu2SnCl3 in seawater at room temperature were determined to be 8-10, 6-8, and 9-10 ppm, respectively; and trace amounts of inorganic tin (IV) species in water were detected. The inorganic tin (IV) species present in the organic extract are butylated to tetrabutyltin, which is detected by GC/MS. (Henley-ISWS)
W78-09963

EFFECT OF DISSOLVED OXYGEN ON CHEMICAL TRANSFORMATIONS OF HEAVY METALS, PHOSPHORUS, AND NITROGEN IN AN ESTUARINE SEDIMENT,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
R. A. Khalid, W. H. Patrick, Jr., and R. P. Gambrell.
Estuarine and Coastal Science, Vol. 6, No. 1, p 21-35, January 1978. 3 fig, 5 tab, 30 ref. DACW39-74-C-0076.

Descriptors: *Sediments, *Chemical analysis, *Heavy metals, *Nutrients, *Dissolved oxygen, Chemistry, Analytical techniques, Laboratory tests, Oxidation-reduction potential, Hydrogen ion concentration, Phosphorus, Nitrogen, Lead, Copper, Cadmium, Manganese, Zinc, Iron, Bays, Estuaries, *Barataria Bay(La).

The effect of dissolved O2 on the chemical transformation of Fe, Mn, Zn, Cu, Pb, Cd, NH4(+)-N, and P in an estuarine sediment suspension was investigated under laboratory conditions. Reduced sediment suspensions were constantly purged with a gas mixture contaning 0.11%, 2.1% and 21% O2 at a flow rate of 20 ml/min. Suspension samples were taken at various time intervals and extracted for different chemical fractions. The data indicated that increasing O2 concentrations in the gas mixture resulted in lower sediment pH and higher oxidation-reduction potential (redox potential) with time. Changes in redox potential and pH

strongly modified the distribution of trace metals in various chemical fractions. The hydroxylamine hydrochloride extraction failed to selectively remove oxides and hydroxides of Mn without dissolving a substantial proportion of reactive Fe, as the recovery of Fe by this extractant was 8 to 10 orders of magnitude greater than Mn. The large recovery of Fe with Mn in this fraction makes it difficult to distinguish trace metals associated with Mn oxides from those associated with Fe oxides. A substantial fraction of total sediment Zn was associated with potentially bioavailable chemical forms, which may be mobilized to more readily available forms due to changes in the physicochemical properties of the sediment-water system. Significnt correlation coefficients obtained between soluble Pb, Cd, and Cu and different Fe fractions suggested a strong relationship between these trace metals and Fe compounds. Phosphorus and NH4(+)-N concentrations decreased sharply with time as a result of increased redox potential levels in the 2.1% and 21% O2 levels. The effect of the 0.11% O2 treatment was negligible. This indicates that oxidized sediment conditions may be an important factor in regulating eutrophication by reducing the levels of P and N available for biota. This necessitates a careful study of changes in the dissolved O2 concentration (reflected by redox potential levels) in the sediment-water system. (Sims-ISWS)
W78-09964

NITRATE DETERMINATION IN FRESH AND SOME ESTUARINE WATERS BY ULTRAVIOLET LIGHT ABSORPTION: A NEW PROPOSED METHOD,
Victoria Univ. of Manchester (England). Pollution Research Unit.
L. Brown, and E. G. Bellinger.
Water Research, Vol. 12, No. 4, p 223-229, 1978. 4 fig, 5 tab, 14 ref.

Descriptors: *Nitrates, *Testing procedures, *Nitrogen compounds, *Water analysis, *Chemical analysis, Water quality, Estuaries, Sea water, Analysis, Estuarine movement, Analytical techniques, Fertilizers, Water pollution sources, Pollutant identification, Chemistry, Testing, Instrumentation, Water chemistry.

The new proposed u.v./resin technique for nitrate determination is either not affected by, or can allow for, the following interfering chemicals at levels occurring in natural polluted or unpolluted waters: chloride, phosphate, sulphate, carbonate/bicarbonate, bromide, nitrite, colored metal complexes, humic acids, ammonium, dyes, detergents, phenol, and other u.v. absorbing organics. The method is quick and has an accuracy of + or - 3%. Concentration of the sample to determine lower levels by evaporation is feasible with certain upland waters but should not be attempted if the sample has a high humic acid concentration. The technique can be used only in nitrate rich estuarine and coastal waters because the lower limit of detection is raised to 0.5 mg/l when the sample is diluted to remove bromide interference. (Henley-ISWS)
W78-09967

TRACE INORGANICS IN RURAL POTABLE WATER AND THEIR CORRELATION TO POSSIBLE SOURCES,
South Carolina State Coll., Orangeburg. Water Lab.
S. S. Sandhu, W. J. Warren, and P. Nelson.
Water Research, Vol. 12, No. 4, p 257-261, 1978. 2 fig, 2 tab, 32 ref.

Descriptors: *Water chemistry, *Water quality, *Domestic water, *Water pollution, *Water pollution sources, Trace elements, Chemical properties, Water analysis, Analytical techniques, Potable water, Groundwater pollution, Pollutant identification, Pollutants, Water properties, Septic tanks, Public health, Water wells.

Ninety-eight water samples, comprising about 10% of the total sources available to rural homes in Hampton County, South Carolina, were selected randomly and analyzed for inorganic constituents. Chemical contamination is widespread in this area, and many people are using substandard quality water. A noticeable number of water samples showed unacceptable levels of arsenic, iron, manganese, and mercury. Iron and colloidal material is chiefly responsible for turbidity in 19% of the water sources. Acceptable levels of cadmium, chloride, copper, lead, nitrate, phosphate, sodium, total solids, and zinc were detected in most of the samples. Statistical analysis indicated that leachings from septic tanks were at least partially responsible for the contamination of shallow water supply sources with nitrate, phosphate, chloride, and arsenic. Iron, lead, and manganese appear to have come from corrosion of antiquated plumbing in older homes. (Henley-ISWS)
W78-09968

SOME RESEARCH AND INFORMATION NEEDS IN SURFACE WATER QUALITY.
American Water Resources Association, St. Paul, MN. Research Committee.
For primary bibliographic entry see Field 5G.
W78-09979

BOTTOM SEDIMENT ANALYSES OF THE RECREATIONAL WATERS OF UPPER SABINO CREEK,
Arizona Univ., Tucson. School of Renewable Natural Resources
P. L. McKee, and S. K. Brickler.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings of the 1977 Meetings of the Arizona Section, American Water Resources Assn.; and the Hydrology Section, Arizona Academy of Science, April 15-16, Las Vegas, Nevada, p 109-114. 1 fig, 1 tab, 13 ref.

Descriptors: *Recreation wastes, *Water pollution sources, *Bottom sediments, *Sampling, Sewage bacteria, Streams, Arizona, Water analysis, Aquatic bacteria, *Sabino Creek(Ariz).

Sabino Creek, major drainage system of a 35.5 sq. mi. watershed beginning high in the coniferous forest in the mountains north of Tucson, Arizona, and pursuing its 9 mile passage to the desert valley floor over 6000 feet below, is an intermittent-perennial stream of yearlong flow assured by snowfall at the highest elevation and summer thunderstorms below. Because of its proximity to an arid metropolitan area of half a million population, recreational demands on the creek are overloading its capacity and creating serious water quality problems. In this study, samples were collected 4 times per month from 8 sampling stations, their location based on user patterns, property boundaries, suspected water quality problem areas, stream flow regime, and other watershed characteristics. Results of bottom sediment fecal coliform bacteria analyses indicate upper Sabino Creek is more hazardous to recreation users than is indicated by surface water bacteria analyses alone. Fine particles were important in affecting increased bottom sediment bacteria densities at some stations. Chlorine injected into the sewage effluent between stations immediately above and below the single sewage treatment facility along the Creek's course had a measurable effect on bacteria concentrations at the lower sampling station. A sampling design allowing for collection of water quality samples during different recreational use days and seasons was used to ascertain base information of water quality differences during these times. Results of the study indicate the importance of including bottom sediment bacteria enumeration in all recreation water quality analyses. Surface water samples alone do not give a true indication of the potential bacterial quality of an aquatic ecosystem used for recreational purposes. (Paylore-Arizona)
W78-10022

CHEMICAL ANALYSES OF SURFACE WATER IN ILLINOIS, 1958-74, VOLUME I, DES PLAINES RIVER BASIN AND LAKE MICHIGAN,
Geological Survey, Champaign, IL. Water Resources Div.
R. W. Healy, and L. G. Toler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 674, Price codes: A25 in paper copy, A01 in microfiche. Water-Resources Investigations 78-22, 1978. 583 p, 1 fig, 5 tab.

Descriptors: *Illinois, *Water quality, *Chemical analysis, *Surface waters, *Basic data collections, Water temperature, Gaging stations, Water sampling, Sites, Water analysis, Methodology, Lake Michigan, *Des Plaines River basin.

Samples of surface water were collected and analyzed by the Illinois Environmental Protection Agency and its predecessor, the Stream Pollution Control Bureau of the Illinois Department of Public Health. The results for the period 1958 to 1974 are presented in tabular form and the history of sampling and analytical methods are summarized. Stream discharge data from records of the U.S. Geological Survey are included for all sites where samples were collected at gaging stations or near enough that reliable discharge estimates could be made. The report is contained in three volumes. This volume (Volume I) includes Des Plaines River basin and Lake Michigan. (See also W78-10035 and W78-10036) (Woodard-USGS)
W78-10034

CHEMICAL ANALYSES OF SURFACE WATER IN ILLINOIS, 1958-74, VOLUME II, ILLINOIS RIVER BASIN AND MISSISSIPPI RIVER TRIBUTARIES NORTH OF ILLINOIS RIVER BASIN,
Geological Survey, Champaign, IL. Water Resources Div.
R. W. Healy, and L. G. Toler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 675, Price codes: A19 in paper copy, A01 in microfiche. Water-Resources Investigations 78-23, 1978. 443 p, 1 fig, 5 tab.

Descriptors: *Illinois, *Water quality, *Chemical analysis, *Surface waters, *Basic data collections, Water temperature, Gaging stations, Water sampling, Sites, Water analysis, Methodology, Mississippi River, Tributaries, *Illinois River basin.

Samples of surface water were collected and analyzed by the Illinois Environmental Protection Agency and its predecessor, the Stream Pollution Control Bureau of the Illinois Department of Public Health. The results for the period 1958 to 1974 are presented in tabular form and the history of sampling and analytical methods are included for all sites where samples were collected at gaging stations or near enough that reliable discharge estimates could be made. The report is contained in three volumes. This volume (Volume II) includes Illinois River basin and Mississippi River tributaries north of Illinois River basin. (See also W78-10034 and W78-10036) (Woodard-USGS)
W78-10035

CHEMICAL ANALYSES OF SURFACE WATER IN ILLINOIS, 1958-74, VOLUME III, OHIO RIVER TRIBUTARIES AND MISSISSIPPI RIVER TRIBUTARIES SOUTH OF ILLINOIS RIVER BASIN,
Geological Survey, Champaign, IL. Water Resources Div.
R. W. Healy, and L. G. Toler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 676, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 78-24, 1978. 354 p, 1 fig, 5 tab.

Descriptors: *Illinois, *Water quality, *Chemical analysis, *Surface waters, *Basic data collections, Water temperature, Gaging stations, Water sampling, Sites, Water analysis, Methodology, Mississippi River, Ohio River, Tributaries.

Samples of surface water were collected and analyzed by the Illinois Environmental Protection Agency and its predecessor, the Stream Pollution Control Bureau of the Illinois Department of Public Health. The results for the period 1958 to 1974 are presented in tabular form and the history of sampling and analytical methods are summarized. Stream discharge data from records of the U.S. Geological Survey are included for all sites where saples were collected at gaging stations or near enough that reliable discharge estimates could be made. The report is contained in three volumes. This volume (Volume III) includes Ohio River tributaries and Mississippi River tributaries south of Illinois River basin. (See also W78-10034 and W78-10035) (Woodard-USGS)
W78-10036

SELECTED DATA FROM THERMAL-SPRING AREAS, SOUTHWESTERN MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10046

ANNUAL WATER-RESOURCES REVIEW WHITE SANDS MISSILE RANGE, NEW MEXICO, 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10049

WATER-QUALITY DATA FOR THE VILLAGE CREEK WATERSHED, NORTHEAST ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10050

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1977.
Geological Survey, Iowa City, IA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10055

GROUND-WATER RECORDS FOR EASTERN OKLAHOMA, PART 2 - WATER-QUALITY RECORDS FOR WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10056

SAMPLING FOR ORGANIC CHEMICALS AND MICROORGANISMS IN THE SUBSURFACE,
Robert S. Kerr Environmental Research Lab., Ada, OK.
W. J. Dunlap, J. F. McNabb, M. R. Scalf, and R. L. Cosby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 679, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/2-77-176, August, 1977. 35 p, 11 fig, 9 ref.

Descriptors: *Water sampling, *Coring, *Organic compounds, *Sampling, *Subsurface investigations, *Earth-solid sampling, Microorganisms, Adsorption, Activated carbon, Groundwater, Adsorption columns, Sampling wells, Core acquisition, Organic sampling.

Sampling procedures developed by the EPA are useful for research and monitoring purposes to detect and accurately measure low levels of chemicals and microorganisms in ground water and subsurface earth solids for relatively shallow depths. Techniques and equipment for constructing wells and obtaining representative and uncontaminated samples were described for sampling ground water at depths less than 7.5 m (25 feet) in compact alluvial formations. Continuous sampling of organics in ground water utilizing selective adsorbents is described, including details of adsorbent columns; configuration of and housings for sampling systems, and sample handling. Coring and coreprocessing techniques were presented for sampling subsurface earth solids for organics and microorganisms at slightly greater depths in similar geologic environments. Additional research is needed to further evaluate, improve, and extend the capabilities of the sampling procedures. (Purdin-NWWA)
W78-10081

THE VARIABILITY OF WATER QUALITY DATA AND ITS SIGNIFICANCE IN WATER QUALITY SIMULATION,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
L. D. Spraggs.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 7 fig, 3 ref.

Descriptors: *Variability, *Simulation analysis, *Water quality, *Data, Monitoring, Rivers, Planning, Mathematical models, Systems analysis, Prediction.

An intensive monitoring study of the Souris River of Manitoba was undertaken to provide data for an associated water quality modeling study. This paper presents the work associated with both these studies to determine the variability of the water quality data and implications of this variability on making predictions using these data. The mathematical model used is a time-dependent one-dimensional water quality model with the facility to simulate nineteen selected water quality parameters. It is shown that there is an error associated with water quaity data which is related to the time of day the station is monitored. This error is a random error which can be several orders of magnitude greater than the laboratory error. Mathematical models will be able to remove the effect of anomalous data taken on the river main stem and are therefore advantageous for analyzing existing conditions and modifications to the river system. (See also W78-10094) (Bell-Cornell)
W78-10107

RISK ASSESSMENT IN WATER QUALITY SAMPLING FOR CALIBRATION/VERIFICATION ANALYSES,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
E. A. McBean, and K. C. Bushert.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 221-244, 1978. 4 fig, 1 tab, 22 ref.

Descriptors: *Risks, *Assessment, *Water quality, *Sampling, *Methodology, Programs, Design, Hydrology, Variability, Equations, Transfer function, Uncertainty, Systems analysis, Probability, Mathematical models, Simulation analysis, Pollutants.

Described is a methodology for aiding the problem of selecting spatial and temporal intensities of sampling for short-term intensive water quality sampling programs. The formulation utilizes an information content via utilization of a variance term that reflects the elements of the water quality system that disrupt intensive sampling programs. A case study of the South Saskatchewan River is included. The methodology represents only one factor of a number that affect sampling program design, other factors including for example the accessibility to sampling locations and manpower resources. The intent of the method is to provide an indication of the information return for more or less effort. (See also W78-10094) (Bell-Cornell)
W78-10108

THE INFLUENCE OF FACTORS OTHER THAN POLLUTION ON THE VALUE OF SHANNON'S DIVERSITY INDEX FOR BENTHIC MACROINVERTEBRATES IN STREAMS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
B. D. Hughes.
Water Research, Vol. 12, p 359-364, 1978. 3 fig, 1 tab, 34 ref.

Descriptors: *Statistical methods, *Sampling, *Benthic fauna, *Biological communities, Invertebrates, Analytical techniques, Mathematical studies, Data collections, Water pollution effects, Variability, Systematics, Animal groupings, Seasonal, *Shannon's Diversity Index, *River Cynon(Wales).

The effect of six factors (sampling method, sample size, depth of sampling, duration of sampling, time of year of sampling and taxonomic level used in the calculation) on the value of Shannon's diversity index were examined using data collected from the River Cynon, a polluted river in South Wales. All parameters except depth and duration of sampling were shown to influence the value of Shannon's diversity index. It was recommended that these factors be taken into consideration when interpreting and comparing index values. (EIS-Deal)
W78-10129

MERCURY AND SELENIUM CONTENTS OF SEALS FROM FRESH AND BRACKISH WATERS IN FINLAND,
Kuopio Univ. (Finland). Dept. of Chemistry.
T. Kari, and P. Kauranen.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 3, p 273-280, 1978. 4 fig, 4 tab, 22 ref.

Descriptors: *Mercury, Marine animals, *Food chains, *Animal metabolism, Path of pollutants, Animal physiology, Metabolism, Industrial wastes, Gas chromatography, Toxicity, Fish physiology, Chemical analysis, *Pollutant identification, Tissue analysis, Bioaccumulation, *Selenium, *Seals, Liver, Phoca, *Finland.

Several recent laboratory studies have demonstrated a protective effect of selenium against the toxicity of both organic and inorganic mercury. In some wild animals living at the top of the food chain remarkably high mercury levels are found, which makes it interesting to study their selenium contents. In seals examined a very strong correlation between mercury and selenium was found in the liver, while little, if any, correlation could be found in the muscle and kidney samples. It was suggested that selenium possibly takes part in the metabolism of mercury by the liver. (EIS-Deal)
W78-10140

OXYGEN CONSUMPTION AS A FUNCTION OF PH IN THREE SPECIES OF FRESHWATER FISHES,
Alabama Univ., University. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-10141

THE TOXICITY OF ENDRIN TO CERTAIN AQUATIC INVERTEBRATES (TOXICITA EN-

DRINU PRO NEKTERE VODNI BEZOBRATLE) (IN CZECH),
For primary bibliographic entry see Field 5C.
W78-10150

THE TOXICITY OF ENDRIN TO CERTAIN FISH SPECIES (TOXICITA ENDRINU PRO NEKTERE DRUHY RYB) (IN CZECH),
For primary bibliographic entry see Field 5C.
W78-10151

TECHNIQUE FOR COLLECTING AND INCUBATING EGGS OF THE FATHEAD MINNOW,
Texas Parks and Wildlife Dept. Heart of the Hills Research Station, Ingram.
For primary bibliographic entry see Field 7B.
W78-10171

TECHNIQUE FOR INCUBATING AND HATCHING EGGS OF SURF SMELT FOR BIOASSAY,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 7B.
W78-10172

MODIFICATION OF THE WATER FLOTATION METHOD FOR SEPARATING ORGANISMS FROM DETRITUS IN BENTHIC SAMPLES,
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 7B.
W78-10173

SEPARATION AND DETERMINATION OF PHENOL AND SALICYCLIC ACID IN INDUSTRIAL WASTES,
Babes-Bolyai Univ., Cluj (Rumania). Dept. of Analytical Chemistry.
S. Gocan, T. Hodisan, H. Nascu, and C. Georgescu.
Revue Roumaine de Chimie, Vol 23, No 2, p 265-268, 1978. 2 fig, 2 tab, 4 ref.

Descriptors: *Phenols, *Chemical wastes, *Chromatography, *Volumetric analysis, *Organic acids, *Solvent extractions, Thin films, Silica, Gels, Photometry, Separation techniques, Chemical wastes, Waste water treatment, Industrial wastes.

Thin-layer chromatography and column chromatography were used to separate and quantify phenol and salicyclic acid produced during the manufacture of aceto-salicyclic acid. In laboratory studies, the two components were separated by thin-layer chromatography on silicagel R with mobile phase benzene-ethyl acetate at a 1:1 volumetric ratio. The differences between Rf values of the components were plotted as a function of the pH of the silicagel thin layer. Using the data obtained from thin layer chromatography, the components were eluted on an 18-cm column filled to 14 cm with silicagel RC having a pH of 9 and a granulation of 160-70 micrometers. Phenol was eluted with an 8:1 volumetric ratio of benzene-ethyl acetate; salicyclic acid was eluted with a benzene-methanol system in a ratio of 3:1. Both components were eluted in a 35-ml volume at a stepwise 10 ml elution rate of 0.5 ml/min flow rate. Volumetric analysis were conducted with a bromate-bromide technique; photocolorimetric analysis was performed with a diazonium salt of sulfanilic acid for phenol and with a diazonium salt of sulfanilic acid for phenol and with FeC13 at pH 2.0-2.5 for salicyclic acid. Results of column chromatography of industrial waste samples agreed with the results of column chromatography of industrial waste samples agreed with the results of the STAS method of water vapor striping. The technique had a detection limit of 40 micrograms/sample. (Lisk-FIRL)
W78-10189

SIMULTANEOUS SPECTROPHOTOMETRIC DETERMINATION OF ZINC AND COPPER WITH BIACETYL BIS OF (4-PHENOL-3-THIOSEMICARBAZONE)-APPLICATION OF THE DETERMINATION OF ZINC IN WASTE WATER FROM A SULFURIC ACID PLANT (PYRITES PROCESS),
Seville Univ. (Spain). Dept. of Analytical Chemistry.
A. G. Asuero, and J. M. Cano.
Microchemical Journal, Vol. 23, No. 2, p 142-150, 1978. 4 fig, 4 tab, 12 ref.

Descriptors: *Spectrophotometry, *Zinc, *Copper, *Absorption, *Analytical techniques, Chemical wastes, Heavy metals, Industrial wastes.

Spectrophotometric procedures to measure zinc and copper in sulfuric acid plant effluents have been designed to use biacetyl bis (4-phenyl-3-thiosemicarbazone) (BBPT) as a reagent. A zinc-bearing solution is mixed with 15 ml of 0.33% BBPT in dimethylformamide, 2 ml of a pH 4.5 acetate buffer, and distilled water to 25 ml; the absorbance is measured against a reagent blank at 440 nm. To simultaneously determine zinc and copper in a solution, the same preparation is followed but absorbance is also measured at 480 and 530 nm. Zinc and copper concentrations are obtained by solving simultaneous equations for absorbance at 440, 480, and 530 nm. An alternative method to quantify zinc and copper involves finding the sum of zinc and copper at pH 6.7 and determining copper from other analogous samples; 1 ml of 0.1 M ethylene-diaminetetraacetic acid, dilute hydrochloric acid, 15 ml of BBPT reagent, and distilled water to 25 ml are added to the sample; absorbance is measured at 440 and 480 nm against a reagent blank. A similar procedure is followed for zinc in waste water; the sample is adjusted to pH 4.0-4.5, filtered, and mixed with 2 ml of sodium fluoride and sodium tartrate solution; and the total concentration of zinc and copper is determined. The optimum concentration for detection of zinc is in the range of 0.6-2.0 ppm with a relative error of plus or minus 0.30%. (Lisk-FIRL)
W78-10194

SPECTROPHOTOMETRIC AND CHELATOMETRIC DETERMINATION OF IRON (III) WITH 2,4,-DIHYDROXYVALEROPHENONE,
Dev Nagri Coll., Meerut (India). Chemical Labs.
J. Singh, K. Lal, and S. P. Gupta.
South African Journal of Science, (Johannesburg), Vol. 72, No. 12, p 378-379, 1976. 14 ref.

Descriptors: *Spectrophotometry, *Chelation, *Iron, Metals determination, Interference, Chelometric titrations, Pollutant identification, Chemical analysis, *Dihydroxyvalerophenone, South Africa.

Reports the spectrophotometric and chelatometric determination of iron with 2,4-dihydroxyvalerophenone (DHV) a reagent which hitherto has not been used in chemical analysis. The proposed method is suitable for the spectrophotometric determination of iron at low concentrations in the presence of a large number of foreign ions. The absorbance values were practically constant over the range 460 to 480 giving rise to a 20nm wide plateau, which makes this reagent suitable for photometer determinations using coloured filters. In the determination of iron with EDTA the use of DHV was found in general to be much more satisfactory than a variety of commonly used indicators, including salicylic acid, thiosalicylic acid, tiron, Chrome Azurol S2-,5-, and 6-hydroxyl m- toluic acids and triphenylmethane dyes. DHV can normally be used over a wider pH range and has a sharp and distinct end point. (So Afr Water Info Center)
W78-10227

HISTORICAL WATER QUALITY DATA, CHICAGO RIVER, SAITARY AND SHIP CANAL, AND CALUMET RIVER SYSTEMS,
Northeastern Illinois Planning Commission, Chicago.
G. R. Elmore, G. D. Harmon, R. P. Reilly, G. T. Lum, and P. R. Larson.
Staff Paper No. 18, April 1977. 205 p, 1 fig, 4 tab, 2 append.

Descriptors: *Water quality, *Data collection, *Illinois, *Curves, Hydrogen ion concentration, Water temperature, Coliforms, Phosphorus, Dissolved oxygen, Nitrates, Nitrites, Ammonia, Biochemical oxygen demand, Oxygen demand, Rivers. *Chicago River, *Sanitary and Ship canal, *Little Calumet River, *Grand Calumet River, *Calumet River, Total dissolved solids.

This paper was one of a series being published by the Northeastern Illinois Planning Commission to describe water quality conditions in the six-county region. Data were presented in a series of computer-plotted graphs which compare the results of selected water quality analyses with applicable State of Illinois water quality standards for the North Branch Chicago River, Sanitary and Ship Canal, and Calumet River systems. The water quality data presented covered the period 1958-1975 for most parameters. Water quality parameters plotted included water temperature, dissolved oxygen, total phosphorus, fecal coliform, NH3 as N, NO3 and NO2, total dissolved solids, pH, and 5-day biochemical oxygen demand. (Humphreys-ISWS)
W78-10273

WASTEWATER TREATMENT PROBLEMS AT NORTH KANSAS CITY, MISSOURI,
Black and Veatch, Kansas City, MO.
For primary bibliographic entry see Field 5D.
W78-10318

WATER POLLUTION TESTS - BIOCHEMICAL OXYGEN DEMAND (BOD),
Regional Water Pollution Control Plant, Palo Alto, CA.
R. Nice.
Water and Sewage Works, Vol. 125, Reference Number, p 186-187, April, 1978.

Descriptors: *Pollutant identification, *Biochemical oxygen demand, *Analytical techniques, *Volumetric analysis, Laboratory tests, *Sewage effluents, Sampling, Aqueous solutions, Chemical reactions, Dissolved oxygen, Water analysis, Laboratory equipment, Waste water treatment, Municipal wastes.

A method to measure BOD in raw sewage, primary, secondary, and final dechlorinated effluent is presented. A sewage seed is obtained by filtering a 1-liter sample of primary effluent which has been incubated for 24 hrs at 20C. The supernatant is filtered through glass wool, frozen, and analyzed for BOD using 1 ml of seed. In sterilized BOD bottles, several milligrams of allyl thiourea and 1 ml seed are mixed with 2 samples each of 10 ml raw sewage, 10 ml primary effluent, 50 ml secondary effluent, or 50 ml final effluent and filled with a prepared diluent. Half of the samples are incubated at 20C for five days; dissolved oxygen (DO) concentrations are then calculated. DO concentrations in the other samples are determined within 15 min of preparation. DO is calculated by adding 2 ml manganous sulfate solution and 2 ml alkaline-iodide-sodium azide solution, stoppering, and then shaking the bottle. The sample is acidified with 2 ml H2SO4, stoppered, shaken to dissolve the precipitate, and titrated. Starch is added if the mixture is not tinted brown; no DO is present if no blue color develops. A brownish solution is titrated with sodium thiosulfate until a pale yellow is achieved. Starch is added and the mixture is further titrated until the blue disappears. The volume of sodium thioulfate equals the DO con-

centration. With this value, BOD is calculated as a function of the initial and final DO concentrations, the seed factor, the sample volume, and a constant. (Lisk-FIRL)
W78-10328

CHLORINATED ORGANICS AS A FACTOR IN REDUCED BIOLOGICAL OXYGEN DEMAND (BOD),
Minnesota Univ.-Duluth. Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W78-10329

CHLORINATED SOLVENTS IN SEWAGE WORKS,
Imperial Chemical Industries Ltd., Brixham (England). Brixham Research Lab.
For primary bibliographic entry see Field 5D.
W78-10330

SELECTED PROBLEMS OF TREATMENT AND DISPOSAL OF DOMESTIC SEWAGE,
For primary bibliographic entry see Field 5D.
W78-10331

ASSESSMENT OF THE TRACE ORGANIC MOLECULAR COMPOSITION OF INDUSTRIAL AND MUNICIPAL WASTEWATER EFFLUENTS BY CAPILLARY GAS CHROMATOGRAPHY/REAL-TIME HIGH-RESOLUTION MASS SPECTROMETRY: A PRELIMINARY REPORT,
California Univ., Berkeley, Space Sciences Lab.
A. L. Burlingame.
Exotoxicology and Environmental Safety, Vol. 1, No. 1, p 111-150, 1977. 17 fig, 4 tab, 27 ref.

Descriptors: *Gas chromatography, *Mass spectrometry, *Trace elements, *Organic compounds, *Analytical techniques, Solvent extractions, Capillary action, Tertiary treatment, Oil wastes, Organic wastes, Waste water treatment, Municipal wastes.

High-resolution gas chromatography, high-resolution mass spectrometry, and elemental composition chromatography identified trace organic compounds in secondary and tertiary municipal effluent and primary petroleum refinery effluent. The municipal waste water samples included: secondary effluent which had been treated by the activated sludge process; tertiary effluent treated with flocculation, sedimentation, filtration, and chlorination; and tertiary effluent also treated with carbon adsorption. Trace organics in the secondary and tertiary effluent were eluted with both 6% and 15% ether in hexane, followed by separation in a column effluent splitter. Samples were analyzed by packed column gas chromatography, capillary column gas chromatography, high-resolution gas chromatography-real-time high-resolution mass spectrometry, and elemental composition chromatography. Secondary effluent contained: di-, tri-, and tetra-, and pentachlorobenzines; tri-, tetra-, and pentachloroanisoles; and various alkylbenzenes. Penatchloroanisole and alkylbenzens were not removed by tertiary treatment. Analyses of the neutral, phenolic, and acidic fractions of refinery effluent were performed by elemental composition chromatography after oxidation and clarification or after nonerated stabilization. Trace amounts of complexed hydrocarbons, oxygenated compounds, nitrogen compounds, and sulfur compounds were detected in the neutral fraction. (Lisk-FIRL)
W78-10332

CHARACTERISTICS OF CALCUTTA SEWAGE,
All-India Inst., of Hygiene and Public Health, Calcutta.
B. Nath, D. B. Mukherjee, and S. B. Das Gupta.
Journal of the Institution of Chemists (India), Vol. 49, No. 6, p 279-281, November, 1977. 2 tab, 3 ref.

Descriptors: *Sewage effluents, *Sewage disposal, *Sampling, *Solid wastes, *Alkalinity, Pollutant identification, Chlorides, Ammonia, Nitrogen, Nitrates, Nitrites, Biochemical oxygen demand, Chemical oxygen demand, Phosphates, Municipal wastes.

Pollutant parameters in sewage were monitored in Calcutta, India, over a two-year period in studies to select a treatment process suitable to the waste water characteristics. Total solids, alkalinity as CaCO3, and chloride concentrations were highest during May and June. Temperature ranged over 23.3-31.2C; the pH averaged 6.75. Other averages were: 1444 mg/liter total solids; 333 mg/liter alkalinity; 275 mg/liter chloride; 154 mg/liter BOD, 411 mg/liter COD; and 33.4 mg/liter total nitrogen. About 64.3-69.4% of the total nitrogen was in free or saline ammonia form; the remainder was found as nitrite or nitrate. All sewage samples lacked dissolved oxygen during the sampling period. Phosphate concentrations ranged over 31.0-50.0 mg/liter; higher nitrogen concentrations were observed during the winter months. (Lisk-FIRL)
W78-10333

ACTINOMYCETE SCUM PRODUCTION IN ACTIVATED SLUDGE PROCESSES,
Drexel Univ., Philadelphia, PA. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W78-10334

COMPENSATION FOR AN INHERENT ERROR IN THE DETERMINATION OF THE CHEMICAL OXYGEN DEMAND OF SEWAGE,
T. Stones.
Effluent and Water Treatment Journal, Vol. 18, No. 6, p 290-292, June, 1978. 5 tab, 4 ref.

Descriptors: *Chemical oxygen demand, *Analytical techniques, *Volumetric analysis, *Testing procedures, *Theoretical analysis, Thermodynamic behavior, Acidity, Acids, Sulfur compounds, Chemical reactions, Oxidation, Degradation(Decomposition), Water waste treatment, Municipal wastes.

Correction factors were defined for the 0.125 N ferrous ammonium sulfate titration of residual dichromate during the analysis of COD in waste water. Inherent errors in the determination of COD result from: the decomposition of dichromate, added as 25 m of a 0.25 or 0.125 N potassium dichromate solution; and by temperatures above 130C induced by sulfuric acid concentrations above 45%. British standard methods recommend a 54.4% acid concentration while American standards advocate a 50.0% sulfuric acid for COD analysis. The 45% acid concentration is reported to result in incomplete oxidation and reduced COD concentrations. The corrections are derived by comparing theoretical and actual titers obtained during COD analysis of glutamic acid solutions. In a reduced scale working model for the determination of COD in waste water, a 10 ml sample of sewage is mixed with 0.5 g mercuric sulfate, and dissolved in 5 ml concentrated sulfuric acid. The sample is then mixed with 20 ml of 0.125 N potassium dichromate and 30 ml of a 0.2% wt/vol solution of silver sulfate in concentrated sulfuric acid; the sample is then heated under reflux for 2 hrs. The cooled aliquot is diluted with 100 ml distilled water and titrated with 0.125 N ferrous ammonium sulfate for excess dichromate titration. The titration corrections are applied to compensate for the thermal decomposition of dichromate. (Lisk-FIRL)
W78-10336

BIOLOGICAL GROWTH ON ACTIVATED CARGON: AN INVESTIGATION BY SCANNING ELECTRON MICROSCOPY,
Michigan Univ., Ann Arbor. Dept. of Environmental and Water Resources Engineering.
W. J. Weber, Jr., M. Pirbazari, and G. L. Melson.
Environmental Science and Technology, Vol. 12, No. 7, p 817-819, July, 1978. 7 fig, 15 ref.

Descriptors: *Activated carbon, *Bacteria, *Protozoa, *Electron microscopy, *Analytical techniques, Aquatic bacteria, Sphaerotilus, Adsorption, Biological treatment, Humic acids, Waste water treatment, Municipal wastes.

Micrographs depicting the bacterial and bacteriovorous protozoan growth on granular activated carbon from mixed batch and expanded bed continuous flow reactors were obtained with a JOEL JSM-U3 scanning electron microscope. Activated carbon samples from a mixed batch reactor treating raw and coagulated sewage and from a continuous flow reactor treating humic acid were immersed in a 2% paraformaldehyde-2.5% glutaraldehyde solution for 2 hrs to kill the attached organisms. The samples were then treated with 1% OsO4 in 0.1 M sodium phosphate buffer at pH 7.3 to fix the liquid portion of the cell membrane. The specimens were dehydrated in ethanol baths, and ethanol-amylacetate solution, and amylacetate and dried with a critical point dryer. Microorganisms attached to carbon from the mixed batch reactor consisted primarily of stalked protozoans; the spherical ciliates were about 16 microns in size and were firmly attached by their stalks to the carbon surface. Carbon from the expanded bed reactor contained rod-like bacteria about 1.3 microns in length. Bacterial colonies on the surface formed a nonhomogenous slime with a porous matrix. (Lisk-FIRL)
W78-10337

EFFLUENT STANDARDS AND WATER QUALITY INFORMATION ADVISORY COMMITTEE--SECOND ANNUAL REPORT--PART 1--MARCH 1, 1974-MARCH 1, 1975,
Environmental Protection Agency, Washington DC. Effluent Standards and Water Quality Information Advisory Committee.
For primary bibliographic entry see Field 5G.
W78-10369

INSTRUCTIONS FOR THE INDIVIDUAL RECORDING OF EFFLUENTS INTO OPEN AIR AND WATER,
Environmental Protection Agency, Research Triangle Park, NC.
I. Wachters.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 319-T, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-TR 76-401, (1976). 171 p.

Descriptors: *Monitoring, *Environmental control, *Analytical techniques, *Data collections, *Pollutant identification, Air pollution, Effluents, Administrative agencies, Environmental engineering, Foreign research, Europe, Foreign projects, Industrial wastes, Pollutants, Path of pollutants, Pollution abatement, Water pollution, Water pollution sources, Inter-agency cooperation.

This Environmental Protection Agency manual presents a system of recording air and water pollution effluents, developed in close cooperation with a Netherlands research institute. This information is valuable for the establishment of a supervisory control that will lead to a reduction in the amount of environmental pollution. The information is also valuable to the decision making process in the expansion and development of new industrial plants, suburbs, agrarian concerns, and highways. Not only the nature and quantity of the effluents are recorded but also their sources, their location and the manner in which they enter the environment. The recording system is arranged so that installations, i.e., one or more processing units within a single source, and sources can be individually and independently treated. This is necessary because effluents can be produced by several independent installations at the same time and yet still can be released into the environment

by the same source. The information recording system uses the following components, each of which are concerned with a different major aspect of effluent monitoring: (1) the plant component; (2) the matter component; (3) the installation and apparatus component; (4) two source components; and (5) two effluent components. (Jordan-Florida)
W78-10370

DIGEST OF EPA'S MONITORING-RELATED STATUTORY AUTHORITY.
Environmental Protection Agency, Washington, DC. Office of Monitoring Systems.
For primary bibliographic entry see Field 5G.
W78-10371

RAPID FLAMELESS ATOMIC ABSORPTION ANALYSIS OF THE METALLIC CONTENT OF SEWAGE SLUDGES - II. CHROMIUM, NICKEL AND ZINC,
Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering.
S. Stoveland, M. Astruc, R. Perry, and J. N. Lester.
The Science of the Total Environment, Vol. 9, No. 3, p 263-269, 1978. 5 tab, 15 ref.

Descriptors: *Pollutant identification, *Spectrophotometry, *Absorption, *Chromium, *Nickel, *Zinc, Sewage sludge, Waste dilution, Analytical techniques, Chemical analysis, Heavy metals, Waste water treatment, Municipal wastes.

A flameless atomic absorption spectrophotometric technique detects chromium, nickel, and zinc in homogenized sludge samples. Sludge samples are diluted with 50 parts 1% Analar nitric acid. The sludge samples are then homogenized for 5 min at 8000 rpm and dried at 99C for 30 sec. For Cr analysis, the sample is ashed at 1,207C for 30 sec and atomized at 2,660C for 10 sec; flameless atomic absorption spectrophotometry is performed at 357.9 nm. Trivalent and hexavalent Cr yield identical signals with flameless atomization. For Ni analysis, the diluted sludge sample is ashed at 971C for 30 sec, atomized at 2,627C for 10 sec, and measured at 232.0 nm. After a sample has been ashed at 520C for 60 sec and atomized at 2,231C for 5 sec, zinc can be measured at 307.6 or 213.9 nm. The latter spectral line provides a detection limit of 0.001 mg/liter and working range of 0.001-0.02 mg/liter; extensive dilution is required for larger zinc concentrations. The 307.8 nm line, with a detection limit of 0.1 mg/liter, is recommended for sewage analysis. Flameless atomic absorption of homogenized sludge yields results comparable to bomb or nitric-sulfuric acid digestion with flame atomic absorption. (Lisk-FIRL)
W78-10395

CATALYSTS USED TO REPLACE SILVER SULFATE IN COD.
Water and Wastes Engineering, Vol 15, No 3, p 14, March, 1978.

Descriptors: Pollutant identification, *Chemical oxygen demand, *Analytical techniques, *Magnesium compounds, *Sulfates, Catalysts, Chemical reactions, Measurement, Sulfur compounds, Waste water treatment, Water quality, Municipal wastes.

Alternatives to silver sulfate determination of COD at various concentrations in waste water were explored. Less costly catalysts were examined to replace the conventional COD testing methods. Magnesium sulfate employed in conjunction with a smaller quantity of silver sulfate was efficient for detecting COD concentrations in the range of 50-500 mg/liter. COD determinations using magnesium sulfate as a catalyst were comparable to test results when silver sulfate was used alone. A combination of silver sulfate, aluminum sulfate, and magnesium sulfate was accurate to 5-50 mg/liter COD. Results comparable to the conventional silver sulfate catalyst technique were obtained with the combined catalysts. (Lisk-FIRL)
W78-10405

MOISTURE DETERMINATION BALANCE SPEEDS UP TOTAL AND VOLATILE SOLIDS ANALYSIS,
Florham Park Sewage Treatment Plant, NJ.
A. J. LaSpina.
Water and Sewage Works, Vol. 125, No. 2, p 61, February, 1978.

Descriptors: *Solid wastes, *Analytical techniques, *Volumetric analysis, *Infrared radiation, *Volatility, Moisture meters, Instrumentation, Moisture content, Measurement, Waste water treatment, Treatment facilities, Municipal wastes.

The Ohaus 6010 moisture determination balance, installed in the Florham Park, New Jersey, sewage treatment plant has reduced the time required for total and volatile suspended solids calculation in sewage samples from 5-6 hrs for the conventional method to 15-20 min. The technique employs infrared radiation to evaporate liquids in the waste water. A 10 g waste sample is placed on a pan and subjected to infrared heat for 10 min. The weight loss of the sample due to moisture loss during heating and the percentage moisture are displayed on a readout in the balance. The residual solids are then reduced to ash by further treatment to remove volatiles. The percentage of volatile and total solids are then calculated from the moisture content and the residual ash weight. The Ohaus 6010 balance does not require constant monitoring by a technician. (Lisk-FIRL)
W78-10424

ESTIMATION OF AROMATIC HYDROCARBONS IN SEAWATER AT PROPOSED DEEP-WATER PORT (DWP) SITES IN THE GULF OF MEXICO,
Coast Guard Research and Development Center, Groton, CT.
R. R. Hiltabrand.
Marine Pollution Bulletin, Vol 9, No 1, p 19-21, January 1978. 1 fig, 3 tab, 5 ref.

Descriptors: *Baseline studies, *Water pollution, *Aromatic compounds, Resources development, Gulf of Mexico, Oil spills, Sea water, Botton sediments, Outer Continental Shelf, Deepwater ports, Pollution detection, Petroleum hydrocarbons, Aromatic hydrocarbons.

Approximately 100 water sampls were collected from three different depths at the proposed deep water port sites in the Gulf of Mexico and analysed for aromatic hydrocarbons by fluorescene spectroscopy. Results indicated that the aromatic hydrocarbon concentrations in the water column decreased as one progresses from the surface water, through the water column, to the bottom sediments. (Sinha-OEIS)
W78-10428

BARIUM CONTENT OF MARINE SEDIMENTS NEAR DRILLING SITES: A POTENTIAL POLLUTANT INDICATOR,
Scripps Institution of Oceanography, La Jolla, CA.; and Science Application Inc., La Jolla, CA.
For primary bibliographic entry see Field 5B.
W78-10432

SHIPBOARD OIL IN WATER CONTENT MONITOR BASED ON LIGHT SCATTERING AT 45 DEGREES, 90 DEGREES AND 135 DEGREES AND TURBIDITY AT 0 DEGREES,
Enviro Control, Inc., Rockville, MD.
A. F. Hadermann, and J. H. Bochinski.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A023 839, Price codes: A08 in paper copy, A01 in microfiche. Prepared for Coast Guard Office of Research and Development Final Report No. CG-D-76, January 1976. 176 p, numerous fig, tab, 4 append. DOT-CG-34170-A.

Descriptors: *Monitoring, *Water quality, *Water pollution, Oil pollution, Baseline studies, Ships, Turbidity, Outer Continental Shelf, Oil-in-water, Light-scattering.

A breadboard oil-in-water content monitor for shipboard applications was designed and assembled. An evaluation followed using various oil mixtures for the test medium. The oil-in-water monitor consists of (1) a sample handling system for homogenizing the oil, and (2) a unique multiangle scattered-light and turbidity sensor. The monitor response is linear from 0 to more than 125 ppm oil concentration. The response time is less than 10 seconds. Accuracy determined for many oil mixtures is plus or minus 3 to plus or minus 5%. The deviation of response (DOR) for sixteen test oil mixtures, including two with Bunker C, is plus or minus 13%. The deviation of responses (DOR) for all seventeen oil mixtures, including one with precipitated components of Bunker C, is plus or minus 21%. The breadboard is equipped with four light-emitting diode sources and four photovoltaic detectors for high reliability and low maintenance, for compensation of drift effects and for reduction of deviation of response to different oil mixtures. Deviations of response of the monitor for oil in the presence of solids and detergents and at different salinities, temperatures, and pH's were obtained and are discussed. Recommendations for a field prototype instrument are presented. (Sinha-OEIS)
W78-10437

SKYLAB/EREP APPLICATION TO ECOLOGICAL, GEOLOGICAL, AND OCEANOGRAPHIC INVESTIGATIONS OF DELAWARF BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas, D. S. Bartlett, W. D. Philpot, R. H. Rogers, and L. E. Reed.
Available from the National Technical Information Service, Springfield, VA 22161 as E78-10001, Price codes: A02 in paper copy, A01 in microfiche. Final Report to NASA Langley Research Center, No. CMS-NASA-1-76, May 1976. 68 p, 5 fig, 5 tab, 41 ref. NAS1-12304.

Descriptors: *Remote sensing, *Monitoring, Environmental effects, Water pollution effects, *Delaware Bay, Outer Continental Shelf, Ocean dumping, Skylab.

SKYLAB/EREP S190A and S190B film products have been optically enhanced and visually interpreted to extract data suitable for mapping coastal land use; inventorying wetlands vegetation; monitoring tidal conditions; observing suspended sediment patterns; charting surface currents; locating coastal fronts and water mass boundaries; monitoring industrial and municipal waste dumps in the ocean; determining the size and flow direction of river, bay and man-made discharge plumes; and observing ship traffic. Film products were visually analyzed to identify and map ten land-use and vegetation categories at a scale of 1:125,000. Comparison of these thematic maps with CARETS Land Use Maps resulted in classification accuracies ranging from 50% to 98%. Digital tapes from the S192 Multispectral Scanner were used to prepare thematic maps of land use. Classification accuracies obtained by comparison of S192 derived thematic maps of land use with USGS-CARETS land-use maps in southern Delaware ranged from 44% to 100%. The resolutions of the S190A, S190B and S192 systems were 20-4-m, 10-20m, and 70-100m, respectively. (Sinha-OEIS)
W78-10441

PHYSICAL AND BIOLOGICAL MEASUREMENTS, JULY 29 - AUGUST 5, 1973, (CRUISE Y7307D),
Inter-American Tropical Tuna Commission, La Jolla, CA., and Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2L.
W78-10447

APPLICATION OF REMOTE SENSING TO THE CHESAPEAKE BAY REGION. VOLUME 2-PROCEEDINGS,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
W. T. Chen, G. W. Greas, Jr., G. D. Hickman, D. A. Pemberton, and T. D. Wilkerson.
National Aeronautics and Space Administration Conference Publication 6 (NASA CP-6), February 1978. 416 p, numerous fig, tab.

Descriptors: *Chesapeake Bay, *Water quality, *Eutrophication, *Water utilization, Water pollution, Coasts, Thermal pollution, Dredging, *Remote sensing, Models, Pollution, Outer Continental Shelf, LANDSAT.

The proceedings of a conference held April 12-15, 1977, at the Coolfont Conference Center, Berkeley Springs, West Virginia are presented. The conference was jointly sponsored by the National Aeronautics and Space Administration, the U.S. Environmental Protection Agency, and the University of Maryland. The purpose of the conference was to assemble representatives of federal and state government agencies engaged in research on the condition and evolution of the Chesapeake Bay to compose a status report, to present current activities and future plans, and to recommend a long-range future course of policies and programs. Findings of the conference were developed and presented by the attendees divided into six working groups, each of which filed a report containing conclusions and recommendations. A summary of the recommendations and conclusions of the conference are contained in Volume 1. (Sinha-OEIS)
W78-10448

5B. Sources Of Pollution

SEA CULTTER INVESTIGATIONS USING OIL SLICKS,
Bendix Aerospace Div., Ann Arbor, MI.
J. Z. Busch, J. W. Crispin, R. G. DeLosh, F. T. Johnson, and D. E. Lamphiear.
Report No. BSR-139 to U.S. Navy, October 1959. 171 p, 89 fig, 4 tab, 6 infolds. Nonr 2349(00).

Descriptors: *Oil pollution, *Oil spills, Pollutant identification, Water pollution, Environmental effects, *Path of pollutants, *Outer Continental Shelf, *Oil slicks, *Sea clutter.

Consideration is given to studying sea clutter by constantly comparing the returns from the 'clean sea' with returns from a 'slicked' area. If it should be discovered that the addition of an oil slick to the sea surface has the same effect on clutter as a reduction in the wind speed by a factor of N and if the factor N can be determined, then the future studies the researcher could, in effect, obtain data on clutter at two wind speeds through the use of a control area on which an oil slick is spread. The pholosophy behind this study program and the method of sea clutter and related phenomena are reviewed and the results of the experimental program are given. (Sinha-OEIS)
W78-09801

DEVELOPMENT OF ADDITIONAL HAZARD ASSESSMENT MODELS,
Little (Arthur D.) Inc., Cambridge, MA.
For primary bibliographic entry see Field 5C.
W78-09804

POLLUTION PROBLEMS OF A COASTAL AND MARITIME STATE,
Department of Trade (England). Marine Div.
For primary bibliographic entry see Field 5G.
W78-09809

MARINE POLLUTION OFF BARBADOS'COASTS,
Ministry of Health and Welfare (Barbados).
For primary bibliographic entry see Field 5G.
W78-09810

SEGREGATED BALLAST TANKER ARRANGEMENTS FOR POLLUTION ABATEMENT DUE TO ACCIDENTS,
Exxon Research and Engineering Co., Linden, NJ. Logistics Dept.; Maritime Administration, Washington, DC. Div. of Ship Design; and Coast Guard, Washington, DC. Office of Merchant Marine Safety.
For primary bibliographic entry see Field 5G.
W78-09813

STUDIES OF CIRCULATION AND PRIMARY PRODUCTION IN DEEP INLET ENVIRONMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
D. F. Winter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 504, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-049, April, 1977, 100 p, 1 tab, 32 fig, 21 ref.

Descriptors: *Circulation, Diffusion, Ecosystems, Ecology, *Estuaries, *Convection, Tides, Tidal waters, *Tidal streams, Hydraulic models, Primary productivity, Ocean currents, Path of pollutants, *Puget Sound, Modeling, *Ecosystem modeling, Hydraulic modeling, *Fiords, Deep inlets.

The results of a three-year study to investigate various aspects of circulation dynamics and primary production in a deep inlet environment is presented. Throughout the course of the research, special attention has been given to Puget Sound, Washington, although many of the findings are applicable to other deep inlet waters. The several tasks undertaken during the course of the project fall into three general categories: (1) Numerical modeling of gravitational convection and tidal motions in deep estuaries, (2) hydraulic model studies of tidal circulation patterns and dye dispersal characteristics in Puget Sound, and (3) Numerical modeling of primary production in a deep inlet (in particular, the deep central basin of Puget Sound). (EIS-Katz)
W78-09829

BIOLOGICAL ASPECTS OF TERRESTRIAL OIL SPILLS, USA CRREL OIL RESEARCH IN ALASKA, 1970-1974,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 5C.
W78-09831

ABIOLOGICAL METHYLATION OF MERCURY IN SOIL,
Environmental Monitoring and Support Lab., Las Vegas, NV.
R. D. Rogers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 902, Price codes: A02 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-077, January 1977. 11 p, 3 tab, 3 fig, 11 ref.

Descriptors: Metals, *Mercury, Soil analysis, *Soil chemistry, Soil contamination, Soil environment, Soil chemical properties, Chemical analysis, *Path of pollutants, *Mercury inorganic compounds, *Methyl mercury, *Mercury methylating factor, Mercury organic compounds, Methylation.

This work defines several factors influencing this methylation of mercuric ion in soil. Two of the most important findings were that it is possible to extract the mercury methylating factor from soil with a solution of 0.5N sodium hydroxide and that this factor is responsible for the abiological methylation of mercury in the soils under investigation. The ability of the soil extract to methylate mercury is influenced by temperature, mercuric ion concentration, and solution pH. The methylating ability of the soil extract was stable at high temperature (121C), but was lost after exposure to ultraviolet radiation. When the 0.5N sodium hydroxide extract of soil was separated into a soluble and insoluble fraction, the ability to methylate mercuric ion remained with the soluble fraction. (EIS-Katz)
W78-09832

PREDICTING EFFECTS OF SULFURIC ACID ON QUALITIES OF IRRIGATION AND DRAINAGE WATERS IN CALCAREOUS SOILS,
Texas A and M Univ. Agricultural Research Station El Paso.
For primary bibliographic entry see Field 5G.
W78-09944

THE NITROGEN ISOTOPE EFFECT ASSOCIATED WITH NITRATE AND NITRITE LOSS FROM WATELOGGED SOILS,
Washington Univ., St. Louis, MO. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 2G.
W78-09946

EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 1. AN OVERVIEW OF CONTAMINANT ARRIVAL DISTRIBUTIONS AS GENERAL EVALUATION REQUIREMENTS,
BCS Richland, Inc., WA. Scientific Systems Dept.
R. W. Nelson.
Water Resources Research, Vol. 14, No. 3, p 409-415, June 1978. 8 fig, 1 tab, 9 ref. ERDA (45-1)-1820,E(45-1)-2320.

Descriptors: *Groundwater, *Water pollution, *Path of pollutants, *Environmental effects, Model studies, Mathematical models, Equations, Pollutants, Soil contamination, Groundwater movement, Water pollution sources.

The environmental consequences of subsurface contamination problems can be evaluated completely and effectively by fulfilling the following five requirements: (1) determining each present or future outflow boundary of contaminated groundwater, (2) providing the location/arrival time distributions, (3) providing the location/outflow quantity distributions, (4) providing these distributions for each individual chemical or biological constituent of environmental importance, and (5) using the arrival distributions to determine the quantity and concentration of each contaminant that will interface with the environment as time passes. The arrival distributions on which these requirements are based provide a reference point for communication among scientists and public decision makers by enabling complicated scientific analyses to be presented as simple summary relationships. (See also W78-09956 thru W78-09958) (Sims-ISWS)
W78-09955

EVAUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 2. OBTAINING LOCATION/ARRIVAL TIME AND LOCATION/OUTFLOW QUANTITY DISTRIBUTIONS FOR STEADY FLOW SYSTEMS,
BCS Richland, Inc., WA. Scientific Systems Dept.

R. W. Nelson.
Water Resources Research, Vol. 14, No. 3, p 416-428, June 1978. 11 fig, 3 tab, 20 ref. ERDA (45-1)-1820,E(45-1)-2320.

Descriptors: *Groundwater, *Water pollution, *Path of pollutants, *Model studies, Mathematical models, Environmental effects, Equations, Pollutants, Soil contamination, Groundwater movement, Water pollution sources.

A steady, two-dimensional flow system was used to demonstrate the application of location/arrival time and location/outflow quantity curves in determining the environmental consequences of groundwater contamination. The subsurface geologic and hydrologic evaluations needed to obtain the arrival results involve a sequence of four phases: system identification, new potential determination, flow system kinematics, and contaminant transport analysis. Once these phases are completed, they are summarized effectively and easily used to evaluate environmental consequences through the arrival distributions. (See also W78-09955 thru W78-09958) (Sims-ISWS)
W78-09956

EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 3. OBTAINING CONTAMINANT ARRIVAL DISTRIBUTIONS FOR STEADY FLOW IN HETEROGENEOUS SYSTEMS,
BCS Richland, Inc., WA. Scientific Systems Dept.
R. W. Nelson.
Water Resources Research, Vol. 14, No. 3, p 429-440, June 1978. 9 fig, 1 tab, 8 ref.

Descriptors: *Water pollution, *Groundwater resources, Groundwater movement, Hydrology, Environmental effects, Groundwater recharge, Mathematical models, *Contaminant arrival distributions, Steady flow.

The versatility of the new contaminant arrival distributions for determining environmental consequences of subsurface pollution problems is demonstrated through application to a field example involving land drainage in heterogeneous porous materials. Though the four phases of the hydrologic evaluations are complicated because of the material heterogeneity encountered in the field problem, the arrival distributions still effectively summarize the minimal amount of data required to determine the environmental implications. These arrival distributions yield a single graph or tabular set of data giving the consequences of the subsurface pollution problems. Accordingly, public control authorities would be well advised to request that the results of subsurface pollution investigations be provided in the form of arrival distributions and the resulting simpler summary curve or tabulation. Such an objective is most easily accomplished through compliance with the requirements presented by Nelson for assuring a complete subsurface evaluation. (See also W78-09955 thru W78-09958) (Lee-ISWS)
W78-09957

EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 4. OBTAINING AND UTILIZING CONTAMINANT ARRIVAL DISTRIBUTIONS IN TRANSIENT FLOW SYSTEMS,
BCS Richland, Inc., WA. Scientific Systems Dept.
R. W. Nelson.
Water Resources Research, Vol. 14, No. 3, p 441-450, June 1978. 10 fig, 4 tab, 4 ref.

Descriptors: *Water pollution, Groundwater resources, Groundwater movement, Hydrology, Environmental effects, Groundwater recharge, Mathematical models, *Groundwater contamination, Transient flow system.

The versatility of the new contaminant arrival distributions for determining environmental consequences of subsurface pollution problems is demonstrated through application to a transient flow system. Though some of the four phases of the hydrologic evaluations are more complicated because of the time dependence of the flow and input contaminant concentrations, the arrival distributions still effectively summarize the data required to determine the environmental implications. These arrival distributions yield two graphs or tabular sets of data giving the consequences of the subsurface pollution problems in a simple and direct form. Accordingly, the public control authorities would be able to use these results to choose alternatives or to initiate corrective actions, depending on the indicated environmental consequences. (See also W78-09955 and W78-09958) (Lee-ISWS)
W78-09958

LOSS OF SPRAY AND PELLETED PICLORAM IN SURFACE RUNOFF WATER,
Agricultural Research Service, College Station, TX.; and Agricultural Research Service, Temple, TX.
R. W. Bovey, C. Richardson, E. Burnett, M. G. Merkle, and R. E. Meyer.
Journal of Environmental Quality, Vol. 7, No. 2, p 178-180, April-June 1978. 3 tab, 9 ref.

Descriptors: *Texas, *Herbicides, *Agricultural runoff, *Weed control, *Pesticide residues, *Surface runoff, Brush control, Watersheds(Basins), Runoff, Rainfall, Leaching, Simulated rainfall, Precipitation(Atmospheric), Rainfall-runoff relationships, Pesticides, Water pollution sources, Pollutants, *Picloram.

This investigation was conducted to determine the concentration of picloram, applied as the pelleted formulation, in surface runoff water that may move from a treated watershed to untreated areas as a result of natural or simulated rainfall. Movement of surface and subsurface applied picloram in surface runoff water also was investigated. The potassium salt of pelleted picloram was applied at 2.24 kg/ha (acid equivalent) to a 1.3-ha rangeland watershed supporting stands of honey mesquite. Surface runoff of 1.5 cm from a 2.1-cm rain received 2 days after treatment contained an average of 2.8 ppm picloram. Picloram content declined rapidly and runoff water contaned less than 5 ppm picloram by 2.5 mo after application. Loss of the potassium salt of picloram from grassland watersheds in surface runoff water was similar whether the picloram was applied as an aqueous spray or as a pellet. Picloram applied subsurface was lost in surface runoff water, but in lower concentrations than when applied to the soil surface. (Henley-ISWS)
W78-09965

PERSISTENCE OF TEBUTHIURON IN SURFACE RUNOFF WATER, SOIL, AND VEGETATION IN THE TEXAS BLACKLANDS PRAIRIE,
Agricultural Research Service, College Station, TX.
R. W. Bovey, E. Burnett, R. E. Meyer, C. Richardson, and A. Loh.
Journal of Environmental Quality, Vol. 7, No. 2, p 233-236, April-June 1978. 5 tab, 12 ref.

Descriptors: *Herbicides, *Agricultural chemicals, *Texas, *Water quality, *Urea pesticides, *Agricultural runoff, Weed control, Water pollution sources, Soil contamination, Pollutants, Persistence, Pesticide residues, Environmental effects, Water pollution, Agricultural watersheds, Leaching, Vegetation, *Tebuthiuron, *Texas, Blacklands Prairie.

The concentration of tebuthiuron (N-(5-(1,1-dimethylethyl)-1, 3,4-thiadiazol-2-y))-N,N' - dimethylurea) applied in the spray or pellet form was measured in surface runoff water from watersheds which received natural or simulated rainfall. The persistence of tebuthiuron in soil and vegetation was also investigated. Pelleted tebuthiuron was applied at 2.24 kg/ha (active ingredient) to a 1.3-ha rangeland watershed. A 2.8-cm rain, 2 days after application, produced 0.94 cm runoff which contained an average of 2.2 ppm of tebuthiuron. Tebuthiuron concentration decreased rapidly with each subsequent runoff event and after 3 mo was less than 0.05 ppm; none was detected in runoff water 1 year after treatment. The concentration of tebuthiuron, applied as a spray at 1.12 kg/ha, decreased to less than 0.01 ppm within 4 mo in runoff from a small plot which received simulated rainfall. On 0.6-ha plots, mean tebuthiuron (sprays and granules) concentration was 0.50 ppm or less in water when the first runoff event occurred 2 mo after application. Concentrations of tebuthiuron in soil and grass from pellet applications were low (less than 1 ppm) and decreased with time. (Henley-ISWS)
W78-09966

BACKGROUND WATER TEMPERATURES AND POWER STATION DISCHARGES,
Central Electricity Generating Board, Leatherhead (England). Central Electricity Research Labs.
J. F. MacQueen.
Advances in Water Resources, Vol. 1, No. 4, p 195-203, June 1978. 5 fig, 1 tab, 16 ref.

Descriptors: *Thermal pollution, *Mathematical models, *Heated water, *Coasts, *Thermal powerplants, Theoretical analysis, Analytical techniques, Analysis, Evaluation, Discharge(Water), Distribution patterns, Distribution, Tidal effects, Tides, Mixing, Currents(Water), *Water temperature, Model studies, Littoral, Spatial distribution, Thermal plumes.

An analytical treatment of the background or far-field temperature distribution associated with the cooling water discharge from a direct-cooling coastal power station was presented. Factors considered in the formation of this temperature field included residual tidal currents, horizontal mixing, the cooling water flow rate, separation of the outlet, and intake and heat transfer across the water surface. A criterion was derived which specifies conditions under which the circulation of water between the outlet and the intake is expected to have a significant influence on background temperatures. As an illustration, the analysis suggested that under conditions typical of the U.K. coast in the southern North Sea, this recirculation, while affecting the operation of the power station, has little effect on the far-field temperature for plants of less than 3-5 GW electrical capacity. At many coastal locations there will be a mean, or residual tidal current running parallel to the shore. The effect of this is to limit the off-shore extent of the temperature field while transporting the heat a considerable distance along the coast. These factors were quantified, and it was demonstrated that the 'area' of the far-field is very sensitive to the threshold temperature which is taken to define its boundary. The results obtained with this model were influenced greatly by the values adopted for residual currents and mixing. The paper, therefore, stressed the need for reliable data, obtained from site surveys, on which the parameters must be based. (Humphreys-ISWS)
W78-09969

EVALUATION OF RIVER THERMAL REGIME MODELS,
Nalco Environmental Sciences, Northbrook, IL. Physical Science Div.
P. P. Paily, and J. F. Kennedy.
Advances in Water Resources, Vol 1, No 4, p 219-227, June 1978. 5 fig, 2 tab, 12 ref.

Descriptors: *Mathematical models, *Rivers, *Water temperature, *Forecasting, Model studies, Spatial distribution, Distribution, Distribution, patterns, Heated water, Thermal powerplants, Water quality, Evaluation, Analytical techniques,

Thermal water, River thermal regime, Iowa thermal regime model, Water quality model, COLHEAT river simulation model.

Brief descriptions and a comparison of three computational models are presented for prediction of the transient stages of river thermal regimes: the Iowa Thermal Regime Model (ITRM), developed at the Iowa Institute of Technology; and the COLHEAT River Simulation Model which was formulated by the Hanford Engineering Development Laboratory Staff. The salient features of each of these models were described and discussed, and the formulation of ITRM was presented in detail. Simplification of ITRM for computeing the steady-state temperature distributions was discussed, and predicted results were compared with actual field measurements in certain reaches of the Missouri and Mississippi Rivers. Thermal regime models can be used reliably for predicting the thermal characteristics of major rivers and their tributaries. Thermal regime analyses using models are useful in water resources planning of river basins, and for siting and sizing of power plants and industries along rivers. A steady-state model utilizing time-independent hydrological and meteorological data as input information may be adequate for most planning studies to obtain the necessary results. (See also W73-08624, W75-08683, and W77-08221) (Humphreys-ISWS)
W78-09972

PARTICULATE FORMATION DUE TO FREEZING HUMIC WATERS,
Savannah River Ecology Lab., Aiken, SC.
J. P. Giesy, and L. A. Briese.
Water Resources Research, Vol. 14, No. 3, p 542-544, June 1978. 1 fig, 1 tab, 29 ref. EY-76-C-09-0819.

Descriptors: *Humic acids, *Decomposing orgaic matter, *Humus, *Particle size, *Organic compounds, Analytical techniques, Chemical properties, Swamps, Physical properties, Colloids, Organic matter, Organic soils, Turf, Freezing, Lignins, Centrifugation, Fibers(Plant), *Skinface pond(SC), Swamp waters.

Water samples were collected from a soft water highly humic pond, and all particulates of more than 0.15 micrometer nominal diameter were removed by continuous flow centrifugation. Freezing caused the formation of brown particulates which could be removed by centrifugation. The particulates can be dispersed by sonification, but the size distribution of orgaic fractions is altered permanently by freezing. (Henley-ISWS)
W78-09984

INTERPRETATION OF HYDROCHEMICAL FACIES BY FACTOR ANALYSIS,
University of South Florida, Tampa. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-09985

QUALITY CHARACTERISTICS OF AGRICULTURAL AND WASTE DISPOSAL RUNOFF WATER,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
C. H. Shelton, and G. M. Lessman.
Journal of Soil and Water Conservation, Vol. 33, No. 3, p 134-139, May-June 1978. 9 tab, 9 ref.

Descriptors: *Agricultural runoff, *Farm wastes, *Water pollution, *Surface runoff, *Agricultural watersheds, *Tennessee, Rainfall-runoff relationships, Agricultural chemicals, Chemical analysis, Watersheds(Basins), Farm management, Cultivation, Water quality, Pollutants, Water pollution sources, Soil contamination, Fertilization, Environmental effects.

Samples were collected of runoff water from four Tennessee watersheds subjected to various cropping, tillage, fertilization, and/or waste disposal practices over a three-year period. Among the quality constituents examined were nitrates, phosphates, chlorides, dissolved solids, sediment, suspended matter, turbidity, biochemical oxygen demand, dissolved oxygen, fecal coliform, and 13 selected metals. Concentrations of most of the constituents in runoff water were low. Highest concentrations usually were associated with high antecedent rainfall and the absence of vegetative cover. (Henley-ISWS)
W78-09994

ARSENIC CONCENTRATIONS IN SURFACE RUNOFF FROM SMALL WATERSHEDS IN TEXAS,
Agricultural Research Service, Temple, TX.
C. W. Richardson, J. D. Price, and E. Burnett.
Journal of Environmental Quality, Vol. 7, No. 2, p 189-192, April-June 1978. 1 fig, 5 tab, 10 ref.

Descriptors: *Arsenicals(Pesticides), *Cotton, *Texas, *Arsenic compounds, *Agricultural chemicals, *Desiccants, Water pollution sources, Pesticides, Agricultural runoff, Water quality, Sodium arsenite, Sediments, Cultivation, Herbicides, Pollutants, Soil contamination, Insecticides, Agriculture, Water pollution, Surface runoff, Agricultural watersheds, *Texas Blackland Prairie.

This study was conducted to determine the movement of arsenic by surface runoff after application of arsenic acid for desiccation of cotton. Arsenic acid was applied at 6.6 kg/ha during the cotton year of a cotton-grain sorghum-oats rotation. The concentration of arsenic dissolved in the runoff water was highest during the first runoff event after application and decreased during subsequent events. Arsenic concentrations in the first runoff after treatment ranged from 250 to 18 ppb, depending on time and tillage after application. Tillage that incorporated treated plant material into the soil reduced arsenic concentration in runoff water. After two or three runoff events, the arsenic concentration decreased to 10 to 20 ppb and remained essentially constant until the next application 3 years later. The arsenic concentration of the sediment from the watersheds averaged 20 ppm and appeared to be related more to the arsenic content of the soil than to the length of time or the tillage between arsenic acid application and first runoff. Assuming average annual runoff and sediment yield, the amount of arsenic that would be transported from a watershed by runoff and erosion is about 7% of the amount applied. Part of the arsenic that moves from a watershed may be arsenic that occurs naturally in the soil. Of the total arsenic moved by a watershed, 38% would be in solution and 62% would be attached to the sediment. (Henley-ISWS)
W78-09997

FORMULAS AND METHODS FOR CALCULATING CONCENTRATION AND LOADS AT ANY POINT ON A STREAM,
Northern Illinois Univ., DeKalb, IL. Dept. of Geology.
R. C. Flemal.
Illinois Water Information System Report of Investigation No. 4, May 1978. 10 p, 1 tab, 2 ref.

Descriptors: *Water quality, *Water pollution, *Path of pollutants, Equations, Mathematical models, Pollutants, Dispersion, Mixing, Streamflow, Suspended load, Mass transfer, Monitoring, Streams, Water pollution sources.

Many cases arise where it is desirable to be able to calculate the concentraton and/or mass of a dissolved constituent at a point or series of points other than stream monitoring stations. For example, it may be of interest to know whether standard violations occur at points immediately downstream from a major point source outfall. It also may be of interest to develop a 'profile' of concentrations/masses along the length of a stream. This paper developed formulas for making such calculations. (Sims-ISWS)
W78-09998

STUDY INVESTIGATES FATE OF METALS IN LAND DISPOSAL.
Water and Wastes Engineering, Vol. 15, No. 3, p 14, March, 1978.

Descriptors: *Heavy metals, *Lysimeters, *Model studies, *Soil types, *Sewage sludge, Copper, Zinc, Cadmium, Nickel, Lead, Sampling, Waste water treatment, Municipal wastes.

The movement of heavy metals, contained in secondary treated waste water applied to land, through soil was examined for 4 soil types. Samples of the soil types were enclosed in drainage lysimeters and dosed at a rate of 2.7 cm/wk over a 2-yr period with effluent bearing 1 ppm each of copper, zinc, cadmium, nickel, and lead. Land plots of two of the soil types were treated in the same manner and protected from rainfall. Bermuda grass grown in the lysimeters, soil at various depths, and water from the root zone were sampled periodically for heavy metal analysis. Results indicated that heavy metals accumulated within the top 12.5 cm and primarily at the surface. Bermuda grass uptake of the heavy metals was minimal; downward movement of the metal through the lysimeters was slow. (Lisk-FIRL)
W78-10016

NONPOINT-SOURCE POLLUTANTS TO DETERMINE RUNOFF SOURCE AREAS,
Agricultural Research Service, Tucson, AZ.
L. J. Lane, H. L. Morton, D. E. Wallace, R. E. Wilson, and R. D. Martin.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 7. Proceedings of the 1977 Meetings of the Arizona Section, American Water Resources Assn.; and the Hydrology Section, Arizona Academy of Science, April 15-16, Las Vegas, Nevada, p 89-102. 13 fig, 4 tab, 14 ref.

Descriptors: *Herbicides, *Pollutants, *Surface runoff, *Tracking techniques, *Path of pollutants, Arizona, Watershed management, *Small watersheds, Peak discharge, Hydrologic systems, Discharge measurement.

A tracer study was conducted on two small semiarid watersheds (within the larger Santa Rita Experimental range south of Tucson, Arizona), each of which was partitioned into geomorphic subzones or hydrologic response units. Each of four zones on both watersheds was treated with approximately 1 kg/ha of four individual water-soluble herbicides. Herbicide yields in surface during the 1976 summer storm season were 0.21% and 0.56% of the total amounts applied. Two methods were developed to relate runoff rate and herbicide (pollutant) discharge rates, the first matching the mean total concentration and total runoff volume, the second matching the instantaneous total concentration and runoff rate from the entire watershed. Results from these two methods suggest that, while they may be equivalent as far as runoff volume is concerned, the second may be more consistent with respect to peak discharge. (Paylore-Arizona)
W78-10021

MANAGEMENT PROGRAMS, RESEARCH AND EFFECTS OF PRESENT LAND USE ACTIVITIES ON WATER QUALITY OF THE GREAT LAKES. VOLUME I.
International Reference Group on Great Lakes Pollution from Land Use Activities. U.S. Section of Task Group A.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 698,

Price codes: A23 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., November 1974, 545 p, references.

Descriptors: *Land use, *Environmental effects, *Water pollution, *Great Lakes, Water quality control, Drainage effects, Water pollution sources, Industries, Pesticides, Herbicides, Erosion, Sedimentation, Nutrients, Feedlots, Research priorities, Regulation, Transportation, Agricultural wastes, Livestock wastes, Nonpoint source pollution.

The study assesses whether the boundary waters of the Great Lakes system are being polluted by land drainage and if so, what remedial measures would provide improvements in controlling pollutants from land usage. The land uses, practices, and effects examined in this volume are: residential, and industrial areas; transportation; extractive areas; pesticides and herbicides; nutrients; erosion and sedimentation; and animal wastes and intensive animal feedlots. For each of these areas, recommendations are made. Land use patterns must be mapped. Both the relationship between storm events and water quality, and the means to control the pollution must be further investigated. In the transportation sector, research must be undertaken establishing both the rate and the quantity of waste production. A survey of gravel and stone industries is needed to determine their seriousness as pollutants. Methods to dispose of brines must be investigated. Research is needed to quantify and identify the contribution of agricultural activities to pesticide pollution and nutrient transport, and to identify appropriate controls. Research needs regulating sedimentation involve refinement of sediment delivery ratios for large watersheds, the effect of land treatment on sediment yield from large watersheds, and refinement of the factors in influencing erosion and sediment yield from urban land. The effects of animal wastes and feedlots are imprecisely understood and require further research. (See also W78-10027) (Nessa-NC)
W78-10026

MANAGEMENT PROGRAMS, EFFECTS OF RESEARCH AND PRESENT LAND USE ACTIVITIES ON WATER QUALITY OF THE GREAT LAKES. VOLUME II.
International Reference Group on Great Lakes Pollution from Land use Activities. U.S. Section of Task Group A.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 699, Price codes: A25 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., November 1974, 585 p, references.

Descriptors: *Land use, *Environmental effects, *Water pollution, *Great Lakes, *Water pollution abatement, Water pollution control, Water quality, Dredging, Water pollution sources, Research priorities, Regulation, Forestry, Recreation, Liquid wastes, Solid wastes, Deep wells, Management, Non-point source pollution.

The study assesses whether the boundary waters of the Great Lakes system are being polluted by land drainage and if so, what remedial measures would provide improvements in controlling pollutants from land usage. The land uses, practices, and effects examined in this volume are: forestry; recreation land; undeveloped land; liquid waste disposal; solid waste disposal; dredging; deep well disposal; and management and control of land use and water quality problems. For each of these areas, recommendations are made. Research is needed to quantify the effects of forest lands and forest activities on the Great Lakes Basin water quality. The problems associated with intensive tree culture must be investigated before the technique is utilized on a large scale. Monitoring of pesticide residues should be expanded to sample aquatic sediments. Recreation was found to cause only localized water quality problems. Many aspects of natural pollution are imperfectly understood and require more exacting models. Liquid waste disposal creates locally severe problems that are not well quantified. Land treatment techniques exist that are capable of solving the problems. Areas for landfill sites should be designated after regional land use patterns are mapped. Technology to dredging related pollution needs to be developed. Deep well disposal does not presently cause problems but may in the future. The major concerns related to nonpoint sources of pollution involve fostering less polluting land use practices, understanding the impact of land use on ground water, and the development of effective and acceptable regulatory techniques. (See also W78-10026) (Nessa-NC)
W78-10027

SALTWATER INTRUSION IN THE FLORIDAN AQUIFER, COASTAL CITRUS AND HERNANDO COUNTIES, FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
L. R. Mills, and P. D. Ryder.
Water-Resources Investigations 77-100 (open-file), 1977. 1 sheet, 2 fig, 2 tab, 5 ref.

Descriptors: *Saline water intrusion, *Aquifers, *Pumping, *Groundwater movement, *Water quality, Urbanization, Water wells, Water supply, Chlorides, Saline water-freshwater interfaces, *Florida, Citrus County, Hernando County, Floridan aquifer.

The coastal parts of Citrus and Hernando Counties, Fla., are undergoing extensive urban development along U.S. Highway 19. The Floridan aquifer, a thick sequence of limestone and dolomite, is the principal source of water supply for the coastal parts of these two counties. The construction of canals that penetrate the Floridan aquifer, deficient rainfall during 1964-75, and pumping of ground water, have caused saltwater to intrude the aquifer. A map shows the inland extend of that intrusion as of 1975. The report is based on field data collected in 1964, 1973, and 1975. (Woodard-USGS)
W78-10039

RIVER QUALITY ASSESSMENT: IMPLICATIONS OF A PROTOTYPE PROJECT,
Geological Survey, Portland, OR. Water Resources Div.; and URS Co., Seattle, WA.
For primary bibliographic entry see Field 5G.
W78-10052

A TRACER STUDY OF THE FLUSHING TIME OF THE SAMPIT RIVER ESTUARY, GEORGETOWN, SOUTH CAROLINA,
Geological Survey, Columbia, SC. Water Resources Div.
F. A. Johnson.
South Carolina Water Resources Commission, Columbia, Report No 10, 1978. 40 p, 25 fig, 1 tab, 7 ref.

Descriptors: *Path of pollutants, *Estuaries, *South Carolina, *Dye releases, *Low flow, Tracking techniques, Tracers, Fluorescent dye, Tidal effects, Mixing, Dispersion, Saline water-freshwater interfaces, *Sampit River estuary, *Georgetown(SC).

Rhodamine WT dye was injected into lower and upper areas of Sampit River estuary at Georgetown, S.C. in April 1977 to determine flushing time of the river during a period of moderately dry weather. In the lower section, dye had flushed from the river or was undetectable after 35 days, although approximately 90 percent was undetectable after 2 weeks. Flushing of the upper Sampit River did not occur, at least during the period between injection on April 8 and May 10. The dye diminished by slow dispersion through tidal action, and its gradual movement in the downstream direction took about 1 week to become very pronounced. It is possible that small increments of dye may have eventually reached Winyah Bay on the low tides. (Woodard-USGS)
W78-10053

TRANSURANIC SPECIATION IN THE ENVIRONMENT,
Oak Ridge National Lab., TN. Environmental Sciences Div.
E. A. Bondietti, and F. H. Sweeton.
Available from the National Technical Information Service, Springfield, VA 22161 as part of NVO-178. In: Transurancis in Natural Environments, Proceedings of a Symposium held in Gatlingurg, Tennessee, October, 1976. Report NVO-178, p 449-476, 6 fig, 5 tab, 39 ref.

Descriptors: *Water pollution, *Speciation, *Plutonium, Environment, Aquatic environment, Food chains, Solubility, *Radioisotopes, *Transurancs.

The question of which Pu oxidation states dominate in the environment is discussed. The information which is presented exemplifies the complexities of evaluating Pu behavior in natural solutions and identifies ways in which further research needs to be structured in order to answer questions concerning environmental mobility and biogeochemistry of Pu and other actinides. It was concluded that Pu is extremely insoluble and thus does not appear to enter food chains readily. There appears to be no evidence suggesting that aging in the environment will change this fact. (Chilton-ORNL)
W78-10068

DISTRIBUTION PATTERNS AND TRANSPORT OF PLUTONIUM IN FRESHWATER ENVIRONMENTS WITH EMPHASIS ON PRIMARY PRODUCERS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 5C.
W78-10069

DISTRIBUTION OF PU238 AND PU239,240 IN AQUATIC MACROPHYTES FROM A MIDWESTERN WATERSHED,
Argonne National Lab., IL. Ecological Sciences Section.
For primary bibliographic entry see Field 5C.
W78-10071

PU238 AND PU239,240 DISTRIBUTION IN FISH AND INVERTEBRATES FROM THE GREAT MIAMI RIVER, OHIO,
Argonne National Lab., IL. Ecological Sciences Section.
For primary bibliographic entry see Field 5C.
W78-10072

EFFECT OF NATURALLY OCCURRING ORGANICS ON PLUTONIUM-237 UPTAKE BY ALGAE AND BACTERIA,
Savannah River Ecology Lab., Aiken, SC.
For primary bibliographic entry see Field 5C.
W78-10073

CASING DEPTHS AND SOLUTE TRAVEL TIMES TO WELLS,
Iowa State Univ., Ames. Dept. of Agronomy.
D. Kirkham, and M. O. Sotres.
Water Resources Research, Vol. 14, No. 2, p 237-243, April, 1978. 7 fig, 9 ref.

Descriptors: *Travel time, *Solutes, *Well casings, Flow nets, Flow rates, Water pollution sources, Water wells, Aquifers, Path of pollutants.

Partially-penetrating well casing may offer some protection against chemical solutes such as nitrates and acids from agriculture industry, strip mines, sanitary landfills or other pollution sources near wells. Travel times for solutes depend on the well and aquifer geometric factors such as well and aquifer geometric factors such as well radius, screened length of the well, and thickness of the aquifer. The longest and shortest travel times and flow nets were computed for 18 well-aquifer geometries assuming piston flow in a steady state along streamlines in a phreatic (water-table) aquifer and a fixed radius of influence. Dimensionless travel time t', increases as the impervious well casing length increases. Multiplication of t' by a factor (p/KH) times b squared gives the real travel time, where f is aquifer porosity, K is conductivity, H is the difference in head between the water table level and the level in the pumped-down well, and b is the radius of influence. These travel times should be useful in well design and protection from solutes. Curves of t' versus 4/b, where r is horizontal distance from the well center to a point on top of the aquifer were given for a number of geometries. (Purdin-NWWA)
W78-10076

AQUIFER STORAGE OF HEATED WATER: PART II - NUMERICAL SIMULATION OF FIELD RESULTS,
Geological Survey, Reston, VA. Water Resources Div.
S. S. Papadopulos, and S. P. Larson.
Ground Water, Vol. 16, No. 4, p 242-248, July-August, 1978, 7 fig, 1 tab, 6 ref.

Descriptors: *Energy transfer, *Thermal energy storage, *Mathematical models, On-site investigations, Aquifers.

A field experiment was conducted by Auburn University to determine the feasibility of thermal energy storage in an aquifer near Mobile, Alabama and to provide data neded for evaluating the validity of energy-transport models. The numerical model used to simulate the experiment, (INTERCOMP, 1976) applies finite-difference techniques to solve simultaneously the equations describing fluid and energy transport. Model parameters were obtained from analysis of pumping-test data, laboratory measurements on core samples, and estimates from available physical data. Simulation result were sensitivre to the anisotropy of the aquifer permeability and the heat capacity of the aquifer matrix. Porosity and hydrodynamic dispersivity had a moderate effect on the steepness of the temperature front but had negligible impact on the spatial position of the front. Simulation of the experiment clearly demonstrated that models can adequately predict the effects of thermal energy transfer and storage in ground-water systems. Thus, they could be used to evaluate the effectiveness of storing thermal energy in a variety of geohydrologic environments and to aid in the planning and design of proposed installations. (See also W78-04292) (Purdin-NWWA)
W78-10080

A MODEL AQUIFER SYSTEM FOR BIOLOGICAL COMPATIBILITY STUDIES OF PROPOSED DEEP WELL DISPOSAL SYSTEMS,
North Carolina Agricultural Experiment Station, Raleigh.
For primary bibliographic entry see Field 5E.
W78-10082

FATE OF 14C-BENZENE IN EGGS AND LARVAE OF PACIFIC HERRING (CLUPEA HARENGUS PALLASI),
National Marine Fisheries Service, Tiburon, CA. Southwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-10127

MIREX INCORPORATION IN THE ENVIRONMENT: TOXICITY IN HYDRA,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
K. Y. Lue, and A. A. de la Cruz.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 4, p 412-416, 1978. 3 tab, 24 ref.

Descriptors: *Bioassay, *Toxicity, *Mortality, *Pesticide kinetics, Path of pollutants, Pesticide residues, Water pollution effects, Behavior, Invertebrates, Organic compounds, Pesticides, *Biomagnification, *HYDRA, *Mirex.

This is part of a series of investigations on the toxicity, physiological, and ecological effects of mirex to non-target organisms. Specimens of Hydra spp. were exposed to 1.0, 0.1 and 0.01 ppm solutions of mirex. Behavioral changes were observed after 2 days of exposure. By the 12th day of exposure mortalities of 78%, 20%, and 6% had occurred at the three respective concentrations. (EIS-Deal)
W78-10136

PCB AND DDT RESIDUES IN A MEDITERRANEAN PELAGIC FOOD CHAIN,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
S. W. Fowler, and D. L. Elder.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 2, p 244-249, 1978. 1 fig, 1 tab, 17 ref.

Descriptors: *Food chains, *Food webs, *DDT, *Polychlorinated biphenyls, *Shrimp, *Plankton, Path of pollutants, Organic compounds, Pesticides, Chlorinated hydrocarbon pesticides, Pesticide kinetics, Aquatic microorganisms, Pesticide residues, *Biomagnification, Tissue analysis, *Mediterranean Sea.

A well-defined pelagic food chain was examined to determine whether certain pollutants such as chlorinated hydrocarbons are indeed biomagnified through the marine food web. Results indicated that PCBs and DDTs do not undergo trophic biomagnification as one proceeds up the food chain. It must be remembered, however, that accumulation through the food chain is probably only one of several factors affecting the concentration of these compounds in pelagic organisms. (EIS-Deal)
W78-10137

PATTERNS OF INCREASING MERCURY CONTENT WITH GROWTH FOR WILD AND CULTURED RED SEA BREAMS, CHRYSOPHYS MAJOR (IN JAPANESE),
Yamaguchi Prefectural Research Inst. of Health (Japan).
H. Kumagai, and K. Saeki.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 44, No. 3, p 269-272, 1978. 2 tab, 3 fig, 16 ref.

Descriptors: *Path of pollutants, *Mercury, *Absorption, *Heavy metals, *Aquiculture, *Fish diets, Size, *Marine fish, *Animal growth, Metals, Public health, Laboratory tests, Food chains, Food webs, Fish physiology, Bioaccumulation, *Red Sea bream, *Methyl mercury, Wild fish, Chrysophys major.

To elucidate the possible routes of uptake of mercury by red sea bream, the patterns of increasing mercury content with growth were traced in wild and cultured fish. The diets of the fish differed from each other and the circumstances relating to mercury levels of the surrounding water was assumed to be the same for both groups. In both the dorsal and ventral flesh of the wild fish the total content of mercury increased exponentially with an increase of the body length. On the other hand, in the dorsal flesh of the cultured fish an equimolar relation was obtained. The ratio of methyl mercury to the total amount of mercury, in wild fish, increased with increasing body length. This ratio remained constant in the case of the cultured fish. From these results it is concluded that the difference in mercury levels between the wild and cultured fish may be derived from the difference in diets. In addition, it was shown that the alkyl mercury in these fish is predominantly methyl mercury, while ethyl and butyl mercury were not detected. (EIS-Katz)
W78-10145

HYDROCARBONS IN THE WATER AND SEDIMENT OF WILDERNESS LAKE II,
Exxon Research and Engineering Co., Linden, NJ. Analytical and Information Div.
R. A. Brown, and P. K. Starnes.
Marine Pollution Bulletin, Vol. 9, p 162-165, 1978. 2 fig, 3 tab, 20 ref.

Descriptors: *Sediments, *Chemical analysis, *Organic compounds, *Aromatic compounds, *Freshwater, Lakes, Surface waters, On-site investigations, Lake sediments, Water properties, Water analysis, Canada, *Colin Scott Lake(Ontario), *Wilderness Lake II.

Hydrocarbons are reported for a wilderness lake. All hydrocarbons, including polynuclear aromatics, appear to be of natural origin. Extractable organics and hydrocarbons occurred in Colin Scott Lake water at concentrations of 7.1 and 1.1 ppb, respectively. This is comparable to median concentrations observed for the Pacific Ocean. The nonvolatile hydrocarbon content of the sediment was 22 ppm, consisting of a complex mixture. (EIS-Katz)
W78-10157

A RELATIONSHIP BETWEEN TOTAL MERCURY CONTENT AND A KIND OF FOOD IN SOME CHOSEN PACIFIC FISH SPECIES (ZALEZNOSC POZIOMU RTECI OGOLNEJOD RODZAJU ODZYWIANIA U WYBRANYCH GATUNKOW RYB PACYFICZNYCH),
Instytut Technologii zym Zywnesci Pochodzenia Morskiege, Szczecin (Poland).
A. Ociepa, and M. Protasowicki.
Zeszyty Naukowe Akademii Rolnicze j W Szczecinie, No 60, p 83-87, 1976. 1 tab, 8 ref.

Descriptors: *Mercury, *Food chains, *Food webs, *Trophic levels, *Marine fish, *Heavy metals, *Predation, *Path of pollutants, Public health, Metals, Pollutants, Bioaccumulation, Biomagnification, Trachurus, Theragra, Merluccius, Hypomesus, Sebastes.

Results of mercury determinations in 5 Pacific fish species: Trachurus symmetricus, Theragra chalcogramma, Merluccius productus, Hypomesus pretiosus, and Sebastes sp., caught off the western coasts of the USA are presented. The mercury content varied in flesh of the species examined, the 0.3 ppm level never being exceeded. Statistical treatment of the results showed significant differences between mercury contents in phytophagous and predatory fishes, which seems to indicate an increasing accumulation of this element in consecutive trophic levels. (EIS-Katz)
W78-10163

SOIL RENOVATION OF EFFLUENT FROM A SEPTIC TANK ON A LAKE SHORE,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
M. M. Gibbs.
New Zealand Journal of Science, Vol 20, p 255-263, 1977. 3 tab, 5 fig, 20 ref.

Descriptors: *Phosphorus, *Nitrogen, *Nutrients, *Nutrient removal, *Seasonal, *Septic tanks, *Coliforms, *Groundwater, *Water pollution sources, *Path of pollutants, Domestic wastes,

Water supply, Nitrogen compounds, Adsorption, Public health, *Soil renovation, *Lake Taupo(New Zealand).

The flow pattern of effluent from a soakhole defined by a thermal survey of the site was confirmed by chemical analysis of the interstitial water. The efficiency of nutrient removal expressed as a mean for the whole site was estimated at 83% for phosphorus and 24% for nitrogen. An apparent seasonal difference in efficiency of phosphorus removal was attributed to lake level changes and the frequency that each soil horizon was either exposed to effluent or flushed with groundwater containing low concentrations of nutrients. The flushing was thought to provide a mechanism by which up to 80% of the effluent could eventually reach the lake. Examination of water within 20 mm of the lake bed showed high of phosphorus, nitrogen, and coliforms, decreasing with distance from the shore. (EIS-Katz)
W78-10164

PESTICIDE RESIDUES IN BEAVER AND RIVER OTTER FROM ALABAMA,
Alabama Cooperative Wildlife Research Unit, Auburn.
E. P. Hill, and J. W. Lovett.
In: Proceedings of the Twenty-ninth Annual Conference, Southeastern Association of Game and Fish Commissioners, October 12-15, 1975, St. Louis, Missouri, p 365-369, 3 tab, 9 ref.

Descriptors: *Pesticide residues, *Aroclor, *DDT, *DDD, *DDE, *Polychlorinated biphenyls, *Dieldrin, *Beavers, Wildlife, *Otters, *Heptachlor, *Path of pollutants, Mammals, Food chains, Public health, Insecticides, Pesticides, Chlorinated hydrocarbon pesticides, Small animals(Mammals), Alabama, *Mirex, *River otters, Castor canadensis, Lutra canadensis.

Tissue samples from beaver and river otter taken by trappers mostly from Southeastern Alabama during January through March 1973 and 1974 were subjected to pesticide residue analyses. Residues found were Mirex, DDT, DDE, DDD, Heptachlor epoxide, Endrin, Dieldrin, Toxaphene and PCB as Aroclor 1260. The occurrence of Mirex in 14 of 19 river otter taken in 1974 may have resulted from large area serial application of Mirex for fireant control. Composite samples of beaver from the Chattahoochee River contained 31 times more total residues than composite samples from other areas. (EIS-Katz)
W78-10165

BOTTOM SEDIMENTS IN A POLLUTED MARINE ENVIRONMENT, UPPER SARONIKOS GULF, GREECE,
California Univ., Santa Cruz. Div. of Applied Sciences.
G. B. Griggs, A. P. Grimanis, and M. V. Grimani.
Environmental Geology, Vol. 2, No. 2, p 97-106, 1978. 10 fig, 2 tab, 19 ref.

Descriptors: Industrial wastes, *Sewage effluents, *Waste water disposal, Domestic wastes, Municipal wastes, Sediments, *Bottom sediments, *Sewage sludge, Heavy metals, *Zinc, *Mercury, *Arsenic, *Chromium, Fertilizers, *Outfall sewers, Path of pollutants, Water pollution sources, Metals, Greece, Upper Saronikos Gulf, Sludge beds.

The domestic and industrial waste water from most of the greater Athens, Greece area is discharged into shallow water at the upper end of the semi-enclosed Saronikos Gulf. The lack of circulation and excess organic matter has led to the formation of a rapidly expanding sludge field. Black anoxic sediment high in organic carbon now cover almost 9 sq km of sea floor and contain high concentrations of heavy metals. Maximum increases above background values range from 22x for mercury, 1500x for arsenic, 1200x for chromium, to 3000x for zinc. The principle sources of metals are (1) a fertilizer factory, (2) the Athens sewer outfall, and (3) the industries in eastern Elefsis Bay. (EIS-Deal)
W78-10176

ORGAOCHLORINE RESIDUE LEVELS IN HERONS AND RAPTORS IN THE TRANSVAAL,
Canadian Wildlife Service, Ottawa (Ontario).
D. B. Peakall, and A. C. Kemp.
Ostrich, Cape Town, Vol. 47, No. 2-3, p 139-141, 1976.

Descriptors: *Organic chlorine compounds, *Chlorinated hydrocarbon pesticides, Pesticide accumulation, Toxicity, Water birds, Ecology, Wildlife conservation, *Pesticide residues, Reproduction, Organo chlorine insecticides, Aquatic animals, Water quality, Toxic pollutants, South Africa, *DDT, *DDE, *Dieldrin, Barberspan, Deelpan, *Herons.

Concern over the effects of persistent pesticides on the reproductive capacity of raptors has mounted since the initial finding of residues of these materials in a Scottish Peregrine egg in 1961. These materials are widely considered to be a major cause of the decline of several species of raptors in the northern temperate zone. Despite the restrictions on the use of DDT in North America and many European countries in recent years the global usage of DDT is probably still increasing. Goldberg (1975) has produced data to show that the areas of heavy DDT use are now in a broad band across northern Africa, the Middle East, India, southeast Asia and Central America and the northern part of South America. Much of central Africa is listed as areas of moderately heavy use. In view of this southwards shift in the usage pattern of DDT it is of interest to have additional information on levels of persistent pesticides in African species which are at the ends of food chains. (So Afr Water Info Center)
W78-10234

GROUND-WATER LAKE RELATIONSHIPS AND GROUND-WATER QUALITY IN THE SAND PLAIN PROVINCE OF WISCONSIN-NEPCO LAKE,
Warzyn Engineering Inc., Madison, WI.
For primary bibliographic entry see Field 2F.
W78-10254

HISTORICAL WATER QUALITY DATA, CHICAGO RIVER, SAITARY AND SHIP CANAL, AND CALUMET RIVER SYSTEMS,
Northeastern Illinois Planning Commission, Chicago.
For primary bibliographic entry see Field 5A.
W78-10273

THERMAL PLUMES FROM SUBMERGED DISCHARGES AT ZION NUCLEAR POWER STATION: ADDITIONAL PROTOTYPE MEASUREMENTS OF INTERACTING PLUMES,
Argonne National Lab., IL.
R. A. Paddock, A. A. Frigo, and J. D. Ditmars.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/WR-77-3, Price codes: A04 in paper copy, A01 in microfiche. Report ANL/WR-77-3, July 1977. 54 p, 27 fig, 4 tab, 3 ref. ERDA W-31-109-Eng-38.

Descriptors: *Thermal pollution, *Powerplants, *Lake Michigan, *Surveys, Heated water, Cooling water, Nuclear powerplants, Measurements, Temperature, Water temperature, Currents(Water), Water circulation, Winds, Discharge(Water), *Zion Nuclear Power Station(Ill), *Plumes, Thermal plumes.

Measurements were made of the thermal plumes from the two submerged discharges of the Zion plant into Lake Michigan during the summer of 1976. The survey results were reported in the form of horizontal isotherm maps at vertical intervals of 1.0 m, from the surface to a depth of 3.0 m, and of selected vertical cross sections. Ambient lake-water temperatures and currents were monitored throughout the study period. Analysis of data from two mappings of double plumes made in 1975 by Argonne at this site had indicated that significant interaction between the plumes from the adjacent discharges occurred in the presence of an ambient current. The interaction resulted in surface areas of the double plumes that were more than ten times the sum of two separate, single-discharge plumes. Comparisons of the results of the present surveys with the previous mappings were limited somewhat because of the difficulties in defining the ambient, or background, water temperature. Temperature data collected in the 1976 surveys exhibited large spatial and temporal variability. Vertical temperature stratification during one of these surveys resulted in entrainment of cooler near-bottom water, greatly reducing plume surface temperatures; and intrusion of a cool-water mass into the site area during the other survey made it possible to define only a range of ambient temperatures. The conclusions from the analysis of the additional double-plume data, constrained by the variability cited above, were that the surface isotherm areas associated with the downcurrent, shielded plume were larger than those of a single plume discharged in the same direction, and that the total double-plume surface isotherm area in one survey appears to exceed that of the sum of two separate, single-discharge plumes. (Sims-ISWS)
W78-10282

ESTIMATION OF DIRECT RUNOFF FROM URBAN WATERSHEDS,
Indiana State Board of Health, Indianapolis.
A. Hossain, A. Ramachandra, and J. W. Delleur.
Journal of the Hydraulics Division-ASCE, Vol. 104, No. HY2, p 169-188, February, 1978. 16 fig, 3 tab, 17 ref.

Descriptors: *Urban runoff, *Watershed management, *Storm runoff, *Fourier analysis, *Linear programming, Mathematical models, Watersheds(Basins), Precipitation excess, Surface runoff, Time lag, Waste water disposal, Municipal wastes.

Linear and nonlinear direct runoff systems models were applied to 11 watersheds in different stages of urbanization to determine watershed response, to develop a regional model describing the relationship between excess rainfall and direct runoff, and to calculate the response of urbanized watersheds to a short series of storms. A convolution integral described the linear relationship between rainfall excess and direct runoff; the Fourier transform method was utilized to calculate the instantaneous unit hydrograph (IUH) or the kernel function. A regional dimensionless IUH was formulated into a smooth curve by combining the dimensionless unit hydrographs from 10 of the watersheds. The regional dimensionless linear IUH evaluated a quasi-linear model that was developed to relate the rainfall excess with the direct runoff. Direct runoff in watersheds with varying degrees of urbanization was predicted by the IUH, when the estimated rainfall excess was incorporated, and also by the quasi-linear model. The nonlinear system model, which considered the rainfall excess as a series of impulses, was not as accurate as the quasi-linear model for predicting direct runoff. First and second order kernels, planar functions of the direct runoff output, were more regenerable for two storms than for six; the regeneration performance of the quasi-linear model was better than that of the nonlinear model. (Lisk-FIRL)
W78-10290

ACTINOMYCETE SCUM PRODUCTION IN ACTIVATED SLUDGE PROCESSES,
Drexel Univ., Philadelphia, PA. Dept. of Environmental Sciences.
W. O. Pipes.
Journal Water Pollution Control Federation, Vol. 50, No. 4, p 628-634, April, 1978. 7 fig, 11 ref.

Descriptors: *Actinomycetes, *Activated sludge, *Scum, *Lipids, *Aerated lagoons, Bubbles, Sewage sludge, Flotation, Physical properties, Waste water treatment, Municipal wastes, Dairy industry.

Actinomycete scum formation on the surface of activated sludge aeration tanks was analyzed using 94 samples collected from 32 activated sludge plants over a 12-yr period. The actinomycetes were of the genus Nocardia and represented as short, highly branched filamentous colonies; actinomycete scum was formed by the secretion of lipids which collected on air bubbles which then agglomerated on the aeration tank surface as a scum. The scumming in aeration tanks was often found in activated sludge plants treating some dairy wastes. BOD in the effluent from the plants was lower than in other plants without actinomycete scum problems; suspended solids were significantly higher. No correlation was found between actinomycete counts and the food-to-microorganism ratio or the sludge volume index. In the samples analyzed, actinomycete counts were never above 100/mg mixed liquor suspended solids when the mean cell retention time was less than 9 days. All of the plants that had scum problems operated at temperatures above 18C and mean cell retention times longer than 12 days; high actinomycete counts were not always associated with scumming. The deflocculated or floating sludge caused by actinomycete scumming had poor separating properties and was not considered a form of sludge bulking. Laboratory tests indicated that the scum might be partially dissolved with hexane or acetone. (Lisk-FIRL)
W78-10334

A SURVY OF PHOSPHORUS LEVELS IN TREATED MUNICIPAL WASTEWATER,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5D.
W78-10335

CONCERNING THE BEHAVIOR OF MBAS AND BIAS IN A MUNICIPAL SEWAGE TREATMENT PLANT (UEBER DAS VERHALTEN VON MBAS AND BIAS AUF EINER KOMMUNALEN KLAERANLAGE),
Stuttgart Univ. (West Germany). Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W78-10339

MODELLING AND OPERATIONAL CONTROL OF WATER QUALITY IN RIVER SYSTEMS,
Australian National Univ., Canberra. Center for Resource and Environmental Studies.
For primary bibliographic entry see Field 5G.
W78-10349

INDUSTRIALIZATION AND RIVER ECOLOGY,
Irrigation Commission, Lucknow (India).
A. C. Chaturvedi.
Journal of the Institution of Engineers (India), Vol. 58, No. 2, p 38-41, February, 1978.

Descriptors: *Water quality, *Model studies, Computers, *Sampling, *Instrumentation, Industrial wastes, Rivers, Waste water disposal, Aeration, Destratification, Water quality control, Waste water treatment, Municipal wastes.

The physical, chemical, and hydraulic characteristics of eight Indian rivers receiving municipal and industrial effluents were investigated by on-site analysis and model studies. Transport equations for the dilution characteristics of the discharged effluents incorporated the balance of convection, turbulent diffusion, production, and dissipation; the rate of dispersion of industrial effluents was dependent upon the transverse mixing. The model contained equations for depth, average velocity, and concentration; rapid vertical mixing of the effluents was observed. Analytical data from the 25 sampling sites was relayed by telemetry to a computer for storage. Discharge velocities from the effluent outfalls had a greater influence on the discharge width; downstream channel flow directly affected dispersion. Artificial destratification to improve water quality by increasing the exchange in the vertical direction was rejected because of adverse temperature disruption; instream oxygenation was considered feasible for improving water quality. Laboratory-scale aeration tanks revealed that a 50% increase in salinity in waste water would destroy ether-soluble bacteria; phenol concentrations increased to 400 mg/liter, causing overloading. When operated at 25-33% salinity, sludge wastage at a rate of 0.5 liters/day was required. (Lisk-FIRL)
W78-10350

PROCEEDNGS OF RECONVENED SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE STATES OF CALIFORNIA, COLORADO, UTAH, ARIZONA, NEVADA, NEW MEXICO, AND WYOMING (7TH) HELD AT DENVER, COLORADO, APRIL 26-27, 1972.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10368

NATIONWIDE EVALUATION OF COMBINED SEWER OVERFLOWS AND URBAN STORMWATER DISCHARGES. VOL. III: CHARACTERIZATION OF DISCHARGE,
American Public Works Association, Chicago, IL. Research Foundation.
M. J. Manning, R. H. Sullivan, and T. M. Kipp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 107, Price codes: A13 in paper copy, A01 in microfiche. Report EPA-60/2-77-064, August 1977. 289 p, 77 fig, 132 tab, 111 ref, 2 append.

Descriptors: *Combined sewers, *Urban runoff, *Water pollution sources, *Sampling, *Urban drainage, Storm water, Surface runoff, Drainage systems, Land use, Census, Distribution patterns, Pollution abatement, Waste water treatment, Municipal wastes.

The characteristics of pollution originating in urban stormwater runoff and combined sewer overflows and the impact on receiving waters were studied by analyzing published and unpublished data. Available data was often derived from reports which did not focus directly on urban runoff but provided pollutant characteristics for other purposes; comprehensive studies of urban runoff pollution characteristics were recommended. Other recommendations included uniform and consistent sampling techniques and closer monitoring of flow quantity during flow quality measurement. Urban storm water discharge models were developed for utilizing census data to evaluate land use and population densities. Pollutants contributed by treated municipal sewage flows during storm conditions were identified as less extensive than pollution loads associated with urban runoff. Receiving water quality was affected by shock loads and solids accumulations associated with urban runoff during storm periods. Methods were developed for redesigning sources of urban runoff pollution such as vacant lot erosion, street surface runoff pollution, and roof leader drainage. (See also W78-00752) (Lisk-FIRL)
W78-10397

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY.
Environmental Protection Agency, Washington, DC. Office of Air and Water Programs.
For primary bibliographic entry see Field 5G.
W78-10403

UTILIZATION OF MODELING IN WATER QUALITY MANAGEMENT STUDIES,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-10420

MEASURING WASTEWATER FLOW WITH DYE,
W. S. Foster.
American City and County, Vol. 93, No. 5, p 38, May, 1978.

Descriptors: *Rhodamine, *Dye dispersion, *Tracers, *Flow rates, *Sewers, Dye concentrations, Tracking techniques, Dyes, Flowmeters, Calibrations, Analytical techniques, Sewerage, Weirs, Flumes, Settling basins, Waste water disposal, Municipal wastes.

Rhodamine WT dye, supplied by E. I. DuPont de Nemours and Co., was used in a dye-dilution tracing method for short-term monitoring of flows in sewers and for calibrating weirs, flowmeters, and flumes. Rhodamine has a specific gravity of 1.2 and a viscosity that requires it be diluted with water to increase the injectable rate above 10 ml/min. The dye is dispersed into the flow at a constant rate by a constant-feed pump or a Mariotee vessel; a sampling unit is installed at a sufficient distance downstream from the injection point to insure adequate mixing. The flow rate of the waste water is calculated as the producy of dye injection rate and the ratio of initial dye concentration to sampled dye concentration. The dye tracer technique is also appropriate for measuring pump performance, settling and chlorine basin efficiency, canal and stream flow rates, and effluent dilution in receiving water bodies. (Lisk-FIRL)
W78-10425

ESTIMATION OF AROMATIC HYDROCARBONS IN SEAWATER AT PROPOSED DEEPWATER PORT (DWP) SITES IN THE GULF OF MEXICO,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5A.
W78-10428

THE AMOCO CADIZ OIL SPILL,
Cremer and Warner, London (England).
For primary bibliographic entry see Field 5C.
W78-10431

BARIUM CONTENT OF MARINE SEDIMENTS NEAR DRILLING SITES: A POTENTIAL POLLUTANT INDICATOR,
Scripps Institution of Oceanography, La Jolla, CA.; and Science Application Inc., La Jolla, CA.
T. J. Chow, J. L. Earl, J. H. Reeds, N. Hansen, and V. Orphan.
Marine Pollution Bulletin, Vol 9, No 4, p 97-99, April 1978. 2 fig, 1 tab, 6 ref.

Descriptors: *Water pollution control, *Barium, *Bottom sediments, Monitoring, Sediments, California, Baseline studies, Metals, *Outer Continental Shelf, *Southern California Bight, Pollutant indicators.

Barite is commonly used as a weighting agent in oil- and gas-well drilling mixture; therefore, the distribution pattern of barium in marine sediments near drilling sites may provide an indicator of

anthropogenic chemical contamination from these operations. Present average content of barium in benthic sediments from the Southern California Bight was determined to be 637 ppm, with a range from 43 to 1899 ppm, and that of the mainland and the channel island intertidal sediments averaged 879 and 388 ppm, respectively. (Sinha-OEIS)
W78-10432

STRATEGIC PETROLEUM RESERVE. SULPHUR MINES SALT DOME, CALCASIEU PARISH, LOUISIANA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of Energy Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10443

MOBILE BAY MODEL STUDY. REPORT I: EFFECTS OF PROPOSED THEODORE SHIP CHANNEL AND DISPOSAL AREAS ON TIDES, CURRENTS, SALINITIES, AND DYE DISPERSION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
R. J. Lawing, R. A. Boland, and W. H. Bobb.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 475, Price codes: A11 in paper copy, A01 in microfiche. Technical Report No. H-75-13, Sept. 1975. 214 p, 15 fig, 6 tab, 28 photos, 118 plates, 4 append.

Descriptors: *Water quality, *Waste disposal, *Baseline studies, *Environmental effects, *Dispersion, Tides, Currents, Salinity, Resources development, Alabama, Outer Continental Shelf, *Mobile Bay(Ala).

The Mobile Bay model was fixed-bed model constructed to linear scale ratios of 1:1000 horizontally and 1:100 vertically. The model reproduced about 268 square miles of the Gulf of Mexico from Pine Beach on the east to about the west end of Dauphin Island, and in a southerly direction to about the -70-ft contour in the Gulf; all of Mible and Bon Secour Bays; a portion of Mississippi Sound; and the Mobile and Tensaw Rivers and adjacent marshes to the junction of the two rivers at Mt. Vernon, some 40 miles upstream from Mobile. The purpose of the model study was to determine the impact of a proposed access channel, referred to as Theodore Ship Channel, and the necessary islands designed to hold the initial construction material and subsequent maintenance dredging on salinities and flow patterns with special interest centered on the oyster industry at the lower end of Mobile Bay. The results of the abbreviated testing program, furnished the Mobile District in preliminary form, and a rating system, incorporating many parameters, such as navigation, economics, environmental effects, esthetics, and others were considered. (Sinha-OEIS)
W78-10445

5C. Effects Of Pollution

ESTIMATE OF MAXIMUM LEVEL OF OIL INOCUOUS TO MARINE BIOTA AS INFERRED FROM LITERATURE REVIEW,
Mississippi State Univ., Mississippi State.
L. R. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 601, Price codes: A02 in paper copy, A01 in microfiche. Office of Coast Guard/Research and Development Report No. CG-D-43-77, April 1977. 21 p, 118 ref. DOT-CG-81-76-1476.

Descriptors: *Oil pollution, *Environmental effects, *Ecosystems, *Bibliograhies, *Water pollution effects, Aquatic animals, Oil spills, Biota, *Outer Continental Shelf, Crude oils, Nigerian crude, Acartia tonsa.

An estimate of the maximum level of oil which can be considered harmless to the marine biological community based on the current state-of-the-art as determined through review and interpretation of the literature was derived. It was found that the pelagic copepod, Acartia tonsa is the most oil-sensitive of the organisms for which there are toxicity data available. The literature review also revealed that Nigerian crude was the most toxic of five crude oils which had been tested against Acartia. The 960 hr TLm (medidan tolerance level) of Nigerian crude for the subject organism was reported to be 0.55 mg/l. Therefore a concentration which would cause no harm would have to be less than 0.55 mg/l. In accordance with accepted practice 0.01 of the TLm value or 0.0055 mg/l should be safe for Acartia tonsa. Therefore, an oil concentration of 5.5 micro g/l should also be safe for all other members of the marine ecosystem. (Sinha-OEIS)
W78-09803

DEVELOPMENT OF ADDITIONAL HAZARD ASSESSMENT MODELS,
Little (Arthur D.) Inc., Cambridge, MA.
P. P. K. Raj, and P. M. O'Farrel.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A042 365, Price codes: A14 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Report No. CG-D-36-77, March 1977. 313 p, numerous fig, tab, ref, append.

Descriptors: *Water pollution, *Chemical wastes, *Hazards, *Model studies, Transportation, Oil spills, Water pollution sources, *Outer Continental Shelf, Spreading, Sinking, Propylene.

Five additional assessment models have been developed to delineate the hazards caused by chemicals with specific properties when they are accidentally released in different environmental conditions. These models describe the sinking, spreading and dissolution of heavy liquids in a river, dissolution of heavier than water low boiling point liquids released underwater, spreading on water of continuously released oil (including experimental results) and cryogenic liquids, and the release of chemicals that react with water. The heating by fire and consequent rupture of a propylene barge tank is also investigated. (Sinha-OEIS)
W78-09804

REPORT OF THE SYMPOSIUM ON PREVENTION OF MARINE POLLUTION FROM SHIPS, HELD IN ACAPULCO, MEXICO, 22-31 MARCH 1976.
Coast Guard, Washington, DC. Office of Marine Environment and Systems; and Inter-Governmental Maritime Consultative Organization, London (England).
For primary bibliographic entry see Field 5G.
W78-09805

AQUATIC DISPOSAL FIELD INVESTIGATIONS EATONS NECK DISPOSAL SITE LONG ISLAND SOUND. APPENDIX D,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 5E.
W78-09822

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. MARSH DEVELOPMENT. APPENDIX K.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5E.
W78-09825

STUDIES OF CIRCULATION AND PRIMARY PRODUCTION IN DEEP INLET ENVIRONMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-09829

BIOLOGICAL ASPECTS OF TERRESTRIAL OIL SPILLS, USA CRREL OIL RESEARCH IN ALASKA, 1970-1974,
Army Terrestrial Sciences Center, Hanover, NH.
F. J. Deneke, B. H. McCown, P. I. Coyne, W. Rickard, and J. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 365, Price codes: A04 in paper copy, A01 in microfiche. Research Report 346, Dec. 1975. 19 tab, 34 fig, 71 ref.

Descriptors: *Oil, *Oil spills, *Arctic, Alaska, Detergents, Terrestrial inhabitants, Oil pollution, Oil wastes, Subarctic, Dispersion, Germination, Revegetation, Methodology, *On-site-investigation, Laboratory tests, Oil detection, *Terrestrial plant communities, Pipelines, *Crude oil, Refined products, Injury response, Plant community recovery, *Plant species susceptibility, Sedge.

Knowledge concerning the biological effects of oil pollution on arctic and subarctic terrestrial ecosystems is limited. USA CRREL research personnel conducted investigations from 1970 through 1974 to expand information in this field. Objectives were to: (1) define the ecosystems most sensitive to the presence of crude oil or its refined products, (2) quantify and understand the injury response, and (3) establish time frames for manifestation of damage and natural restorative processes in arctic and subarctic regions. This is accomplished through: (1) surveys of natural oil seepages and past accidental spills in the Arctic and Subarctic (2) initiation of controlled oil spills and (3) detailed laboratory investigations. Results demonstrated that terrestrial oil spills will to some degree be detrimental to both arctic and subarctic plant communities. Degree and longevity of damage will be influenced primarily by the magnitude of the spill, season of occurrence and existing soil moisture content. Rapid recovery of plant communities subjected to spills will occur only if root systems remain relatively unaffected. Damage will be more extensive and long-term when root systems are saturated with oil. Effects of damage will be manifested gradually over several seasons being influenced by winter stresses. Variation does exist in plant species susceptibility. Carex aquatilis a predominant sedge of the arctic is markedly resistant to crude oil damage. In the taiga Picea mariana is very susceptible. Plant recovery can be enhanced through the application of fertilizer. Fertilization, in addition to its direct effect on plant nutrition, will stimulate microbial decomposition of crude oil. (EIS-Katz)
W78-09831

ABIOLOGICAL METHYLATION OF MERCURY IN SOIL,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5B.
W78-09832

EFFECTS OF CYANOPHAGE SAM-1 UPON MICROCYSTIS AERUGINOSA,
Wisconsin Univ.-Oshkosh.
D. L. Parker, G. P. Jansen, and L. Corbett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 078, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-079, July 1977, 53 p. 7 tab, 47 ref, 20 fig.

Descriptors: *Algae, *Viruses, *Viricides, Water pollution effects, *Sewage, *Aquatic algae, Aquatic bacteria, Eutrophication, Nutrients, Aquatic weed control, Aquatic plants, *Cyanophyta, *Cyanophage, *Microcystis, Isogeny, SAM-1.

Cyanophage SAM-1, which infects Synechococcus cedrorum, Anacystis nidulans and strains of Microcystis seruginosa has been isolated from sewage. The host range of cyanophage SAM-1 differs from those of other reported cyanophages. Phage SAM-1 stocks are rapidly inactivated at temperatures above 45C or at pH values below 4 or above 10. The properties of cyanophage SAM-1 are compared with those of other cyanophages. (EIS-Katz)
W78-09833

EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 1. AN OVERVIEW OF CONTAMINANT ARRIVAL DISTRIBUTIONS AS GENERAL EVALUATION REQUIREMENTS,
BCS Richland, Inc., WA. Scientific Systems Dept.
For primary bibliographic entry see Field 5B.
W78-09955

EVAUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION 2. OBTAINING LOCATION/ARRIVAL TIME AND LOCATION/OUTFLOW QUANTITY DISTRIBUTIONS FOR STEADY FLOW SYSTEMS,
BCS Richland, Inc., WA. Scientific Systems Dept.
For primary bibliographic entry see Field 5B.
W78-09956

SOME RESEARCH AND INFORMATION NEEDS IN SURFACE WATER QUALITY.
American Water Resources Association, St. Paul, MN. Research Committee.
For primary bibliographic entry see Field 5G.
W78-09979

RECLAMATION OF ORPHANED MINE SITES AND THEIR EFFECT ON THE WATER QUALITY OF THE LYNX CREEK WATERSHED,
Arizona Univ., Tucson. School of Renewable Natural Resources; and Forest Service, (USDA), Prescott, AZ. National Forest.
T. R. Verma, and E. N. Felix.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings of the 1977 Meetings of the Arizona Section, American Water Resources Assn.; and the Hydrology Section, Arizona Academy of Science, April 15-16, Las Vegas, Nevada, p 49-59. 3 fig, 7 tab, 8 ref.

Descriptors: *Reclamation, *Mine wastes, Mining, Mine acids, *Drainage, Watersheds(Basins), *Water pollution sources, Soil contamination, *Revegetation, Limestones, Neutralization, Water quality, Arizona, Landscaping, *Lynx Creek watershed(Ariz).

The 13,600-acre study area located 8 miles southeast of Prescott, Arizona, is in a semiarid climate of abundant sunshine and low humidities. Since approximately 600 acres in the watershed are patented mining claims, including many worked for over a century, reclamation has focussed on attempts to minimize serious water pollution problems originating from these old mine tailing ponds and dumps. Selected for an in-depth trial was the Sheldon Mine Complex where concerted efforts were made at revegetation, landscape design, and watershed improvement. Reseeding using those species well adapted to the particular soil, climate, and topography of the site was done following (1) recontouring of the site, (2) application of crushed limestone, (3) addition of top soil at depths from 6-8 inches. The limestone provided a buffer strip between the top soil and the underlying acidic spoil material. While the treatment applied to this particular site is not feasible for the entire watershed because of costs, the alternative under consideration is the installation of limestone filtering structures along Lynx Creek to help neutralize some of the toxic metals before they reach the stream itself. In designing the trial site, primary consideration was given to aesthetics, with the final configuration made to blend in with the surrounding topographical and vegetative site characteristics. Land shaping of the spoil material contributed to water conservation and establishment of a stable vegetative cover. Proper drainage was assured by minimizing degree of slope, and decreasing sheet and rill erosion, thus enhancing revegetation success. Future plans include chemical analysis of Lynx Lake to determine changes in water quality as a result of the Sheldon Mine Reclamation project. The final product it is hoped will be a mine reclamation manual applicable to orphaned mine sites in environmentally similar locations. (Paylore-Arizona)
W78-10019

EFFECT OF ILLUVIATED DEPOSITS ON INFILTRATION RATES AND DENITRIFICATION DURING SEWAGE EFFLUENT RECHARGE,
R. A. Herbert.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings of the 1977 Meetings of the Arizona Section, American Water Resources Assn.; and the Hydrology Section, Arizona Academy of Science, April 15-16, Las Vegas, Nevada, p 183-190. 4 fig, 1 tab, 20 ref.

Descriptors: *Infiltration rates, *Sewage effluents, *Denitrification, *Percolation, *Induced infiltration, Nitrogen, Hydraulic conductivity, *Recharge, Arizona, Suspended solids.

This study, conducted to determine the interrelationships among nitrogen transformations, infiltration rates, and development of the black layer found in the Santa Cruz River downstream of the Tucson (Arizona) sewage treatment plant, tested these interrelationships by percolating sewage effluent through clear acrylic columns uniformly packed with river sand for the first run, with gravel for the second run. Sewage effluent was continuously applied to three of the columns for 28 and 64 days during the first and second runs respectively. The remaining column was continuously flooded with tap water to serve as a control. Infiltration rates decreased rapidly upon application of the sewage, and within a few days a black layer developed, its thickness inversely related to the infiltration rate but not a cause of reduced flow, which is attributed, rather, to clogging of the surface by suspended solids. There was an average reduction in total nitrogen of 62.9% for the first run, and 15.9% for the second. The mechanisms of removal for run 1 were predominately absorption and denitrification, whereas the predominate removal mechanism in run 2 was filtering of organic nitrogen with adsorption and denitrification also playing an important role. (Paylore-Arizona)
W78-10023

THE DETERMINATION, ASSESSMENT, AND DESIGN OF 'IN-STREAM VALUE' STUDIES FOR THE NORTHERN GREAT PLAINS REGION,
Montana Univ. Missoula, Dept. of Geology.
For primary bibliographic entry see Field 6G.
W78-10028

SYNERGISTIC EFFECTS OF ENVIRONMENTAL VARIABLES ON THE METABOLISM OF THE COPEPOD EUTERPINA ACUTIFRONS FROM TWO DIFFERENT AREAS OFF THE COAST OF THE STATE OF SAO PAULA, BRAZIL,
Sao Paulo Univ. (Brazil) Dept. of Physiology.
G. S. Moreira, and W. b. Vernberg.
Fishery Bulletin, Vol. 76, No. 2, 1978, p 449-455, 2 fig, 3 tab, 25 ref.

Descriptors: Environmental effects, *Water pollution effects, Temperature, Salinity, Respiration, *Copepods, *Metabolism, Brazil, South America, *Euterpina acutifrons, Bays, Coasts, Synergism.

Copepods were collected from a polluted area (Santos Bay) and an unpolluted area (Sao Sebastiao Channel) to determine the combined effects of temperature and salinity on respiratory rate of the two populations. Four experimental groups of copepods were used: Sao Sebastiao animals kept in Sao Sebastiao water (35% salinity); Santos animals kept in Santos water (28% salinity); Sao Sebastiao animals kept in Santos water; and Sao Sebastiao animals kept in diluted Sao Sebastiao water (28% salinity). Metabolic rate of animals in the first group was less influenced by changes in salinity than were the other groups. Rate did, however, increase with increasing temperture up to 30C; at 32C, rates either leveled off or decreased. Greatest increases in respiration rate were seen between 15 and 20C. It was concluded that water quality of Santos Bay was responsible for changes in the metabolic regulatory capacity of the copepods of that area. (Chilton-ORNL)
W78-10059

COPPER SENSITIVITY OF PACIFIC HERRING, CLUPEA HARENGUS PALLASI, DURING ITS EARLY LIFE HISTORY,
California Univ., Livermore. Lawrence Livermore Lab.
D. W. Rice, Jr., and F. L. Harrison.
Fishery Bulletin, Vol 76, No 2, p 347-356, 6 fig, 3 tab, 46 ref.

Descriptors: Environmental effects, *Water pollution effects, *Copper, *Toxicology, *Herrings, Larvae, Embryonic growth stage, Hatching, *Pacific herring, Life history.

Measurements of cumulative mortality, % hatching, and larval length upon hatching were made on herring embryos and larvae which were exposed continuously to copper in a flow through system and to embryos and larvae exposed to 36 duration pulses of copper. Embryos exposed continuously to copper showed mortalities beginning at 90 h after fertilization and for a short interval thereafter (response period). Larvae exposed continuously to copper showed mortalities beginning immediately after exposure at 300 microg/l. When embryos were exposed to 36 h pulses of copper, reduced sensitivity was seen when exposure took place after the response period. When eggs were exposed to 36 h pulses before the response, the resulting larvae grew less than those hatched from eggs exposed during the developmental stages. (Chilton-ORNL)
W78-10060

THE TOXICITY OF OILS AND PETROLEUM HYDROCARBONS TO ESTUARINE CRUSTACEANS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
H. E. Tatem, B. A. Cox, and J. W. Anderson.
Estuarine and Coastal Marine Science, Vol 6, No 4, 1978, p 365-373, 4 fig, 3 tab, 27 ref.

Descriptors: Environmental effects, *Water pollution effects, *Oil pollution, *Crustaceans, Oils, *Toxicity, Temperature, Salinity, Aromatic compounds, Coasts, Texas, *Organic compounds, Estuarine environment.

This report presents data on the toxicity of four oils, their water-soluble fractions, and some specific petroleum hydrocarbons (PH), to grass shrimp (Palaemonetes pugio), brown shrimp (Penaeus aztecus), and white shrimp (P. setiferus). Bunker C oil and refined No. 2 fuel oil were more toxic than the two crude oils tested. Larvae of grass shrimp were more sensitive to PH than adults. Young penaeds were more resistant than adults. Temperature and salinity changes increase sensitivity of shrimp to PH. Toxicity tests with three naphthalene compounds (naphthalene, 2-methylnaphthalene, and kimethyl-naphthalenes) showed that naphthalenes were highly toxic to brown shrimp and grass shrimp with the dimethyl-

naphthalenes producing lethal responses in a few hours of exposure. Concentration of petroleum hydrocarbons found in environmental samples was less than the toxic concentrations determined for these compounds. (Chilton-ORNL)
W78-10061

EFFECT OF EXPERIMENTALLY APPLIED CHLORINATED HYDROCARBONS ON THE BIOMASS OF THE FIDDLER CRAB, UCA PUGNAX (SMITH),
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
C. T. Krebs, and I. Valiela.
Estuarine and Coastal Marine Science, Vol 6, No 4, 1978, p 375-386, 6 fig, 2 tab, 46 ref.

Descriptors: *Water pollution effects, Environmental effects, Sewage sludge, Salt marshes, *Chlorinated hydrocarbon pesticides, Populations, *Crabs, Coasts, Massachusetts, *Biomass, Fiddler crabs, Population dynamics.

The effect of experimental additions of sewage sludge containing chlorinated hydrocarbons on the population dynamics of fiddler crab populations in a salt marsh is evaluated. The sludge fertilizer treatments lowered crab densities within the treated plots (density was reduced from 113+ or - 10 crabs/sq m in control plots to 47 + or - 5 crabs sq m in a lower dose plot and to 16 + or - crabs/sq m in a higher dose plot). Younger crabs were more sensitive than older crabs. Although the sludge fertilizer contained various heavy metals and other industrial wastes, chemical fractionation revealed that only the fraction containing the chlorinated hydrocarbons showed toxicity. Immigration tests showed substantial mortality to crabs entering treated plots. It was concluded that losses of crabs through contamination of marsh sediments with chlorinated hydrocarbons would affect a principal component of the salt marsh fauna including prey and predator populations in the ecosystem. (Chilton-ORNL)
W78-10062

SALINITY TOLERANCE OF THEODOXUS FLUVIATILIS (MOLLUSCA GASTROPODA) FROM FRESHWATER AND FROM DIFFERENT SALINITY REGIMES IN THE BALTIC SEA,
Oulu Univ. (Finland). Dept. of Zoology; and Oulu Univ. (Finland). Bothnian Bay Research Station.
P. Kangas, and G. Skoog.
Estuarine and Coastal Marine Science, Vol 6, No 4, 1978, p 409-416, 3 fig, 3 tab, 13 ref.

Descriptors: Environmental effects, *Salinity, Resistance, Freshwater, *Snails, Temperature, *Gastropods, Baltic Sea, *Salt tolerance.

Snails were gradually adapted to test salinities over a period of a few days. All populations showed a clear connection between their tolerance ranges and the salinity regimes of their original habitats. A common range of high tolerance was observed at salinities between 1.5 and 10%. Populations from areas with higher salinity showed a range which was shifted towrds higher salinities (15-20%) while those from freshwater exhibited the highest tolerance in low salinities (1.0-0%). Studies of temperature effects showed higher tolerance at 5C than 15C. (Chilton-ORNL)
W78-10063

RESPONSE OF THE ESTUARINE AMPHIPOD GAMMARUS DAIBERI TO CHLORINATED POWER PLANT EFFLUENT,
New York Univ. Medical Center, NY. Inst. of Environmental Medicine.
T. C. Ginn, and J. M. O'Connor.
Estuarine and Coastal Marine Science, Vol 6, No 5, May, 1978. p 459-469,6 fig, 4 tab, 12 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, *Chlorination, Powerplants, Effluent, *Amphipods, *Hudson River.

Evidence indicates that G. daiberi can tolerate laboratory exposure to chlorinated Indian Point effluent for 1 h without adverse effects on survival. Total residual chlorine concentrations generally do not exceed 0.1-0.5 mg/l in power plant effluents. The highest chlorine residual observed in this investigation was 0.18 mg/l. Based on bioassays, test organisms appear to tolerate short-term exposures to chlorine concentrations up to 0.5 mg/l without adverse effects. At ambient temperatures of approximately 26C, G. daiberi displayed active avoidance of unchlorinated effluent at temperatures above 30C. At lower ambient temperatures (15C), G. daiberi did not avoid unchlorinated full-strength effluent as observed at the higher ambient temperature. (Chilton-ORNL)
W78-10065

THE EFFECT OF TEMPERATURE ON GROWTH AND AMMONIA EXCRETION OF THE MANILA CLAM TAPES JAPONICA,
Woods Hole Oceanographic Inst., MA.
R. Mann, and S. J. Glomb.
Estuarine and Coastal Marine Science, Vol 6, No 3, March 1978, p 335-339, 2 tab, 14 ref. NOAA 04-6-158-44016.

Descriptors: Environmental effects, *Temperature, *Growth rates, *Clams, *Ammonia, Reproduction, Mollusks, Water pollution effects, Water temperature.

Over the 77 day period of this investigation, meat production was enhanced at 12C and was less at 14, 16, and 18C. At temperatures above 14C a marked increase in ammonia excretion occurred. An increase in gametogenic activity was also noted above 14C. Two annual periods of spawning have been reported in spring and late autumn coincident with a minimum water temperature of 14C. It is suggested that this temperature coincides with a change in emphasis in Tapes japonica from a metabolism concerned with accumulation of reserve material to reproductive activity. (Chilton-ORNL)
W78-10066

METHYLMERCURY INHIBITION OF FIN REGENERATION IN FISHES AND ITS INTERACTION WITH SALINITY AND CADMIUM,
New Jersey School of Medicine, Newark. Dept. of Anatomy.
P. Weis, and J. S. Weis.
Estuarine and Coastal Marine Science, Vol 6, No 3, March 1978, p 327-334, 2 fig, 3 tab, 35 ref.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, *Cadmium, Fish, *Salinity, Fin regeneration, *Methylmercury.

Caudal fin regeneration in mullets (Megil cephalus) was significantly retarded by 0.01 mg/l methylmercury in 9% salinity at all measurement times (4, 7, 10, and 13 days). At 0.001 mg/l the retardation became significant only at later measurements. The degree of retardation was dose-dependent. In Fundulus confluentus, the addition of 0.01 or 0.05 mg/l methylmercuric chloride retarded growth at 35% salinity but not at 9%. Addition of cadmium chloride counteracted the growth-inhibiting action of methylmercury. Fish exposed to the two toxicants simultaneously exhibited growth rates comparable to controls. (Chilton-ORNL)
W78-10067

TRANSURANIC SPECIATION IN THE ENVIRONMENT,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W78-10068

DISTRIBUTION PATTERNS AND TRANSPORT OF PLUTONIUM IN FRESHWATER ENVIRONMENTS WITH EMPHASIS ON PRIMARY PRODUCERS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
L. D. Eyman, and J. R. Trabalka.
Available from the National Technical Information Service, Springfield, VA 22161 as part of NVO-178. In: Transuranics in Natural Environments, Proceedings of a Symposium held in Gatlinburg, Tennessee, October, 1976, Report NVO-178, p 477-487, 2 fig, 2 tab, 17 ref.

Descriptors: Environmental effects, *Water pollution effects, *Path of pollutants, *Plutonium, Food chains, Sediments, *Phytoplankton, *Primary productivity, Aquatic environment, Freshwater, *Distribution patterns, Radioisotopes.

Bed sediment is identified as the major repository of transuranic elements entering aquatic ecosystems. Plutonium reaches the bed sediment as a result of association with and subsequent settling of suspended particulate matter. It is suggessted that the major role of phytoplankton in plutonium kinetics of aquatic systems is one of removal of Pu from the water column. The term Trophic Transfer Factor (TTF) is proposed to relate concentrations observed in biota to that of the the sediment as an alternative to the traditional expression of Concentration Factor (CF). It is assumed that accumulation in the tissues of organisms at higher trophic levels will be dominated by gut absorption rather than by direct uptake from water. It was concluded that future research on pathways of plutonium to man from aquatic ecosystems should concentrate on those food chains which have the smallest number of trophic transfers between abiotic sources and man. (Chilton-ORNL)
W78-10069

PLUTONIUM-237: AN IMPORTANT RESEARCH TOOL FOR STUDIES OF ENVIRONMENTAL PLUTONIUM KINETICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
J. R. Trabalka, and L. D. Eyman.
Available from the National Technical Information Service, Springfield, VA as part of NVO-178. In: Transuranics in Natural Environments, Proceedings of a Symposium held in Gatlinburg, Tennessee, October, 1976. Report NVO-178, p 489-503, 3 fig, 3 tab, 16 ref.

Descriptors: Environmental effects, *Water pollution, *Absorption, *Plutonium, Distribution, Fish, Channel catfish, Aquatic environment, Ecosystems, *Kinetics, Path of pollutants, Radioisotopes.

Results are presented of and the rationale for the use of Pu-237 in investigations of the uptake, retention, and distribution of Pu (IV) in channel catfish and in a littoral aquatic micro-ecosystem. Uptake of ingested plutonium relative to plutonium hydroxide in channel catfish was influenced by chelation. The highest observed retention at 63 days was 3.8% of ingested dose for Pu-237 citrate, while retention of the fulvate was 0.6%. Tissue distribution studies showed that only about 10% of intracardially injected Pu citrate was excreted. Blood clearance rates were similar to those found in small mammals and were related to plasma protein transferrin. Fractional body burdens in bone, liver, and kidney were 31%, 24%, and 9% respectively 17 days after injection. In a year-old aquatic microcosm spiked with Pu-237 citrate, a distribution coefficient of 9 x 10000 was found for sediment. Materials balance at 90 days post spike showed estimates of 0.001% in water, 0.04% in biota, and over 99.9% in sediments. (Chilton-ORNL)
W78-10070

DISTRIBUTION OF PU238 AND PU239,240 IN AQUATIC MACROPHYTES FROM A MID-WESTERN WATERSHED,
Argonne National Lab., IL. Ecological Sciences Section.
C. W. Wayman, G. E. Bartelt, and J. J. Alberts.
Available from the National Technical Information Service, Springfield, VA 22161 as part of NVO-178. In: Transuranics in Natural Environments, Proceedings of a Symposium held in Gatlinburg, Tennessee, October, 1976. Report NVO-178, p 505-516, 6 tab, 10 ref.

Descriptors: Environmental effects, *Water pollution effects, *Plutonium, Absorption, Aquatic plants, Food chains, Aquatic environment, *Great Miami River, Mound Laboratory, Canals, Ponds, Radioisotopes, Watershed management, *Distribution, Ohio.

Aquatic plants collected from the Great Miami River were found to have higher levels of Pu238 downstream from Mound Laboratory than upstream. Plants from canal and ponds had elevated levels of Pu238 which was attributed to the higher levels of this isotope in the sediments and water of the canal land ponds. Plants grown in a dry canal bed demonstrated that there was very little translocation of Pu238 above the roots. It was concluded that primary producers in an aquatic ecosystem are capable of scavenging and accumulating plutonium from the surrounding water and sediments to levels which are the highest observed in all biota. It was suggested that this fact may be significant in providing an additional and possibly more direct route to man via the consumption of waterfowl. (Chilton-ORNL)
W78-10071

PU238 AND PU239,240 DISTRIBUTION IN FISH AND INVERTEBRATES FROM THE GREAT MIAMI RIVER, OHIO,
Argonne National Lab., IL. Ecological Sciences Section.
G. E. Bartelt, C. W. Wayman, S. E. Groves, and J. J. Alberts.
Available from the National Technical Information Service, Springfield, VA 22161 as part of NVO-178. In: Transuranics in Natural Environments, Proceedings of a Symposium held in Gatlinburg, Tennessee, October, 1976. Report NVO-178, p 517-529, 1 fig, 5 tab, 20 ref.

Descriptors: Environmental effects, *Water pollution effects, Plutonium, Fish, Invertebrates, Absorption, *Great Miami River, Mound Laboratory, Ohio, Radioisotopes.

Pu238 and Pu239,240 activities were determined for minnows, shad, goldfish, carp, crayfish, and clams collected from the Great Miami River. Fish collected below the effluent discharge pipe of Mound Laboratory showed higher Pu238 activity than those taken upstream. Activities in carp gastrointestinal tract were higher than in carp bodies presumably due to sediment found in the gut. There appeared to be little transfer of Pu across intestinal walls into body tissues of carp. Crayfish collected downstream of Mound Laboratory had elevated levels of Pu238 particularly in soft tissues as opposed to shell. Activities in crayfish tended to increase during an effluent pulse. It was concluded that a size-dependent relationship may exist in crayfish with larger size classes having lower activities/unit weight than smaller size classes and this may be due to differences in relative surface area of the shell and gills. (Chilton-ORNL)
W78-10072

EFFECT OF NATURALLY OCCURRING ORGANICS ON PLUTONIUM-237 UPTAKE BY ALGAE AND BACTERIA,
Savannah River Ecology Lab., Aiken, SC.
J. P. Giesy, Jr., D. Paine, and L. W. Hersloff.
Available from the National Technical Information Service, Springfield, VA 22161 as part of NVO-178. In: Transuranics in Natural Environments, Proceedings of a Symposium held in Gatlinburg, Tennessee, October, 1976. Report NVO-178, p 531-543, 4 tab, 43 ref.

Descriptors: Environmental effects, *Water pollution effects, *Plutonium, *Absorption, *Algae, *Bacteria, *Organic compounds, Radioisotopes.

Naturally occurring organics in four nominal diameter size fractions (F I > 0.0183; 0.0183 F II > 0.0032; 0.0032 > F III > 0/009; F IV < 0.009 microm) were introduced in Scenedesmus obliquus and Aeromonas hydrophila cultures at concentrations equal to those found in nature. Plutonium-237 uptake was determined in log phase cultures after 6 hr incubations. Fraction I and II were found to significantly reduce P-237 uptake by S. obliquus. F IV increased uptake and F III had no effect. Only F V increased Pu-237 uptake in A. hydrophila. (Chilton-ORNL)
W78-10073

SPATIAL DISTRIBUTION OF NEARSHORE FISH IN THE VICINITY OF TWO THERMAL GENERATING STATIONS, NANTICOKE AND DOUGLAS POINT, ON THE GREAT LAKES,
Fisheries and Marine Service, Ottawa (Ontario). Great Lakes Biolimnology Lab.
C. K. Minns, J. R. M. Kelso, and W. Hyatt.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 885-892, 1978. 2 fig, 5 tab, 16 ref.

Descriptors: *Spatial distribution, *Temporal distribution, *Thermal powerplants, *Biological communities, *Fish populations, *Thermal stratification, Great Lakes, Powerplants, *Thermal pollution, Water temperature, Seasonal, Diurnal, Diel Migration, *Pelaic communities.

At both sites fish densities were generally greatest in the shallowest, 3-5 m, depths. At Nanticoke, where the nearshore has low relief, there was no distinguishable communities. At Douglas Point, where depth increases rapidly offshore, there was evidence of benthic and pelagic communities. There was no evidence of altered fish distribution in relation to temperature. At Nanticoke there was no vertidal variation in temperature and no vertical response was to be expected. At Douglas Point there was thermal stratification present in the summer and there was no apparent response. The influence of incident radition was uncertain because of the effects of diurnal migrations. At both locations fish were clustered horizontally to varying degrees in the spring and fall, while the summer fish were distributed more evenly. Densest clusters were usually in the vicinity of the turbulent discharge at both locations. The lack of temperature response and the similarity of Nanticoke with situations at nearby streams on Lake Erie suggest that the fish are responding to currents and perhaps topography. (EIS-Deal)
W78-10124

RELATIONSHIP BETWEEN CYTOPLASMIC DISTRIBUTION OF MERCURY AND TOXIC EFFECTS OF ZOOPLANKTON AND CHUM SALMON (ONCORHYNCHUSKETA) EXPOSED TO MERCURY IN A CONTROLLED ECOSYSTEM,
British Columbia Univ., Vancouver. Inst. of Oceanography.
D. A. Brown, and T. R. Parsons.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 880-884, 1978. 2 tab, 34 ref.

Descriptors: *Mercury, *Toxicity, *Zooplankton, *Enzymes, *Chum Salmon, Cytological studies, Fish physiology, Copper, Zinc, Animal pathology, Heavy metals, Proteins, Animal metabolism, Path of pollutants, Biochemistry, Water pollution effects, Cytoplasm, Metallothionein, Tissue analysis.

Fish and zooplankton simulatneously exposed to trace, 1, and 5 micrograms Hg/l. In fish and zooplankton, pathological effects appeared to coincide with saturation of metallothioncin and 'spillover' of Hg into the high molecular weight protein (enzyme-containing) pool. Coincidental with increases of Hg in tissue were decreases of Cu and Zn. Pathological effects of Hg are explained in terms of tertiary and quarternary structural changes in metalloenzymes resulting from replacement of Cu and Zn by Hg. Decreases in tissue Cu and Zn with increasing Hg concentration are discussed as an intracellular displacement of Cu and Zn by Hg and as duodenal and cellular exclusion processes. (EIS-Deal)
W78-10125

SURVIVAL OF THE SALMONID VIRUSES INFECTIOUS HEMATOPOIETIC NECROSIS (IHNV) AND INFECTIOUS PANCREATIC NECROSIS (IPNV) IN OZONATED, CHLORINATED, AND UNTREATED WATERS,
Naval Support Activity, Seattle, WA.
For primary bibliographic entry see Field 5F.
W78-10126

FATE OF 14C-BENZENE IN EGGS AND LARVAE OF PACIFIC HERRING (CLUPEA HARENGUS PALLASI),
National Marine Fisheries Service, Tiburon, CA. Southwest Fisheries Center.
M. B. Eldridge, T. Echeverria, and S. Korn.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 861-865, 1978. 3 tab, 24 ref.

Descriptors: *Food webs, *Aromatic compounds, *Oil, *Herrings, Oil spills, Oil pollution, Larval growth stage, Food chains, Fish eggs, Path of pollutants, Water pollution effects, Absorption, Fish physiology, Tissue analysis, Bioaccumulation, Biomagnification, *Crude oil, *Benzene, Depuration.

Eggs and larvae of Pacific herring were exposed to low concentrations of 14C-labeled benzene, a soluble, aromatic component of crude oil. All life stages accumulated benzene from water in direct proportion to the initial exposure concentrations, reaching equilibrium within 6-12 h. Feeding larvae exposed to benzene through water and live food accumulated benzene initially from the water, then secondarily from the food. The maximum amount of benzene accumulated in tissues was inversely related to age. Eggs accumulated up to 10.9 times the initial concentration, yolk-sac larvae up to 6.9 times, and feeding larvae to 3.9 times. Reasons for these differences in total accumulation and uptake rate are discussed. Results provide evidence for food web magnification of petroleum-based hydrocarbons. (EIS-Deal)
W78-10127

POPULATION ESTIMATES OF SOCKEYE SALMON (ONCORHYNCHUS NERKA) IN A FERTILIZED OLIGOTROPHIC LAKE,
Fisheries and Marine Service, Nanimo (British Columbia). Pacific Biological Station.
D. G. Robinson, and W. E. Barraclough.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 851-860, 1978. 2 fig, 5 tab, 28 ref.

Descriptors: *Sockeye salmon, *Fish populations, *Oligotrophy, *Fertilization, *Nutrients, Population, Biological communities, Growth rates, Nutrient requirements, Fish reproduction, Spawning, Acoustics, Lake stages, Lakes, Canada, British Columbia, Great Central Lake.

Pelagic juvenile sockeye salmon populations were studied in Great Central Lake, British Columbia, during 1969-76 to determine the effect of nutrient enrichment upon their growth and survival. Data for population estimates were collected concurrently by a high-frequency echosounder and a mid

water trawl. Echogram counts supplemented by trawl catches yielded estimates with low variance, good resolution between age-groups, and indicated close correlation between numbers of spawners and resultant progeny within respective treatments. Survival to the fall for the treated 1969-72 brood years averaged 11.6% of potential egg deposition compared to 3.5% for the pretreatment 1968 brood year fish; 2.73 and 6.29% for the post-treatment 1974 and 1975 brood year fish. A carry-over of fertilization effects on the immediate post-treatment 1973 brood year may have induced a cyclic pattern on the survival of the two succeeding year-classes. The relatively consistent annual production of age 0+ sockeye may be due to the inherent stability of inlake spawning and incubation coupled with the low predation rates. The conservative estimate of a 2.5 increase in survival relative to the natural level indicates a positive response to enhanced feeding conditions caused by the fertilization of this oligotrophic lake. (EIS-Deal)
W78-10128

THE INFLUENCE OF FACTORS OTHER THAN POLLUTION ON THE VALUE OF SHANNON'S DIVERSITY INDEX FOR BENTHIC MACROINVERTEBRATES IN STREAMS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5A.
W78-10129

THE ACUTE EFFECT OF BUNKER C OIL AND AN OIL DISPERSANT ON: 1 SERUM GLUCOSE, SERUM SODIUM AND GILL MORPHOLOGY IN BOTH FRESHWATER AND SEAWATER ACCLIMATED RAINBOW TROUT (SALMO GAIRDNERI),
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
B. A. McKeown, and G. L. March.
Water Research, Vol 12, p 157-163, 1978. 2 fig, 1 tab, 22 ref.

Descriptors: *Oil, *Surfactants, *Fish physiology, *Rainbow trout, *Toxicity, Oil pollution, Oil spills, Organic compounds, Animal pathology, Sodium, Cytological studies, Animal metabolism, Fish behavior, Ion transport, Ions, *Oil dispersants, Gills, *Bunker C Oil, *Glucose.

Bunker C oil dispersant were tested for physiological stress on both freshwater and saltwater acclimated rainbow trout. Both compounds tested tended to reduce serum glucose levels with Bunker C causing the more significant decrease (P less than 0.08), indicating a possible dysfunction of the kidney. The freshwater treatment group showed a significant decrease in sodium levels (P less than 0.01) when treated with a dispersant, while under similar conditions, saltwater acclimated fish show a very marked increase in serum sodium cncentrations (P less than 0.025). Those fluctuations in sodium levels are resultant from direct interference with the energy activated sodium transport systems of the gills. Micro-photographs of gill filaments and lamellae show severe damage caused by the dispersant and dispersant/oil mixture with less impairment resultant from Bunker C exposure. (EIS-Deal)
W78-10130

AN EVALUATION OF ACUTE BROMINE CHLORIDE TOXICITY TO GRASS SHRIMP (PALAEMONETES SPP.) AND JUVENILE BLUE CRABS (CALLINECTES SAPIDUS),
Academy of Natural Sciences of Philadelphia, Benedict, MD. Benedict Estuarine Lab.
D. T. Burton, and S. L. Margrey.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 2, p 131-138, 1978. 2 tab, 20 ref.

Descriptors: *Bromine, *Bioassay, *Chlorides, *Crabs, *Shrimp, *Toxicity, Water purification, Disinfection, Biocontrol, Juvenile growth stage, Water pollution effects, Salinity, Animal physiology, Animal metabolism, Chlorine, Fouling, Paleomonetes sp., Callinectus, Blue Crab.

Post-larval grass shrimp 24-h, 48-h, and 96-h LC50's were 1.1, 0.8, and 0.6 mg/l total residual bromine chloride, respectively. All LC50 values were significantly different. Juvenile blue crab 48-hr and 96-h LC50's were 1.2 and 0.8 mg/l, respectively. A comparison of sensitivities between grass shrimp and blue crab at 48 and 96 hours was attempted but not statistically possible. (EIS-Deal)
W78-10131

THE TOXICITY OF MCPA TO FISH, LIGHT AND ELECTRON MICROSCOPY AND THE CHEMICAL ANALYSIS OF THE TISSUE,
Jyvaskyla Univ. (Finland). Dept. of Chemistry.
M. L. Hattula, H. Reunanen, and A. U. Arstila.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 4, p 465-470, 1978. 1 tab, 8 ref.

Descriptors: *Herbicides, *Pesticide residues, *Toxicity, Mortality, *Brown trout, Animal physiology, Animal pathology, Path of pollutants, Water pollution effects, Chemical analysis, Electron microscopy, Cytological studies, Fish physiology, Animal metabolism, Tissue analysis, *MCPA, *Goldfish.

The results of chemical analysis show that the tissue concentrations of MCPA were of the same order in spite of the varied doses of application. The light microscopic observations showed that in the two exposure levels 10 and 30 ppm MCPA no changes were observed in any of the tissues studied. The whole body samples of the goldfish after 40 and 60 ppm exposure did not differ from those of the controls. In the electron microscopic studies no obvious changes were observed in the livers of the experimental fish when they were compared to controls. (EIS-Deal)
W78-10132

REDUCED MOVEMENT OF PRECOCIOUS MALE ATLANTIC SALMON PARR INTO SUBLETHAL DIMILIN-G1 AND CARRIER CONCENTRATIONS,
Maine Univ. at Orono. Dept. of Entomology.
J. Granett, S. Morang, and R. Hatch.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 4, p 462-464, 1978. 1 tab, 11 ref.

Descriptors: *Toxicity, *Larval growth stage, *Atlantic salmon, *Insecticides, *Fish behavior, Carriers, Salmonids, Animal behavior, Pesticides, Fish physiology, Fish migration, *Black flies, *Dimilin-G1.

These tests indicated behavioral effects of an insecticide and carrier at concentrations at or below projected practical treatment levels for black fly control. The effect observed in the laboratory was a repellency, since the fish chose to swim up treated flumes less frequently than up the untreated flume (water control). When fish did choose a treated flume, the shorter time spent there also indicated a repellency . Repellency, if substatiated with field tests would indicate a possible detrimental effect on fish spawning migrations. Black fly control if it became operationsl, would occur throughout the spring and summer, depending on the black fly species present in a given locality, at the time when salmon migration occurred. (EIS-Deal)
W78-10133

MIREX INCORPORATION IN THE ENVIRONMENT: TOXICITY IN HYDRA,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-10136

PCB AND DDT RESIDUES IN A MEDITERRANEAN PELAGIC FOOD CHAIN,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W78-10137

ACUTE TOXICITY OF PHOSPHATE ESTER MIXTURES TO INVERTEBRATES AND FISH,
Fish and Wildlife Service, Columbia, MO. Fish-Pesticide Research Lab.
M. J. Nevins, and W. W. Johnson.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 2, p 250-256, 1978. 2 tab, 25 ref.

Descriptors: *Toxicity, *Phosphates, *Rainbow trout, *Crayfish, *Channel catfish, *Sunfishes, *Minnows, Animal pathology, Phosphorous compounds, Polychlorinated biphenyls, Path of pollutants, Water pollution effects, Invertebrates, Mortality, *Phosphate esters, Hydraulic fluids.

This study examines one characteristic of phosphate esters, a potential replacement for the toxic polychlorinated biphenyls. The acute toxicity of three commercial phosphate ester mixtures (hydraulic fluids) was tested against two invertebrates and four fish. Pydraul 50E was more toxic than Houghtosafe 1120 in static and flow-through tests; Pydraul 115E was the least toxic. In flow-through tests these phosphate esters were less acutely toxic than PCB's. However, sublethal reactions to the phosphates suggest a need for chronic toxicity studies. (EIS-Deal)
W78-10138

MERCURY AND SELENIUM CONTENTS OF SEALS FROM FRESH AND BRACKISH WATERS IN FINLAND,
Kuopio Univ. (Finland). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-10140

OXYGEN CONSUMPTION AS A FUNCTION OF PH IN THREE SPECIES OF FRESHWATER FISHES,
Alabama Univ., University. Dept. of Biology.
G. R. Ultsch.
Copeia, No 2, p 272-279, 1978. 3 fig, 1 tab, 33 ref.

Descriptors: *Hydrogen ion concentration, *Channel catfish, *Sunfishes, *Acidity, Environmental effects, Mortality, Water pollution effects, *Acid mine water, *Respiration, Fish physiology, *Oxygen demand, Acidic water, Freshwater fish, Water quality, Metabolism, Mode of action, *Sublethal effects, Goldfish.

The routine rate of oxygen consumption (V02) was measured over a sulfuric acid pH range of 3.5 to 7.0 for three species of freshwater fishes previously exposed for at least two weeks to pH 7.5 or 5.0. V02 was also measured at pH's from 4.0 to 7.0, in increments of 0.5 pH units, for each species after maintenance at the measurement pH. Preliminary tests showed that acute exposure to pH 3.5 (sulfuric acid) was lethal to all three species, and that only Leposmis macrochirus could survive exposure to 4.0 for at least two weeks. V02 did not show any significant decrease at pH's below 5.0 in Lepomis macrochirus or Carrasius auratus, but was significantly depressed in Ictalurus punctatus at pH 3.5. These results suggest that the importance of anoxia as a factor contributing to the death of fishes at low pH may vary among species. (EIS-Katz)
W78-10141

THE AMMONIA EXCRETION OF TROUT DURING A 24-HOUR PERIOD,
Rostock Univ. (East Germany). Dept. of Animal Physiology.
J. Rychly, and B. A. Marina.
Aquaculture, Vol 11, p 173-178, 1977. 2 fig, 20 ref.

Descriptors: Fish physiology, *Metabolism, *Trout, *Ammonia, *Nitrogen, *Nitrogen compounds, Wastes, Environmental effects, Diets, Salmonids, Nutrients, Diurnal, Proteins, *Rainbow trout, Excretion, *Nitrogen balance, Circadian rhythm.

Ammonia excretion of fed and starved rainbow trout was measured during a period of 24 h. Measurements were performed every 2 h. Fed fish excreted about four times as much as those which were starved for 12 days. Significant differences were noticed between highest and lowest 2 h values, indicating a possible circadian rhythm of ammonia excretion and nitrogen metabolism in fish. (EIS-Katz)
W78-10143

EFFECTS OF SALINITY AND TEMPERATURE ON THE ACUTE TOXICITY OF CADMIUM TO THE ESTUARINE CRAB PARAGRAPSUS GAIMARDII (MILNE EDWARDS),
Rostock Univ. (East Germany). Dept. of Animal Physiology.
J. K. Sullivan.
Australian Journal of Marine and Freshwater Research, Vol 28, p 739-43, 1977. 1 tab, 21 ref.

Descriptors: *Salinity, *Water temperature, Environmental effects, *Crabs, *Cadmium, *Lethal limits, *Bioassay, *Toxicity, Mortality, Water quality control, *Estuarine environment, Shellfish, Invertebrates, Crustaceans, Metals, Water pollution effects, Water pollution sources, Laboratory tests, Heavy metals, Industrial wastes.

In static acute toxicity tests on the crab P. gaimardii the cadmium chloride concentrations fatal to 50% of the test animals over 96 h were determined for temperatures of 5 and 19C and salinities of 8.6, 17.5, 26.3, and 34.6o/oo. The LC50 values ranged from 15.7, to 101.9 mg Cd2+/1. The mortality was greater at the higher temperature but at both temperatures a decrease in salinity caused an increase in the lethality of cadmium for the crabs. (EIS-Katz)
W78-10144

KARMEX HERBICIDE WITH FERTILIZATION AND AERATION TO CONTROL FILAMENTOUS ALGAE IN HATCHERY PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5G.
W78-10146

THE EFFECT OF SCOURING FLOODS ON THE BENTHOS OF BIG BUFFALO CREEK, MISSOURI,
Missouri Dept. of Conservation, Columbia.
F. Ryck, Jr.
In: Proceedings of the Twenty-Ninth Annual Conference, Southeastern Association of Game and Fish Commissioners, October 12-15, 1975, St. Louis, Missouri, p 36-45. 4 fig, 40 ref.

Descriptors: *Benthic fauna, Environmental effects, Aquatic habitats, Biological communities, *Invertebrates, *Flash floods, On-site investigations, Benthos, Diptera, Aquatic insects, Crustaceans, Scour, Streamflow, Flood damage, Distribution, Monitoring, Mayflies, Missouri, *Big Buffalo Creek(Mo), *Riffle invertebrates, *Species diversity.

The effects of scouring floods on the diversity and density of the riffle benthic macroinvertebrate community of Big Buffalo Creek, an unpolluted Missouri Ozark Stream were evaluated from December, 1968 through September, 1969. A modified Hess sampler was used to collect the invertebrate samples. Flash floods that scoured stream substrates had little effect on water quality assessments, although they did cause the temporary dislocation and dispersal of riffle benthic macroinvertebrates. The density and structure of this community was essentially identical to pre-flood conditions one month after floods. Diversity index values for samples collected 8 days after a flood were near normal. Apparently, riffle invertebrates were not dispersed over great distances and were therefore able to rapidly repopulate scoured areas. At the end of the study, after seven severe floods, the density, diversity, and species composition of the macroinvertebrate fauna were nearly identical to values observed at the start of the study. (EIS-Katz)
W78-10147

POTENTIAL FOR SOFT SHELL CRAB PRODUCTION UTILIZING HEATED EFFLUENTS FROM POWER PLANTS IN THE GALVESTON BAY SYSTEM,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
For primary bibliographic entry see Field 5G.
W78-10148

THE TOXICITY OF ENDRIN TO CERTAIN AQUATIC INVERTEBRATES (TOXICITA ENDRINU PRO NEKTERE VODNI BEZOBRATLE) (IN CZECH),
J. Trnkova.
Vertebratologicke zpravy, 1977, 1, p 18-20. 4 ref. English summary.

Descriptors: Pesticides, *Insecticides, *Chlorinated hydrocarbon pesticides, *Bioassay, Laboratory tests, Aquatic life, Aquatic insects, *Daphnia, Molluscs, Amphipoda, Oligochaetes, *Endrin.

In 1972 through 1975, the toxicity of endrin in form of the preparation Endrin 20 Spolana was tested to current species of aquatic invertebrates. The values of LC50 and LC90 were determined for 23 species of invertebrates inhabiting both stagnant and running waters. The values of LC50 (72 hrs) are complied in tables. It results from these data that endrin is highly toxic to most species of aquatic invertebrates and that contamination of surface waters with endrin might seriously endanger biocoenoses of both stagnant and running waters. (See also W78-10151) (EIS-Katz)
W78-10150

THE TOXICITY OF ENDRIN TO CERTAIN FISH SPECIES (TOXICITA ENDRINU PRO NEKTERE DRUHY RYB) (IN CZECH),
E. Wohlegemuth.
Vertebratologicke zpravy, 1977, Vol. 1, p 20-21, 5 ref. English summary.

Descriptors: *Pesticides, *Insecticides, *Chlorinated hydrocarbon pesticides, *Bioassay, Laboratory tests, Aquatic life, Aquatic insects, *Daphnia, Molluscs, Amphipoda, Oligochaetes, *Endrin.

The toxicity of endrin in form of rodenticide preparations was tested to 10 species (Poecilia reticulata, Coregonus lavaretus, C. peled, Salmo gairdneri, Cyprinus carpio, Carassius carassius, Tinca tinca, Leucaspius delineatus, Gobio gobio, Stizostedion lucioperca). The results show a high sensitiveness of fish to endrin (LC50 72 hrs varies between 10-2 and 10-5 mg 1) and a rapid penetration of endrin into fish bodies. Thus, an incidental contamination of aquatic ecosystems with endrin presents a serious danger to the life of the fish stocks. (See also W78-10150) (EIS-Katz)
W78-10151

ACCUMULATION OF COBALT DURING EMBRYONIC DEVELOPMENT OF RAINBOW TROUT (SALMO GAIRDNERI) (RICH),
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Isotopenlaboratorium.
J. Kunze, H. Buhringer, and U. Harms.
Aquaculture, Vol. 13, 1978, p 61-66. 2 tab, 4 fig, 6 ref.

Descriptors: *Rainbow trout, *Metals, Juvenile growth stage, *Fish eggs, Fish farming, *Cobalt, *Cobalt radioisotopes, Metals, Water pollution effects, Calcium, Biochemistry, Fish physiology, Trace elements.

Studies on the accumulation of cobalt by fish eggs are described. Gamma-Energy measurements of 57Co and atomic absorption with the flameless technique were used for the detection of the cobalt. The cobalt level of the eggs was found to be directly proportional to the cobalt content of the aquatic medium, and its uptake decreased with increasing calcium ion concentration in the water. The accumulation of bivalent cobalt ions was found to take place on the surface of the eggs, where they are reversibly bound by the binding force of chorion-mucopolysaccharide. The present study did not show any increase in cobalt content within the larvae that hatched from the eggs. (EIS-Katz)
W78-10152

EFFECT OF SALINITY AND TEMPERATURE CHANGES ON SPONTANEOUS MUSCLE NECROSIS IN PENAEUS AZTECUS IVES,
Gulf Coast Research Lab., Ocean Springs, MS.
G. J. Lakshmi, A. Venkataramiah, and H. D. Howse.
Aquaculture, 1978, Vol. 13, p 35-43. 3 tab, 3 fig, 10 ref.

Descriptors: *Aquiculture, *Shrimp, Commercial shellfish, Crustaceans, Animal pathology, Animal physiology, Mortality, *Salinity, *Water temperature, *Gulf of Mexico, Animal behavior, *Brown shrimp, Penaeus aztecus, Muscle necrosis, Temperature changes.

Spontaneous muscle necrosis was studied in brown shrimp in relation to salinity and temperature changes. The incidence of necrosis and subsequent mortality of necrotic shrimp appeared to be directly related to the magnitude of the changes. Necrosis occurred mainly in the distal 4 to 6 segments. Histopathological studies of the necrotic muscles showed an absence of pathogens. The significance of these results to the bait shrimp industry located along the coast of the Gulf of Mexico and future pond culture of shrimp was discussed. (EIS-Katz)
W78-10153

THE EFFECTS OF SALINITY AND TEMPERATURE ON THE DEVELOPMENT AND SURVIVAL OF FISH PARASITES,
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
H. Moller.
Journal of Fish Biology, 1978, Vol. 12, p 311-323, 2 tab, 11 fig, 23 ref.

Descriptors: *Salinity, *Water temperature, *Fish diseases, Animal parasites, *Fish parasites, *Herring, Estuarine environment, Estuarine fisheries, Copepods, Commercial fisheries, *Aquiculture, Marine parasites, Freshwater parasites, *Marine ectoparasites, Leeches.

In brackish water the variety of marine and freshwater parasite species is considerably reduced. The distribution in brackish water of most marine endoparasites is restricted by the salinity tolerance of their hosts, most of the parasite species are more tolerant than their hosts. The influence of salinity and temperature on nine species has been examined; first stage larvae of Contracaecum

aduncum develop in 0-32o/oo salinity; Cryptocotyle lingua proved to be infective at salinities down to 4o/oo. The greatest resistance was found in Anisakis larvae from herring, which survived for more than half a year. Parasites in the fish intestines appear to be unaffected by changing water salinities, as the osmolarity in the intestines stays nearly constant. Marine ectoparasites (Acanthochondria depressa, Lepeophtheirus pectoralis) survive about three times longer than freshwater species (Piscicola geometra, Argulus foliaceus) when salinity is 16o/oo. High temperature increases the effects of adverse salinities on parasites. There is evidence that none of these ectoparasitic species can develop within the range of 7-20o/oo salinity. (EIS-Katz)
W78-10154

THE EFFECTS OF IMPOUNDMENT AND REGULATION UPON THE STOMACH CONTENTS OF FISH AT COW GREEN, UPPER TEESDALE,
Freshwater Biological Association, Ambleside (England).
D. T. Crisp, R. H. K. Mann, and J. C. McCormack.
Journal of Fish Biology, 1978, Vol. 12, p 287-301, 4 tab, 7 fig, 11 ref.

Descriptors: *Freshwater fish, *Dams, Dam sites, Impoundments, Impounded waters, Reservoirs, Reservoir fisheries, Reservoir operations, Reservoir release, Brown trout, Bullheads, *Fish food, Molluscs, Worms, *Aquatic insects, Amphipods, Stomach contents, England, River Tees, Terrestrial insects.

The stomach contents of 1003 brown trout, 1551 bullheads and 800 minnows taken from the reservoir basin and below the dam, before and after impoundment of the river Tees, were examined. Their composition reflected observations by other workers on river and reservoir benthos, except for the increase in numbers of Hydra and Nais below the dam, and Mollusca, Hirudinea and oligochaetes in the reservoir. Trout below the dam ate more Ephemeroptera nymphs and Chironomidae larvae but fewer terrestrial casualties after river regulation, whereas bullheads ate more Mollusca but fewer Plecoptera nymphs. In both species Baetidae nymphs increased in numerical importance relative to Eodyonuridae. Trout, but not bullheads, took zooplankton discharged from the reservoir. Before impoundment, trout within the reservoir basin ate chiefly benthic organisms and terrestrial casualties. Inundated terrestrial material, mainly earthworms, formed the bulk of their food for at least three years after impoundment, whilst from the second year onwards Chironomidae and, in some years, Gammarus became increasingly important. Zooplankton was taken by all sizes of reservoir trout. (EIS-Deal)
W78-10155

TOLERANCE OF SOME CIRRIPEDE NAUPLII TO FLUCTUATING SALINITIES,
University Coll. of North Wales, Bangor. Marine Science Lab.; and Natural Environment Research Council, Bangor (Wales). Marine Invertebrate Biology Unit.
D. F. Cawthorne.
Marine Biology, Vol. 46, p 321-325, 1978. 6 fig, 1 tab, 7 ref.

Descriptors: *Salt tolerance, *Salinity, *Larvae, *Mortality, *Invertebrates, Environmental effects, Laboratory tests, Saline water, Water quality, Lethal limit, Crustaceans, Water properties, Larval growth, Stage, Immature growth stage, Estuarine environments, Chemical properties, Elminius, Balanus, *Barnacles, *Cirripedes.

The effects of fluctuating salinity on the mortality of newly released nauplii of three species of barnacle, Elminius modestus, Balanus balanoides, and B. hameri have been measured. The larvae were exposed to three different types of salinity regime; in all cases, a regime which fluctuated gently between full-strength sea water and a reduced concentration was found to be least damaging. The contributions of the abruptness of salinity shock, and the degree of exposure to reduce salinity, are considered as factors influencing mortality. Survival depends upon the interaction of both these factors, but the abruptness of the shock which the barnacles receive is of major importance in determining their survival range. (EIS-Katz)
W78-10156

CADMIUM ENRICHMENT IN SHELLS OF MYTILUS EDULIS,
Uppsala Univ. (Sweden). Dept. of Paleontology.
U. Sturesson.
Ambio, Vol. 17, No. 3, 1978, p 122-125. 4 fig, 25 ref.

Descriptors: *Metals, *Cadmium, *Mussels, Water pollution effects, Path of pollutants, Marine animals, Bioassay, Laboratory tests, Seawater, Marine fisheries, Commercial shellfish, *Lead, Bioindicators, Biochemistry, *Shellfish, Shellfish farming, Marine molluscs, Bioconcentration, Mollusc shells, Cadmium enrichment.

The accumulation of cadmium in various parts of the shell of Mytilus edulis was measured. The mussels were grown in aquariums containing seawater with known concentrations of cadmium. The shells were separated into periostracum, nacre, and calcitic and calcitic/aragonitic calcium carbonate, and the samples were analyzed with a differential pulse anodic stripping technique. The highest values of cadmium were found in the periostracum and the nacre. These results, compared with the results of a previous investigation of lead uptake in shells of Mytilus edulis, show that the shells generally accumulate more lead than cadmium under similar conditions. (EIS-Katz)
W78-10158

IMPLICATIONS OF AN ENVIRONMENTALLY INDUCED HAMARTOMA IN COMMERCIAL SHRIMPS,
Gulf Coast Research Lab., Ocean Springs, MS.
R. M. Overstreet, and T. Van Devender.
Journal of Invertebrate Pathology, 1978, Vol. 31, p 234-238. 1 tab, 7 fig, 8 ref.

Descriptors: *Shrimp, Crustaceans, *Fish diseases, Mississippi, *Mississippi River, Water pollution effects, *Animal diseases, *Animal pathology, Animal populations, Commercial shellfish, On-site investigations, *Hamartoma(Fish), *Brown shrimp, *White shrimp, Penaeus aztecus, Penaeus setiferus.

An overgrowth of muscle protruded through the ventral portion of the sixth abdominal segment of Penaeus aztecus and P. setiferus. This hamartoma was observed in 33 post-larval shrimp and is the first reported from a crustacean. Even though afflicted individuals represented a small proportion of the shrimp examined, nearly all such individuals were collected from the presumed most heavily polluted site. We suggest an unidentified pollutant as the cause of the abnormality. (EIS-Katz)
W78-10159

AQUATIC LIFE--WATER QUALITY RECOMMENDATIONS FOR HEAVY METAL AND OTHER INORGANIC TOXICANTS IN FRESH WATER,
Colorado Div. of Wildlife, Fort Collins.
For primary bibliographic entry see Field 5G.
W78-10160

INVESTIGATIONS OF THE TOXIC MECHANISMS OF AMMONIA TO FISH-GAS EXCHANGE IN RAINBOW TROUT (SALMO GAIRDNERI) EXPOSED TO ACUTELY LETHAL CONCENTRATIONS,
Bristol Univ. (England). Research Unit for Comparative Animal Respiration.
G. R. Smart.
Journal of Fish Biology, 1978, Vol 12, p 93-104, 3 tab, 8 fig, 28 ref.

Descriptors: *Ammonia, *Fish physiology, *Rainbow trout, Bioassay, Aquiculture, Fish hatcheries, Animal behavior, Animal metabolism, *Respiration, Dissolved oxygen, Oxygen requirements, *Toxicity, *Un-ionized ammonia, Oxygen consumption, Ventilation volume, Respiratory frequency, Blood chemistry, Toxic actions, Toxic mechanisms.

Exposure to acutely lethal un-ionized ammonia concentrations resulted in a 3.3-fold increase in oxygen consumption. This was associated with increases in ventilation volume, respiratory frequency and amplitude. 'Cough' frequency was not significantly affected. Heart rate and dorsal aortic blood pressure were increased and cardiac output was estimated to have more than doubled. Dorsal aortic blood PO2 decreased but no significant changes in erythrocyte number, hematocrit, hemoglobin concentration, blood pH or P50 were observed. Possible toxic actions of ammonia were discussed and it was speculated that, as in mammals, ammonia may act by impairing cerebral energy metabolism. (EIS-Katz)
W78-10161

AN EVALUATION OF THE INTRODUCTION OF FLORIDA LARGEMOUTH BASS INTO AN OKLAHOMA RESERVOIR RECEIVING A HEATED EFFLUENT,
Oklahoma Cooperative Fishery Research Unit, Stillwater.
R. W. Rieger, and R. C. Summerfelt.
In: Proceedings of the Thirtieth Annual Conference, Southeastern Association of Fish and Wildlife Agencies, October 24-27, 1976. Jackson, Mississippi, p 48-57. 1 fig, 6 tab, 20 ref.

Descriptors: *Bass, *Growth rates, *Spatial distribution, *Heated water, *Powerplants, *Environmental effects, *Thermophilic animals, *Water temperature, Warm-water fish, Productivity, Sport fish, Freshwater fish, Electric powerplants, On-site investigations, Reservoirs, Mortality, Temperature, *Micropterus salmoides floridans, *Florida bass.

The purpose of this study was to observe growth, survival, and spatial distribution of the Florida largemouth bass and of the northern subspecies in an Oklahoma reservoir thermally enriched by a heated effluent from an electrical generating plant. Hatchery-reared fingerlings of both subspecies were stocked in 1974 and 1975 after they were marked with either fluorescent pigments sprayed into the dermis, or, with magnetized metal injected into the nasal cartilage. Growth of the Florida subspecies was greater than that of the northern subspecies in both years of the study, but the difference was significant only in 1975. Overwinter survival of Florida bass was lower than that of northern bass in both years, and was especially low (1.6%) during the winter of 1974-75, when lake temperatures were lower than during the winter of 1975-76. Spatial distribution of Florida bass during the winter of 1974-75 was largely limited to the vicinity of the thermal plume. (EIS-Katz)
W78-10162

A RELATIONSHIP BETWEEN TOTAL MERCURY CONTENT AND A KIND OF FOOD IN SOME CHOSEN PACIFIC FISH SPECIES (ZALEZNOSC POZIOMU RTECI OGOLNEJOD RODZAJU ODZYWIANIA U WYBRANYCH GATUNKOW RYB PACYFICZNYCH),
Instytut Technologii zym Zywnesci Pochodzenia Morskiege, Szczecin (Poland).
For primary bibliographic entry see Field 5B.
W78-10163

PESTICIDE RESIDUES IN BEAVER AND RIVER OTTER FROM ALABAMA,
Alabama Cooperative Wildlife Research Unit, Auburn.
For primary bibliographic entry see Field 5B.
W78-10165

EFFECTS OF STREAM CHANNELIZATION ON AVIAN DIVERSITY AND DENSITY IN PIEDMONT, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Services.
A. L. Ferguson, R. W. Ellis, and J. B. Whelan.
In: Proceedings of the Twenty-ninth Annual Conference, Southeastern Association of Game and Fish Commissioners, Oct. 12-15, 1975, St. Louis, Missouri, p 540-548. 2 tab, 4 fig, 38 ref.

Descriptors: Biological communities, Game birds, Non-game birds, Habitats, Environmental effects, *Water birds, Streams, *Channeling, *Shrubs, Population, *Succession, Plant growth, Flood control, Plant populations, *Piedmont Virginia, *Diversity, *Shannon-Weaver Formula, *Stream channelization, *Avian populations.

Species diversity and density for game and non-game birds were studied during winter and summer, 1975, on three streams in the Virginia Piedmont which were channelized 2, 5, and 9 years prior to field work. Three study sites were located along streams in secondary succession bottomland hardwood communities. Indices were calculated for bird species diversity (BSD) and foliage height diversity (FHD) using the Shannon-Weaver information theory formula. To further assess any differences in either diversity or density among the three sites the following variables were also examined: the number of breeding birds per hectare, the mean number of birds observed per hour, and the average number of birds species seen per day. Results indicated that BSD and FHD increased from the 2-year-old to 9-year-old, channelized streams. A significant increase was observed in avian diversity and density through progressive successional stages of the channelized streams. Breeding birds per hectare was positively correlated with percent shrub cover. Stream channelization was found to be a disruptive process which sets back plant community succession, resulting in lower avian diversity and density. (EIS-Katz)
W78-10166

EFFECTS OF VARIOUS LEVELS OF CRUDE OIL ON OLNEY BULRUSH (SCIRPUS OLNEYI) AND MARSHHAY CORDGRASS (SPARTINA PATENS),
Kansas Forestry, Fish and Game Commission, Independence.
J. L. Gebhart, and R. H. Chabreck.
In: Proceedings of the Twenty-ninth Annual Conference, Southeastern Association of Game and Fish Commissioners, Oct. 12-15, 1975, St. Louis, Missouri, p 567-577. 7 tab, 14 ref.

Descriptors: *Oil pollution, Water pollution effects, Environmental effects, *Growth rates, *Bulrushes, Aquatic plants, *Marsh plants, Oil, *Oil spills, *Plant growth, Water pollution sources, Pollutants, Monocots, Roofed aquatic plants, Brackish water marshes, Laboratory tests, Oxygen, Scirpus olneyi, Spartina patens, *Cordgrass, *Crude oil.

A tank study was conducted to determine the effects of various concentrations of crude oil on brackish marsh plants. Scirpus olneyi and Spartina patens were grown in tanks and subjected to a light and a heavy crude oil at four concentrations and four water levels over an 8.5-month period. A fluctuating water level (+5 to -5 cm) with 80 ppt of the heavy crude oil was the treatment most detrimental to S. olneyi. Crude oil enhanced growth and survival of S. olneyi at a water level +5 cm above the soil surface. Growth increased with increasing oil concentrations and was greater for heavy oil than for light oil of equal concentrations. For S. patens treated with crude oils, a fluctuating water level (+5 to -5 cm) and a +5 cm water level were the most detrimental. High oil concentrations were detrimental to S. patens at water levels of -5 cm and 0 cm. Damage to S. patens was more severe for heavy oil than for light oil. As soil concentrations increased, damage was more evident. (EIS-Katz)
W78-10167

SEASONAL OCCURRENCE AND DIVERSITY OF FISH IN A HEATED DISCHARGE CHANNEL, TENNESSEE RIVER,
Tennessee Valley Authority, Decatur, AL. Biothermal Research Station.
W. B. Wrenn.
In: Proceedings of the Twenty-ninth Annual Conference, Southeastern Association of Game and Fish Commissioners, October 12-15, 1975. p 235-247, 1 tab, 5 fig, 35 ref.

Descriptors: *Water temperature, Aquatic populations, *Powerplants, *Heated water, Biological communities, *Sunfishes, *Bass, *Channel catfish, *Mortality, Thermal powerplants, Sauger, Environmental effects, Discharge(Water), Walleye, Herrings, Thermal pollution, Waste water(Pollution), *Tennessee River, *Species diversity, *Species composition.

The fish population in the heated discharge channel from Colbert Steam Plant on the Tennessee River was sampled from January 1972 to December 1973 to determine the effects of temperature on species composition, relative abundance, and diversity. Electrofishing and gillnetting yielded a total of 34 species; median number of species per sample for each type of gear was nine. Species that were commonly collected from the discharge channel at maximum summer temperatures included: spotted gar, gizzard, and threadfin shad, carp, bluegill, longear sunfish, spotted bass, largemouth bass, and channel catfish. The occurrence of only three species (Skipjack herring, sauger and walleye) was considered temperature dependent; these species apparently avoided the heated effluent at temperatures over 30C. Mortalities resulting from temperature differences were not observed. Regression analysis of two diversity indices computed for the electrofishing data indicated that species diversity was inversely related to temperature in the discharge channel but that the Shannon index was not temperature dependent. (EIS-Katz)
W78-10169

INTERACTIONS OF BLUE TILAPIA AND LARGEMOUTH BASS IN A POWER PLANT COOLING RESERVOIR,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
R. L. Noble, R. D. Germany, and C. R. Hall.
In: Proceedings of the Twenty-Ninth Annual Conference, Southeastern Association of Game and Fish Commissioners, October 12-15, 1975. St. Louis, Missouri, p 247-251. 4 tab, 7 ref.

Descriptors: Aquatic populations, *Tilapia, Freshwater fish, *Bass, *Fish reproduction, *Spawning, *Fish behavior, *Standing crops, Cichlids, Ecosystems, Life cycles, Fish establishment, Reproduction, Inhibition, Texas, *Trinidad Lake(Texas), *Micropterus.

In the presence of a dense population of blue tilapia, the population of northern large mouth bass declined in three years to one-third its 1972 abundance in Trinidad Lake, Texas. A pond experiment with Florida largemouth bass indicated that bass failed to reproduce successfully at a tilapia density of 2000 lb/A, but at 1000 lb/A some bass spawning occurred. Trends in gonosomatic indices suggest that eggs were retained by bass at high tilapia densities. (EIS-Katz)
W78-10170

METABOLIC ALTERATION AND EXCRETION OF ANTHRACENE BY DAPHNIA PULEX,
Oak Ridge National Lab., TN. Environmental Sciences Div.
S. E. Herbes, and G. F. Risi.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 2, p 147-155, 1978. 3 fig, 1 tab, 13 ref.

Descriptors: *Aromatic compounds, *Food webs, *Toxicity, Absorption, Zooplankton, *Metabolism, *Daphnia, *Radioactivity techniques, *Tracers, Kinetics, *Food chains, Aquatic populations, Organic compounds, Poisons, Chemical analysis, *Carcinogens, Biomagnification, *Anthracene, Bioaccumulation.

The effect of excretory processes on the potential for bioaccumulation of polycyclic aromatic hydrocarbons (PAH) was examined. Daphnia rapidly accumulated labeled anthracene until reaching an equilibrium concentration 760 times that of the water. Test organisms were subsequently placed in clean water to monitor excretion. Excretion followed a two-step process consisting of an initial rapid loss of PAH folled by a much slower, decreasing rate which eventually reached an equilibrium value of 8% of initial PAH body concentration. A water-soluble anthracene metabolite was also noted in Daphnia, but the rate of metabolism was insufficient to prevent bioaccumulation of PAH. (EIS-Deal)
W78-10174

THE EFFECT OF POLYCHLOROBIPHENYLS (AROCLOR 1242) ON BICARBONATE-C14 UPTAKE BY EUGLENA GRACILIS,
State Univ. of New York at Albany. Dept. of Chemistry.
A. M. Bryan, and P. G. Olafsson.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 3, p 374-381, 1978. 5 fig, 1 tab, 8 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Toxicity, *Photosynthesis, Cytological studies, Absorption, Metabolism, *Pesticide kinetics, *Euglena, *Aquatic algae, Inhibition, Population, Growth rates, *Sodium compounds, *Photosynthetic bacteria, *Water pollution effects, Path of pollutants, Mode of Action, Pesticides.

Aroclor 1242 is inhibitory to long-term batch growth of Euglena gracilis at 10 ppm. Exposure to PCB's, subsequent to an initial drop of 50% in the first 30 minutes, does not appear to inhibit photosynthesis on a per cell basis over the time span of four hours. Consequently our experimental findings suggest that inhibition of population growth does not lie directly in the photosynthetic pathway despite the initial inhibition by Aroclor 1242 on Euglena gracilis in 'light'. 'Dark' absorption of bicarbonate appears to decrease with increased PCB exposure. This decrease may be causally related to the population growth inhibition observed. (EIS-Deal)
W78-10175

RECOLONIZATION OF ROCKY SHORES IN CORNWALL AFTER USE OF TOXIC DISPERSANTS TO CLEAN UP THE TORREY CANYON SPILL,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
A. J. Southward, and E. C. Southward.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 682-706, 1978. 21 fig, 2 tab, 135 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, Coasts, Biological communities, *Toxicity, Mortality, Aquatic algae, Ecosystems, Population, *Intertidal areas, *Biomass, Persistence, *Surfactants, *Herbivores, *Littoral, Organic compounds, Water pollution effects,

*Recolonization, *Dispersants, *Crude oil, Cornwall, Torrey Canyon oil spill, Kuwait crude oil.

Fourteen thousand tons of Kuwait crude oil was stranded along 150 km of the coast of West Cornwall, England, in March 1967. The oil was treated with 10,000 tons of toxic dispersants during cleaning operations. By itself the oil was not very toxic, although it killed some limpets and barnacles, and most of the mortalities that followed cleaning were due to the dispersants. There was a graded effect. Most animals and some algae were killed on the shores treated heavily with dispersants, while a few animals and most algae survived in places less heavily treated. The general sequence of recolonization was similar to that which has been found after small-scale experiments, where the rocks were scraped clean, or where limpets were removed, but took longer to complete. Fluctuations in the populations of algae and herbivorous animals during the course of the recolonization illustrate the importance of biological interactions in controlling the structure of intertidal communities. Pollution disturbance affects the herbivores more than plants, hence the point of stability of the community is shifted towards the sheltered shore condition of low species richness and greater biomass. (EIS-Deal)
W78-10177

INFLUENCE OF ENVIRONMENTAL CONTAMINATION ON CYTOCHROME P-450 MIXED-FUNCTION OXYGENASES IN FISH: IMPLICATIONS FOR RECOVERY IN THE WILD HARBOR MARSH,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
J. J. Stegeman.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 668-674, 1978. 3 fig, 3 tab, 27 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, *Toxicity, Fish physiology, Animal metabolism, *Enzymes, *Proteins, *Marshes, *Coastal marshes, *Salt marshes, Biological communities, Population, *Fish populations, Size, Organic compounds, Metabolism, Ecosystems, *Oil tankers, Fundulus, Florida oil spill, Cytochrome P-450, Oxygenases.

Levels of hepatic cytochrome P-450 and the catalytic functions benzo(a)pyrene hydroxylase and aminopyrine demethylase were significantly greater in populations of mummichog sampled from contaminated marshes than in those fish from nearby reference marshes. Aminopyrene demethylase, but not benzo(a)pyrene hydroxylase, was also elevated in fish from one of the references marshes. The levels of cytochrome P-450 and benzo(a)pyrene hydroxylase were highest in fish from the Wild Harbor Marsh, site of the 1969 Florida spill. A correlation between size and benzo(a)pyrene hydroxylase activity was identified in some of the populations studies, although influence by this factor did not mask the population differences. The results are consistent with the hypothesis that elevated levels of mixed-function oxygenase activity in fish from Wild Harbor are the result of oil spilled 8 yr ago, and that recovery of this marsh is not yet complete. (EIS-Deal)
W78-10178

OILED SEABIRD RESCUE AND CONSERVATION,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
R. B. Clark.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 675-678, 1978. 18 ref.

Descriptors: *Oil spills, Oil, *Oil pollution, *Mortality, *Water birds, *Birds, Disasters, *Wildlife conservation, *Conservation, *Beaches, *Coasts, Water pollution effects, Organic compounds, *Auk, Feathers, Torrey Canyon oil spill, Research unit, Rehabilitation of oiled sea birds.

Attempts were made to clean and rehabilitate nearly 8000 oiled birds (Mainly auks) following the wreck of the Torrey Canyon. Since this was an almost total failure, a Research Unit on the Rehabilitation of Oiled Seabirds was established to devise effective treatment methods. This has involved a study of the mechanism of water repellency in seabird plumage and led to the development of cheap, effective cleaning methods and full recovery of the birds within 2-3 weeks of capture. These methods have been used successfully on small numbers of birds by amateurs and also operationally on larger numbers of the Research Unit. Even with appropriate organization and facilities it is doubtful whether the rescue and treatment of oiled birds can make a material contribution to seabird conservation. (EIS-Deal)
W78-10179

FLORIDA OIL SPILL IMPACT ON THE BUZZARDS BAY BENTHIC FAUNA: WEST FALMOUTH,
Woods Hole Oceanographic Institution, MA.
H. L. Sanders.
Journal of the Fisheries Research Board of Canada, Vol 35, p 717-730, 1978. 18 fig, 3 ref.

Descriptors: Oil, Oil pollution, *Oil spills, *Benthic fauna, *Intertidal areas, Seasonal, Beaches, Barges, *Toxicity, *Mortality, Biological communities, *Tidal waters, Organic compounds, Water pollution effects, Statistical methods, Sampling, Bays, *Species diversity, *Polychaetes, Florida oil spill, Buzzards Bay, West Falmouth.

No matter what criterion is used to measure the effects of the Florida oil spill, the densities and species composition and the array of statistical methods demonstrate that the same hierarchical pattern emerges. Densities and species composition remain stable over time at the minimally oiled and unoiled stations, but display considerable fluctuations and marked changes at the more heavily oiled stations. Cluster analysis reveals profound temporal changes in the fauna from samples collected at the severely and intermediately oiled stations but demonstrates a much more homegeneous pattern with only small seasonal changes from samples obtained at the marginally oiled stations. (EIS-Deal)
W78-10180

COMPARISONS OF OILED AND UNOILED INTERTIDAL COMMUNITIES IN CHEDABUCTO BAY, NOVA SCOTIA,
New Brunswick, St. John. Div. of Sciences.
M. T. Thomas.
Journal of the Fisheries Research Board of Canada, Vol 35, p 707-716, 1978. 3 fig, 9 tab, 23 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, *Intertidal areas, Biological communities, *Biomass, *Spatial distribution, *Clams, *Sediments, Beaches, *Coasts, Organic compounds, Water pollution effects, Path of pollutants, Canada, *Species diversity, *Oil tankers, Tissue analysis, Bioaccumulation, *Periwinkle, *Chedabucto Bay.

During 1976, detailed surveys of four oiled and four unoiled control stations, each subdivided into seven standardized intertidal levels, were carried out in Chedabucto Bay. Seventy-one species were found, 14 unique to control and 9 to oiled locations. Species diversity was uniformly higher at control than oiled stations. No differences in horizontal zonation of major species were apparent. Analysis of abundance and biomass data for the eight stations and seven tidal levels showed a significant overall difference between oiled and control station. The flora were particularly affected at oiled stations and species dominant on both sedimentary and rocky shores at all but the lowest tidal levels have been reduced. Oiled stations showed significantly greater concentrations of oil in biota and sediments than unoiled, where concentrations were essentially at background levels. (EIS-Deal)
W78-10181

FURTHER STUDIES ON THE MERCURY CONTENTS IN SOME SPECIES OF MARINE FISH AND MOLLUSCS,
Genoa Univ. (Italy). Ist. di Farmacologia e Farmacognosia.
A. Caviglia, and F. Cugurra.
Bulletin of Environmental Contamination and Toxicology, Vol 19, p 528-537, 1978. 1 fig, 1 tab, 22 ref.

Descriptors: *Mercury, *Mollusks, *Heavy metals, Fish physiology, *Poisons, *Public health, *Food chains, *Animal metabolism, Chemical analysis, Path of pollutants, Metals, Spectrophotometry, Water pollution sources, Bioaccumulation, *Methylmercury, Italy.

Laboratory analysis showed that 11 of 53 species examined contained a total mercury content higher than the legal allowable limit of Italy for consumption. Questions such as: Are there species so contaminated as to make some precautionary measures necessary, and; Is mercury contamination increasing, Are raised but left unanswered. (EIS-Deal)
W78-10182

BIOACCUMULATION OF LEAD IN ATLANTIC SALMON (SALMO SALAR),
Bedford Inst. Oceanography, Dartmouth (Nova Scotia).
S. Ray.
Bulletin of Environmental Contamination and Toxicology, Vol 19, p 631-636, 1978. 2 fig, 2 tab, 13 ref.

Descriptors: *Lead, *Toxicity, *Heavy metals, *Atlantic salmon, Fisheries, *Trace elements, Mining, *Mine wastes, Industrial wastes, *Fish physiology, Animal metabolism, *Commercial fishing, Water pollution sources, Spectrophotometry, Path of pollutants, Chemical analysis, Metals, *Bioaccumulation, Tissue analysis, Liver, Kidneys, New Brunswick, Canada.

As a result of increased mining and other industrial activity the trace element content of the Northeast New Brunswick rivers has increased. Salmon were sampled for lead content of several organ tissues. It became apparent that the liver and kidney tissues selectively accumulated lead. The long term effect of this residual level on organ function is not known. (EIS-Deal)
W78-10183

PERSISTENCE OF AROCLOR 1254 IN A CONTAMINATED ESTUARY,
Environmental Research Lab., Gulf Breeze, FL.
A. J. Wilson, and J. Forester.
Bulletin of Environmental Contamination and Toxicology, Vol 19, p 637-640, 1978. 2 fig, 5 ref.

Descriptors: *Polychlorinated biphenyls, *Oysters, *Crabs, Fish, Sediments, *Estuaries, *Aroclors, *Pesticide residues, *Pesticide kinetics, *Chlorinated hydrocarbon pesticides, Persistence, *Longevity, *Stability, Path of pollutants, Water pollution sources, Animal behavior, Spawning, Tissue analysis.

The persistence of PCBs in oysters was studied in a situation in which the source of the pollutant had been stemmed for several years. Concentrations of up to 5 milligrams/kg body weight were detected 7 years after cessation of PCB pollution. The study demonstrated the persistence of PCBs

long after point-source discharges were eliminated. (EISnDeal)
W78-10184

ALTERATIONS IN THE ACTIVITY OF SOME DIGESTIVE ENZYME OF CHANNA PUNCTATUS, EXPOSED TO LEAD NITRATE,
D. A. V. Coll., Muzaffarnagar (India). Dept. of Zoology.
K. V. Sastry, and P. K. Gupta.
Bulletin of Environmental Contamination and Toxicology, Vol 19, p 549-555, 1978. 2 tab, 22 ref.

Descriptors: *Lead, *Enzymes, *Animal metabolism, Fish physiology, *Toxicity, Trace elements, *Heavy metals, *Teleosts, *Bioassay, *Digestion, *Proteins, Metals, Metabolism, *Channa, Digestive system.

The effect of exposure of Channa punctatus to a sub-lethal concentration of lead nitrate on the activities of alkaline phosphatase, acid phosphatase amylase, maltase, lactase, trypsin, and pepsin has been investigated. A decrease in the activity of alkaline phosphatase has been recorded after 15 days of exposure but there was no significant change after 30 days. Acid phosphatase showed an elevation in activity of both stages. All the three carbohydrases show elevation after 15 days, followed by an inhibition after 30 days of treatment. The activity of pepsin and trypsin remained above the normal level throughout the tenure of the experiment. The pattern of alteration in enzyme activities due to lead was found to be different in liver and digestive system. (EIS-Deal)
W78-10185

DISPERSA OF FISHES VIA THE ORANGE-FISH TUNNEL, SOUTH AFRICA,
South African Div. of Nature and Environmental Conservation, Grahamstown.
For primary bibliographic entry see Field 8I.
W78-10212

SILICA, NITROGEN AND PHOSPHORUS REQUIREMENTS OF SOME SOUTHERN AFRICA DIATOMS,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
G. C. Coetzer, D. F. Toerien, and F. R. Schoeman.
Journal of the Limnological Society of South Africa, Vol. 3, No. 1, p 27-31, 1977. 20 ref. 3 fig.

Descriptors: *Silica, *Nitrogen, *Phosphrous, *Diatoms, Nutrient requirements, Morphology, Algae growth, Algae yield, Growth limiting nutrients, *South Africa, Nitzchia, Navicula.

The yield coefficients and minimum cell concentrations of silica, nitrogen, and phosphorus have been determined for four diatoms, Navicula pelliculosa, (Brebisson ex Kutzing) Hilse, Nitzschia elliptica, Hustedt, N. palea (Kutzing) W. Smith and N. Perpusilla Rabenhorst. It was found that the three Nitzschia species require more Si>N P whereas the Navicula species needs more N>Si P. Where possible the results are evaluated in the terms of the morphological and ecological characteristics of these diatoms. (So Afr Water Info Center)
W78-10213

THE INFLUENCE OF LIGHT INTENSITY ON THE GROWTH OF DIFFERENT MICROCYSTIS ISOLATES,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Botany.
G. H. Kruger, and J. N. Eloff.
Journal of the Limnological Society, South Africa, Vol. 3, No. 1, p 21-25, 1977. 10 ref, 3 tab, 7 fig.

Descriptors: *Light intensity, *Algae growth, Algae cultures, Batch processes, Growth inhibition, Sensitivity, Specific growth rate, Turbidity, Photooxidation, Lysis, *Microcystis, South Africa.

The influence of light intensity on the growth of seven Microcystis isolates was investigated using a batch culture system. The growth of Microcystis cultures was generally inhibited by light intensities higher than 10 pwEinsteins m-2 sec-1. The optimal light intensity determined over a growth period of 22 days ranged between 7,5 - 22wEinsteins m-2 sec-1. M. aeruginosa (UV-008) was the most sensitive and M. incerta (UV-003) was the least sensitive. Maximum specific growth rates ranged from 0,52 to 1,32 day for M. aeruginosa (UV-008) and M. incerta (UV-003) respectively. Sensitivity towards high light intensity was not related to toxicity, presence of bacteria in culture, colonial habit, cell size or presence of gas vacuoles. A very good correlation (r=>0.99) existed between turbidity and cell number in M. aeruginosa (UV-007) cultures before the initiation of the death phase or before cells started bleaching or lysing. (So Afr Water Info Center)
W78-10214

THE ABSORPTION OF OXYGEN FROM LIQUID CULTURES OF BLUE-GREEN ALGAE BY ALKALINE PYROGALLOL,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-10216

ZOOPLANKTON IN A TROPICAL ENDORHEIC LAKE (LAKE CHILWA, MALAWI) DURING DRYING AND RECOVERY PHASES,
Lake Chilwa Coordinated Research Project, Limbe (Malawi).
For primary bibliographic entry see Field 2H.
W78-10218

ORGAOCHLORINE RESIDUE LEVELS IN HERONS AND RAPTORS IN THE TRANSVAAL,
Canadian Wildlife Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5B.
W78-10234

ALGAL GROWTH POTENTIAL AND THE SUCCESSION OF ALGAE IN A NITROGEN LIMITED IMPOUNDMENT,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
R. D. Walmsley, and P. J. Ashton.
South African Journal of Science (Johannesburg) Vol. 73, No. 5, p 151-152, 1977. 2 fig, 5 ref.

Descriptors: *Algal bioassay, *Algae growth, Available nutrients, *Nitrogen fixation, Nitrogen starvation, *Eutrophication, Rietvlei dam, Selenastrum capricornutum, Anabaena flosaquae, Volvox rousseletii, Anabaena Circinalis, Microsytis aeruginosa, South Africa.

The short article describes preliminary algal bioassays on snap samples of water from Rietvlei dam, near Pretoria which indicated that the algal growth potential of the dam for nitrogen - fixing algae, during the summer months, was high. The algal succession and bloom development is related not only to the quantities of available nutrients, but also to environmental factors such as water temperature and inflow. (So Afr Water Info Center)
W78-10247

MASS MORTALITY OF CAPE CORMORANTS CAUSED BY FISH OIL IN THE WALVIS BAY REGION OF SOUTH WEST AFRICA,
H. H. Berry.
Madoqua (Windhoek), Vol. 9, No, 4, p 57-62, 1976. 1 Map, 3 tab, 4 ref.

Descriptors: *Water birds, *Oil pollution, Marine pollution, Fish processing wastes, Commercial fishing, *South West Africa(Cape Cormorant), Walvis Bay.

Describes a large scale mortality of Cape Comorants due to fish oil pollution on the South West African coast near Walvis Bay. The fish oil contamination is thought to be due to the compaction of tons of anchovies, high in oil content, into the purse nets or the holds of fishing trawlers, resulting in the release of considerable quantities of oil which is dispersed into the sea by pumping from the hold and the flushing of trawler holds and bilges which is standard procedure at sea. (So Afr Water Info Center)
W78-10249

WASTEWATER DISINFECTANTS: MANY CALLED - FEW CHOSEN,
CH2M/Hill, Corvallis, OR.
For primary bibliographic entry see Field 5D.
W78-10308

BACTERIAL DEHALOGENATION OF HALOGENATED ALKANES AND FATTY ACIDS,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
T. Omori, and M. Alexander.
Applied and Environmental Microbiology, Vol. 35, No. 5, p 867-871, 1978. 6 tab, 10 ref.

Descriptors: *Halogens, *Chlorination, *Biodegradation, *Pseudomonas, *Enzymes, Catalysts, Halogenated pesticides, Cultures, Chlorinated hydrocarbon pesticides, Analytical techniques, Waste water treatment, Municipal wastes.

Unacclimated sewage sludge was capable of releasing halides from 1,9-dichlorononane, 1-chloroheptane, and 6-bromohexanoate. None of the sludge organisms could utilize the 1,9-dichlorononane as the sole growth medium. Resting Pseudomonas cells derived from n-undecane grown cultures released more chloride from 1,9-dichlorononane in the absence of chloramphenicol; cells derived from glycerol-grown cultures dehalogenated 1,9-dichlorononane, except in the presence of chloroamphenicol. Five n-undecane-utilizing bacteria were used to test for the possibility of an enzyme-catalyzed reaction by a non-specicic dehalogenase. None of the five bacteria could subsist on 1,9-dichlorononane, but rest cells from 24-hr n-undecane cultures catalyzed chlorine release. Four of the five bacteria dehalogenated 1-chloroheptane; all five dehalogenated 6-bromohexanoate. Sewage samples incubated with n-undecane or 1,9-dichlorononane showed a greater tendency for n-undecane utilization or dehalogenation, respectively. Possible dehalogenation processes were attributed to: an inductible enzyme; co-metabolism and constitutive latent enzymes; or a different enzyme issued to cleave two substituted fatty acids. (Lisk-FIRL)
W78-10327

ANTIBIOTIC RESISTANCE PATTERNS OF FECAL COLIFORMS ISOLATED FROM DOMESTIC SEWAGE BEFORE AND AFTER TREATMENT IN AN AEROBIC LAGOON,
Singapore Univ. Dept. of Microbiology.
R. B. Bell.
Canadian Journal of Microbiology, Vol. 24, No. 7, p 886-888, 1978. 2 tab, 12 ref.

Descriptors: *Coliforms, *Resistance, *Antibiotics(Pesticides), *Bactericides, *Settling basins, Aerobic treatment, Sewage bacteria, Oxidation lagoons, Disinfection, Transfer, Sampling, Waste water treatment, Municipal wastes.

The antibiotic sensitivity of fecal coliforms isolated from raw sewage and aerobic storage lagoon effluent was measured in Taber, Alberta, Canada. The isolated colonies were exposed to antibiotic discs, bearing 10 micrograms of ampicillin, aureomycin, chloromycetin, gentamicin, streptomycin, tetracycline, or 300 micrograms sulfadiazine. The aerobic lagoon reduced fecal coliform counts by about 95%. While most coliform populations in raw sewage exhibiting resistance to single antibiotics were diminished by lagoon treatment, 11.5% were resistant to tetracycline and 0.8% to gentamicin in both raw and treated sewage. Of the fecal coliform populations in the lagoon effluent, 7.7% were resistant to streptomycin, 4.6% to ampicillin, and 18.%% to sulfadiazine. The 3.9% population in the raw sewage resistant to chloromycetin disappeared in the lagoon effluent. About 3.1% of the raw sewage coliforms and 4.6% of the effluent coliforms were resistant to a combination of four antibiotics; 5.4% of the raw sewage population was immune to a combination of five antibiotics. The apparent lack of intercellular transfer of resistance in the sediments of the lagoon effluent was attributed to the low population densities and not to an extrachromosomal R-factor. (Lisk-FIRL)
W78-10338

TROUT SIGH WITH RELIEF AS PLANT ENDS POLLUTION,
Stearns and Wheeler, Cazenovia, NY.
For primary bibliographic entry see Field 5D.
W78-10374

IMPACT OF ADSORBED PETROLEUM HYDROCARBONS ON MARINE ORGANISMS,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
C. L. Ho, and H. Karim.
Marine Pollution Bulletin, Vol 9, No 6, p 156-162, June 1978. 9 fig, 2 tab, 18 ref.

Descriptors: *Oil pollution, *Oysters, *Oil spills, *Water pollutin effects, Sediments, Louisiana, Outer Continental Shelf, Crassostrea virginica.

Adsorptions of south Louisiana crude oil from seawater by clays, non-clay minerals and sediments were conducted in the laboratory. Effect of sediment-adsorbed and water dispersed crude oil on adult oysters were investigated in aquaria. Hydrocarbons in oyster tissues and surrounding water were identified by gas chromatography. Field specimens from an area of a new oil spill and an area five months after an oil spill were also analysed. Evidence of secondary chemical effect of aged oil in sediments on oyster mortality is presented. Oil coated asbestos surfaces severely reduced recruitment of sedentary larval organisms. (Sinha-OEIS)
W78-10429

ASSESSMENT OF THE MACROBENTHOS IN AN ANTARCTIC ENVIRONMENT FOLLOWING RECENT POLLUTION ABATEMENT,
British Antarctic Survey, Cambridge (England).
H. M. Platt.
Marine Pollution Bulletin, Vol 9, No 6, p 149-153, June 1978. 1 fig, 4 tab, 18 ref.

Descriptors: *Water pollution effects, *Benthos, *Antarctic Ocean, *Pollution abatement, Environmental effects, Oil pollution, Polar Regions, Outer Continental Shelf, South Georgia.

Quantative population data for shallow Antarctic soft-bottom communities in King Edward Cove, South Georgia indicate that although once grossly polluted by organic effluent and fuel oil from a whaling station, the fauna recovered within some eight years after contamination ceased. The results are discussed in relation to comparable studies in other polar and temperate areas. (Sinha-OEIS)
W78-10430

THE AMOCO CADIZ OIL SPILL,
Cremer and Warner, London (England).
A. J. O'Sullivan.
Marine Pollution Bulletin, Vol 9, No 5, p 123-128, May 1978. 3 fig, 1 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, Outer Continental Shelf, *Amoco Cadiz, France, Brittany.

A preliminary account is given of the events surrounding the wreck of the Amoco Cadiz on the Brittany coast in March, which caused the most massive oil polution on record. The Amoco Cadiz was carrying 120,000 tons of light Iranian crude oil and 100,000 tons of light Arabian crude as well as the remains of her own fuel oil when she grounded on the coast of Brittany on 17 March. She lost most, if not all this oil by 30 March, making this the largest oil spillage ever recorded. Some 300 km of the coastline of Brittany, including areas of outstanding ecological and biogeographical interest, and whose landscape, flora and fauna are a major basis for the economy of the region, are affected. (Sinha-OEIS)
W78-10431

EFFECT OF OILS ON TEXTURE AND TASTE,
Coastal Commestibles Inc., Eboracum Borealis (England).
K. Dall, G. E. O'Ficks, B. Owman, G. Rahame, and L. E. Wis.
Marine Pollution Bulletin, Vol 9, No 4, p 95-97, April 1978. 2 fig, 4 tab.

Descriptors: *Oil pollution, *Taste, Water pollution effects, Toxicity, Organoleptic properties, Outer Continental Shelf, Texture, Hydrocarbons, Melanogrammus aeglefinus, Solanum tuberosum.

A test programme has established and evaluated both the direct effects and the organoleptic consequences of a range of product oils on two common species which contribute much to food chains of coastal biocoenososes. These are (1) the coastal anacanthinid teleost Melangogrammus aeglefinus and (2) the ubiquitous supralittoral phanerogram Solanum tuberosum. (Sinha-OEIS)
W78-10433

SIZE-SELECTIVE MORTALITIES OF CLAMS IN AN OIL SPILL SITE,
Maine State Dept. of Marine Resources, Augusta.
R. L. Dow.
Marine Pollution Bulletin, Vol 9, No 2, p 45-48, February 1978. 2 fig, 3 tab, 2 ref.

Descriptors: *Oil spills, *Mortality, *Water pollution effects, *Oil pollution, Clams, Maine, Outer Continental Shelf, Mya arenaria.

Mixed No. 2 fuel oil and JP5 jet fuel, following an oil spill into Long Cove, Searsport, Maine, U.S.A., in March 1971 became concentrated locally at levels up to more than 250 ppm in intertidal sediments from 15 to 25 cm below the surface and continued until 1976 to kill successive year class juvenile clams as in normal growth behaviour they burrowed down through redistributed overlying clean sediments into the oil concentration beneath. (Sinha-OEIS)
W78-10435

5D. Waste Treatment Processes

BARGES CUT OUTFALL IN HALF.
For primary bibliographic entry see Field 5E.
W78-09823

OXON SYSTEM USES IN AND OUT PUMPS,
For primary bibliographic entry see Field 8C.
W78-09835

METHOD OF REMOVING DISSOLVED ORGANO-LEAD COMPOUNDS FROM WATER,
PPG Industries, Inc., Pittsburgh, PA. (Assignee).
J. M. Otto.
U.S. Patent No. 4,070,282, 8 p, 1 fig, 1 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 966, No 4, p 1491, January 24, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water polluiton treatment, Separation techniques, *Lead compounds, Activated carbon, Organic wastes, Automotive antiknock compounds.

In the production of alkyl lead compounds, especially tetraethyl lead automotive anti-knock compounds, a sodium-lead alloy and ethyl chloride are reacted in an autoclave. The reaction product of the autoclave is fed to a steam still for separation. In the steam still, Considerable quantities of water and steam are added to the feed, and the gases are separated from the liquids and solids. The water from the various intermediate processes as well as the products from the steam still process present a serious lead control problem. It has now been found that the aqueous compsition containing dissolved organo-lead compounds, such as the overflow from clarifier ponds and settling lagoons, may be reduced in dissolved organo-lead compound content to less than one part per million by feeding the liquid composition to a bed of activated carbon, passing the luquid composition through the bed and recovering the liquid from the bed substantially reduced in dissolved organo-lead content. Typically, the method contemplated is useful in reducing the dissolved organo-lead content. (Sinha - OEIS)
W78-09836

APPARATUS FOR TREATING SEWAGE,
American Water Recycling Co., Apache Junction, AZ. (Assignee).
L. R. Adams.
U.S. Patent No. 4, 070, 292, 7 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 966, No 4, p 1494, January 24, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Mixing, *Aeration, Chemical reactions, Halogens, Disinfection.

An apparatus for treating sewage is disclosed. The apparatus includes a modular treating tank which is divided by a perforated baffle or screen into primary and mixing zones. The mixing zone has a curved or semispherical end wall. A mixing and aeration system utilizing a high efficiency ejector withdraws liquid from the mixing chamber and directs the recirculated flow toward the primary chamber across the perforated baffle. The effluent from the treating tank is subsequently chemically disinfected by timed, periodic addition of a chemical such as a selected halogen. A recirculating generally oval or circular flow pattern in which liquid is withdrawn from the mixing zone, aerated and directed toward the primary chamber is established. Complete mixing with the incoming sewage occurs in the primary chamber tc maintain a uniform concentration of oxygen, feed and purifying organisms throughtout the tank volume. (Sinha-OEIS).
W78-09839

METHOD AND APPARATUS FOR TREATING WASTE WATER ON SHIPS,
Daicel Ltd., Osaka (Japan): and Katayama Chemical Works Co. Ltd. (Japan). (Assignee).
S. Katayama, S. Kanada, and M. Kamata.
U.S. Patent No. 4,071,445, 8 p, 3 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 966, No 5, p 1873, January 31, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Water quality control, *Filtration, *Aeration, Separation techniques,

Ships, *Membrane processes, Semipermeable membranes, Equipment, Water reuse.

This invention relates to a method of treating waste water on a ship employing a closed system, comprising the steps of passing the waste water through a coarse mesh filter and/or crushing means, subsequently separating the waste water by flotation under aerated condition to reduce suspended solids in the waste water to below 1,000 ppm, and clarifying the resulting treated water by passing the water through a semipermeable membrane. The apparatus which is used for practicing the method comprises (1) means for feeding waste water on a ship; (2) a coarse filter and/or crushing means for removing relatively large solids from the waste water; (3) at least one liquid-solid separation column of te flotation type having downwardly slanting bubble generating plates projecting alternately from opposed inner walls of the column; (4) means for supplying a pressurized gas to be distributing channel; and (5) a treating system incorporating a semipermeable membrane and a high-pressure pump. (Sinha-OEIS)
W78-09843

PLASTIC PIPE FOR DEEP SEWER.
For primary bibliographic entry see Field 8G.
W78-09844

NEW SEWER CLEANING SERVICE.
For primary bibliographic entry see Field 8C.
W78-09845

PRECIPITATION OF IRON RELATED COLOR BODIES,
Chemed Corp., Cincinnati, OH. (Assignee).
S. N. Paul.
U.S. Patent No. 4,071,450, 3 p, 5 ref; Official Gazette of the United States Patent Office, Vol 966, No 5, p 1874, January 31, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, *Iron oxides, *Mine wastes, Suspended solids, Dyes, *Chemical precipitation, Blue and green dyes.

This invention is directed to treatment of iron waste water, containing particles of iron oxides and hydroxides in various combinations and in various stages of oxidation. Waters of this type result from mining operations in which beneficiation operations produce waste waters containing iron compounds, especially tailing water from iron ore mines. These waters contain red and red-brown particles finely dispersed and somewhat colloidal, which do not settle out by themselves. It has now been found that comparatively small amounts of blue or green basic dyes such as methylene blue, methyl violet, malachite green, and the like effectively and economically precipitate these colored particles, and yield an aqueous effluent that can be discharged into streams and lakes without discoloration. The precipitate is believed to form because these basic dyes have a cationic charge and are substantive to the negatively charged red color bodies. The dye should be blue or green to permit ready blending of the treated effluent with the receiving stream. (Sinha-OEIS)
W78-09846

APPARATUS FOR REMOVAL OF CONTAMINANTS FROM WATER,
Westinghouse Electric Corp., Pittsburgh, PA. (Assignee).
K. Moeglich.
U.S. Patent No. 4,072,596, 9 p, 8 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 967, No. 1, p 234, February 7, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, Water purification, Polychlorinated biphenols, *Electrolysis, Electrodes, Electric current, *Oxidation, *Reduction(Chemical), Phenols.

A vessel is described for facilitating the removal of oxidizable impurities such as phenol and/or polychlorinated biphenyl from dilute aqueous solutions or dispersions. The vessel contains stacked, packed beds having characteristics of alternating high and low electrical conductivity with separately controlled pairs of electrodes for the two alternate types of beds. An aqueous solution containing contaminants is passed through the successive beds and is subjected to an alternating current field for decomposition of the contaminants in the high resistivity beds and oxidization in the lower resistivity beds by hydrogen peroxide produced by alternating current electrolysis of water. The preferred electrodes are hollow and water cooled. In addition, the bed is jacketed and cooling water is circulated through the jacket to maintain a more efficient, lower process temperature. The bed having lower resistivity includes conductive particles which may be graphite, and may include activated carbon or equivalent material. It also contains non-conductive particles coated with catalysts. The catalyst may be an oxidation catalyst such as MnO2, Cr2O3, Bi2O3, or PbO2; or the reduction catalyst such as oxides of nickel, iron and oxides of other Group VIII metals. The highly resistive bed is packed with non-conductive particles only. (Sinha-OEIS)
W78-09850

AERATOR FOR BODIES OF WATER,
W. H. Daniel.
U.S. Patent No. 4,072,612, 4 p, 5 fig, 13 ref; Official Gazette of the United States Patent Office, Vol. 967, No. 1, p 238, February 7, 1978.

Descriptors: *Patents, *Waste water treatment, *Water treatment, Sewage treatment, Water quality control, *Aeration, Mixing, Equipment.

A stream of mixed air and water is introduced beneath the surface of a body of water. It is applicable as an aerator for a fish tank and for bodies of liquid sewage. A submerged water intake with a filter on it leads to the axial inlet of a centrifugal pump of the type that can handle substantial quantities of air. An air inlet to the axial pump inlet introduces the air centrally into the pump chamber, where it is admixed with water and discharged from a peripheral outlet to a point beneath the surface of the water. The pump can be of the type that has a rotor with a number of vanes of airfoil configuration. (Sinha-OEIS)
W78-09851

BIOELECTRIC NEUTRALIZATION OF ACID WATERS,
Office of Secretary (Interior), Washington, DC. (Assignee).
F. D. Sisler, and F. E. Senftle.
U.S. Patent No. 4,072,798, 7 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 967, No. 1, p 287, February 7, 1978.

Descriptors: *Patents, *Waste water treatment, *Acid mine waters, Water pollution treatment, Water quality control, Biological treatment, Electrodes, Electric currents, Activated sludge, Anaerobic conditions, Equipment, *Neutralization, *Bioelectric neutralization.

An energy-source material for the bacteria in lakes is needed in order to hasten lake recovery and the reestablishment of essentially neutral water. The addition of sewage sludge into an acid strip-mine lake increases the rate of recovery of the lake. The rate of recovery of an acid strip-mine lake can be greatly increased using the biochemical fuel cell principle by the addition of electrodes and a simple external circuit in the lake. An apparatus to be used in a process for bioelectric neutralization of a body of water having a bottom of anaerobic mud and an acid supernatant liquid comprises a buoy riding on the surface of the water, and an upper electrode preferably of carbon suspended from the buoy; a lower electrode preferably of iron embedded in the anaerobic mud; and a flexible, insulated copper cable, conductively attached to the upper and lower electrodes. Several sets of such apparatus may be used spaced apart from each other in the body of water. (Sinha-OEIS)
W78-09852

POLLUTED WATER PURIFICATION,
Phillips Petroleum Co., Bartlesville, OK. (Assignee).
F. Farha, Jr., and E. O. Box, Jr.
U.S. Patent No. 4,072,608, 4 p, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol. 967, No. 1, p 237, February 7, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Industrial wastes, Water quality control, Organic wastes, *Oxidation, *Catalysts, *Chemical reactions.

Organically polluted waters are purified by contacting with a solid copper-manganese-oxygen catalyst promoted with an iron group metal under oxidizing conditions. In one preferred embodiment, an aqueous stream obtained from the effluent of an oxidative dehydrogenation process containing contaminating oxygen-containing organic materials is subjected to oxidizing conditions in the presence of a copper-manganese-iron-oxygen catalyst to conver the water to a potable aqueous product. (Sinha-OEIS)
W78-09853

REPAIRING DAMAGE SEWERS AND WATER MAINS.
For primary bibliographic entry see Field 8G.
W78-09876

SEWER PIPE SYSTEM PROTECTS SUBURB'S WATER SUPPLY.
For primary bibliographic entry see Field 8G.
W78-09914

POLYMER HELPS 'OVERFLOWS' GO DOWN THE DRAIN,
Clinton Bogert Associates, Fort Lee, NJ.
For primary bibliographic entry see Field 8C.
W78-09920

COST-MINDED COMMUNITY CHOOSES SMALL DIAMETER GRAVITY SYSTEM,
R. T. Fey.
Water and Sewage Works, Vol. 125, No. 6, p 58-61, June, 1978.

Descriptors: *Septic tanks, *Sewerage, *Absorption, *Pipelines, *Domestic wastes, Plastic pipes, Construction materials, Soils, Gravity, Pipe flow, Waste water treatment, Municipal wastes.

Septic tank effluent from residences and businesses in Westboro, Wisconsin, is transported through small diameter gravity sewers to a tricelled absorption field composed of sand and gravel. Existing septic tanks, the primary form of waste water treatment in Westboro, were replaced with circular or rectangular septic tanks; the ownership was transferred to the sewer district to insure regular pumping of sludges, scum, and other accumulations. Waste waters from these tanks are transported to two lift stations through polyvinyl chloride gravity sewers and force mains with diameters ranging over 1.5-3.0 inches. Effluent is then pumped to a 9,500 gal siphon chamber which periodically discharges waste water through one of three siphons leading to the adsorption cells. The siphon chamber is designed to discharge about 8,400 gal four times each day through 12-inch diameter pipes to one of the ad-

sorption cells at an application rate of 1.25 gpd/sq ft. Effluent is uniformly distributed through perforated, manifold, and header pipes. The soil adsorption field has a capacity of 30,000 gpd, sufficient for effluent from 120 homes. Seventy-nine homes, 5 businesses, and one school are currently connected to the system. (Lisk-FIRL)
W78-09921

INTERNATIONAL CONTRACTOR AND SUPPLIER FEATURES SLUDGE TECHNOLOGY.
For primary bibliographic entry see Field 8C.
W78-09928

ACTIVATED-CARBON TREATMENT REDUCES CHLORINE DERIVATIVES.
Water and Wastes Engineering, Vol 15, No 4, p 55, April, 1978. 1 fig.

Descriptors: *Activated carbon, *Chlorination, *Disinfection, *Sewage treatment, *Polychlorinated biphenyls, *Tertiary treatment, Separation techniques, *Chlorine, Ammonia, Waste water treatment, Municipal wastes.

A two-stage activated carbon system has been developed for the removal of chlorinated compounds from treated effluent. Designed by Caltech/JPL and NASA in cooperation with Orange County, California, the system incorporates activated carbon treatment prior to chlorination to remove potentially hazardous, compounds such as phenols, aliphatic amines, aromatic amines, and polychlorinated biphenyls. The second stage removes chlorinated compounds on the activated carbon after chlorination. Residual chlorine is also removed by the final activated carbon treatment. The combined chlorination-activated carbon treatment system has been shown effective in removing ammonia, which is converted to chloramines during chlorination and removed by subsequent activated carbon treatment. (Lisk-FIRL)
W78-09940

RANGE OF INCINERATORS.
For primary bibliographic entry see Field 5E.
W78-10012

COMBINED SEWER CLEANER.
For primary bibliographic entry see Field 8G.
W78-10018

EFFECT OF ILLUVIATED DEPOSITS ON INFILTRATION RATES AND DENITRIFICATION DURING SEWAGE EFFLUENT RECHARGE,
For primary bibliographic entry see Field 5C.
W78-10023

ALASKA VILLAGE DEMONSTRATION PROJECTS: FIRST GENERATION OF INTEGRATED UTILITIES FOR REMOTE COMMUNITIES,
Environmental Protection Agency, College, AL. Arctic Environmental Research Lab.
B. H. Reid.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 137, Price codes: A03 in paper copy, A01 in microfiche. Working Paper No. 22, October 1973, 29 p, 6 fig, 11 ref.

Descriptors: *Sanitary engineering, *Rural areas, *Alaska, *Economics, *Social aspects, Water supply, Waste water disposal, Regional analysis, Potable water, Waste water treatment, Regulation, Standards, Environmental effects, Sewage disposal, Sewage treatment, Regional development, *Appropriate technology, *Village demonstration projects, *Remote communities.

Sanitary utility conditions in rural Alaska are described as poor. Advancement beyond traditional subsistence living for residents of these remote communities will be based on economics primarily, but solution of many public health and social problems depends upon utility services appropriate for the economic, social and natural environment. In anticipation of these problems , the U.S. Congress authorized projects to demonstrate provision of sanitation utilities for remote villages using concepts not previously applied. Facilities such as those providing for water supply, water treatment and personal sanitation are required. A review of earlier attempts to provide these required services yielded two conclusions: that conventional watering point and honey bucket projects have been unsuccessful because they fail to provide a real improvement; and that many projects fail due to the absence of financial and conceptual endorsement by the indigenous population. Thus it was determined that any successful project must be acceptable to its recipients and it must provide for actual improvement. In consultation with the people, ground rules for design were established and two projects were undertaken to show feasibility. The project design presented focuses on the Wainwright project. Costs were minimized to allow future use of these concepts by low income communities; water, wastewater and emissions meet state and Federal regulations and guidelines. The report recommends that the system approach used to provide for village utilities be extended in further studies. (Zayac-NC)
W78-10030

ALUM ADDITION AIDS SLUDGE PROCESS IN PHOSPHORUS REMOVAL.
Water and Wastes Engineering, Vol. 15, No. 3, p 14, March, 1978.

Descriptors: *Chemical precipitation, *Oxygenation, *Coagulation, *Phosphorus, *Nutrient removal, Biochemical oxygen demand, Suspended solids, Activated sludge, Oxygen, Waste water treatment, Municipal wastes.

Alum precipitation of phosphorus with lime additions to maintain alkalinity was evaluated in a plug flow, oxygen aerated, activated sludge reactor. Alum doses from 84-184 mg/liter were added during five steady-state operating periods to the co-current liquid oxygen contacting reactor. The food-to-microorganism ratio was maintained between 0.18-0.24 g BOD/g mixed liquor volatile suspended solids. BOD levels were reduced by 82-92% to 7.4-19 mg/liter; phosphorus in the effluent decreased by 54-86% to 1.05-3.26 mg/liter. When the reactor was operated on a step-feed method with a food-to-microorganism ratio of 0.23 g BOD/b mixed liquor suspended solids, BOD was reduced by 89%. Sludge oxygenation, followed by three-stage oxygen aeration, sequentially reduced mixed liquor suspended solids (MLSS) in each stage to 10,700 mg/liter, 7,060 mg/liter, 5,020 mg/liter, and 4,150 mg/liter. Step-feed operation produced an effluent before clarification containing an average of 6,500 mg MLSS/liter and required less oxygen than co-current contact operation. (Lisk-FIRL)
W78-10057

POLYACRYLAMIDES SHOWN TO BE EFFECTIVE FLOCCULANTS.
Water and Wastes Engineering, Vol. 15, No. 3, p 14, March, 1978.

Descriptors: *Polymers, *Flocculation, *Hydrolysis, *Anions, *Suspended solids, Coagulation, Chemical precipitation, Organic wastes, Chemical reactions, Waste water treatment, Municipal wastes.

Polymerized linear and branched polyacrylamides were compared as flocculating agents for removing suspended solids and organic materials from waste water. Linear and branched anionic polyacrylamides were polymerized and fractionated into portions having different molecular weights. The samples were hydrolyzed to several anionic levels and evaluated for flocculating properties and efficiencies. The linear polyacrylamides were more efficient at flocculation than the branched structures; the higher the molecular weight of either the branched or linear polyacrylamides, the better the flocculating efficiency. Optimum flocculation occurred when the polymers were hydrolyzed from 15-30% and the waste water had a pH lower than 6.5. (Lisk-FIRL)
W78-10058

INTERIM TREATMENT PLANT BUILDS SLUDGE CONCENTRATORS.
Water and Wastes Engineering, Vol 15, No 3, p 48, March, 1978.

Descriptors: *Sludge treatment, *Dewatering, *Treatment facilities, *Sludge digestion, *Polymers, Cations, Pressure, Gravity, Separation techniques, Soil filters, Waste water treatment, Municipal wastes.

Four gravity pressure sludge concentrators employing cationic polymeric conditioning have been installed at a 20 mgd interim waste water treatment plant in Independence, Missouri. The plant, providing municipal and industrial waste treatment until an 80 mgd facility is completed, contains an arethen aeration and sedimentation basin, an aerobic digester, and two sand filters. Treatment reduces the BOD from an initial 180-200 ppm to 5 ppm and suspended solids from 200-225 ppm to 2 ppm. The accumulation of sludge in the aerobic digester, where it was stored and chemically treated, led to the installation of sludge concentrators which increase the solids content of the sludge from 4% to 14.5%. After the sludge is thickened to the 4% solids level, it is conditioned by gravity dewatering and pressure; the sludge cake is pumped to a truck for land application. (Lisk-FIRL)
W78-10064

RELIABILITY CONCEPTS IN PLANNING STORM-DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-10118

DOE CONTRACTS FOR SLUDGE DEWATERING.
Product Finishing, Vol 31, No 5, p 53, May, 1978.

Descriptors: *Biological treatment, *Filtration, *Design criteria, *Suspended solids, *Biochemical oxygen demand, Rural areas, Sewage treatment, Laboratories, Nutrient removal, Porous media, Microbial degradation, Waste water treatment, Municipal wastes, *Dewatering.

Biospiral waste water treatment systems, distributed by Sludge Dewatering Ltd., have been selected for installation in three areas in Wales with small populations. The system contains a rotating disc biological filter formed on the archimedian screw design; an automatic rotating drum removes suspended solids. Effluent qualities guaranteed by the Biospiral system are 20/30 BOD and suspended solids, respectively. The unit is especially suitable for warm climates. The installation of the units, designated by England's Department of the Environment, will be in areas with populations of 160, 200, and 500. The Biospiral will treat raw waste in one area, laboratory and domestic wastes in another, and supplenment on existing plant in the third area. (Lisk-FIRL)
W78-10134

A NEW PACKING MEDIUM FOR BIOLOGICAL PERCOLATING FILTERS.
Water Services, Vol 82, No 985, p 192-193, March, 1978.

Descriptors: *Biological treatment, *Filters, *Filtration, *Packed beds, *Trickling filters, Particle shape, Particle size, Nutrient removal, Porous media, Waste water treatment, Municipal wastes.

An injection molded filtration medium for biological waste water treatment has been developed by Alcor International Ltd. of Crawley, Sussex, England. The geometrically-shaped Biofil medium has triangular faces delineated by serated edges which promote random packing and filter bed stability for biological growth. Point loading in individual units is eliminated by the design of the Biofil which evenly distributes the bed load through a series of planes. The uniform Biofil particles enhance distribution of the waste load with even contact time; blockage by biological growth is alleviated by the design which allows solids to filter through. The filter volume is reduced and the removal efficiency increased by the Biofil because of its improved load/efficiency curve, leading to a cost savings. The medium's surface area is conductive to high-rate biooxidation and has performed as well as other plastic packing. Biofil is suitable for primary or secondary treatment, biological percolating filters, and roughing and polishing of effluent. (Lisk-FIRL)
W78-10135

SEWAGE PUMPING THE PREFAB WAY.
For primary bibliographic entry see Field 8C.
W78-10139

RANDOM PLASTIC FILTER MEDIUM.
Effluent and Water Treatment Journal, Vol 17, No 12, p 659, December, 1977.

Descriptors: *Biological treatment, *Filters, *Plastic, *Trickling filters, *Packed beds, Separation techniques, Treatment facilities, Filtration, Biodegradation, Nutrient removal, Porous media, Permeability, Waste water treatment, Municipal wastes.

The Random FLOCOR plastic medium for percolating filters reportedly treats a biological load three times the capacity of a mineral filter medium of the same volume. The cylindrical FLOCOR medium is structurally capable of with-standing its own weight and preventing blockage by accretion. Forced aeration is not required because of the open structure providing more than 95% void space. The FLOCOR medium has a comprehensive strength of 7,000 kg/cu m with a surface area of 240 sq m/cu m. The use of FLOCOR reduces the number or size of trickling filters and its light weight permits easy installation. Filters require simple foundations and bases and pre-fabricated walls. Percolating filter heights up to 4-5 m can be accommodated when FLOCOR is utilized. (Lisk-FIRL)
W78-10142

WASTEWATER TREATMENT FACILITY.
Consulting Engineer, Vol. 50, No. 5, p 96, May, 1978.

Descriptors: *Activated sludge, *Regional development, *Infiltration, *Percolation, *Seepage, Tertiary treatment, Drainage, Glacial aquifers, Trout, Environmental effects, Waste water treatment, Waste water disposal, Municipal wastes.

A regional waste water treatment facility, designed by the engineering firm of Foth and Van Dyke and Associates, Inc. of Green Bay, Wisconsin, replaces two treatment plants and a number of septic systems in four Wisconsin towns. The regional facility maintains two activated sludge plants for secondary treatment of the effluent from the four towns. Tertiary treatment is provided by a 20-acre glacial deposit infiltration-percolation system. Effluent is passed to three seepage lagoons equipped with a surrounding underdrain system. The waste water is filtered prior to groundwater recharge or river disposal. Little maintenance is required for the natural soil ponds which saved an estimated $350,000 over a 20-yr period. The regional waste water treatment facility reduced the pollutant load on a trout stream in the area. (Lisk-FIRL)
W78-10149

SAVE IT AERATION.
Effluent and Water Treatment Journal, Vol. 18, No. 4, p 197, April, 1978.

Descriptors: *Aeration, *Oxygenation, *Transfer, Equipment, *Bubbles, Shear stress, Aerated lagoons, Sewage bacteria, Plastic pipes, Waste water treatment, Municipal wastes.

The Mixaerator was designed on the basis of a 72% oxygen transfer by a 3 mm bubble at 60 cm depth; it provides zero diffuser head loss and thorough mixing during aerobic digestion. The Mixaerator is constructed of a resin-bonded fiberglass casing with a polypropylene air pipe and manifold and horizontal diffusers. Air is discharged through 100 perforations of 4-7 mm in diameter in the diffuser head. The airlift action exerted by the bubbles and water on the intake, at the base of the aerator, accelerates intake at a perpendicular angle to the diffuser, causing shearing of the bubbles to prevent bacterial growth on the aerators. The unit discharges a horizontal surface stream at 177 cu m/hr generated by blowers or centrifugal fans exerting pressures of 1 psi. Large systems with 23 Mixaerator units have maintained oxygenation efficiencies of 2.6 kg oxygen/kilowatt-hr. (Lisk-FIRL)
W78-10168

BLANFORD AREA MAIN DRAINAGE SCHEME.
Water Services, Vol 82, No. 983, p 59-60, January, 1978.

Descriptors: *Sewage treatment, *Sewerage, *Treatment facilities, *Sewers, *Design data, Equipment, Groundwater, Pumping plants, Drainage, Excavation, Aeration, Activated sludge, Sludge treatment, Dewatering, Waste water treatment, Municipal wastes.

Thirteen miles of sewers and rising mains were constructed in the Blandford area in England to connect a 6.8-mile area of scattered villages to the Tarrant Crawford sewage treatment plant. Asbestos cement, and in some cases spun iron, sewer pipes ranging in diameter from 6-24 inches were installed under adverse groundwater and rainfall conditions requiring pumping at 6,000 gal/min in the excavation areas. The treatment works, with provisions for accomodating a population of 40,000 treats 619,987 gal/day of municipal wastes and 84,780 gal/day of industrial wastes to 30 mg/liter suspended solids and 20 mg/liter BOD. Flows exceeding 3 dry weather flows are treated to 150 mg/liter suspended solids. Peak flows are stored for 3 hrs in three 365 cu m storm water tanks and pumped to the treatment plant when the flow subsides. Influent is screened by mechanically raked curve bar screens, and passed through a Pista grit trap. Sewage passing to the activated sludge feed and aeration through a Pista grit trap. Sewage passing to the activated sludge feed and aeration chamber is automatically controlled by a storm water penstock and a flume control measure. The activated sludge is aerated and thoroughly mixed by a horizontally rotating Passavant Mammoth Rotor. Dissolved oxygen is automatically maintained by a sensor activated motorized effluent weir which controls submergence of the rotor. Effluent passes into three 13.7-m diameter final mergence of the rotor. Effluent passes into three 13.7-m diameter final settling tanks where activated sludge is hydrostatically removed and liquid is discharged to a river. Activated sludge is returned by screw pumps to the system and the excess is thickened in a 7.6 m diameter tank equipped with a picket fence stirrer and stored for disposal. (Lisk-FIRL)
W78-10186

REGENERATION OF WASTE ACID FROM A NEW ILMENITE TREATMENT PROCESS BY ELECTRODIALYSIS,
Nevada Univ., Reno. Dept. of Chemical and Metallurgical Engineering.
J. J. Barney, and J. L. Hendrix.
Industrial and Engineering Chemistry, Product Research and Development, Vol 17, No 2, p 148-155, June, 1978. 11 fig, 6 tab, 21 ref.

Descriptors: *Acid mine water, *Titanium, *Electrodialysis, *Sulfur compounds, *Membrane processes, Anodes, Cathodes, Anion exchange, Separation techniques, Electric currents, Waste water treatment, Industrial wastes.

Sulfuric acid recovery from ilmenite waste streams utilized in titranium ore processing was performed with electrodialysis and compared to evaporation recovery. The electrodialysis unit was stacked with a heterogeneous anion exchange membrane, a homogeneous divinylbenzene-styrene copolymer membrane with attached ion exchange groups, an acid-resistant cathode, and a platinum-coated titanium anode. Two-stage operation, with the concentrate solution flowing counter-currently between two stacks arranged in series, required 12.5 kilowatt hrs/kg of H2S04 to produce a 56.9% H2S04 concentrate and a 2.2 N H2S04 depleted waste. The high power requirements for two-stage operation with a current of 15 A required more power than operation at 20 A and 30 A for waste acid concentrations above 1.5 N H2S04. To produce a 50% H2S04 concentrate in one-stage operation at 20 A, a minimum of 9.48 kilowatt hrs/kg of H2S04 in the concentrate was required; operation in this mode decreased membrane life and required a platinum anode because of the higher acid concentrations. Acid recovery by electrodialysis demanded more power than evaporation processes but produced an acid with fewer impurities originally present in the waste stream. (Lisk-FIRL)
W78-10188

SEPARATION AND DETERMINATION OF PHENOL AND SALICYCLIC ACID IN INDUSTRIAL WASTES,
Babes-Bolyai Univ., Cluj (Rumania). Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W78-10189

RECOVERY OF SULFURIC ACID IN THE PRODUCTION OF TERTCARBOXYLIC ACID (DAISANKYU KARUBON SAN SEIZO NI OKERU RYUSAN NO KAISU SHORIHO),
Y. Souma, H. Sano, E. Ishii, H. Ishikawa, and T. Tsujitani.
Osaka Kogyogijutsu Shikensho Kiho (Bulletin of Govt. Industrial Res. Inst., Osaka), Vol. 29, No. 1, p 60-64, 1978. 3 fig, 4 tab, 6 ref.

Descriptors: *Sulfur compounds, *Organic acids, Columns, *Heat treatment, *Filtration, Organic compounds, Polymers, Organic wastes, Carbon, Carbon dioxide, Waste water treatment, Chemical wastes, Industrial wastes.

Concentrated sulfuric acid was recovered from tert-carboxylic acid production waste streams by a heated packed bed column. The waste sulfuric acid was first diluted to 50-60% of its initial concentration; dissolved polymeric byproducts were extracted with hexane. The diluted sulfuric acid was passed through a column packed with either isolite or glass beads and heated to 250-380C or 280-360C, respectively. At 320C, this isolite-packed column recovered a 92% sulfuric acid concentrate and removed 97% of the organic com-

pounds. The glass bead-packed column recovered 97% sulfuric acid and removed 96% of the organic compounds from waste streams at 340C. Approximately 97-99% of the polymeric by-products decomposed to carbon dioxide during treatment. (Lisk-FIRL)
W78-10190

PRINCIPLES OF AEROBIC TREATMENT OF FOOD PROCESSING WASTES: NITROGEN AND PHOSPHORUS RELATIONSHIPS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
J. H. Sherrard, R. W. Benninger, and T. R. Stall.
Journal of Food Technology, Vol. 13, No. 3, p 175-186, June, 1978. 9 fig, 1 tab, 4 ref.

Descriptors: *Activated sludge, *Food processing industry, *Phosphorus, *Nitrogen, *Chemical oxygen demand, Nutrient requirements, Nutrient removal, Municipal wastes, Nitrification, Alkalinity, Nutrient removal, Carbon, Waste water treatment, Industrial wastes.

The feasibility of combined treatment of nutrient deficient food processing wastes and municipal sewage was examined with a laboratory activated sludge system fed with synthetic wastes water under varying ratios of COD:N and COD:P. In the tests for phosphorus, influent COD was maintained at 325 mg/liter and the COD:P ratio at 32.6:1, 63.6:1, or 126.5:1. Influent COD was maintained at 300 mg/liter in total Kjeldahl nitrogen (TKN) tests; COD:TKN ratios were 7.89:1 and 5.07:1. The mean cell residence time was varied. The highest COD:P ratio produced a phosphorus limited system at low mean cell residence times; COD and phosphorus removal could be controlled by the residence time. The yield coefficient decreased as retention time increased; a maximum yield of 0.446 mg bacteria/mg COD utilized and a decay coefficient of 0.096/day were produced. TKN removal increased with increased mean cell residence; COD removal was consistently high and carbon was the limiting nutrient. With longer residence times, more of the nitrogen was converted to nitrate. Oxidation of carbon and nitrogen destroyed alkalinity; sufficient buffering was required to maintain microbial growth. The maximum yield was 0.438 mg bacteria/mg COD utilized and the decay coefficient was 0.036/day. Combined treatment of food processing wastes and municipal sewage was considered to be both feasible and economical. (Lisk-FIRL)
W78-10191

A GOOD WASTEWATER TREATMENT SYSTEM,
Lou Ana Foods, Inc., Opelousas, LA.
N. J. Smallwood, and R. A. Scott.
Industrial Water Engineering, Vol. 15, No. 3, p 22-24, 1978.

Descriptors: *Food processing industry, *Oily water, *Oil wastes, *Sumps, *Storm runoff, Surface runoff, Subsurface drains, Flocculation, Separation techniques, Cooling water, Acidity, Flotation, Aeration, Biological treatment, Waste water treatment, Industrial wastes.

Collection, storage, and treatment methods for process water, surface runoff, and cooling tower water are described for the Lou Ana Foods, Inc., vegetable oil refinery in Opelousas, Louisiana. Process waste water, containing oil, processing reagents, and sludge, flows by gravity to a sump for collection, mixing, and pH adjustment. Storm runoff, containing oils from machinery and spills, is contained by concrete mats and dikes; subsurface drains carry the runoff to a sump adjacent to the processing waste sump. The flow of runoff to the sump is interrupted by a pneumatic-electronic signal when a preset rainfall level is reached; rain water is allowed to overflow the sump. The oil-bearing process water is acidified and pumped to two parallel decanters followed by two decanters in series. Oil floating to the surface is removed by a swinging suction arm; water is continually drawn off by gravity to the other two decanters; settled sludge is removed to a dewatering container for subsequent landfill disposal. Waste water is contained in eight equalization tanks prior to neutralization, flocculation, and dissolved air flotation. Cooling tower water is discharged to a flash tank for steam exhaustion, decanted for oil removal, and released to the storm water discharge system. (Lisk-FIRL)
W78-10192

FLUIDIZED BED ELECTROLYSIS FOR REMOVAL OR RECOVERY OF METALS FROM DILUTE SOLUTIONS,
Akzo Zout Chemie Nederland, B.V., Hengelo (Netherlands).
G. van der Heiden, C. M. S. Raats, and H. F. Boon.
Chemistry and Industry, No. 13, p 465-468, June, 1978. 5 fig, 2 tab.

Descriptors: *Electrolysis, *Metals, *Cathodes, *Electrodes, *Anodes, Separation techniques, Deposition(Sediments), Copper, Mercury, Zinc, Nickel, Cadmium, Waste water treatment, Industrial wastes.

Fluidized bed electrolysis can remove metals in concentrations to 1 mg/liter from hydrometallurgical process streams and chlorinated hydrocarbon plant waste waters. The fluidized bed electrolysis cell has anode and cathode compartments, separated by an Akzo Zout Chemie diaphragm with a hydrodynamic permeability of 0.01 cu m water/hr/sq m diaphragm at 1 atm. Six contact electrode current feeders are located around the cylindrical diaphragm; anodes are placed in the center. Metal particles, about 0.5 mm in diameter and usually of the same composition as the metal to be deposited, are fluidized in the cathode compartment and deposited with the waste metals during electrolysis on the bottom of the compartment. This process employs a high specific active cathode area, high mass transfer, and low cathodic current densities at high current intensities. Copper in a chlorinated hydrocarbon plant waste stream was reduced from 100 to less than 1 mg/liter in one pass through the fluidized bed electrolysis cell. Mercury in a brine from a mercury cell chlor-alkali electrolysis plant was reduced to 0.05 mg/liter by deposition on copper particles; the mercury was recovered from the copper by distillation. Other possible applications of fluidized bed electrolysis include copper and nickel separation, copper removal from sulfuric acid, and separation of copper and cadmium from a zinc electrolyte. (Lisk-FIRL)
W78-10193

SIMULTANEOUS SPECTROPHOTOMETRIC DETERMINATION OF ZINC AND COPPER WITH BIACETYL BIS OF (4-PHENOL-3-THIOSEMICARBAZONE)-APPLICATION OF THE DETERMINATION OF ZINC IN WASTE WATER FROM A SULFURIC ACID PLANT (PYRITES PROCESS),
Seville Univ. (Spain). Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W78-10194

CONDITIONS FOR THE PRECIPITATION OF HEAVY METALS FROM WASTEWATER BY THE LIME SULFURATED SOLUTION (CALCIUM POLYSULFIDE) PROCESS,
Osaka Prefecture Univ. (Japan). Dept. of Chemical Engineering.
T. Aratani, K. Yahikozawa, H. Matoba, S. Yasuhara, and T. Yano.
Bulletin of the Chemical Society of Japan, Vol. 51, No. 6, p 1755-1760, June, 1978. 15 fig, 6 ref.

Descriptors: *Chemical precipitation, *Calcium compounds, *Heavy metals, *Coagulation, *Cadmium, Chromium, Carbon dioxide, Aeration, Alkalis(Bases), Sulfides, Waste water treatment, Industrial wastes.

Optimum process parameters were defined for the precipitation of cadmium and chromium from a synthetic waste water by a calcium polysulfide coagulalnt in a batch stirred vessel with CO2 aeration. The reaction of calcium polysulfide with CO2 released CaS2O3, H2S, and S; bivalent heavy metals were precipitated as metal sulfides or hydroxides. The vessel contents were agitated at 0-18 hertz; temperatures were maintained at 10-85C; pH was varied over 0-14; and CO2 was blown at the rate of 0.5 cu dm/min. The initial heavy metal concentration ranged over 25-1,000 ppm and mole ratios of sulfur in the calcium polysulfide over 5-50. Optimum operating conditions were concluded to be pH 3-11, 10-85C, and 10 hertz agitation. Stoichiometric quantities of the coagulant precipitated heavy metals in initial concentrations higher than 250 ppm. When the metal concentration was below 50 ppm, a quantity of coagulant in excess of the stoichiometric amount, considered to be 4.7-5.4 sulfide atoms metal ion, was required for precipitation. Poor removal of low metal concentrations was attributed to the colloidal nature of the precipitates. (Lisk-FIRL)
W78-10195

OIL/WATER SEPARATION TECHNOLOGY: THE OPTIONS AVAILABLE - PART I,
American Cyanamid Co., Stamford, CT.
For primary bibliographic entry see Field 5G.
W78-10196

OZONE TREATMENT OF KRAFT MILL WASTES,
British Columbia Research Council, Vancouver.
K. S. Ng, J. C. Mueller, and C. C. Walden.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1742-1749, July, 1978. 6 fig, 3 tab, 9 ref.

Descriptors: *Ozone, *Pulp wastes, *Toxicity, *Biochemical oxygen demand, *Color, Nutrient removal, Oxidation, Pilot plants, Pulp and paper industry, Bleaching wastes, Hydrogen ion concentration, Industrial wastes, Waste water treatment.

Recent applications of ozone to color and BOD removal provided the impetus for this study on the differential reactivities and sequential destruction of major pollutants in kraft mill effluents. The studies also tested the capacity of ozone to remove toxicity, color, BOD, and total organic carbon (TOC) from four batches of British Columbia bleached kraft pulp mill effluents. Effluents adjusted to pH 3, 7, and 9 were contacted for 2 min in a column with gas containing 1% ozone and 99% oxygen; the total ozone dosage was controlled by the number of passages through the contact tower. In studies to optimize the pH for ozone treatment at a dosage of 8.8 mg/liter, toxicity removal increased with an increase in pH from 4.2 to 7.0 to 9.0; TOC, BOD, and color removal were unaffected by effluent pH. An ozone dosage of 45 mg/liter, the highest and most effective concentration tested, was used to define mathematical expressions for color and BOD removal with respect to ozone dosage. This dosage was calculated to remove 28-30% of color, 20-22% of BOD, and 5-6% of TOC from a typical bleached kraft whole mill effluent. Toxicity removal during ozone treatment was very limited and was attributed to foam separation or oxidation rather than the ozonation process itself. Sequential removal of toxicity, color, BOD, and TOC was not apparent. (Schulz-FIRL)
W78-10197

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA (5)

ON THE DEGRADATION OF KRAFT LIGNIN BY BACTERIA ISOLATED FROM SEA WATER,
Nagoya Univ. (Japan). Dept. of Agriculture.
H. Kawakami, and T. Ohyama.
Japan Tappi, Vol. 32, No. 6, p 23-31, June, 1978. 10 fig, 6 tab, 17 ref.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Lignins, *Pseudomonas, *Marine bacteria, Aquatic bacteria, Microbial degradation, Organic acids, Oxygen demand, Biological treatment, Pine trees, Waste water treatment, Industrial wastes.

Pine and beech kraft lignins were biodegraded by Pseudomonas strains isolated from sea water which utilized dehydrodivanillin (DDV) and dehydrodivanillic acid. Bacterial growth in a medium spiked with 0-10% NaCl demonstrated that the Pseudomonas MN-3.1 and MN-3.2 strains had fresh water origins while MT-9.10 was marine in origin. The marine bacterium did not degrade the lignin as efficiently as fresh water varieties; the fresh water bacteria were more effective in degrading kraft lignins. Oxygen uptake by MN-3.2 was monitored in substrates containing vanillic acid, protocatechuic acid, and p-hydroxy benzoic acid. Slight changes in the C, H, N, O, S, and OCH3 concentrations in the pine and beech kraft lignins were observed after MN-3.2 degradation. The bacteria caused demethylation but not demethoxylation of guaiacyl lignin models. Few differences were observed in the carboxyl and phenolic hydroxyl functional groups between the original and the degraded pine and beech lignins. The impact of MN-3.2 degradation on yields of alkaline nitrobenzene oxidation products and permanganate oxidation products was also evaluated. Uniform degradation of the kraft lignins by these isolated strains was noted. (Lisk-FIRL)
W78-10198

PULP AND PAPER SLUDGE IN FORMED FIBRE PRODUCTS,
Norwegian Pulp and Paper Research Inst., Oslo.
For primary bibliographic entry see Field 5E.
W78-10199

EFFLUENT FROM TEXTILE PROCESSING - WATER TREATMENT REQUIREMENTS, METHODS, AND COST,
Shirley Inst., Manchester (England).
G. J. Parish.
International Dyer and Textile Printer, Vol. 159, No. 12, p 555-559, June, 1978. 2 tab, 4 ref.

Descriptors: *Textiles, *Dyes, *Water quality, *Color, *Water reuse, Water quality standards, Sewers, Treatment facilities, Chemical oxygen demand, Alkalis(Bases), Acids, Heavy metals, Toxins, Waste water treatment, Industrial wastes.

Water quality standards, treatment methods, and cost factors are reviewed for textile processing effluent. Pollutants considered directly toxic to aquatic life include acids, alkalis, and heavy metals. For discharge of these toxins to a sewer, acids and alkalis should be in the range of pH 6-10, heavy metals no higher than 30 mg/liter, cyanide within the range of 1 mg/liter, and sulfide at a concentration of 10 mg/liter. Concentrations of 20 mg/liter BOD, 30 mg/liter suspended solids, and temperatures of 35C in effluents should not disturb the biological balance of receiving waters; sewer discharges of 1000 mg/liter sulfate, 10 mg/liter detergent, 100 mg/liter grease and oil, and 45C temperatures are permissible. Nutrients, hard detergents, and COD may have a long term impact on the environment. The tolerance limit for color in effluents discharged to a receiving water is about 0.05 optical density. Pretreatment of waste water can reduce surcharges levied by sewer authorities; selection of biodegradable chemicals and reuse of treated or untreated process baths can also reduce costs. Water quality standards for reuse of processing effluents are 0.005 optical density, 5 mg/liter suspended solids, 200 mg/liter COD, 1000 mg/liter dissolved solids, and 0.3 mg/liter Fe and Cu. Further cost reductions can be realized by waste heat recovery. (Lisk-FIRL)
W78-10200

ADSORPTION ON ACTIVATED CARBON: A SOLUTION TO DYE WASTE PROBLEMS,
Chemviron Ltd., Basingstoke (England).
O. G. Rhys.
Journal of the Society of Dyers and Colourists, Vol. 94, No. 7, p 293-297, July, 1978. 1 tab.

Descriptors: *Dyes, *Textiles, *Activated carbon, *Adsorption, *Color, Surfactants, Biological treatment, Separation techniques, Water reuse, Granules, Particle size, Heat treatment, Waste water treatment, Industrial wastes.

Adsorption on granulated activated carbon of dye wastes from textile dyebaths reduces effluent organic wastes and color to a level suitable for dyebath water reuse. Granular activated carbon derived bituminous coal, coconut shells, pulp mill black ash, or other materials can be processed to provide a total pore surface area of 1000 sq m/g. Activated carbon configurations include a single fixed bed, fixed beds in series or in parallel, moving beds, and upflow expanded beds with biological treatment. Some dyebaths may require pretreatment with screening, sand filtration, diatomaceous earth filration, or clarification to remove lint and suspended solids before adsorption; pH adjustment can coagulate colloidal materials. Disperse dyes may require pretreatment by biological degradation or increasing the carrier or cationic surfactant concentrations in the dyebath. Thermal regeneration and reuse of the granular carbon, with losses ranging 2-10% makes adsorption economically attractive; the oxidation of metals from mordant and metal-complex dyes during regeneration does not interfere with adsorption capacities. Median organic carbon reductions of 94% and color removals of 98-100% have been achieved by 13 textile manufacturers in the United States using activated carbon; carbon adsorption operations in three textile dyeing plants are detailed. (Lisk-FIRL)
W78-10201

TREATMENT OF DYEING WASTE LIQUOR WITH WASTE SLUDGE FROM ALUMINUM PRODUCTION FACTORY (ARUMINYUMU SEIHIN KOJO HAIKI SURAJI NI YORU SENSHOKU HAISUI SHORI),
F. Iso, and H. Nakada.
Kogai (Pollution Control), Vol. 13, No. 3, p 1-7, 1978. 7 fig, 2 tab, 6 ref.

Descriptors: *Dyes, *Aluminum, *Sludge, *Color, *Heat treatment, Metals, Textiles, Particle size, Sludge treatment, Waste water treatment, Industrial wastes.

Waste sludge from an aluminum production factory was used to decolor dyeing waste liquors containing direct blue, acid blue, reactive red, basic red, disperse orange, and sulfur black dyes. Optimum color removal was obtained when the aluminum sludge was preheated at 450C. Aluminum sludge was also found suitable for decoloring sulfur dyes in waste liquors. Optimum decoloration was achieved with aluminum sludge particle sizes smaller than 149 micrometers; particle sizes of 500-1,190 and 1,190-2,00 micrometers were also tested. The aluminum sludge was regenerated by heating at 400-600C. Aluminum sludge in an aqueous solution was also effective for decolorization; color removal by aluminum sludge was attributed to coagulation and absorbtion. (Lisk-FIRL)
W78-10202

SOLVENT EXTRACTION RECOVERY OF COPPER FROM MINE AND SMELTER WATERS,
Fried-Krupp G.m.b.H., Rheinhausen (West Germany).
G. Barthel.
Journal of Metals, Vol. 30, No. 7, p 7-12, July, 1978. 7 fig, 5 tab.

Descriptors: *Copper, *Solvent extractions, *Mine drainage, *Selectivity, *Ion exchange, Solvents, Electrolytes, Metals, Resins, Waste water treatment, Industrial wastes.

A solvent extraction-eletrowinning process for the selective removal of copper from mine waters and wash waters in copper smelters was compared to cementation processes and ion exchange with solid, copper-selective resins. Shell metal extractant 529 (SME 529) was selected over five other solvent extraction reagents for pilot plant studies because of its higher load capacity and lower requirements for relatively non-volatile substances. The waste water feed contained 80-660 mg/liter copper at pH levels of 1.35-1.90; solvent concentrations of 3.2% SME 529 were used in a kerosene solution. The extraction apparatus consisted of four mixer/settler units, arranged in series. Re-extraction was performed with an electrolyte containing 20.8-28.5 g/liter copper and 138-153 g/liter free H2S04; cathode copper was extracted from the recycled electrolytes within the electrolysis cells. The solvent extraction-electrowinning process reduced the copper content of a waste stream at about pH 1.3 from less than 10 mg/liter to less than 0.5 mg/liter; cathodic copper was simultaneously recovered. The process was considered competitive with cementation and ion exchange processes. (Lisk-FIRL)
W78-10203

ELECTROCHEMICAL RECOVERY OF METALS FROM DILUTE SOLUTIONS,
Salford Univ. (England). Dept. of Chemistry and Applied Chemistry.
A. Kuhn.
Chemistry and Industry, No. 13, p 447-453, July, 1978. 10 fig, 4 tab, 19 ref.

Descriptors: *Metals, *Electrochemistry, *Anodes, *Cathodes, *Electrodes, Membranes, Electrical equipment, Design criteria, Mechanical equipment, Carbon, Separation techniques, Waste water treatment, Industrial wastes.

Current and developing technology is reviewed for the electrochemical winning of metals from dilute primary ore leachates, mine dump leachates, and other industrial effluents. Conventional electrowinning cell types include the conventional cell, shaped anodes, cross-flow electrolytes, ultrasonic agitation, air sparging, baffled flow, and current reversal. Solvent extraction-electrowinning techniques can remove metal concentrations as low as 1 g/liter from dilute waste streams. Continuous metal recovery cells recently developed, providing low voltage because of a small anode-cathode gap, include Ecological Engineering Ltd.'s Eco-Cell, the bipolar Pump cell, and fluidized beds. Intermittent metal recovery cells, including the Chemelec, the Swiss-roll type cells, parallel plates and three-dimensional electrodes with carbon, require higher voltage because of the larger anode-cathode gap. The Chemelec cell employs a fluidized bed process in which the cathode is mechanically removed when the metal growth limit is reached; the cell can also provide continuous metal recovery at a high current density. (Lisk-FIRL)
W78-10204

SULFIDE REMOVAL WITH MANGANESE AS CATALYST,
Barrie Tanning Ltd. (Ontario).
S. Shivas.
The Leather Manufacturer, Vol. 95, No. 7, p 22-23, July, 1978.

Descriptors: *Tannery wastes, *Sulfides, *Manganese, *Aeration, *Catalysts, Chemical precipitation, Sludge treatment, Lime, Organic wastes, Waste water treatment, Industrial wastes.

Manganese is used as a catalyst to decrease aeration time during sulfide removal from unhairing liquors in Barrie Tannery in Ontario, Canada. The unhairing liquors are pumped to a 60,000 Imperial gal cement silo equipped with Eimco diffusers which bubble air from the silo base through the liquor. Dissolved manganese is added in to separate feeds of 100 ppm; the second feed replaces manganese that has become ineffective by entrapment in grease or hair. When desulfiding is completed, the diffusers stop and seal; the sludge settles; and the supernatant is decanted from the silo. The lime-rich sludge is resettled and removed for agricultural land application. Returning a portion of the residual sludge, which contains most of the precipitated manganese, to the influent liquor improves the desulfiding operation. Acidifying the sulfur depleted liquor to below pH 6 prevents sulfide formation during storage and precipitates about 70% of the organic matter for subsequent removal by filtration. The full-scale plant at Barrie was constructed at a cost of $10,000. (Lisk-FIRL)
W78-10205

STUDIES ON THE RECYCLING OF COLLECTED EFFLUENTS IN CHROME UPPER LEATHER MANUFACTURE (II)-APPLICATION OF RECYCLING SYSTEM OF COLLECTED TANNERY EFFLUENTS IN INDUSTRIAL SCALE (KUROMU KOKAKU SEIZO NIOKERU SHUGO HAISUI NO JUNKANRIYO NI KAN SURU KENKYU (II)-KOJO SUKEERU NI YORU OUYOTEKI KENTO),
Nippi, Inc., Tokyo (Japan).
Y. Niwa, M. Kawakami, I. Yokokawa, H. Shimada, and K. Abe.
Hikaku Kagaku (Leather Chemistry), Vol. 23, No. 4, p 199-213, 1978. 8 fig, 19 tab, 3 ref.

Descriptors: *Tannery wastes, *Recycling, *Coagulation, *Filtration, *Aeration, Sulfide, Chrome, Chloride, Oxidation, Odor, Chemical oxygen demand, Biochemical oxygen demand, Suspended solids, Nitrogen, Salts, Water reuse, Water conservation, Waste water treatment, Industrial wastes.

Processing effluents from the chrome tanning of upper leathers were treated for reuse. Unhairing, tanning, and dyed fatliquoring waste waters were screened, aerated individually and collectively, coagulated, settled, passed through a Contra-flow sand filter, and oxidized with Ca(ClO)2; the treated effluent was recycled to the original point-of-use and retreated 10 times. The recycled effluents from the various processes were tested for pH, total solids, soluble solids, suspended solids, volatile solids, total nitrogen, volatile nitrogen, chloride ions, sulfide ions, calcium, chrome, BOD, and COD. The recycling process was effective in controlling pH and reducing suspended solids, sulfide ions, and chrome; BOD, COD, and chloride ions were relatively unaffected by the treatment process. The chemical and physical properties and commercial value of the leather were not adversely affected by the use of recycled process waters. Recycling recovered 95.0-97.1% of the effluents and reduced raw water consumption by 91.2-92.1%. (Lisk-FIRL)
W78-10206

THE BIODEGRADABILITY OF TANNERY CHEMICALS,
British Leather Manufacturers' Research Association, Egham (England).
D. R. Corning.
Journal of the Society of Leather Technologists and Chemists, Vol. 62, No. 3, p 63-67, May-June 1978. 7 fig, 3 tab, 3 ref.

Descriptors: *Tannery wastes, *Activated sludge, *Dyes, *Oxygen demand, *Pilot plants, Laboratory tests, Domestic wastes, Chemical oxygen demand, Biochemical oxygen demand, Chromium, Phosphorus, Respiration, Nutrients, Waste water treatment, Industrial wastes.

The biodegradability of natural tanning agents, syntan A, biocides, and dyes was evaluated with laboratory and pilot-scale activated sludge units and an automatic multi-station respirometer. The natural tannin, myrabolam, was more susceptible to degradation by activated sludge, than minosa and syntan A. There were no significant improvements when sludge inocula in the respirometer were acclimated prior to treatment of the tanning agents. Oxygen uptake in the respirometer over 70 hrs of treatment of biocides, added as 50 mg/liter, ranged from about 400-550 mg/liter. When dyes with similar COD values but varying COD:BOD ratios were treated in the activated sludge units, BOD removal ranged 77-96.%. COD was reduced by 65% or less at COD:BOD ratios of 100 or more; for lower ratios, COD was reduced by 72-85%. Activated sludge treatment of combined domestic sewage and chrome side leather tanning effluent maintained effluent COD reductions of 80% when the tanning wastes comprised 50% of the influents. The addition of sodium dihydrogen phosphate to increase phosphate levels to 20 mg/liter improved the reactor performance for higher tannery loads; 300-400 mg/liter total nitrogen was considered adequate. The pilot units achieved an average COD and BOD removal of 66%, sulfide reductions of 99%, and an effluent chromium level below 6 mg/liter. (Lisk-FIRL)
W78-10207

AN ADVANCED COMPUTER-CONTROLLED SEWAGE TREATMENT PLANT.
Municipal Administration and Engineering, (Johannesburg), Vol. 42, No. 503, p 5, 7, 9, 11-13, 29, 1977.

Descriptors: *Sewage treatment plants, *Computers(Automatic control), *Process control, Diffused air aeration, Activated sludge process, Pressure filtration, *Sludge treatment, Construction, Intake systems, Primary sedimentation, Biological filtration, Sludge disposal, Anaerobic digestion, Waste water treatment, Britain, South Africa.

The Anglian Water Authority is now operating one of the world's most advanced sewage treatment works at Whitlingham near Norwich. The original works at Whitlingham was designed to treat daily 34,000 cubic metres of sewage from a population of 157,000 persons. The new works, fitted with a Kent automatic process control system, has been extended to treat a total of 55,000 m3 per day from a population of 200,000. The construction and working of the plant are described, which includes the inlet works, flow diversion, primary sedimentation, secondary treatment, activated sludge, process, biological filtration, central control system, sludge treatment and disposal, pressure filtration and services. (So Afr Water Info Center)
W78-10220

ENERGY REQUIREMENTS FOR THE BIOLOGICAL TREATMENT OF SEWAGE (IN AFRIKAANS),
P. G. J. Meiring.
Chemsa (Johannesburg), Vol. 3, No. 7, p 117-119, 1977, 4 ref, 7 tab.

Descriptors: *Biological treatment, *Solar energy, Self purification, Oxygen demand, Activated sludge, *Energy requirements, Electricity, Biological reactor, Economics, *Costs, Waste water treatment, South Africa.

The author takes a look at a challenge facing the world today namely, that of more advanced wastewater purification at a lower cost and using less energy. He then goes on to compare a capital intensive treatment plant (chemical) with an energy intensive plant (activated sludge) and comes to the conclusion that the biological plant is the better proposition. (So Afr Water Info Center)
W78-10224

CONCENTRATING SOLUBLE OILS.
South African Mining and Engineering Journal (Johannesburg) Vol. 88, No. 4122, p 15, 1976. 2 Illustr.

Descriptors: Reverse osmosis, *Ultrafiltration, *Waste disposal, *Oil recovery, *Oil wastes, Incineration, Waste treatment, South Africa.

A short article describing the ultrafiltration of soluble oil emulsion wastes having a water content of typically 95 percent into oil concentrate and water, which is clean enough to discharge to sewers. The oil concentrate can be burnt in oil or gas fired incinerators or be accepted by reclamation companies for refining. (So Afr Water Info Center)
W78-10225

A SLOW SAND FILTRATION WATER TREATMENT PLANT OF SIMPLE CONSTRUCTION AND EASY OPERATION FOR USE IN THE KWA ZULU HOMELANDS,
Kwa Zulu Government Service, Empangeni (South Africa), Div. of Water Supply.
For primary bibliographic entry see Field 5F.
W78-10229

TREATMENT OF EFFLUENT FROM THE ATHLONE SEWERAGE PLANT BY THE DESAL PROCESS,
National Inst. of Metallurgy, Johannesburg (South Africa).
J. Franzidis, J. W. De Kock, and A. D. Carr.
Report No 1843, 1976. 20 p, 7 fig, 10 tab, 8 ref.

Descriptors: *Desalination, *Ion exchange, *Electrolytes, Resins, Sewage effluents, *Sewage treatment, Water reuse, Total dissolved solids, Water quality, Potable water, Chlorides, Agricultural water, Pollutants removal efficiency, Ion exchangers regeneration, Flow rate, Rinsing, Carbonation, Process design, *DESAL process, Athlone, Cape Town, South Africa.

Describes an investigation of a desalination technique involving ion exchange by weak-electrolyte resins. The object was the determination of whether waste water from the Cape Town Municipal Sewerage Works at Athlone could be reused. Reduction of the total dissolved solids to below the upper potability limit would make the sewerage effluent suitable for reclamation to potable standards, and a simultaneous reduction of chlorides would improve it for agricultural use. The aspects investigated were the capacities of the resins for the different ions of the raw water, the regeneration levels needed to achieve these capacities, the effect of flow rates on the system, and the quality of the purified water produced. Additional information was also obtained on the regeneration, rinsing, and carbonation procedures. On the basis of the results obtained, certain modifications to the basic design have been recommended to adapt the process to the local raw water. (So Afr Water Info Center)
W78-10232

THE APPLICATION OF CENTRIFUGES TO THE DEWATERING OF SLUDGES,
Alfa-Laval Co. Ltd., Brentford (England).
H. E. Zurcher.
Municipal Administration and Engineering, Vol. 42, No. 488, p 7-11, 8 fig, April 1976.

Descriptors: *Centrifuges, *Sludge dewatering, Sludge processing, *Waste water treatment plants,

Equipment description, Industrial wastes, Primary sludge, Activated sludge, Screens, South Africa.

Sludge dewatering by means of centrifuges has found wide acceptance in the Scandanavian countries and there are now definite signs that Germany, Holland and Britain will make use of this equipment on an increasing scale over the years to come. The article then goes on to describe the sludges and the processes; primary and mixed sludges; secondary sludges; decanters for primary, primary digested and mixed digested sludges; and finally, machines for surplus activated sludge. (So Afr Water Info Center)
W78-10236

EXPLORATORY INVESTIGATION FOR SEWER AND PIPELINE CONSTRUCTION,
For primary bibliographic entry see Field 8D.
W78-10243

TWO BELT FILTER PRESS PROVIDES LOW COST DEWATERING.
Modern Power and Engineering, Vol. 72, No. 3, p 35, March, 1978.

Descriptors: *Sludge treatment, *Dewatering, Screens, *Filters, *Equipment, Continuous flow, Sludge disposal, Pressure, Design criteria, Porosity, Permeability, Waste water treatment, Sewage sludge, Municipal wastes.

The Perrin model FBP continuous belt filter press provides two separate screens to accommodate varying porosity specifications. The continuous screen belts are independently washed and available in widths of 2-10 ft. The filter press utilizes different screen sizes for supplying high and low pressure operation. The screen belts are constructed with an automatic tracking apparatus and with varying porosities to meet specific dewatering needs. Frictional wear on the belts is reduced in the Perrin press by its single converging screens and simple sludge circuits. Drainage and pressing operations are reportedly more efficient because the screens are individually washed, providing double processing of sludge on clean screens. Perrin manufactures seven models of the continuous belt filter press, producing dewatered sludge with solids contents of 15-40%. (Lisk-FIRL)
W78-10250

RECLAIMED WATER - A HEALTH HAZARD,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
For primary bibliographic entry see Field 5F.
W78-10251

SURFACE WATER AND FOUL SEWER SCHEMES.
Water Services, Vol. 82, No. 987, p 313-314, May, 1978.

Descriptors: *Sewerage, *Storm drains, *Surface runoff, *Sewers, *Manholes, Excavations, Pumping plants, Pumps, Railroads, Tunnel construction, Tunneling, Plastic pipes, Pipelines, Conduits, Equipment, Waste water treatment, Municipal wastes, Cofferdams.

England's Thames Water Authority has contracted P. Trant Ltd. to construct surface water sewers in Old Poole town and waste water sewers in the Newbury. Both sewerage systems will pass under railway lines through small tunnels that will be driven without disrupting rail service. The Old Poole storm sewer project will include manholes and 1.4 km of sewer lines with diameters ranging of 225-975 mm. The project also includes the construction of two pumping stations, equipped with twin screw Archimedean pumps with maximum capacities of 330 gal/sec. The line beneath the railroad bed will be passed through a bore thrust, 900 mm in diameter. The Newbury project will include 2.25 km of 300-600 mm diameter sewers laid up to 6 m deep due to ground conditions, and 1 km of 350 mm polyvinyl chloride pipe pumping main. The tunnel beneath the rail tracks will be 1000 mm in diameter; a pumping station near the tracks will be constructed at a depth of 8 m. Steel sheet-piled cofferdams will be required to shore up the side of the excavation during construction because of the trains' vibrations. (Lisk-FIRL)
W78-10291

SEWER RESTORED BY THERMOSET RESIN CURED IN PLACE,
Illinois State Univ., Normal, Coll. of Applied Science and Technology.
For primary bibliographic entry see Field 8G.
W78-10293

MONTREAL SEWER CONTRACTOR IS FORCED TO USE HIGH AIR PRESSURE IN TREACHEROUS CLAY,
For primary bibliographic entry see Field 8G.
W78-10295

HYDRAULIC SHEET PILE DRIVER HAMMERS DOWN SEWER TRENCH COSTS,
For primary bibliographic entry see Field 8C.
W78-10297

EXPERIENCES IN OPERATING SMALL PACKAGE-TYPE SEWAGE-TREATMENT UNITS,
N. P. Nicolle.
Water Pollution Control, Vol. 77, No. 1, p 112-115, 1978.

Descriptors: *Biological treatment, *Treatment facilities, *Operation and maintenance, *Screens, *Filtration, Aeration, Settling basins, Cleaning, Chlorination, Corrosion control, Dissolved oxygen, Sewage sludge, Laboratory tests, Waste water treatment, Municipal wastes.

Problems associated with the operation and maintenance of small package sewage treatment plants are reviewed. Hand-raked screens can clog if they are not cleaned often enough, resulting in sewage overflows to the receiving water body. Covered stainless steel screenings containers with drainage holes should be emptied daily at a disposal site. Stone traps, which can be stirred to remove organic accumulations and sand, are recommended over detritus channels at the inlet to the sewage treatment plant. V-notched overflow weirs on the sedimentation tanks should be cleaned frequently to prevent high overflow rates. Biological filters are preferred for treatment; replacement of distributor arm parts may require professional engineers. Operation of vertical disc and surface aerators at maximum speeds can cause excessive oxygen concentrations; dissolved oxygen concentration tests should be performed regularly, as well as mixed liquor suspended solids content, oxygen absorption, COD, suspended solids, ammonia, and bacteriological tests. Final sedimentation tanks should be cleaned daily to prevent algae accumulations which can contribute to increased humus or activated sludge. Regular maintenance of sand and filters is recommended for operation efficiency. Corrosion of chlorination equipment has often occurred due to leaks and improper handling of the equipment. (Lisk-FIRL)
W78-10298

DIFFUSED AIR SUPERSEDES MECHANICAL SURFACE AERATION AT OXFORD,
Thames Water Authority, London (England). Vales Div.
V. H. Lewin, and J. R. Henley.
Effluent and Water Treatment Journal, Vol. 18, No. 4, p 163-165, 167, 169, April, 1978. 5 tab, 12 ref.

Descriptors: *Aeration, *Activated sludge, *Aerated lagoons, *Oxygen, *Hydraulic equipment, Water quality, Protozoa, Design data, Equipment, Treatment facilities, Waste water treatment, Municipal wastes.

A diffused air aeration system and a Vitox liquid oxygen augmentation system were installed to supplement the mechanical surface aeration-activated sludge system in the sewage treatment works at Oxford, Sanford on Thames, England. Increased flows to the treatment plant necessitated nearly use of the 3.3 mgd diffused air system after installation to maintain effluent quaity. The efficiency of the plant was improved when the aeration tanks were deepened from 2.44 to 5.0 m and the 40 aeration units were converted to accommodate the extra depth. Two Vitox pumps, supplying 0.5 tons 02/day, were later installed to provide supplementary oxygen during breakdowns and upgrading of the plant operation. This system was unable to improve effluent quality and could not provide adequate treatment in the event of a cone breakdown. Plastic concrete-weighted Venturators and an air compressor were purchased as an auxillary unit. An analysis of protozoa and rotifera in the surface aeration and diffused air systems indicated that Pertrichia, Rotifera Lecane, and Philodina were most abundant. Further upgrading and replacement of the surface aeration system, as well as advanced monitoring systems, tank drainage systems, mixed liquor distribution chambers, and final clarifiers, are planned. (Lisk-FIRL)
W78-10299

WASTEWATER CHLORINATION BY JET DIFFUSION,
Ridgewood Water Pollution Control, NJ.
J. J. Lagrosa, M. G. Mandt, and G. F. Burde.
Public Works, Vol. 109, No. 4, p 71-73, April, 1978. 2 tab.

Descriptors: *Chlorination, *Disinfection, *Jets, *Diffusion, *Activated sludge, Oxidation lagoons, Coliforms, Biochemical oxygen demand, Chlorine, Waste water treatment, Municipal wastes.

Waste water chlorination by water jet diffusion was incorporated into the 5 mgd contact stabilization-activated sludge treatment facility in Ridgewood, New Jersey, to reduce effluent fecal coliform counts. The jet disinfection unit, developed by the Pentech Division of Houdaille Industries, employs a Venturi reactor tube equipped with a jet plume. Waste water is pumped through the jet into the assembly, forming a vacuum which draws chlorine into the stream; the hydrolyzed hypochlorous acid formed is immediately lethal to the microorganisms at the proper pH. Effluent fecal coliform counts have ranged over 21-70/100 ml since the jet diffusion chlorination system was installed. The chlorine dosage has been reduced to about 18 lbs/million gal to maintain a chlorine residual of 1.0 mg/liter; BOD concentrations have been reduced by 90-94%. (Lisk-FIRL)
W78-10300

CHEMICAL CONDITIONING OF SLUDGE,
R. A. Macaulay.
Water Pollution Control, Vol. 77, No. 1, p 69-71, 1978. 3 fig, 1 tab, 3 ref.

Descriptors: *Polyelectrolytes, *Activated sludge, *Sludge digestion, *Polymers, *Flocculation, Dewatering, Anions, Cations, Sludge treatment, Waste water treatment, Municipal wastes.

Polyelectrolyte conditioning of sewage sludge prior to dewatering by centrifuguation or vacuum filtration was investigated intests at 25 South African waste water treatment plants. Organic primary, secondary, digested, and activated sludges were conditioned with Zetag 92 cationid polyelec-

trolyte. Chemical sludges were flocculated with Magnafloc 155 anionic polyelectrolyte. Solids contents were increased to 22.3-25.3% for primary sludges, 13.8-29.0% for digested sludges, and 8.8-17.3% for waste activated sludges. The anionic polymer increased solids contents in chemical sludges to 15.0-26.0%. A nonlinear relationship was established between the polymer dosage and the recovery percentage. Activated sludge required a significantly higher polymer dosage than digested sludge. (Lisk-FIRL)
W78-10301

BELT FILTER PRESSES: A NEW SOLUTION TO DEWATERING.,
A. E. Dembitz.
Water and Wastes Engineering, Vol. 15, No. 2, p 36, 38, 40, 41, 70, February, 1978.

Descriptors: *Sludge treatment, *Dewatering, *Pressure, *Filtration, *Gravity, Polymers, Equipment, Activated sludge, Industrial wastes, Design data, Waste water treatmentm Municipal wastes.

Belt filter press and recessed plate press designs and manufacturers are discussed as alternatives to vacuum filters, centrifuges, gravity sludge dewaterers, and incinerators for municipal, activated, and industrial sludges. Belt filter presses usually incorporate an initial gravity drainage stage, followed by dewatering of sludge between a perforated and a solid continuous belt; 0.25-2.0 inches thick cakes can be obtained. Sludge conditioning with organic polymers has increased the potential dewatering capabilities of filter presses. Two-stage gravity dewatering belt presses, manufactured by Ecodyne and Permutit Co's, dewater 1-2% solids sludges on 14-16% solids content; units with widths of 3-6 ft cost about $50,000-70,000. A completely equipped system with 8-10 ft wide belts costs approximately $80,000-120,000. Three-stage belt filter presses are often required to produce an autogenously combustible sludge with a solids content of 25%. Recessed plate presses, operating at pressures of about 125 psi or more, have low power requirements and are capable of handling difficult industrial sludges; the numerous small precision parts of the units may make recessed filter plates more expensive. (Lisk-FIRL)
W78-10302

REST-AREA WASTEWATER TREATMENT,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
G. W. Hughes, D. E. Averett, and N. R. Francingues.
Transportation Research Record, Vol. 631, p 30-36, 1977. 5 fig, 1 tab, 5 ref.

Descriptors: *Design criteria, *Highways, *Average flow, *Activated sludge, *Design standards, Aeration, Oxidation lagoons, Application methods, Evaporation, Waste identification, Domestic wastes, Unsteady flow, Waste water treatment, Municipal wastes, Septic tanks.

Various rest-area waste water treatment processes and problems associated with these in several states were reviewed as a preliminary step to developing design parameters for rest-area facilities that comply with P. L. 92-500. The principal methods of treatment encountered were: septic tanks with leach fields; facultative, aerobic, or totally evaporative lagoons; land application; and package extended aeration, activated sludge plants. Problems associated with the rest-area treatment processes were inadequate information on waste characteristics and incorrect calculation of flow fluctuations. Data on effluent characteristics, previously assumed to be similar to domestic wastes, demonstrated lower concentrations of BOD and suspended solids but higher ammonia levels and COD:BOD ratios. Miscalculations of rest-area usage originated in the practice of averaging percentages of daily traffic; a more accurate method for determining waste water flows utilized monthly traffic summaries and incorporated three peak-month averages. An extended aeration-activated sludge plant at a Mississippi rest-area was cited as producing an effluent in compliance with P. L. 92-500 standards. (Lisk-FIRL)
W78-10303

FORMULATING PUBLIC POLICY ON LAND APPLICATION OF WASTEWATER AND RESIDUALS,
For primary bibliographic entry see Field 5E.
W78-10304

FIXED-GROWTH NITRIFICATION OF SECONDARY EFFLUENT,
Los Angeles County Sanitation Districts, Whittier, CA.
J. A. Gasser, C. L. Chen, and R. P. Miele.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE1, p 77-92, February, 1978. 7 fig, 6 tab, 3 ref.

Descriptors: *Nitrification, *Activated sludge, *Chemical precipitation, *Ammonia, *Activated carbon, Packed beds, Filtration, Gravels, Sands, Columns, Aeration, Oxygen, Waste water treatment, Municipal wastes.

Fixed growth nitrification of activated sludge liquor and alum-clarified raw and carbon-filtered raw sewage was investigated in two 1.73 m high columns. The columns were packed with gravel, silica sand, river-washed stone, or granulated activated carbon and operated at varying empty-bed detention times and temperatures to obtain effluent ammonia-N concentrations of less than 2 mg/liter. Backwashing was required to prevent solids accumulations. Secondary effluent was supplied to the columns at a rate of 0.29 gal/min/sq ft; air or pure oxygen was injected into one column. Successful nitrification of the activated sludge liquor was accomplished with the gravel filter medium. The sand medium was limited by solids accumulation; the alum-clarified and alum-carbon treated effluent was adequately nitrified in the fixed growth process. The correlation between temperature and empty-bed detention time influenced nitrification; 2 hrs detention time required 20C, while 80 min detention required 25C to reduce effluent ammonia-N to 2 mg/liter. No significant differences in nitrification were observed between air and oxygen aeration; pH adjustments were not required for activated sludge effluent. Influent COD concentrations above 90 mg/liter adversely affected nitrification and increased detention time requirements. (Lisk-FIRL)
W78-10305

LAND TREATMENT OF WASTEWATER MAY BE KEY TO POLLUTION CONTROL,
For primary bibliographic entry see Field 5E.
W78-10306

MAKE SEWAGE WORKS WORK,
Associated Water and Air Resources Engineers, Inc., Nashville, TN.
C. D. Malone, and P. Swann.
American City and County, Vol. 93, No. 6, p 79-81, June, 1978. 2 fig.

Descriptors: *Activated sludge, *Operation and maintenance, *Personnel management, *Training, *Aerated lagoons, Effluent streams, Anaerobic digestion, Plastic pipe, Aeration, Sampling, Automation, Design criteria, Waste water treatment, Municipal wastes.

Improvements in operation, maintenance, and performance of the expanded Archie Elledge Waste Treatment Plant in Winston Salem, North Carolina, included personnel training and reorganization and process modifications. The 36 mgd activated sludge plant, with a peak capacity of 54 mgd, was unable to maintain design effluent parameters soon after start-up. A consulting engineering firm was retained to perform plant reorganizations and evaluations. Operating personnel underwent a 20-hr on-the-job training program; operation and maintenance responsibilities were reorganized. High organic concentrations from one influent source were reduced by adding pretreatment with a second aerated lagoon with a 2 mgd capacity to operate in parallel with the existing 1.33 mgd aerated lagoon. Surge control was provided by varying the waste water depths in the lagoons. Anaerobic digester supernatant was returned to the pretreatment lagoons as a source of nitrogen rather than to the primary clarifiers. About 4,000 ft of polyvinyl chloride pipe was installed to divert the digester supernatant to the lagoons. Three additional aerators were installed in the activated sludge basins to increase dissolved oxygen concentrations. Effluent flows from the centerwells of the final clarifiers were reduced somewhat by increasing the diameter of one of the clarifier centerwells. Sampling procedures were automated; other process modifications are under consideration. (Lisk-FIRL)
W78-10307

WASTEWATER DISINFECTANTS: MANY CALLED - FEW CHOSEN,
CH2M/Hill, Corvallis, OR.
J. W. Smith.
Water and Wastes Engineering, Vol. 15, No. 6, p 18-25, June, 1978. 1 fig, 1 tab, 40 ref.

Descriptors: *Chlorination, *Disinfection, *Ozone, *Toxicity, *Reviews, *Sewage bacteria, Viruses, Bioassay, Oxidation, Chemical reactions, Water treatment, Effluents, Environmental effects, Ultraviolet radiation, Bromine, Organic wastes, Water analysis, Coliforms, Pilot plants, Municipal wastes, Waste water treatment.

Enteric virus survival rates in domestic sewage treatment and the formation of toxic compounds during waste water chlorination have led to questioning of the reliability of the coliform test as a means of assessing disinfectant performance, as well as a search for alternatives to chlorination. Numerous investigations have been directed toward characterizing chlorination byproducts and their associated toxicities, as well as evaluating methods for reducing residual chlorine concentrations in potable and waste waters. A variety of disinfectants are discussed with respect to current technology level, efficiency, energy consumption, toxic effects, and costs. Of the disinfectants currently being considered, ozone is cited as the most promising alternative to chlorine. Advantages of ozone include its powerful oxidizing nature, byproduct oxygen generation, and viricidal properties. Recent studies on ozone disinfection efficiency and the possible toxicity of ozonation intermediates are reviewed. Additional pilot studies on the use of bromine chloride, chlorine dioxide, and ultraviolet irradiation are described. (Schulz-FIRL)
W78-10308

SOME HOT NEWS ABOUT SLUDGE,
Portland Water District, ME.
For primary bibliographic entry see Field 5E.
W78-10309

THERMALLY CONDITIONED SLUDGE HAS AGRICULTURAL USES.
For primary bibliographic entry see Field 5E.
W78-10310

PHYSICO-CHEMICAL TREATMENT OF MUNICIPAL WASTEWATER. COAGULATION-FLOCCULATION,
Agricultural Univ., Wageningen (Netherlands). Dept. of Water Purification.
J. Leentvaar, W. G. Buning, and H. M. M. Koppers.

Water Research, Vol. 12, No. 1, p 35-40, 1978. 8 fig, 6 tab, 13 ref.

Descriptors: *Flocculation, *Coagulation, *Domestic wastes, *Pilot plants, *Carbon, Iron compounds, Lime, Suspended solids, Biochemical oxygen demand, Chemical oxygen demand, Phosphorus compounds, Detergents, Organic compounds, Chemical precipitation, Waste water treatment, Municipal wastes.

Coagulation-flocculation of wastes primarily domestic in origin was investigated in pilot studies using ferric chloride, hydrated lime, and alum with and without coagulation aids. Treatment efficiency was evaluated according to effluent concentrations of total organic carbon, BOD, COD, suspended solids, ammonia, phosphorus, proteins, and low organic acids. At pH 5.3, a ferric chloride dose of 61 mg/liter reduced suspended solids by 93%, soluble organic carbon by 27%, and total organic carbon by 54%. Alum, added as 47 mg Al/liter at pH 5.9, removed 94% of the suspended solids, 24% of the soluble carbon, and 58% of the total carbon. A 520 mg/liter dose of hydrated lime at pH 11.0 reduced suspended solids by 90%; when ferric chloride was added as a coagulation aid, the removal efficiency of soluble carbon was increased from 17% to 23% and total organic carbon reduction was improved from 44% to 56%. Alum flocculation removed a larger percentage of the anionic detergents in the waste water than the other two flocculants; all three agents removed 99% of the orthophosphate and 14-18% of the ammonia. Cost comparisons concluded that ferric chloride was the most economical flocculant of the three tested. (Lisk-FIRL)
W78-10311

TREATING SLUDGES.
For primary bibliographic entry see Field 5E.
W78-10312

OXYGEN ACTIVATED SLUDGE TRIALS AT PERSLEY,
R. W. Fuggle, R. A. Charlton, and J. L. Hutton.
Effluent and Water Treatment Journal, Vol. 18, No. 5, p 225, 228, 230-232, May, 1978. 7 fig, 2 tab, 5 ref.

Descriptors: *Activated sludge, *Oxygenation, *Sewage bacteria, *Settling rates, *Pilot plants, Biochemical oxygen demand, Organic loading, Oxygen, Protozoa, Suspended solids, Diurnal, Waste water treatment, Municipal wastes.

A Wimpey Unox oxygen activated sludge pilot plant was installed in the Persley, Scotland, sewage treatment plant in an attempt to reduce the growth of filamentous bacteria causing poor sludge settling characteristics. About 15% of the waste water flow to the plant originated from a chicken processing plant, a dyeing operation, a fish processing plant, an animal breeding laboratory, and a refuse dump. The Unox pilot plant was operated on three test modes: 26 days at 2-6 hrs retention; 29 days at 1-7 hrs; and 29 days at diurnal variations of 1.7 1.0 hrs. Various recycle and biological loadings were also examined. Effluent BOD and suspended solids concentrations were reduced to less than 20 mg/liter and 22 mg/liter, respectively, at a biological loading of 0.6-0.9 kg BOD/kg mixed liquor volatile suspnded solids/day. Sludge settling characteristics improved when the pilot plant was operated on the third test mode. A photomicrographic comparison of effluent from the Unox pilot plant and the original activated sludge plant showed a significant reduction in filamentous bacteria in the Unox effluent. Higher dissolved oxygen concentrations, larger and more active microbial populations, or higher carbon dioxide concentrations in the liquor were cited as possible factors involved in reducing filamentous bacterial growth. (Lisk-FIRL)
W78-10313

DISSOLVED AIR FLOTATION TACKLES SLUDGE THICKENING,
Komline-Sanderson Engineering Corp., Peapack, NJ.
T. R. Komline.
Water and Wastes Engineering, Vol. 15, No. 2, p 63-67, 69, February, 1978. 2 fig, 2 ref.

Descriptors: *Flotation, *Dissolved oxygen, *Sludge treatment, *Dewatering, *Polymers, Equipment, Design data, Activated sludge, Sewage sludge, Foaming, Waste water treatment, Municipal wastes.

The performance and costs of dissolved air flotation in thickening waste activated sludge were evaluated in pilot plant studies conducted at 20 municipal treatment plants and industries using the Komline-Sanderson Peapack, New Jersey, HR-400 flotation unit. The flotation unit can thicken sludge at a rate of 2.25 lbs dry solids/sq ft/hr with a 4% float concentration and a suspended solids removal rate of 95%. Units often operate at double the capacity when sludge is of normal quality; the overall design of the unit permits adequate thickening of difficult sludges. The flotation unit is designed to operate at a recycle rate of 2 gpm/sq ft, retention of tank pressure of 60-70 psi, pressure, 75-95% air saturation, and an air/solids ratio of 0.035. Solids contents of sludges conditioned with polymers are usually 1% higher than sludges treated without polymer flotation aids. In the flotation unit, influent and recycled sludges are mixed with an air/polymer mixture to form a surface sludge blanket 8-24 inches thick above the waste water surface. A skimmer unit equipped with fixed vertical blades moves the flotating sludge along the surface of the flotation tank; a bleaching plate horizontally mounted before an inclined ramp also moves the sludge. Effluent is reaerated with aeration eductors in a retention tank to increase the air/water surface interface. The high dissolved oxygen content of the sludge contributes to lowering BOD in the influent activated sludge. Float suspended solids concentrations have ranged over 2.5-12% in the pilot plants studied; costs associated with dissolved air flotation are reviewed. (Lisk-FIRL)
W78-10314

USE AND MISUSE OF CHLORINATION FOR THE PROTECTION OF PUBLIC WATER SUPPLIES AND THE TREATMENT OF WASTEWATER,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5F.
W78-10315

TEXAS UTILITY TAPS MUNICIPAL SEWAGE PLANT FOR DEPENDABLE COOLING WATER SUPPLY.
For primary bibliographic entry see Field 5E.
W78-10316

SWISS TUNNEL CONFIRMS MINI'S URBAN ROLE.
For primary bibliographic entry see Field 8E.
W78-10317

WASTEWATER TREATMENT PROBLEMS AT NORTH KANSAS CITY, MISSOURI,
Black and Veatch, Kansas City, MO.
P. J. Schmidt.
Journal Water Pollution Control Federation, Vol. 50, No. 4, p 635-644, April, 1978. 5 fig, 3 tab.

Descriptors: *Organic loading, *Corrosion control, *Biochemical oxygen demand, *Industrial wastes, *Settling basins, Activated sludge, Pilot plants, Chemical precipitation, Suspended solids, Aeration, Corrosion control, Anaerobic conditions, Waste water treatment, Municipal wastes.

On-site data collections, bench scale studies, and an activated sludge pilot plant evaluated treatment inefficiencies and corrosion problems at 7 mgd North Kansas City primary waste water treatment plant in Missouri. About 90% of the BOD in the influent stream originated from food processing plants, paint factories, soft drink bottling, paper processing, and grain storage and milling operations. The influent had temperatures ranging over 29-41C and a low pH. BOD was reduced by 1-17% and suspended solids by about 90%; hydrogen sulfide concentrations ranged over 0.3-5.0 mg/liter. Besides primary settling, the plant also provides vacuum sludge filtration. Sludge septicity in the primary tanks was caused by sludge blankets up to 1 m deep in the center of the tank; a picket fence unit installed in one tank reduced the sludge blanket to less than 130 mm and improved BOD removal. Bench scale tests demonstrated that further BOD removal could be achieved with 25-50% mg/liter additions of ferric chloride as a flocculating agent. The activated sludge pilot plant study concluded that BOD could be reduced by 89-99% to an average of 53 mg/liter and suspended solids could be reduced by 78-95% to 20 mg/liter average with aeration for 20 hrs. (Lisk-FIRL)
W78-10318

CONTACT STABILIZATION TREATMENT OF A COLLOIDAL ORGANIC WASTEWATER,
Memphis State Univ., TN.
H. A. Kharajian, and J. H. Sherrard.
Journal Water Pollution Control Federation, Vol. 50, No. 4, p 645-652, April, 1978. 6 fig, 1 tab, 22 ref.

Descriptors: *Solids contact processes, *Stabilization, *Activated sludge, *Colloids, *Organic wastes, Oxidation lagoons, Settling basins, Aeration, Mixing, Chemical oxygen demand, Waste water treatment, Municipal wastes.

Parameters influencing the biodegradation of a colloidal organic waste water during contact stabilization treatment were studied in a continuous flow bench-scale activated sludge unit containing a contact rank, a sedimentation basin, and a stabilization tank with regulated sludge wastage and recycle. Synthesized waste water containing diluted colloidal yogurt, beef extract, inorganic nutrient salts and a colloidal COD content comprising 45% of the total 420 mg COD/liter was used in the study. The contact had a hydraulic retention time of 2.2 hrs and was mechanically mixed and aerated. Sludge recycle from the sedimentation basin was maintained at about 15 ml/min; the stabilization tank had a hydraulic retention time of about 4.9 hrs. Mean cell residence time varied over 0.77-4.2 days in the contact tank and 3.2-22.1 days in the total system. High levels of COD removal at low mean cell residence times in the contact tank were observed and did not impair sludge settling properties. High specific utilization rates were maintained in the contact tank because of the sludge settling properties and low hydraulic retention times. Factors causing the observed yield to decrease at lower cell retention times were not clear. About 82.2% of the microbial solids in the contact tank were transferred to the stabilization tank, compared to an average of 17.2% in the steady state systems. (Lisk-FIRL)
W78-10319

ULTRAFILTRATION OF COMPLEX WASTEWATERS: RECYCLING FOR NONPOTABLE USE,
Kentucky Univ., Lexington. Dept. of Chemical Engineering.
D. Bhattacharyya, A. B. Jumawan, Jr., S. O. Witherup, and R. B. Grieves.

Descriptors: *Membrane processes, *Filtration, *Surfactants, *Recycling, *Water reuse, Tertiary treatment, Model studies, Carbon, Dissolved solids, Computers, Oily water, Toxicity, Waste water treatment, Municipal wastes.

Charged, non-cellulosic membrane ultrafiltration of laundry and shower waste water produced a reusable, non-potable water supply that was shown not to be an irritant or toxin to mice and rabbits in oral, ocular, and dermal application tests or to human skin. Synthetic laundry wastes containing a nonionic surfactant, polyphosphates, silicates, hypochlorites, clay, and oil, and synthetic shower wastes containing aliphatic acid soaps, toothpaste, hair oil, shampoo, insect repellent, sodium orthophenylphenolate, and soil, were filtered in an ultrafiltration module operated at a channel velocity of 500 cm/sec and a transmembrane pressure of 560 kiloPascals. A 90% water recovery was predicted by computer scale-up of the model data at a feed flow rate of 1,000 cu cm/day; 90% of the organic carbon and phosphate and 52% of the dissolved solids were removed from laundry wastes at this performance level. A 75% reduction in organic carbon and a 45% removal of dissolved solids were attained with 90% recovered shower wastes. Refiltration of ultrafiltered waste water mixing with 10% make-up water was evaluated with curves describing organic carbon and dissolved solids accumulations on the membrane and residuals in the water. Toxicity and irritation by the recycled water were negligible in tests with mice, rabbits, and humans. (Lisk-FIRL)
W78-10320

SHOCK LOAD ATTENUATION TRICKLING FILTER,
Southern Illinois Univ., Carbondale. Dept. of Thermal and Environmental Engineering.
E. E. Cook, and L. P. Herning.
Journal of Environmental Engineering Division-ASCE, Vol. 104, No. EE3, p 461-469, June, 1978. 6 fig, 8 ref.

Descriptors: *Trickling filters, *Organic loading, *Attenuation, *Biological treatment, *Biota, Biocontrol, Microbial degradation, Plastics, Packed beds, Laboratory tests, Kinetics, Chemical oxygen demand, Waste water treatment, Municipal wastes.

The kinetics of shock load attenuation by trickling filters were examined in a laboratory-scale filter with interchangeable sections. An 8-ft column stacked with 8 plastic media-packed boxes, each providing 27 sq ft of media surface area, was fed at four organic loading rates: 200 mg/liter COD or 400 mg/liter COD at 200 gal/day/sq ft; 400 mg/liter COD or 800 mg/liter COD at 400 gal/day/sq ft. During each run, the bottom filter box was successfully moved to the top of the stacked column and exposed to the four organic loadings. After eight runs, the trickling filter configuration had resumed the original arrangement. As the top box was moved down through the column, COD removal efficiency decreased; the COD reduction by the first box was relatively constant at the highest organic loading, independent of its position in the filter. Boxes from the middle and lower depths in the filter were capable of higher substrate removal when placed at or near the top of the filter; when in the higher positions, these boxes received higher organic loadings than in the steady-state position. The ability of the trickling filter to accommodate shock loads was attributed to a reserve capacity of starved bacteria in the lower parts of the trickling filter. Under shock loads, the upper strata of the filter, operating at maximum metabolic capacity, allowed organic wastes to trickle to the lower starved biota. The stabilization of COD removal efficiency implied the presence of a COD saturation point. (Lisk-FIRL)
W78-10321

ELECTRO-OXIDATION OF AMMONIA IN WASTE WATER,
Joslin (Elliott P.) Research Lab., Boston, MA.
L. Marincic, and F. B. Leitz.
Journal of Applied Electrochemistry, Vol. 8, No. 4, p 333-345, 1978. 9 fig, 7 tab, 11 ref.

Descriptors: *Electrolysis, *Oxidation, *Ammonia, *Platinum, *Electrodes, Density currents, Nutrient removal, Efficiencies, Anodes, Cathodes, Economic feasibility, Titanium, Tantalum, Waste water treatment, Municipal wastes.

Electrocatalysts and optimum operating conditions were defined for the electrooxidation of ammonia at concentrations of 2-170 mg/liter in waste water. A three-electrode cell was employed to test the suitability of platinum, titanium, tantalum, Teflon-bonded platinum, and graphite-bearing platinum as electrocatalysts; platinum was the only material which sustained an adequate peak current density of 2.30 milliamperes/cm during oxidation of 100 mg/liter ammonia at pH 8. A continuous flow bench-scale electrolytic cell containing a platinized titanium anode and stainless steel cathode was operated at various ammonia concentrations, flow rates, current densities, electrode potentials, and spacer thicknesses. The optimum current density for ammonia oxidation was about 0.476 milliamperes/sq cm. Low current densities (0.158 milliamperes/sq cm) produced the highest current efficiency; current efficiency ranged over 13.5-40.2%. Ammonia conversion ranged over 25.3-56.9% under influent concentrations of 27-30 mg/liter. A commercial powder platinum catalyst with a platinum loading of 30 mg/sq cm achieved 23.7-40.8% ammonia reductions at a current efficiency of 25%. While the process was considered technically feasible, the high cost of platinum was considered to make the process economically unattractive. (Lisk-FIRL)
W78-10322

HEAT TREATMENT AND LOW PRESSURE OXIDATION OF AQUEOUS SEWAGE SLUDGE,
Technische Hogeschool, Eindhoven (Netherlands). Lab. for Physical Technology.
S. P. P. Ottengraf, and J. P. Lotens.
Water Research, Vol. 12, No. 3, p 171-178, 1978. 15 fig, 6 tab, 12 ref.

Descriptors: *Heat treatment, *Oxidation, *Filtration, *Resistance, *Dewatering, Sludge treatment, Chemical oxygen demand, Phosphorus, Nitrogen, Laboratory tests, Waste water treatment, Municipal wastes.

The impact of wet-air oxidation and heat treatment on the specific filtration resistance, COD, nitrogen, and phosphorus of liquid sewage sludge was measured in laboratory and full-scale tests. The laboratory reactor was operated at 160, 180, and 200C for 0.5, 1.0, and 2.0 hrs; pressure was maintained at 26 atm and gas flow at 3.6 liters/hr. Laboratory results indicated that filtrate COD increased with increasing residence time at the lowest temperature; the lowest specific resistance of 16,000,000 sq sec/g was achieved at 180C and 0.5 hrs. Phosphorus was not readily dissolved and nitrogen in the dry solids decreased slowly. A full-scale Zimpro wet-air oxidation unit was operated at 165 and 185C with a mean cell residence time of 48.5 min; the COD conversion rate in the reactor was calculated at 5.2%, although the observed COD reduction was 10-15%. Operation at 165C required 45,000 kilocalories/hr more heat than at 185C, representing a 20% increase in steam consumption. Sludge treated at 185C had a mean filtration resistance of 80,000,000 sq sec/g, compared to 600,000,000 sq sec/g at 165C; this increase was attributed to axial mixing of the liquid phase in the reactor. Heat treatment at 160, 180, 200, and 220C with nitrogen pressurization demonstrated that filtration resistance decreased with increasing temperature and residence time up to a certain point. With a constant residence time, specific resistance decreased significantly in the range of 150-160C; heat treatment did not increase sludge resistance over that of wet-air oxidation. (Lisk-FIRL)
W78-10323

SINGLE VESSEL ACTIVATED SLUDGE TREATMENT FOR SMALL SYSTEMS,
M. C. Goronszy.
Process Biochemistry, Vol. 13, No. 6, p 19-25, June, 1978. 6 fig, 3 tab.

Descriptors: *Activated sludge, *Aeration, *Oxygen, *Transfer, *Biological treatment, Settling basin, Aerated lagoons, Nitrification, Denitrification, Weirs, Waste water treatment, Municipal wastes.

Sequential operation of single vessel activated sludge treatment is suitable for small scale systems accommodating fluctuating hydraulic and organic loads. Single vessel systems operate at a food-to-microorganism ratio of 0.05 kg BOD applied/day/kg mixed liquor suspended solids, with extended aeration at a rate of 2.4 kg 02/kg BOD applied /day. A six-hour cyclic operation, with a 100 min storm cycle, provides up to 18 hrs aeration; nitrification or denitrification can be induced by adjusting the aeration time. When nitrification in a six-hour cycle is desired, the waste water is aerated for 4.5 hrs, following settling and decanting; denitrification requires 3 hrs aeration after 1.5 hrs of anoxic conditions and a 50% higher oxygen transfer rate. Because a larger settling area is provided, sludges with poor settling properties can be more readily accommodated in sequential than in continuous systems. Shallow vessels for populations of 500-2,000 have a maximum depth of 1.5 m, with an endless channel or racetrack configuration. Shallow vessels utilize a decant rate of 34 liters/sec for a 500 person unit; decantation is performed by a cast iron bellmouth which is steadily lowered over the 30 min decant period. Oxygen transfer, dependent upon the depth of aeration float immersion, varies over 4.2-5.2 kg 02/hr m. Rectangular vessels, with diffused or mechanical aeration, provide treatment for larger populations of up to 4,000. (Lisk-FIRL)
W78-10324

PURE OXYGEN ACTIVATED SLUDGE SYSTEM TRANSFERS OXYGEN RAPIDLY,
Calspan Corp., Buffalo, NY. Environmental Systems Dept.
J. Y. C. Huang, and M. G. Mandt.
Water and Sewage Works, Vol. 125, No. 6, p 98-100, 102-103, June, 1978. 7 fig, 2 tab, 16 ref.

Descriptors: *Activated sludge, *Aeration, *Oxygenation, *Electric power costs, *Performance, Dissolved oxygen, Aerated lagoons, Settling basins, Sewage sludge, Transfer, Waste water treatment, Equipment, Municipal wastes.

Pure oxygen and air activated sludge systems were compared in terms of power requirements, solids separation characteristics, sludge yield, and substrate removal kinetics. Oxygen generators included cryogenic air-separation systems for large plants, requiring about 350 kilowatt hrs/ton O2, and pressure-swing adsorption systems for small operations, consuming 380 kilowatt hrs/ton O2. Oxygen dissolution and mixing equipment required 23.8 brake hp/hr to dissolve 83.3 lb O2/hr. Power requirements for oxygen aeration were shown to be economically competitive with air systems only at high mixed liquor dissolved oxygen concentrations. Sludge settling characteristics in oxygen systems were not significantly different from those of air systems operated at the same solid retention time, mixed liquor suspended solids concentrations, and mixing intensity. Sludge solid contents of 2.0-3.0% have been achieved in both oxygen and air systems; a dissolved oxygen level of 1.0 mg/liter, which could be maintained by either system, contributed to sludge settleability and decreased sludge production. The reduced aeration tank size required for oxygen systems was offset by a larger clarifier size required at suspended solids levels in excess of 3,000-5,000 mg/liter. There were no significant differences in sludge yield or substrate removal kinetics between

pure oxygen and air activated sludge systems. (Lisk-FIRL)
W78-10325

THE APPLICATION OF SURPLUS SLUDGES FROM HUMAN WASTE DISPOSAL PLANTS TO SANDY SOIL (2) - THE EFFECT OF MIXING SLUDGE ON THE PHYSICAL PROPERTIES OF THE SOIL (HAMAKAIDA SANDY LOAM) (SHINYO SHORIJO NI OKERU YOJO ODEI NO SHASHITSU DOJO EN RIYO (2) - DOJO NO BUTSURITEKI SEISHITSU NI OYOBOSU ODEI KONGO NO EIKYO),
Kochi Univ. (Japan). Lab. of Applied Analytical Chemistry.
For primary bibliographic entry see Field 5E.
W78-10326

BACTERIAL DEHALOGENATION OF HALOGENATED ALKANES AND FATTY ACIDS,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W78-10327

CHLORINATED ORGANICS AS A FACTOR IN REDUCED BIOLOGICAL OXYGEN DEMAND (BOD),
Minnesota Univ.-Duluth. Dept. of Chemistry.
R. M. Carlson, and D. W. Long.
Journal of Environmental Sciences and Health, Vol A13, No. 2, p 177-186, 1978. 5 tab, 11 ref.

Descriptors: *Biochemical oxygen demand, *Chlorination, *Organic compounds, *Phenols, *Degradation(Decomposition), Organic acids, Disinfection, Organic wastes, Sewage sludge, Analytical techniques, Waste water treatment, Municipal wastes.

The contribution of the chlorinated organic forms of phenols, benzoic acids, and anilines to BOD reduction during waste water chlorination was compared to the impact exerted by the original phenols, benzoic acids, and anilines present in the waste water. A 5 ml aliquot of a standard solution containing 150 mg/liter each of reagent grade glucose and glutamic acid was seeded with 1 ml/liter settled domestic sewage and mixed with 0.001 M aliquots of phenol, benzoic acid, and anilines, and their chlorinated derivatives. BOD determinations were made after one to five days of incubation at 20C. Aniline was found to be the most resistant of the three parent organics to degradation. The second order chlorinated organics were more resistant to degradation when the parent organic was significantly degradable. Metabolic activity was not reduced by any of the chlorinated organics except 4-chloro-3-methylphenol; the chloroorganics were not found to contribute to BOD values. When both the parent organic and the chlorinated derivative were present, the BOD was attributable only to the parent. It was concluded that the chlorinated second order organics were not readily degradable within the test period and will not be represented by the resulting BOD value. (Lisk-FIRL)
W78-10329

CHLORINATED SOLVENTS IN SEWAGE WORKS,
Imperial Chemical Industries Ltd., Brixham (England). Brixham Research Lab.
D. Brown.
Effluent and Water Treatment Journal, Vol. 18, No 3, p 110, 112-113, 115-117, March, 1978. 5 tab, 8 ref.

Descriptors: *Solvents, *Chlorination, *Activated sludge, *Trickling filters, *Sludge digestion, Treatment facilities, Sampling, Influent streams, Effluent streams, Organic compounds, Waste water treatment, Municipal wastes.

Raw, settled, and final effluent sewage samples from six English sewage treatment plants were analyzed for chlorinated organic solvents (trichloroethylene, perchloroethylene, alpha-trichloroethane, and chloroform). The plants employed diffused air activated sludge, surface aeration activated sludge, trickling filters with or without a Passavant ditch, or double filtration after activated sludge treatment. Chloroform levels in the effluent after biological treatment and in the biological and digested sludges in two treatment plants were below detection limits; chloroform levels were high in primary sludge from a trickling filter plant but were lower in the final effluent (0-102 micrograms/liter) and in the biological sludge (100 micrograms/kg). Alpha-trichloroethane was not detected in the biological and digested sludge from two plants or in the final effluent of one of these; a mean level of 1 microgram/liter was found in the other plant effluent. Trichloroethylene was apparent in final effluent samples plants at mean concentrations of 45 and 5-13 micrograms/liter. Low levels of the solvent were found in sludges from three of the plants sampled. Low levels of perchloroethylene were found in final effluent and sludge samples at four of the plants; the mean effluent concentration was 144 micrograms/liter in an activated sludge plant, with negligible amounts in the digested sludge. The remova of chlorinated hydrocarbons was attributed to biodegradation and/or volatilization; the chlorinated aliphatics entering with the raw sewage were passed on to biological treatment and not preferentially absorbed by primary sewage. (Lisk-FIRL)
W78-10330

SELECTED PROBLEMS OF TREATMENT AND DISPOSAL OF DOMESTIC SEWAGE,
A. Znaker.
Water and Sewage Works, Vol. 125, Reference Number, p 182-185, April, 1978. 3 fig, 1 tab, 2 ref.

Descriptors: *Graphical analysis, *Graphical methods, *Analytical techniques, *Dissolved oxygen, *Biochemical oxygen demand, Streams, Reaeration, Self-purification, Oxygenation, Waste water treatment, Municipal wastes.

A nomograph was used to calculate the maximum BOD Load that may be discharged into a receiving stream without causing a specific oxygen deficiency downstream. The nomograph was developed as a simpler alternative to the Thomas equation. The ratio of the reaeration rate to the deoxygenation rate in the stream is first calculated for use in the nomograph. The acutal dissolved oxygen deficit upstream and the maximum allowable deficit downstream are plotted on the primary scale and their linear value intersected with the first reference line using a strait edge. The intersection point is then transferred to a second reference line; a second intersection point is labelled, using oblique tie-lines. This point is connected to the value of the reaeration:deoxygenation ratio and extended to intersect with another reference line. This reference point is connected to the value of the maximum allowable dissolved oxygen deficit downstream plotted on a secondary scale; the maximum BOD Load is read at the intersection point of this line on the secondary scale. The value obtained is then multiplied by the average flow of the stream. (Lisk-FIRL)
W78-10331

ACTINOMYCETE SCUM PRODUCTION IN ACTIVATED SLUDGE PROCESSES,
Drexel Univ., Philadelphia, PA. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W78-10334

A SURVY OF PHOSPHORUS LEVELS IN TREATED MUNICIPAL WASTEWATER,
Corvallis Environmental Research Lab., OR.
J. H. Gakstatter, M. O. Allum, S. E. Dominguez, and M. R. Crouse.
Journal Water Pollution Control Federation, Vol. 50, No. 4, p 718-722, April, 1978. 2 tab, 10 ref.

Descriptors: *Phosphorus, *Nitrogen, *Nutrient removal, *Detergents, *Surveys, Tertiary treatment, Trickling filters, Activated sludge, Legal aspects, Phosphates, Oxidation lagoons, Waste water treatment, Eutrophication, Municipal wastes.

Phosphorus and nitrogen levels were measured in samples of treated effluent from 809 waste water treatment facilities which discharge effluent to lakes, reservoirs, or tributaries. The treatment plants were categorized into four groups: 709 not under a phosphate detergent ban and not providing tertiary phosphate removal; 42 New York plants were phosphate detergent bans were imposed halfway through the sampling period; 25 Indiana plants under a phosphate detergent bans; and 33 plants providing tertiary phosphate removal but not under detergent bans. The effluent from the group of 709 plants had median phosphorus concentration of about 6.1 mg/liter and a medium nitrogen level of about 15 mg/liter. Effluents from the New York plants averaged 3.4 mg/liter phosphorus and 13.5 mg/liter nitrogen. The median phosphorus concentration was about 2.7 mg/liter and median nitrogen level about 11.6 mg/liter in the Indiana plants. The plants providing tertiary treatment produced median phosphorus levels of 1.8 mg/liter and nitrogen concentrations of 11.6 mg/liter. The phosphate detergent ban in Indiana accounted for a 50% reduction in the per capita phosphorus load in the effluent when compared to the 709 plants without phosphate restrictions. Activated sludge and stabilization ponds provided greater nitrogen and phosphorus remova than did primary treatment or trickling filtration. (Lisk-FIRL)
W78-10335

COMPENSATION FOR AN INHERENT ERROR IN THE DETERMINATION OF THE CHEMICAL OXYGEN DEMAND OF SEWAGE,
For primary bibliographic entry see Field 5A.
W78-10336

BIOLOGICAL GROWTH ON ACTIVATED CARGON: AN INVESTIGATION BY SCANNING ELECTRON MICROSCOPY,
Michigan Univ., Ann Arbor. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5A.
W78-10337

ANTIBIOTIC RESISTANCE PATTERNS OF FECAL COLIFORMS ISOLATED FROM DOMESTIC SEWAGE BEFORE AND AFTER TREATMENT IN AN AEROBIC LAGOON,
Singapore Univ. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-10338

CONCERNING THE BEHAVIOR OF MBAS AND BIAS IN A MUNICIPAL SEWAGE TREATMENT PLANT (UEBER DAS VERHALTEN VON MBAS AND BIAS AUF EINER KOMMUNALEN KLAERANLAGE),
Stuttgart Univ. (West Germany). Dept. of Chemistry.
R. Wagner.
GWF-Wasser/Abwasser, Vol. 119, No. 5, p 235-241, May, 1978. 10 fig, 3 tab, 16 ref.

Descriptors: *Surfactants, *Activated sludge, *Phosphorus, *Sampling, *Chemical oxygen demand, Biochemical oxygen demand, Treatment facilities, Domestic wastes, Graphical analysis, Analytical techniques, Waste water treatment, Municipal wastes.

Daily loads and concentrations of anionic surfactants, or methylene blue active substances, and nonionic surfactants, or bismuth active substances, were measured in the raw sewage and the activated sludge effluent of the Busnau-Stuttgart sewage treatment plant in West Germany. Influent methylene blue levels averaged 11.9 mg/liter and bismuth levels about 3.08 mg/liter; effluent concentrations were approximately 0.59 mg/liter methylene blue and 0.28 mg/liter bismuth. The daily surfactant loading on the plant was described by a logarithmic normal distribution. Total phosphorus averaged 14.5 mg/liter in the influent and 11.5 mg/liter in the effluent; COD and BOD levels were 354 mg/liter and 194 mg/liter, respectively, in the influent and 64.0 and 5.9 mg/liter, respectively, in the effluent. Peak loading was found to occur on Monday and Saturday, with lowest concentrations occurring on Sunday. Fluctuations in surfactant loading were reflected in parallel deviations in total phosphorus, COD, and BOD loads. Mean BOD and COD reductions of 96.4% and 81.0%, respectively, correlated to a mean methylene blue removal of 94.4% and a mean bismuth reduction of 91.2%; total phosphorus was reduced by 16.9% in the effluent. (Lisk-FIRL)
W78-10339

DESIGN CRITERIA FOR DISSOLVED AIR FLOTATION,
Permuitt Co., Paramus, NJ.
J. G. Walzer.
Pollution Engineering, Vol. 10, No. 2, p 46-48, 1978. 5 fig.

Descriptors: *Flotation, *Dissolved oxygen, *Hydraulic models, *Design criteria, *Separation techniques, Hydraulic design, Design flow, Depth, Settling basins, Waste water treatment, Mathematical models, Model studies, Municipal wastes.

Design criteria for dissolved air flotation systems are calculated in mathematical models optimizing hydraulic loading rates, solids loading rates, and the air-solids ratio. The optimum surface area of the separator at 100% efficiency is equal to the ratio of the waste water flow to the praticle rise rate. Thus, any particle with a rise rate greater than or equal to the hydraulic loading rate or the detention/water depth ratio will ideally be removed by dissolved air flotation. Pilot plant studies demonstrate that solids removal efficiency at specific design hydraulic loading rates decreases when the solids loading rate increases. Pilot plant studies are recommended to calculate the design criteria for solids loading rates as related to the size of the thickening tank and dewatering equipment. The air-to-solids ratio for flotation systems is expressed as the product of the air solubility at atmospheric pressure (1.3 mg air wt/l cc air), the efficiency factor, and the pressure per suspended solids in the waste water. When effluent recycle is incorporated into the system, the waste water flow rate is included in the design equation for the air-to-solids ratio. (Lisk-FIRL)
W78-10340

OPTIMAL PERIODIC CONTROL OF ACTIVATED SLUDGE PROCESS - I. RESULTS FOR THE BASE CASE WITH MONOD/DECAY KINETICS,
Houston Univ., TX. Dept. of Chemical Engineering.
D. Sincic, and J. E. Bailey.
Water Research, Vol. 12, No. 1, p 47-53, 1978. 9 fig, 3 tab, 9 ref.

Descriptors: *Mathematical models, *Activated sludge, *Kinetics, *Diurnal distribution, *Flow control, Flow profiles, Optimization, Frequency analysis, Distribution patterns, Analytical techniques, Waste water treatment, Municipal wastes.

Mathematical models incorporating Monod's equation and microbial decay kinetics are used to redesign continuous-stirred steady state activated sludge reactors to operate in an optimal periodic control mode. Under periodic operation, diurnal fluctuations are controlled in the base case design and variations in effluent substrate quantity are reduced. Mathematical models for optimal periodic operation include waste and sludge recycle flow rates, feed substrate concentration, objective function, and variability index. The periodic gain control strategy is based on a linearization of the system about a base periodic state. Using periodic flow configurations to minimize effluent substrate, the average effluent concentration is reduced by 38% compared to steady state operation. Treatment efficiency is be further improved by periodic variation in the sludge recycle flow rate. Simulated process parameters are used to illustrate the optimal periodic operation of the activated sludge reactors. (Lisk-FIRL)
W78-10341

APPLICATION OF MASS TRANSFER TO ROTATING BIOLOGICAL CONTACTORS,
Hydroscience, Inc., Westwood, NJ.
J. Famularo, J. A. Mueller, and T. Mulligan.
Journal Water Pollution Control Federation, Vol. 50, No. 4, p 653-671, April, 1978. 14 fig, 3 tab, 38 ref, 1 append.

Descriptors: *Biological treatment, *Mass transfer, *Model studies, *Kinetics, *Mathematical models, Pilot plants, Hydraulic loading, Performance, Design criteria, Waste water treatment, Municipal wastes.

Mass transfer and biological reaction kinetics were used to design fixed film rotating biological contactors. The Michaelis kinetic equations were used to describe the rates of oxygen consumption and substrate removal in a fixed film treatment process. Oxygen and substrate diffusion flux values were calculated as a function of oxygen or substrate diffusivity in the biofilm, oxygen or substrate concentration, and the organism yield coefficient. Mass transfer through the liquid phase to the biofilm interface in aerated, sectors was dependent upon the liquid film oxygen and substrate concentrations and the oxygen and substrate mass transfer coefficients above the waterline. Similar equations were derived for mass transfer in submerged sectors. The mass transfer coefficients were expressed as a function of the liquid film thickness and the oxygen and substrate diffusivity in the biofilm. The rotating biological contactor model was tested in three pilot plant operations which treated municipal, pulp, and paper mill wastes. To determine and verify kinetic constants, the pilot plants were run at two hydraulic loadings. By incorporating mass transfer, hydraulic, and kinetic processes governing BOD removal, full-scale plant performance was predicted for various hydraulic loadings, waste strengths, media diameters, and rotational velocities. The models were also considered applicable for optimizing rotating biological contactor performance and incorporating nitrification. (Lisk-FIRL)
W78-10342

TEMPERATURE EFFECTS ON THE ACTIVATED SLUDGE PROCESS,
Texas Univ. at Austin. Dept. of Civil Engineering.
B. A. Sayigh, and J. F. Malina, Jr.
Journal Water Pollution Control Federation, Vol. 50, No. 4, p 678-687, April, 1978. 13 fig, 18 ref.

Descriptors: *Activated sludge, *Kinetics, *Temperature, *Growth rates, *Dissolved oxygen, Performance, Efficiencies, Settling velocity, Oxygen demand, Waste water treatment, Analytical techniques, Municipal wastes.

Process kinetics and performance efficiently were evaluated in a completely mixed continuous flow activated sludge reactor operated at 4, 10, 20, and 31C with sludge ages of 0.5-3.0 days. The kinetic relationships between sludge yield, soluble substrate utilization, and oxygen uptake were described by empirical equations; the process parameters monitored included microbial growth, performance efficiencies, settling characteristics in terms of sludge volume index, and the volatile suspended solids content of the effluent. The cell synthesis coefficient was not influenced by the soluble substrate concentration of the influent or by temperatures in the range of 4-20C; the coefficient decreased significantly at 31C. When the sludge age was increased from 1 to 3 days, the ratio of the net yield coefficient to the cell synthesis coefficient decreased in the range of 4-20C. The soluble substrate removal coefficient increased at 31C; the removal efficiency was independent of temperature at a sludge age of 3 days or more. Effluent BOD was also consistently below 10 mg/liter at all temperatures at a sludge age of at least 3 days. Dissolved oxygen utilization decreased with decreasing temperatures. The sludge volume index in the range of 4-20C was maintained at less than 200 mg/liter at all sludge ages; the index deteriorated at 31C when the sludge age was less than 2.75 days. The effluent volatile suspended solids concentration decreased with increasing sludge age. (Lisk-FIRL)
W78-10343

SHOCK LOAD RESPONSE OF ACTIVATED SLUDGE WITH CONSTANT RECYCLE SLUDGE CONCENTRATION,
El-Azhar Univ., Cairo (Egypt). School of Civil Engineering.
M. M. Saleh, and A. F. Gaudy, Jr.
Journal Water Pollution Control Federation, Vol. 50, No. 4, p 764-774, April, 1978. 10 fig, 1 tab, 11 ref.

Descriptors: *Activated sludge, *Organic loading, *Recycling, *Feeding rates, *Performance, Chemical oxygen demand, Suspended solids, Analytical techniques, Waste water treatment, Municipal wastes.

The cyclic and step shock loading response of an activated sludge system operated with a constant sludge recycle concentration was evaluated according to effluent quality stability. The reactor was operated with a normal influent organic substrate concentration of 500 mg/liter glucose and a cell recycle of 8,000 mg/liter. During step shock loading tests, the substrate concentration increased from 500 mg/liter to 1,500 or 3,000 mg/liter and the recycle concentration remained constant. The three-fold increase in substrate concentration did not adversely affect effluent quality; six-fold substrate shocks produced a three-day transient period in the biomass before steady state resumed. Cyclic shock loading of the reactor was then performed at a cell recycle of 10,000 mg/liter. The reactor was fed on a diurnal schedule of 12 hrs at a substrate concentration of 500 mg/liter glucose, followed by 12 hrs at 1,500 mg/liter over an 18-day period. Minimal cyclic disturbance was observed in the effluent quality during the first week of pulsing shock loads. The significant cyclic peaks of total COD and suspended solids in the effluent decreased after the sixth day of operation and were negligible after the 10th day. The study concluded that high activated sludge reactor performance could be expected under shock load conditions when the cell recycle concentration was held constant. (Lisk-FIRL)
W78-10344

FACTORS AFFECTING THE DESIGN OF DISSOLVED AIR FLOTATION SYSTEMS,
Mississippi State Univ., Mississippi State.
V. Gulas, R. Lindsey, L. Benefield, and C. Randall.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1835-1840, July, 1978. 8 fig, 1 tab, 5 ref.

Descriptors: *Flotation, *Design criteria, *Dewatering, *Sludge treatment, *Suspended solids, Separation techniques, Model studies, Organic loading, Hydraulic models, Analytical techniques, Mathematical models, Waste water treatment, Municipal wastes.

The design procedure, based on the air-to-solids ratio in dissolved air flotation sludge thickening systems, incorporated the influence of sludge age and concentration on operating parameters. Three continuous flow dissolved air flotation reactors were operated with synthetic influent COD concentrations of 500, 1,000, and 1,500 mg/liter and sludge ages of 5, 10, and 13 days. Reactor performance was assessed according to effluent soluble COD, mixed liquor suspended solids concentration, oxygen uptake, and the sludge volume index; operating parameters monitored during flotation included the percentage of float solids, the subnatant suspended solids concentration, the float volume, and the rise rate of the interface. From laboratory reactor data, the design procedure established the relationships between sludge age and sludge volume index at varying seasonal temperatures; the float solids percentage and feed solids concentration were calculated for specific air-to-solids ratios. Relationships between the maximum float solids percentage and sludge volume index and between interfacial rise rates and feed solids concentration were also calculated at specific air-to-solids ratios. The air-to-solids ratio was derived from the feed solids concentration, soluble air concentration at 1 atm, the recirculation ratio, the gage pressure, and the pressurization system efficiency. The maximum required thickener area was determined from the ratio of total influent flow at critical seasonal temperatures to the rise rate. (Lisk-FIRL)
W78-10345

PREDICTIVE MODEL FOR DESIGN OF FIXED-BED ADSORBERS: SINGLE-COMPONENT MODEL VERIFICATION,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
J. C. Crittenden, and W. J. Weber, Jr.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE3, p 433-443, June, 1978. 8 fig, 2 tab, 4 ref, 1 append.

Descriptors: *Model studies, *Adsorption, *Forecasting, *Mathematical models, *Distribution patterns, Mass transfer, Resistance, Transport, Equilibrium, Simulation analysis, Solutes, Phenols, Waste water treatment, Municipal wastes.

The simulation performance of the Michigan Adsorption Design and Applications Model (MADAM) for fixed bed adsorbers treating single component solutions was verified by four adsorption columns operated with varying fixed bed depths and hydraulic loadings. The dimensionless groups characterizing the model adsorption systems for single components included: the solute distribution parameter, representing the solid-to-liquid adsorbate concentration; the modified Stanton number, defining the liquid phase mass transfer removal efficiency; and the Sherwood number, comparing mass transfer resistances of solids and liquids. The adsorbate distribution parameters of the single solutes, phenol, p-bromophenol, p-toluene sulfonate, and dodecyl benzene sulfonate, ranged over 2,492-4,636; the Sherwood numbers ranged 0.857-17.0. The model simulations, which incorporated the two-step in-series transfer resistances and solids and liquid diffusion, adequately predicted single solute kinetics in the fixed bed adsorption systems. For verification of the model, the equilibrium uptake which was independent of the hydraulic loading was calculated in one of the columns and the result was used for other hydraulic loadings. (Lisk-FIRL)
W78-10346

SOURCES OF ERROR IN PARAMETER ESTIMATION FOR MATHEMATIC MODELS IN PROCESSES KINETICS (FEHLERQUELLEN DER PARAMETERABSCHAETZUNG VON METHEMATISCHEN MODELLEN DER PROZESSKINETIK),
A. Moser.
GWF-Wasser Abwasser, Vol. 119, No. 5, p 242-252, May, 1978. 17 fig, 2 tab, 36 ref, 1 append.

Descriptors: *Kinetics, *Activated sludge, *Mathematical models, *Model studies, *Design criteria, Analytical techniques, Performance, Automation, Optimization, Adsorption, Oxygen, Estimating, Waste water treatment, Municipal wastes.

Potential errors in parameter estimations are cited for the development of mathematical models of activated sludge process kinetics required for optimization and automation. Simple models with a minimum number of process parameters are recommended; erroneous kinetic parameters should be avoided to prevent miscalculations. Variable physical properties that may be disregarded and result in faulty models include oxygen, carbon dioxide, pH, temperature, and sludge adsorption. Limited development of Monod or enzyme kinetics, reliance on stationary or mobile kinetics alone, and homogeneous or heterogeneous modelling can lead to reactor parameters that are valid only under ideal or limited conditions. Conditions inherent in individual processes that may be overlooked when model parameters are formulated should be identified through laboratory, pilot plant, and full-scale evaluations. These conditions include oxygen transfer, mixing characteristics, ideal flow deviations in continuous operations, electrode response time, and the dimensions of microbial flocs and films. Potential errors in the Monod kinetics and the Monod constant for the substrate concentration can result from pseudokinetic constants. (Lisk-FIRL)
W78-10347

ALLOCATIONAL INEFFICIENCY OF BENEFIT/COST APPLIED TO WATER AND SEWERAGE SUPPLY: INTERACTIONS BETWEEN TIME-SERIES AND CROSS-SECTIONAL MODELS,
Pennsylvania State Univ., University Park. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-10348

INDUSTRIALIZATION AND RIVER ECOLOGY,
Irrigation Commission, Lucknow (India).
For primary bibliographic entry see Field 5B.
W78-10350

RECOVERY OF TWO POLLUTED RIVERS,
For primary bibliographic entry see Field 5G.
W78-10351

LAND TREATMENT OF SEWAGE: EPA'S VIEW,
Chicago Water and Sewage Works, IL.
F. Reid.
Water and Sewage Works, Vol. 125, No. 4, p 64-67, April, 1978.

Descriptors: *Spray irrigation, *Groundwater recharge, *Infiltration, *Cost analysis, *Nutrients, Return flow, Organic wastes, Federal government, Grants, Envionmental engineering, Vegetation effects, Treatment faclities, Waste water treatment, Municipal wastes.

The EPA's policies on land treatment of waste water by rapid infiltration, groundwater recharge, and vegetation fertilization are reviewed. The use of primary-treated, secondary-treated, or mixed wastes in land application is influenced by the type of waste, local soil, application method, and area topography. EPA policy emphasizes the need to examine the constituents of municipal wastes in evaluating treatment requirements. Land application of pure domestic wastes removes and utilizes up to 99% of the nutrients and other waste products. Municipal wastes containing non-degradable household detergents may require pretreatment before land application; food processing wastes are usually amenable to land application without pretreatment. Variables influencing land treatment include climate, soil condition, and height above groundwater. The statutes adopted by EPA give preference to land application when it is a cost-effective alternative to other treatment systems. About 15% of the grants that have been issued by the EPA have funded land application systems, primarily in small communities. Although pretreatment may reduce the cost-effectiveness of land application, the same would be required before discharging wastes into receiving waters. Land treatment has the additional benefit of supplying nutrients and is not as energy or chemically intensive as advanced waste water treatment methods. The EP policy on land treatment also considers the advantage of producing recoverable water by this method. (Lisk-FIRL)
W78-10352

SEWERAGE FOR DEVELOPING COUNTRIES,
Loughborough Univ. of Technology (England). Dept. of Civil Engineering.
J. Pickford.
Effluent and Water Treatment Journal, Vol. 18, No. 3, p 119-120, 122-123, 127, 129, 1978. 3 fig, 1 tab, 11 ref.

Descriptors: *Sewerage, *Septic tanks, *Africa, *Asia, *South America, Water supply, Diseases, Domestic wastes, Cities, Sewage treatment, Sewage disposal, Waste water treatment, Foreign countries, Waste water disposal, Municipal wastes.

Social and economic factors are considered in alternative sewerage designs for developing nations. In some countries, sewer systems constructed in the 19th and early 20th centuries are still in operation. An estimated 140 million people in developing countries have no sanitary or sewerage provisions. Only about 3% of the population in developing countries is serviced by sewers that connect to treatment facilities; an estimated 200 million have household sewerage systems, ranging from septic tank systems to pit or bucket latrines. Economic situations in developing countries may limit sewer installation in many areas; water supplies to remove wastes are also inadequate in many parts of the world. Blockage and septicity in sewer systems are common problems in tropica countries. Conventional sewerage is often feasible only in industrial areas or in commercial and higher class residential areas. Modified sewerage is applicable in areas where housing is under construction and a system can be installed simulatneously. Rural, low-density, and transitional districts are more amenable to on-site household treatment systems. In over-populated urban areas, high density villages, or transitional districts, communal latrines or vacuum truck systems can provide waste removal in the absence of adequate drainage and disposa land. (Lisk-FIRL)
W78-10353

WASTEWATER PLANT CONSTRUCTION.
For primary bibliographic entry see Field 5G.
W78-10354

BETTER O AND M PROGRAMS IS ULTIMATE ANSWER TO O AND M PROBLEMS,
Detroit Water and Sewage Dept., MI.
A. C. Davanzo, and W. B. Thompson.
Water and Wastes Engineering, Vol. 15, No. 3, p 22-23, March, 1978.

Descriptors: *Operation and maintenance, *Treatment facilities, *Management, *Publications, *Personnel, Engineering education, Training, Personnel management, Engineering personnel, Operations, Biological treatment, Waste water treatment, Municipal wastes.

Camp Dresser and McKee of Boston, Massachusetts, were retained by the Detroit Water and Sewage Department to formulate operation and maintenance manuals and train personnel employed in the new 800 mgd waste water treatment plant. The plant has a maximum capacity of 1,200 mgd and a staff of 500 people employed over three shifts. The plant provides primary treatment, secondary aeration treatment, chemical flocculation for phosphrous remova, scum and grease removal, clarification, and incineration. Operation and maintenance priorities were identified for certain sludge treatment and disposal operations where effluent quality standards were threatened; maual preparation and personnel training were initiated in these areas. Final manuals describing operation and maintenance guidelines for all processes will be assembled into a comprehensive volume. Training and evaluation of the personnel will culminate in testing that will include both written and practical examinations. In-plant training programs are also being established to educate new employees, as well as maintain and update the operation and maintenance manuals as required. (Lisk-FIRL)
W78-10355

SEWAGE SLUDGE - WASTE OR AGRICULTURAL ASSET.,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5E.
W78-10357

CURRENT STATUS OF ON-SITE WASTEWATER MANAGEMENT,
C. L. Senn.
Journal of Environmental Health, Vol. 40, No. 5, p 279-284, March-April, 1978. 2 tab.

Descriptors: *Waste disposal, *Domestic wastes, *Underground waste disposal, *Septic tanks, *Land development, Land management, Land use, Planning, Zoning, Absorption, Soil disposal fields, Regulation, Soil tests, On-site investigations, Waste water treatment, Municipal wastes.

Current planning techniques and regulations governing on-site waste water treatment facilities are reviewed. Zoning and land use planning are recommended before land development begins; soil topography, geology, aquifer, vegetation, and climate analyses are initial considerations in regulating on-site sewage systems. Building permits should be issued by building and plumbing regulatory agencies before actual on-site systems are constructed to insure that proper design criteria are met and site characteristics are suitable. The Manual of Septic Tank Practice has modified the design criteria for on-site treatment; other methods or residential waste treatment include aerobic treatment, soil absorption evapotranspiration, pressurized subsurface absorption, electric osmosis for impervious soils, waterless and water-conserving toilets, mound systems, and recycling systems. Absorption field design, septic tank design, and water depth parameters mandated by various state agencies are presented; land use planning practices and regulations adopted in some states are reviewed. The development of new on-site treatment methods and standardization of test methodology are recommended. The expanded requirements of on-site waste water treatment regulations are considered. (Lisk-FIRL)
W78-10358

COST STUDIES FOR RENOVATED WASTEWATE,
Municipal Environmental Research Lab., Cincinnati, OH.
R. M. Clark, J. N. English, and J. I. Gillean.
Journal Water Pollution Control Federation, Vol. 50, No. 4, p 688-697, April, 1978. 18 fig, 9 tab, 8 ref.

Descriptors: *Water supply, *Water supply development, *Reservoir storage, *Cost analysis, *Water reuse, Impaired water use, Reclaimed water, Water demand, Tertiary treatment, Water resources development, Municipal wastes, Waste water treatment.

An economic evaluation of three options for expanding the potable water supply in San Diego, California, and Dallas, Texas, included two in which waste water was renovated. The first scheme involved expanding the existing water supply source; a cost analysis concluded that this option would increase the total cost of water by 23.5% in Dallas and decrease the total cost by 3.4% in San Diego. The second scheme, in which treated water would be routed to an existing reservoir to supply up to 50% of the water demand, would cost Dallas an additional 46.5% and San Diego 41.7%. In the third option, waste water would be treated to higher levels in a renovation plant and directed to the inlet of the water treatment plant; total costs for this scheme would increase by 64.4% for Dallas and 52.0% for San Diego. (Lisk-FIRL)
W78-10359

DIESEL GENERATING SETS PROVIDE BACKUP POWER.
For primary bibliographic entry see Field 8C.
W78-10360

RETROSPECTIVE ASSESSMENT OF WASTEWATER TECHNOLOGY IN THE UNITED STATES. 1800-1972,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of History.
For primary bibliographic entry see Field 5G.
W78-10362

PROCESS SELECTION FOR OPTIMAL MANAGEMENT OF REGIONAL WASTEWATER RESIDUALS,
Delaware Univ., Newark. Dept. of Civil Engineering.
R. I. Dick, D. L. Simmons, R. O. Ball, and K. Perlin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 572, Price codes: A12 in paper copy, A01 in microfiche. Report NSF/RA-760578, October 1976. 269 p, 17 fig, 11 tab, 169 ref, 3 append.

Descriptors: *Sludge treatment, *Mathematical models, *Digital computers, *Computer programs, *Optimization, Cost analysis, Operation and maintenance, Capital costs, Sludge disposal, Analytical techniques, Performance, Cost-benefit analysis, Waste water treatment, Municipal wastes.

Mathematical models were developed for the optimal selection and integration of sludge treatment and disposal processes. This preliminary report on the first of two years of research focuses on sludge treatment processes culminating in land application. The mathematical models relate process performance to design and operation parameters and waste water and sludge characteristics. The models also incorporate capital and operating costs into the design of processes with selected sizes and operating strategies. Based on performance and cost data, a digital computer program outlined in the report identified the optimum integration of various processes. Parameters extraneous to the direct cost basis of the mathematical optimization scheme considered in this report included: public acceptance, environmental impact, and indirect costs and benefits. Limited data on sludge characteristics restricted the development of process variables such as mean cell retention time in activated sludge processes, sludge mixing, the impact of aerobic and digestion for various temperatures and times on sludge thickening and dewatering, and the influence of conditioning practices on sludge dewaterability. (Lisk-FIRL)
W78-10363

SLUDGE HANDLING AND DISPOSAL PRACTICES AT SELECTED MUNICIPAL WASTEWATER TREATMENT PLANTS.
Sverdrup and Parcel and Assocs., Inc., St. Louis MO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 048, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-430/9-77-007, April 1977. 60 p, 12 fig, 8 tab, 2 append.

Descriptors: *Sludge treatment, *Sludge disposal, *Treatment facilities, *Anaerobic digestion, *Filtration, Centrifugation, Cost analysis, Research and development, Incineration, Cities, Sewage sludge, Dewatering, Waste water treatment, Municipal wastes.

Sludge treatment practices of 46 of the 54 members of the Association of Metropolitan Sewerage Agencies are described. Flow charts of plant processes, capacities, and sludge generation are detailed for the 98 plants studied; the majority of the plants reviewed are located in heavily populated urban areas. Processes for treatment of primary, secondary, and combined sludges are analyzed and associated costs are presented. The most frequently employed methods of sludge treatment, in descending order, are: anaerobic digestion, gravity thickening, and vacuum filtration; centrifugation and incineration are also reviewed. Current and future demonstration and research projects are discussed, as well as nontechnical data associated with sludge management. (Lisk-FIRL)
W78-10364

OXYGEN-ACTIVATED SLUDGE PLANT COMPLETES TWO YEARS OF SUCCESSFUL OPERATION,
Air Products and Chemicals, Inc., Allentown, PA.
C. S. McDowell, and J. Gianelli.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 271, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-600/2-77-040, July 1977. 195 p, 75 fig, 12 tab, 9 ref, 2 append.

Descriptors: *Activated sludge, *Aeration, *Oxygen, *Optimization, *Water quality, Oxygenation, Biochemical oxygen demand, Suspended solids, Sludge treatment, Operations, Performance, Waste water treatment, Municipal wastes.

The conversion to and performance of an oxygen-activated sludge system installed in the Westgate municipal sewage treatment plant, serving Fairfax County, Virginia, is described. The report encompasses the first two years of operation of the $1.7 million oxygen-activated sludge plant, including start-up, optimization, operation, and problems. The treatment facility was upgraded from an 8 mgd aeration-sedimentation operation without sludge return to a 14 mgd oxygen-activated sludge system. The new system reduces BOD by 92%; the former process reduced BOD by only 50%. The effluent produced by the oxygen-activated sludge system has consistently contained 10-15 mg/liter total BOD, less than 5 mg/liter soluble BOD, and less than 20 mg/liter suspended solids. Weekly oxygen requirements have averaged 0.7-1.0 kg O2/kg BOD removed, less than originaly anticipated. After the optimization program was completed, sludge production increased to 1.4 kg total

suspended solids/kg BOD removed; the sludge volume index has ranged from 35-110 mg/g total suspended solids. (Lisk-FIRL)
W78-10365

EVALUATION OF FLUIDIC COMBINED SEWER REGULATORS UNDER MUNICIPAL SERVICE CONDITIONS,
Freeman (Peter A.) Associates, Inc., Berlin, MD.
For primary bibliographic entry see Field 8C.
W78-10366

ALUM USED FOR REMOVING PHOSPHORUS FROM WASTEWATER.
Water and Wastes Engineering, Vol. 15, No. 4, p 67, April, 1978.

Descriptors: *Phosphorus, *Nutrient removal, *Chemical precipitation, *Coagulation, *Chemical reactions, Activated sludge, Aluminum, Sludge treatment, Waste water treatment, Municipal wastes.

Alum conditioning of waste water has been instituted at the 900,000 gpd activated sludge treatment facility in Trenton, Ontario, Canada. The waste water has an average pH of 7.2 and contains 200 mg/liter BOD and 3.0 mg/liter phosphorus. Alum treatment methods investigated included continuous 55 mg/liter additions, continuous 14.3 mg/liter additions, 12 hr 30 mg/liter additions, 24 hr cyclic 20 mg/liter additions, and no chemical additions. The 14 mg/liter continuous alum treatment after aeration of the wastes reduced phosphorus concentrations to 0.6 mg/liter and alum requirements by 57%. The theoretical ratio of 1 mole Al:1 mole P has been reduced due to the phosphorus remova by alum sludge return to the system. Higher amounts of phosphorus were removed with lesser amounts of alum, possibly because of phosphate binding by the alum sludge. Jar tests of alum removal of phosphorus overestimated the alum dosage required by 500%. (Lisk-FIRL)
W78-10367

TROUT SIGH WITH RELIEF AS PLANT ENDS POLLUTION,
Stearns and Wheeler, Cazenovia, NY.
J. L. Swanson.
Water and Wastes Engineering, Vol 15, No 3, p 26-27, 31, March, 1978. 1 fig.

Descriptors: *Oxidation lagoons, *Aeration, *Rotors, *Flocculation, *Chlorination, Settling tanks, Chemical reactions, Aerated lagoons, Drying, Sludge treatment, Pumps, Waste water treatment, Municipal wastes.

An 0.95 mgd waste water treatment plant constructed for Cazenovia, New York, reduced the pollution load on the Chittenango Creek, a feed stream to Oneida Lake. The plant was constructed with provisions for expansion to 2.1 mgd. Treatment is supplied by an oxidation ditch with horizontal rotary aerators requiring low maintenance and providing high oxygen transfer. After the influent is comminuted and aerated, it is flocculated in settling tanks. Sludge is returned by two pumps to the preaeration tank and liquid is contacted for 15 min with chlorine. Sludge is dried in three paved earthen beds. Nitrification is maintained at 50% during the summer months; BOD is reduced by 85%. Provisions for plant expansion include additional primary and secondary settling tanks, aeration splitter boxes for chemical conditioning mixers, clariflocculators, and aeration basins in series to provide two-stage nitrification. The existing treatment facility was constructed at a cost of $1,790,000. (Lisk-FIRL)
W78-10374

DRAFT ENVIRONMENTAL IMPACT STATEMENT, GRAND STRAND REGION, SOUTH CAROLINA.
Environmental Protection Agency, Atlanta, GA. Region IV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 059, Price codes: A16 in paper copy, A01 in microfiche. Report EPA-904/9-77-002, February 3, 1977, 237 p.

Descriptors: *Environmental effects, *South Carolina, *Waste water treatment, *Comprehensive planning, Facilities, Environmental engineering, Project feasibility, Water pollution control, Growth rates, Aquatic environment, Atlantic Coastal Plain, Water pollution treatment.

This environmental impact statement evaluates plans for three wastewater treatment facilities proposed for construction by the Grand Strand (South Carolina) Water and Sewer Authority. Objectives and beneficial impacts of the project include: replacement of existing inadequate facilities; opening of closed shellfish areas; wetlands improvement; adherence to surface and groundwater standards; energy and natural resource conservation; preservation of high quality surface waters; and recreation area enhancement. Possible adverse impacts would be erosion at project sites; biological productivity reduction in the floodplain; noise and odor; incompatibility with a nearby country club; and a burdened solid waste disposal system. Negative or no growth is not a feasible alternative, since substantial investment has been made in tourist facilities. Development controls would not replace the need for treatment facilities, nor would recycling of industrial wastes. Although operations at existing facilities would be improved, reduction in pollution cannot be accurately predicted. Water and sewer rate structure alterations would have no impact because of the tourist industry. A program to reduce urban runoff pollution and flow and waste reduction are potentially feasible non-structural alternatives. (Malefatto-Florida)
W78-10376

RAPID FLAMELESS ATOMIC ABSORPTION ANALYSIS OF THE METALLIC CONTENT OF SEWAGE SLUDGES - II. CHROMIUM, NICKEL AND ZINC,
Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering.
For primary bibliographic entry see Field 5A.
W78-10395

AN ION-EXCHANGE PROCESS WITH THERMAL REGENERATION - XII. DESALTING OF SEWAGE EFFLUENTS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
B. A. Bolto, K. H. Eppinger, P. S. K. Ho, M. B. Jackson, and N. H. Pilkington.
Desalination, Vol. 25, No. 1, p 45-59, March, 1978. 5 fig, 7 tab, 11 ref.

Descriptors: *Ion exchange, *Resins, *Heat treatment, *Desalination processes, *Permeability, Permselective membranes, Organic wastes, Carbon, Adsorption, Activated sludge, Separation techniques, Waste water treatment, Municipal wastes.

Thermally-regenerable ion exchange resins (Sirotherm), containing active microion exchange particles within a salt and water penetrable matrix, were evaluated for desalting of physio-chemically treated effluent, permeability of the matrix to organic wastes, and matrix structure modification to anion permeation. Treated effluent was passed through a column packed with 226 g of dry weight of resin, operated at an adsorption cycle of 50.5 min at 10-20C and a regeneration cycle of 15.5 min at 80-90C. Unprotected ion exchange resin performance dropped about 20% after 100 cycles and stabilized at 45% after 600 cycles. Two fouling stages of the resin were identified, the second occurring between 991-1300 cycles. Resin foulants comprised polymeric carboxylic acids; they were removed by trap resin Amberlite IRA 401S, which stripped more organics from the resin then others tested. When tertiary effluent from an activated sludge process was desalted, the resin was economically competitive with conventional ion exchange, but cost 60-85% of the operating costs for reverse osmosis and 60-120% of conventional chemicaly-regenerated ion exchange processes. Accidental fouling of the resin was eliminated with caustic brine treatment at 45C, which also reduced anion diffusion through the matrix in some cases. An advantage associated with Sirotherm was the recovery of waste heat. (Lisk-FIRL)
W78-10396

CATALYSTS USED TO REPLACE SILVER SULFATE IN COD.
For primary bibliographic entry see Field 5A.
W78-10405

A SIMPLE, EFFECTIVE TECHNIQUE FOR CONTROLLING SOLIDS RETENTION TIME IN ACTIVATED SLUDGE PLANTS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
R. E. Roper, Jr.,, and C. P. L. Grady, Jr.
Journal Water Pollution Control Federation, Vol 50, No 4, p 702-708, April, 1978. 6 fig, 9 ref.

Descriptors: *Graphical analysis, *Graphical methods, Curves, *Operations research, *Activated sludge, Analytical techniques, Mathematical models, Recycling, Hydraulic design, Calibrations, Charts, Waste water treatment, Municipal wastes.

Operational charts were developed to assist activated sludge reactor operators in controlling the solids retention time. A hydraulic formula was employed to calculate the solids retention time in an activated sludge reactor as a function of aeration tank volume, waste sludge flow rate, and recycle ratio. The sludge wastage rate necessary to achieve any desired solids retention time was determined under the assumption that mixed liquor suspended solids loss in the effluent is negligible; the results of the analysis were presented graphically. A calibration chart was then devised to correlate the data in the hydraulic control chart to full-scale reactor parameters. A calibration coefficient, related to the effluent suspended solids/substrate removal ratio, was employed to correlate the hydraulically estimated and the actual solids retention time. Using full-scale plant data, a calibration chart was devised. The impact of recycle ratio adjustments on the plant performance was then calculated with a two-curved operating diagram. One set of curves depicted the maximum liquor suspended solids loading capacity of the settler at a given recycle ratio. The other set of curves diagrammed the actual mixed liquor suspended solids concentration in the aeration chamber at a specific influent flow rate and concentration. The graphical technique was successfully used to operate a 5.45 cu m/day pilot plant. (Lisk-FIRL)
W78-10415

EVALUATION OF WASTEWATER TREATMENT ALTERNATIVES,
TenEch Environmental Services, Inc., Louisville, KY.
For primary bibliographic entry see Field 5G.
W78-10419

MOISTURE DETERMINATION BALANCE SPEEDS UP TOTAL AND VOLATILE SOLIDS ANALYSIS,
Florham Park Sewage Treatment Plant, NJ.
For primary bibliographic entry see Field 5A.

W78-10424

MEASURING WASTEWATER FLOW WITH DYE,
For primary bibliographic entry see Field 5B.
W78-10425

COUNTRIES RESEARCH WASTE TREATMENT AND FISH FARMING.
Water and Wastes Engineering, Vol. 15, No. 3, p 63, March, 1978.

Descriptors: *Oxidation lagoons, *Nutrients, *Fish farming, *Fish diets, *Sewage, Aquatic environment, Nutrient requirements, Coliforms, Waste water treatment, Municipal wastes.

A research project on the feasibility of utilizing sewage stabilization ponds for fish farming has been supported by institutions in Israel, Kenya, Thailand, Malaysia, and Peru. The stabilization ponds, averaging 1.5 m in depth, promote bacterial and algal growth in a warm and sunlit environment. Fecal coliforms are reduced by 98% in stabilization ponds due to other predatory organisms, the physical conditions in the ponds, and the lack of nutrients. The research will examine the uptake of heavy metals and pesticides by fish and the transfer of pathogens on the scales or in the gut of fish. Stabilization pond design, operation, and quality may have to be altered from the conventional rapid treatment and discharge of waste water to accommodate fish production. Considerations include the type and concentration of the wastes and nutrient levels required for fish growth. (Lisk-FIRL)
W78-10426

POINT-OF-USE WATER TREATMENT ALLOWS SELECTIVITY.
Water and Wastes Engineering, Vol. 15, No. 3, p 56, March, 1978.

Descriptors: *Septic tanks, *Domestic wastes, *Soil disposal fields, *Water utilization, *Water wells, Treatment facilities, Grants, Government supports, Oxidation lagoons, Waste water treatment, Water treatment, Municipal wastes.

Point-of-use waste water and potable water treatment systems are reviewed as an alternative to centralized waste water treatment facilities and water supply connections. A municipal waste water treatment facility for two towns in Minnesota, eligible for 80% EPA funding, cost an estimated $2,800,000 for a stabilization pond, sewers, a pumping plant, and other treatment equipment. The sandy loam soils in the two areas were reportedly suitable for septic tanks and soils treatment units costing an estimated $1,500-2,000/lot. If the homeowners would have been required to pay 20% of the per capita costs of the centralized treatment plant, they would have had to pay $2,000 more than for a septic tank system. The example was used to demonstrate the need for investigation of point-of-use waste water treatment. Point-of-use treatment was also applied to potable water. In the example cited, connection of a remote farm to a centralized water supply cost an estimated $2,350 more than drilling a private well and installing water treatment equipment. In this case, point-of-use water treatment system operation cost an estimated $520/yr less than equivalent water usage charges. (Lisk-FIRL)
W78-10427

A MATHEMATICAL MODEL FOR OPTIMIZING CHALORINATION OF WASTE STABILIZATION LAGOON EFFLUENT,
Utah State Univ., Logan.
B. A. Johnson.
Available from University Microfilms International, Ann Arbor, MI 48106; Order No. 7730647. PhD Thesis, 1977, 290 p.

Descriptors: *Chlorination, *Mathematical models, *Oxidation lagoons, *Optimization, *Treatment facilities, Disinfection, Sewage bacteria, Filtration, Sands, Chemical oxygen demand, Waste water treatment, Municipal wastes.

A mathematical model was developed to optimize chlorination of oxidation lagoon effluent with varying characteristics in Logan, Utah. Chlorination of primary and secondary oxidation lagoon effluent was evaluated in an on-site test facility over a year-long period. Tests were also conducted on the chlorination of lagoon effluent after it had been filtered through sand. The bacterial removal efficiency of the lagoon system was also monitored. Contact periods of 1 hr or less adequately disinfected the lagoon effluent. Temperature, sulfide, and COD levels in the effluent controlled the chlorine dose required for adequate disinfection; filtered effluent required lower chlorine doses. The mathematical model predicted the chlorine dose required for varying effluent characteristics and optimized chlorination practices with design curves. (Lisk-FIRL)
W78-10434

AERATION EQUIPMENT COSTS REDUCED BY NEW SYSTEM.
Water and Sewage Works, Vol. 125, No. 5, p 81, May, 1978.

Descriptors: *Aeration, *Plastics, *Plastic pipes, *Equipment, *Construction materials, Aerated lagoons, Design data, Corrosion control, Head loss, Fluid friction, Waste water treatment, Treatment facilities, Municipal wastes.

Envirex Inc. manufactured the fiberglass-reinforced plastic rotary lift aeration unit which was installed in the 3 mgd Marshall, Michigan, waste water treatment plant. Selection of the unit reduced installation costs by 20%. The light weight PFT rotary lifts, reportedly comparable to stainless steel in corrosion resistance, reduced head losses and power costs because of their larger internal diameters and lower surface resistance; the 4-inch header had about the same capacity as a 6-inch steel header. Fiberglass-reinforced plastic pipe, molded urethane-rubber tees, elbows, and flanges, and glass-wound vinyl-ester upper and lower headers were used when the eight rotary lift systems were installed. The header assembly accommodated Envirex snap-on diffusers, superfusers, and air-locked crowns and was designed for uniform air distribution to the diffusers. The Marshall plant also provided primary treatment, final settling, and chlorination. (Lisk-FIRL)
W78-10436

CARBON REGENERATION FURNACE FOR COLESHILL.
Water Services, Vol. 82, No. 987, p 303, May, 1978.

Descriptors: *Activated carbon, *Tertiary treatment, *Incineration, *Heat treatment, *Treatment facilities, Conveyance structures, Construction materials, Equipment, Waste water treatment, Municipal wastes.

An activated carbon regeneration furnace, manufactured by Sutcliffe Speakman and Co. Ltd. of Leigh, Lancashire, England, has been incorporated into the Coleshill advanced waste water treatment plant. Carbon slurry from the activated carbon plant is collected in a steel tank, dewatered, and passed by screw conveyors to the top of the regeneration furnace. The furnace is a 5 m high mild steel cylinder lined with refractory blocks and equipped with 7 man-holed hearths with internal diameters of 1.5 m. A rotating central shaft, driven by a variable speed, nickel-chrome rabble arm, agitates the carbon in the 7 hearths as it falls through grates between the hearths during the drying process. The propane-fueled regeneration furnace also contains an air fan which generates combustion air at a rate of 5.6 cu m/min and burners which supply 200,000 Btu's/hr. The system has sequential starters for the conveyor and furnace drive motors; burners are individually controlled and monitored by an ultra-violet detection system. Waste furnace gases are saturated with water before they are scrubbed and emitted through the stack. (Lisk-FIRL)
W78-10440

HOT SPRINGS GETS REGIONAL TERTIARY TREATMENT PLANT.
Water and Sewage Works, Vol. 125, No. 5, p 92, May, 1978.

Descriptors: *Interceptor sewers, *Activated sludge, *Tertiary treatment, *Sludge treatment, *Filtration, Chlorination, Sewerage, Dewatering, Pumping plants, Chemical precipitation, Phosphorus, Nutrient removal, Polymers, Drying, Waste water treatment, Municipal wastes, Hot springs, Computers.

Upgrading of the sewerage and trickling filter waste water treatment plant in Hot Springs, Arkansas, included the construction of a $14.7 million tertiary treatment plant, new interceptors and force mains costing a total of $3.8 million, and three pumping plants costing $1.6 million. An additional 15,000 acres will also be sewered. The modular 12 mgd tertiary treatment plant, with a peak capacity of 30 mgd, provides primary aeration and settling, as well as degritting, coarse bar screening, and automatic primary sludge removal. The activated sludge system is aerated with high purity oxygen and mixed with three mechanical mixers; detention time is 1.33 hrs wit a recycle rate of 30%. Gravity thickened primary sludge is mixed wit waste activated sludge which has been thickened with polymers in a dissolved air flotation tank. The mixed sludge is heated to 350F in a wet air oxidation tank for 15 min at 500 psi; the sludge is stored and supernatant is decanted. Two coil filters dewatered the sludge to a cake suitable as a soil amendment. The activated sludge liquor is treated with alum and polymer for phosphorus precipitation and filtered through a 49-inch mixed media filter, prior to chlorination and discharge. Filter backwash water, which is also used for chlorination, was down, pump seal, and fire extinguishing, is passed to the clarifiers after use. Screening, degritting, primary sludge remova, phosphate precipitation, and filter backwashing are compute-controlled. (Lisk-FIRL)
W78-10476

SEWAGE TREATMENT FOR SMALL COMMUNITIES.
Water and Waste Treatment, Vol. 21, No. 4, p 24, April, 1978.

Descriptors: *Biological treatment, *Filters, *Equipment, *Design data, *Suspended solids, Filtration, Nutrient removal, Tertiary treatment, Cleaning, Waste water treatment, Municipal wastes.

The Biospiral operates as a submerged disc biological unit to treat waste water loads for populations of 10-880. The Biosprial unit is constructed of prefabricated steel and contains a rotating biological filter disc in the form of an Archimedean screw. Following biological treatment, effluent passes to an automatic drum filter for suspended solids removal. The Biosprial consistently reduces waste water pollutants to a BOD/suspended solids ratio of 20/30, with low maintenance and operation requirements. Effluent passes through a patented tertiary filter before discharge; sludge and liquor are continuously recirculated. The biodisc filter cloth is automatically cleaned; residue is returned to the plant inlet or passes to the sludge storage tank. The Biosprial is supplied by G. F. Dickson Environmental Engineering, Ltd., ready for process and power connections. Additional Biosprial units can be installed for larger populations. (Lisk-FIRL)

W78-10484

5E. Ultimate Disposal Of Wastes

AQUATIC DISPOSAL FIELD INVESTIGATIONS EATONS NECK DISPOSAL SITE LONG ISLAND SOUND. APPENDIX D,
New York Ocean Science Lab., Montauk.
R. J. Valenti, and S. Peters.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 720, Price codes: A05 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station Technical Report No. D-77-6, September 1977. 98 p, 24 ref, 6 append.

Descriptors: *Waste disposal, *Environmental effects, *Benthos, Baseline studies, Fish, Shellfish, Lobsters, *Outer Continental Shelf, *New York Bight, Ocean dumping, Dredged material.

The major goal of the Eatons Neck disposal site field investigation was to evaluate the effects of aquatic disposal of dredged material on organisms and water quality, including the significance of physical, chemical, and biological factors that influence the rate of disposal site recolonization by benthic animals. This volume of the study presents demersal fish sampling data at Eatons Neck. The spatial and temporal distributions of the more abundant demersal fish are discussed. The food habits of eight benthic foraging fish species are also presented. Data on lobsters include monthly histograms denoting spatial and temporal distributions, male-female ratios, and relative abundance of exploitable legal-sized lobsters. The report concludes that the Eatons Neck site is a valuable area with regard to fishery resources. Throughout the sampling, with few exceptions, the disposal site accounted for the largest catches of fish. The disposal site was also found to be a prime lobstering area and accounted for 91.3% of the total number of lobsters collected. The study recommends that prime consideration be given to lobster fishery in any future disposal operations since it represents the most utilized resource of the area. (Sinha-OEIS)
W78-09822

BARGES CUT OUTFALL IN HALF.
Engineering News-Record, Vol. 200, No. 9, p 15, March, 1978.

Descriptors: *Outfall sewers, *Outlets, *Sewage disposal, *California, *Concrete pipes, Pipelines, Treatment facilities, Transport, Trenches, Waste water treatment, Waste water disposal, Municipal wastes.

A 38,000 ft outfall sewer in San Francisco Bay, California, was constructed with barge-mounted equipment at a substantial savings. The $15.8 million outfall, which is part of a $162 million project to upgrade sewage treatment in 7 Alameda County municipalities, cost less than half of the estimated expense of constructing an outfall to discharge wastes into 25 ft tidal waters. A channel was dredged instead of shoring a trench and all pipe was transported by barge from Santa Fe rather than by truck. Original plans called for transporting the pipes for the outfall on a hydraulically-operated apparatus that would walk to the site of the outfall. The pipe is constructed of 96-inch diameter reinforced concrete with 9-inch walls and is stabilized with a 4-ft cover within the trench. The outfall can accommodate a 75 mgd dry weather flow with a peak capacity of 185 mgd. Included in the entire project are a 20 mgd treatment plant, 6 pumping plants, 31 miles of interceptor sewers, and upgrading of 3 treatment plants. (Lisk-FIRL)
W78-09823

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. MATERIAL RELEASE. APPENDIX E,
Army Engineer District, San Francisco, CA.
J. F. Sustar, R. M. Ecker, and W. T. Harvey.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 790, Price codes: A99 in paper copy, A01 in microfiche. Army Engineer District San Francisco Final Report, 'Dredge Disposal Study, San Francisco Bay and Estuary', August 1977. 638 p, numerous fig, tab, ref.

Descriptors: *Estuaries, *Dredging, *Sediment transport, *Environmental effects, California, Sedimentation, Water resources, Dredged material, San Francisco Bay(CA).

In April 1972, the San Francisco District of the United States Army Corps of Engineers initiated a study to quantify the impact of dredging and dredged sediment disposal operations on the environment of San Francisco Bay and Estuary. The study was set up to isolate the questions regarding the environmental impact of dredging operations and to provide answers at the earliest date. The study was organized to investigate (1) the factors associated with dredging and the present system of aquatic disposal in the Bay, (2) the condition of the pollutants (biogeochemical), (3) alternative disposal methods, and (4) dredging technology. The study elements were intended first, to identify the problems associated with dredging and disposal operations and, second, to address the identified problems in terms of mitigation and/or enhancement. The division into separate but interrelated study elements provided a greater degree of expertise and flexibility in the Study. This report Appendix E, Material Release, presents the findings of studies on the long term movement of sediments. The overall study is the basis for the composite Environmental Impact Statement for Dredging Activities in the San Francisco Bay System. (Sinha-OEIS)
W78-09824

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. MARSH DEVELOPMENT. APPENDIX K.
Army Engineer District, San Francisco, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 544, Price codes: A19 in paper copy, A01 in microfiche. Army Engineer District San Francisco Final Report, 'Dredge Disposal Study, San Francisco Bay and Estuary', April 1976. 446 p, 11 fig, 9 tab, 26 ref, 10 photos.

Descriptors: *Marshes, *Waste disposal, Dredging, Spoil banks, Wetlands, California, Land use, Resources development, Baseline studies, Dredged material, Artificial propagation, Substrates, Spartina foliosa, Salicornia, San Francisco Bay(CA).

The Marsh Development Study was initiated in August 1973 to formulate workable procedures for the artificial propagation of intertidal marsh land plants upon a dredge material substrate. On the intertidal margins of San Francisco Bay are two dominant marshland plants: California cordgrass (Spartina foliosa) and, pickleweed, consisting of several representatives of the Genus Salicornia. Forty-eight cordgrass and 18 pickleweed test plots were established in an unconfined dredge material disposal area and were monitored for two growing seasons. A survey was made of potential marshland development areas in San Francisco Bay in conjunction with the study. The survey indicated that there were approximately 270 sq. km. of diked lands adjacent to San Francisco Bay which could be filled to provide elevations appropriate for marsh development. The project proved to be an economically practical method of disposal. Marsh development may be an attractive alternative for other dredging projects which are located near suitable diked low-lands.
W78-09825

QUALITY CHARACTERISTICS OF AGRICULTURAL AND WASTE DISPOSAL RUNOFF WATER,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-09994

WATER RESOURCES AND EFFLUENT DISPOSAL - KEY FACTORS IN MIDDLE EASTERN DEVELOPMENT,
For primary bibliographic entry see Field 5G.
W78-10009

MARINE SLUDGE DISPOSAL.
Effluent and Water Treatment Journal, Vol. 18, No. 1, p 14, January 1978.

Descriptors: *Sludge disposal, *Sludge treatment, *Sea water, *Sewage sludge, *Marine plants, Marine animals, Marine biology, Outfall sewers, Waste water disposal, Municipal wastes.

Ocean dumping practices of sludge disposal used in England are reviewed. Land disposal of sludge was considered economically feasible where adequate land was available and agricultural aspects were conducive to land application. Sewage sludge has been disposed of in the North Sea, the Firth of Clyde, and Liverpool Bay at sites that were investigated over long periods. The New York Bight was cited as an example of ocean disposal which proved detrimental to the marine ecology. Sludge disposal in the New York Bight caused sludge blanketing over the ocean bed, created anaerobic zones, and altered the character of the aquatic organisms and plants in the area. Sludge disposal at other sites has reportedly enhanced the flora and fauna of an area by enriching the source of food without causing eutrophication. Further research by marine biologists, ecologists, and sewage treatment authorities is recommended. (Lisk-FIRL)
W78-10011

RANGE OF INCINERATORS.
Water Services, Vol. 81, No. 975, p 294, May, 1977. 1 fig.

Descriptors: *Incineration, *Drying, *Sludge treatment, *Sludge disposal, *Dewatering, Equipment, Flyash, Design data, Sewage sludge, Waste water treatment, Waste water disposal, Municipal wastes.

The Nicholas Herreshoff multiple furnace, developed by Neptune Nicholas Ltd. of Camberley, Surrey, England, incinerates sewage sludge at temperatures ranging from 760-870C. The furnace is constructed of a vertical cylinder containing circular hearths; sludge is dried in the upper zone, combusted in the middle zone, and the resulting ash is cooled in the lower zone where combustion gas is also preheated. Rotary scrapers or rabble blades operated by a vertical shaft with an external power source, move the sludge through the different levels. Sludge is dried in the upper zone at a temperature of 70C while the outlet gases are about 425C. Few odorous gases are generated by evaporation with configuration; fly ash gases require minimal scrubbing. Dried sludge with a solids content of 40-50% is ignited on the combustion hearth in the presence of an oxidizing atmosphere; the ash is cooled by the fresh air of combustion. The incinerator has a diameter of 8 m and is available with 4-12 levels. The system is automatically controlled and is capable of accommodating fats, skimmings, or screenings which are introduced above the combustion hearth. (Lisk-FIRL)
W78-10012

STUDY INVESTIGATES FATE OF METALS IN LAND DISPOSAL.
For primary bibliographic entry see Field 5B.

W78-10016

INTERIM TREATMENT PLANT BUILDS SLUDGE CONCENTRATORS.
For primary bibliographic entry see Field 5D.
W78-10064

A MODEL AQUIFER SYSTEM FOR BIOLOGICAL COMPATIBILITY STUDIES OF PROPOSED DEEP WELL DISPOSAL SYSTEMS,
North Carolina Agricultural Experiment Station, Raleigh.
E. Horvath, and G. H. Elkan.
Ground Water, Vol. 16, No. 3, p 174-185, May-June, 1978. 12 fig, 21 ref.

Descriptors: *Injection wells, *Biodegradation, Laboratory tests, Aquifers, Model studies, Industrial wastes, Deep wells, Waste disposal.

Planning of deep well disposal systems must take into account the biological compatibility of the waste with the aquifer. Studies have shown that microorganisms can react with highly toxic wastes. A model aquifer system was designed for the following purposes; anaerobic, aseptic compositing of effluent samples; collection of gases generated in the model elements; isolation of model elements against down-stream contamination; and imposition of normally-distributed waste concentration profile in the feed stream. An experimental run was conducted to access the effects of injection of formaldehyde-free synthetic waste to the model inoculated with aquifer flora. The model was physically and chemically similar to the existing waste disposal aquifer. Microbial activity in the model became evident due to an increase in pH of the effluents resulting from the dissimilation of acidic waste constituents and certain organic ions. The populations of aerobic and faculative heterotrophs increased sharply at first but decreased in the latter stages as waste concentration increased. By the end of the run formate degradation had ceased entirely. Acetic acid, methanol, and aromatic acids were not significantly degraded. The population decrease and formate degradation decrease coincided with the point at which the pH dropped rapidly. (Purdin-NWWA)
W78-10082

BOTTOM SEDIMENTS IN A POLLUTED MARINE ENVIRONMENT, UPPER SARONIKOS GULF, GREECE,
California Univ., Santa Cruz. Div. of Applied Sciences.
For primary bibliographic entry see Field 5B.
W78-10176

PULP AND PAPER SLUDGE IN FORMED FIBRE PRODUCTS,
Norwegian Pulp and Paper Research Inst., Oslo.
M. Damhaug.
Norsk Skogindustri, Vol. 31, No. 5, p 108, 112, 1978. 3 fig, 1 tab, 2 ref.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Fibers(Plant), *Wood wastes, *Sludge, Clays, Absorption, Chemical oxygen demand, Suspended solids, Performance, Waste disposal, Dewatering, Sludge treatment, Sludge disposal, Industrial wastes.

The Norwegian Pulp and Paper Institute tested dewatered pitch-bearing waste fiber from a sulfite plant and fibrous sludge from an integrated sulfite pulp and paper mill as supplements to raw materials for producing molded fiber packaging products. The fibrous sulfite pulp and paper mill sludge had a clay filler content of 20-25%; the sulfite waste fiber had a pitch content of 24%. One of the sludges was added to the formed fiber raw material as 10-15% of a pulp mixture containing newspaper waste and waste paper board. Neither sludge affected the normal 35-48% water absorption of the formed products. Sludges added as up to 15% of the raw material did not adversely affect the operation of the molding equipment. The sludge additions did not increase the suspended solids or COD concentrations in the effluent. The economic feasibility of sludge additions was dependent upon the cost of sludge dewatering and transport. (Lisk-FIRL)
W78-10199

LETS TALK RUBBISH: PART 8, TO BURN OR NOT TO BURN.
Municipal Engineer, Vol. 8, No. 2, p 57-59, 1977.

Descriptors: Solid wastes, Industrial wastes, Ash, *Incinerators, Furnaces, Kilns, Burning, Pyrolysis, *Sludge incineration, Plastic wastes, *Air pollution effects, Calorific values, Hazardous wastes, Waste disposal, Athlone sewage works, Johannesburg, Port Elizabeth, *South Africa.

Obnoixous and hazardous waste, both solid and liquid, seems to be appearing on the scene in ever increasing quantities. The article discusses the question facing many towns and cities with regard to this type of refuse. Do they burn it or bury it. Various incinerators in use in South African cities are discussed as well as recent developments overseas. (So Afr Water Info Center)
W78-10210

CONCENTRATING SOLUBLE OILS.
For primary bibliographic entry see Field 5D.
W78-10225

COMPOSTING AS AN ALTERNATIVE METHOD OF WASTE DISPOSAL,
H. Gross.
Municipal Engineer, Vol. 7, No. 6, p 59-61, 1976.

Descriptors: *Waste disposal, Recycling, Industrial wastes, *Solid wastes utilization, Municipal wastes, *Composting, Fermentation, Costs, Equipment design, Sewage sludge, Pasteurization, Environment aspects, Health hazards, Buhler refuse disposal plant, Parow composting plant, Cape Town, South Africa.

The waste disposal problem of each Community possesses characteristics of its own, and any refuse disposal installation has to be tailored accordingly. Due to the latent danger to the water table, disposal by tipping is not acceptable any more in the Cape Peninsula. Furthermore the cost factor militates against incineration. The remaining alternative is composting. The article describes a Bi-rotor machine specially developed for coarse reduction of bulky waste. The machine can be used as a processing unit in refuse composting. Composting of sewage sludge is also discussed as pumping the untreated effluent into the sea is threatning to pollute the open water and using the dried digested sludge as a fertilizer may, even after biological treatment, be a carrier of disease. (So Afr Water Info Center)
W78-10238

THE PORTOBELLO OUTFALL AT BRIGHTON.
Water Services, Vol. 82, No. 988, p 356-357, June, 1978. 2 fig.

Descriptors: *Outlets, *Tunnel construction, *Tunneling, *Excavation, *Shafts(Excavations), Outfall sewers, Construction equipment, Tunnels, Equipment, Grouting, Ultimate disposal, Waste water disposal, Municipal wastes.

A 2.13 m internal diameter, 1,830 m long tunnel discharges waste water from the Portobello, England, treatment plant and pumping station into the ocean at a depth between 14.4-20.2 m. A 44 m vertical shaft leading to the tunnel was supported in the area's water-bearing chalk by peripheral ring grouting. The diffuser system, located along the last 347 m of the tunnel, consists of 9 vertical shafts connecting the four-port diffuser heads to the tunnel to provide 36 outlets. Grouting and cast iron rings were required during excavation below 1080 m because of chalk deterioration. The chalk face was excavated by hand with air tools and a Markham shield. Pumps were required to remove water during excavation of the diffuser shafts. The completed outfall tunnel has a capacity of 1,495 gal/sec. (Lisk-FIRL)
W78-10294

SWANSEA'S SEA OUTFALL IN TAILOR-MADE.
Surveyor, Vol. 151, No. 4486, p 7-9, June, 1978.

Descriptors: *Outfall sewers, *Outlets, *Estuaries, *Channels, *Construction materials, Concrete pipes, Sewers, Combined sewers, Sewerage, Storm water, Pumping plants, Waste water disposal, Sludge disposal, Municipal wastes.

The design and construction of the major outfalls along the South Wales coast, discharging municipal sewage and industrial waste into the Bristol Channel and Severn Estuary, are described. A 1,100 m-long storm water outfall into Swansea Bay was part of the sewerage project in the Sandfields and Swansea area. The 1,675 mm external diameter pipe has walls 12.7 mm thick, a flow rate of more than 1,651 liters/sec, and is constructed of spirally-welded steel sections; the sections were joined in strings seven units long and towed into position. The Swansea sewerage project also included construction of 725 m of sewers, 215 m of precast concrete pipelines and manholes, 360 m of spun iron rising man, a pumping plant, and associated sewers and pipelines. Out-falls still in the planning stage include sludge and sewage disposa lines; the nine sewage and industrial outfalls located along the coast of South Wales range in length over 1,100-3,500 m. (Lisk-FIRL)
W78-10296

FORMULATING PUBLIC POLICY ON LAND APPLICATION OF WASTEWATER AND RESIDUALS,
G. H. Emrich.
Water and Sewage Works, Vol. 125, No. 3, p 78-81, March, 1978. 7 fig, 4 tab, 12 ref.

Descriptors: *Application techniques, *Spray irrigation, *Infiltration, *Percolation, *Overland flow, Groundwater recharge, Return flow, State governments, Water pollution, Nutrient removal, Crop response, Waste water treatment, Waste water disposal, Ultimate disposal, Sludge disposal, Municipal wastes.

Land application processes in operation for disposal of waste water and sludge were reviewed as guides for formulating public policy on land disposal. Overland flow as practiced in the marsh-pond system at Brookhaven, New York, removes a large quantity of the nutrients in waste water with minimal percolation of pollutants into the soil; groundwater and subsurface monitoring is recommended for overland flow sites. The Flushing Meadows rapid filtration project in Phoenix, Arizona, releases about 80 mgd of activated sludge effluent to infiltration-percolation basins underlined with sand and gravel. Depending upon weather conditions, nitrogen removal varies from 30-90% at a distance 20 ft into the groundwater below the basins; phosphorus is reduced by 90% at a distance 100 ft from the basin. The suitability of spray irrigation is dependent upon soil, geologic, and groundwater conditions at the site; advantages of spray irrigation include economic nutrient supplements to crops and groundwater recharge. Spray irrigation of waste water has been successfully practiced at: Pennsylvania State University, University Park; Muskegon, Michigan; and Longwood, Pennsylvania. Land disposal of sludges in metropolitan areas is often unsuitable because of

the heavy metal content originating from industrial wastes. (LiskvFIRL)
W78-10304

LAND TREATMENT OF WASTEWATER MAY BE KEY TO POLLUTION CONTROL,
W. J. Hartman, Jr.
Water and Sewage Works, Vol. 125, No. 5, p 82-83, May, 1978.

Descriptors: *Application methods, *Overland flow, *Groundwater recharge, *Regulation, *Technical societies, Technology, Research and development, Legal aspects, Public lands, Public rights, Waste water treatment, Waste water disposal, Municipal wastes.

Instigation of land application as an alternative waste treatment program which produces no residual solids is dependent upon the coordination of the public, regulating institutions, and technical groups. Land treatment is applicable to communities limited to 1 million where suitable land is available. Restraining parameters, governed by the public, require consideration in the selection of land treatment sites. Out-right purchase of farmland for waste application is not recommended because of existing constraints placed upon the agricultural industry. Farm-city coordination is suggested, as well as localized land treatment sites rather than regionalized treatment. Sewage effluent regulations can be simplified and made consistent; technical plans and design parameters should be comprehensible to user groups. Land treatment techniques and regulations can be reduced by the institutional and technical groups to a form understandable by the general public. Groundwater, stream flow, and surface water supplies should be considered in the formulation of land treatment policies. (Lisk-FIRL)
W78-10306

SOME HOT NEWS ABOUT SLUDGE,
Portland Water District, ME.
K. Brough.
Water and Wastes Engineering, Vol. 14, No. 8, p 22-26, August, 1977. 2 fig, 6 tab, 4 ref.

Descriptors: *Sludge treatment, *Soil amendments, *Corn(Field), *Silage, *Crop response, Fertilizers, Farm wastes, Nitrogen, Phosphorus, Potassium, Nutrients, Coliforms, Heavy metals, Waste water treatment, Sludge disposal, Municipal wastes.

Zimpro heat-treated sludge was stored in 3-4 ft piles and applied to two one-acre plots seeded with silage corn. The sludge was placed on plastic sheets to reduce seepage; a portion of one pile was covered and leachate samples from both piles were collected after several weeks of storage. Sludge was applied to portions of the corn plots as the sole amendment or in conjunction with manure and chemical fertilizers. The Zimpro sludge contained about 3% total nitrogen, 0.5% phosphorus, and 0.1% potassium; leachate samples from one pile after a heavy rain contained about 280 mg/liter total Kjedahl nitrogen and 120 mg/liter ammonia. Plant growth was not as extensive in one of the plots treated with sludge and manure than in plots that had also received chemical fertilizers; no significant growth differences were observed in the other plot treated under the same conditions. Anaysis of the corn tissue and crop yield showed no significant differences between the bulk yield and the heavy metal uptake concentrations for the different soil amendments. Odor problems in the stored sludge indicated the need to maintain aerobic conditions in the piles through aeration or mechanical turning. The sludge could be applied with conventional manure spreaders. High coliform counts in the sludge were attributed to contamination by transport and spreading equipment; negligible coliforms were found in the sludge soon after Zimpro heat treatment. (Lisk-FIRL)
W78-10309

THERMALLY CONDITIONED SLUDGE HAS AGRICULTURAL USES.
Water and Sewage Works, Vol. 125, No. 5, p 73-75, May, 1978.

Descriptors: *Sludge treatment, *Heat treatment, *Application methods, *Pastures, *Silage, Corn(Field), Dewatering, Activated sludge, Filtration, Turf grasses, Turf, Soil amendments, Sludge disposal, Municipal wastes.

Several municipalities practicing land application of thermally conditioned sludge are identified. The Zimpro sludge conditioning process employs compressed air and heating to 350F to destroy pathogens and dewater the sludge to 25-50% solids. Thermally conditioned sludge from Jeffersonville and Speedway in Indiana, is applied to lawns, gardens, and some pasture land. Sludge from Indio, California, is conditioned and vacuum filtered at a rate of 6.4 tons/day for use as a fertilizer base by a fertilizer manufacturer. Ten tons/day of North Olmstead, Ohio, waste activated and primary sludge is thermally conditioned and supplied to residents and farmers or used to fill in hollows around the treatment plant. About 25,000 gal/wk of thermally conditioned and thickened sludge is injected or spread on crop and pasture land in Bedford Heights, Ohio, by the Ny-Trex company. Thermally conditioned sludge in Lancaster, Pennsylvania, is applied to silage corn crops; sludge from a second thermal unit for the county of Lancaster conditions wheat and corn crop soils at one farm. Denton, Texas, sludge is applied to hayfields and pasture land; Troy, Ohio, applies its sludge to a 30-acre municipal cornfield. Silage corn was successfully grown in tests at Portland, Maine, with thermally-conditioned sludge. The University of Florida has grown crops of turf grass in a mixture of thermally conditioned sludge, wood chips, sugar refinery wastes, sandy muck, and water treatment sludge. (Lisk-FIRL)
W78-10310

TREATING SLUDGES.
Environmental Science and Technology, Vol. 12, No. 5, p 511-512, May, 1978.

Descriptors: *Sludge treatment, *Sludge disposal, *Heat transfer, *Application methods, *Incineration, Sewage sludge, Ultimate disposal, Solid wastes, Salts, Heavy metals, Toxins, Waste water treatment, Municipal wastes.

Sewage sludge treatment and disposal were the major topics of a symposium conducted by the Division of Environmental Chemistry of the American Chemical Society in March, 1978. Co-pyrolysis of sewage sludge and refuse-derived fuel was described as an innovative and alternative process of heat recovery, eligible for an additional 10% funding under P. L. 95-217. A co-pyrolysis system installed in the 30 mgd Central Contra Costa, California Sanitation District treatment plant, may supply up to 90% of the power for operating the plant and recalcining lime used in treating waste water. Pyrolysis, maintaining temperatures up to 2,400F, destroys most toxic materials and oxidizes most heavy metals; the ash produced by pyrolysis occupies about 3-10% of the original sludge volume and is suitable as a soil amendment when metal content is not important. Sludge incinerators can be retrofitted with heat recovery units. Treating sewage sludge with molten alkali, sulfate, or oxide salts in the kiln at 550C was suggested as a source of heavy metal recovery and toxic organic compounds removal. Costs associated with molten salt treatment of sewage sludge were estimated at $30/ton. (Lisk-FIRL)
W78-10312

TEXAS UTILITY TAPS MUNICIPAL SEWAGE PLANT FOR DEPENDABLE COOLING WATER SUPPLY.
Combustion, Vol. 49, No. 11, p 31-32, May, 1978. 1 tab.

Descriptors: *Tertiary treatment, *Cooling towers, *Cooling water, *Powerplants, *Chemical precipitation, Flocculation, Phosphates, Boiler feed water, Reverse osmosis, Industrial water, Water supply, Waste water treatment, Water reuse, Municipal wastes.

Tertiary treated municipal effluent from Amarillo and Lubbock, Texas, is used as cooling water in Southwestern Public Service Company's mechanical draft cooling towers for power generation. The tertiary treatment plant has a capacity of more than 18 mgd and will conserve a daily potable water supply for 75,000 people. Tertiary treatment consists of a high contact cold-lime reacting clarifier, designed by the Graver Division of Ecodyne Corp., in which chemical flocculants precipitate suspended solids in a flash mixing zone. pH is adjusted with alum and lime, as well as carbonates and carbon dioxide gas contained in well water; phosphates are reduced to less than 1.0 mg/liter. Reverse osmosis units further treat the tertiary effluent for use as boiler make-up water, reducing suspended solids, trace organics, and colloids by 85%. Cooling tower blowdown is used to irrigate agricultural crops; sludge from tertiary treatment will supply the additive requirements of the stack scrubbers at one power plant to be completed. (Lisk-FIRL)
W78-10316

THE APPLICATION OF SURPLUS SLUDGES FROM HUMAN WASTE DISPOSAL PLANTS TO SANDY SOIL (2) - THE EFFECT OF MIXING SLUDGE ON THE PHYSICAL PROPERTIES OF THE SOIL (HAMAKAIDA SANDY LOAM) (SHINYO SHORIJO NI OKERU YOJO ODEI NO SHASHITSU DOJO EN RIYO (2) - DOJO NO BUTSURITEKI SEISHITSU NI OYOBOSU ODEI KONGO NO EIKYO),
Kochi Univ. (Japan). Lab. of Applied Analytical Chemistry.
I. Kataoka, and I. Kataoka.
Kochidaigaku Gakujutsu Kenkyu Hokoku (Research Reports of Kochi Univ., Agricultural Science), No. 26, p 45-57, 1978. 1 fig, 5 tab, 5 ref.

Descriptors: *Sands, *Loam, *Sewage sludge, *Soil physical properties, *Bulk density, Soil amendments, Capillary action, Permeability, Evaporation, Aggregates, Particle size, Saturated soils, Waste water disposal, Municipal wastes, Ultimate disposal.

The physical characteristics of a sandy loam soil were examined after additions of 1-4% powdered surplus sewage sludge. The initial bulk density of the soil was 1.40 g/cu cm; the 13 sludge bulk densities ranged 0.22-0.77 g/cu cm. The bulk density of the 1% sludge-soil mixtures ranged 1.35-1.43 g/cu cm; bulk density usually decreased after sludge additions. Increased bulk density was attributed to the fine particle size of some of the sludges. When the soil-sludge mixtures were saturated with water, a linear relationship between the evaporation and the duration period was established during the first 13 days, followed by a curvilinear relationship during the next 13-32 days. Sludge additions did not control evaporation from the soil. The capillary-rise time to the surface for the soil alone was 8 min; 1% sludge additions increased the rise time to 10-85 min. The water capacity of the soil, initially 38.2%, ranged from 33.2-41.0% when 1% sludge was added; capacity was related to the particle size and shape and the wetting resistance of the sludges. Insoluble aggregate formation in the mixture increased from 5.1% to 5.4-7.8% after 9 mos of repeated wetting and drying; aggregate formation also improved after wheat cultivation. The permeabilities of the sludge-soil mixtures were lower than that of soil alone. (Lisk-FIRL)
W78-10326

CHARACTERISTICS OF CALCUTTA SEWAGE,
All-India Inst., of Hygiene and Public Health, Calcutta.
For primary bibliographic entry see Field 5A.

W78-10333

ESTABLISHING GUIDELINES FOR LAND-BASED WASTE MANAGEMENT PLANNERS,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
M. Baker, and L. A. Christensen.
Water and Sewage Works, Vol. 125, No. 4, p 76-80, April, 1978. 1 fig, 1 tab, 11 ref.

Descriptors: *Application methods, *Recycling, *Sludge disposal, *Legal aspects, *Decision making, Economics, Land use, Methodology, Social aspects, Technology, Waste water treatment, Waste water disposal, Municipal wastes.

Technical, economic, legal, and socio-political considerations are incorporated into a design framework for sewage treatment and disposal decision making. Alternative methods of waste treatment should be evaluated with cost-benefit analyses. Resources recovery and land application of waste water treatment residuals can be encouraged through government policies, reducing depletion of certain natural resources. This can be accomplished through legal regulations or through an economic incentive program. Fee simple title and ownership, easements, leases, and other contractual arrangements are the alternatives cited for land acquisition and management. Other considerations incorporated into the decision framework are transport, other types of recycling processes, management objectives, and revenue producing alternatives. (Lisk-FIRL)
W78-10356

SEWAGE SLUDGE - WASTE OR AGRICULTURAL ASSET.,
Water Pollution Research Lab., Stevenage (England).
E. Coker, and R. Davis.
New Scientist, Vol. 78, No. 1101, p 298-300, May 1978. 1 fig, 1 tab.

Descriptors: *Application methods, *Sludge treatment, *Soil amendments, *Nutrients, *Fertilization, Grazing, Grasslands, Pastures, Crop production, Agriculture, Waste water treatment, Sewage sludge, Municipal wastes, Heavy metals, Pathogenic bacteria.

The use of sewage sludge as an agricultural fertilizer is reviewed as an alternative method of disposal. Liquid sludges, with high soluble nitrogen concentrations, can be applied to crop and pasture lands by spray irrigation; they generally contain higher levels of nutrients than solid sludges. Solid sludges must be ploughed into fields but contain higher levels of organic material. England's Department of the Environment, the National Water Council, and the Agricultural Development and Advisory Service have recommended that a Cu:Ni:Zn ratio of 2:8:1 be maintained when adding sludge to soils. Standards for As, B, Cd, Cr, Hg, Mo, Pbm and Se in sewage sludge and soils have also been proposed. Guidelines on sludge application rates to crop lands define the amount of nitrogen to be added to soils to maintain the proper balance. Salmonella, Taenia saginata, Heterodera rostachiensis, and other pathogenic or infectious organisms should be reduced or removed. Grazing on land treated with raw sludge should be delayed for six months; pasture land receiving treated sludge should not be used for three weeks. When treated sludge is applied to land that will be planted with crops that are eaten raw, planting should be postponed until one year after sludge application. (Lisk-FIRL)
W78-10357

CURRENT STATUS OF ON-SITE WASTEWATER MANAGEMENT,
For primary bibliographic entry see Field 5D.
W78-10358

IWES 83RD SUMMER MEETING AND CONFERENCE, 1978.
For primary bibliographic entry see Field 5G.
W78-10361

PROCESS SELECTION FOR OPTIMAL MANAGEMENT OF REGIONAL WASTEWATER RESIDUALS,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-10363

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR SLUDGE DISPOSAL AND LAND RECLAMATION IN FULTON COUNTY, ILLINOIS.
Environmental Protection Agency, Chicago, IL. Region V.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 386, Price codes: A19 in paper copy, A01 in microfiche. June, 1976. 388 p, 84 tab, 67 fig.

Descriptors: *Environmental effects, *Environmental sanitation, *Sludge disposal, *Soil environment, *Land reclamation, Landfills, Public health, Sewage disposal, Sewage treatment, Sludge, Sewage sludge, Sludge digestion, Sludge treatment, Waste disposal, Municipal wastes, Sewage disposal, Reclamation, Land management, Land development, Soil management.

The Metropolitan Sanitary District of Greater Chicago (MSDGC) is currently involved in a project to dispose of digested sewage sludge by utilizing it to reclaim strip-mined land. The project's environmental impact statement reported that effluents from sludge retention basins and runoff from sludge application has resulted in surface water contamination. It was also found that strip-mine runoff had contributed to surface water, as well as groundwater, contamination. However, groundwater had not been degraded by the sludge application. In addition, the report found that the chance of erosion had been decreased by sludge application. Although complaints of offensive odors had been reported, discontinuation of spray application should eliminate the odors. The report also found that adverse health effects may be caused if heavy metals from the sludge are absorbed into plants or animals which are consumed and that the noise levels at the site were similar to those caused by agricultural processes. In general, the site's suitability for agricultural or recreational uses has been improved by its preparation for sludge application. Alternatives considered by MSDGC included: sludge dewatering; sludge stabilization; sludge disposal; sludge utilization; and sludge treatment. (Malefatto-Florida)
W78-10372

COUNTRIES RESEARCH WASTE TREATMENT AND FISH FARMING.
For primary bibliographic entry see Field 5D.
W78-10426

POINT-OF-USE WATER TREATMENT ALLOWS SELECTIVITY.
For primary bibliographic entry see Field 5D.
W78-10427

MOBILE BAY MODEL STUDY. REPORT I: EFFECTS OF PROPOSED THEODORE SHIP CHANNEL AND DISPOSAL AREAS ON TIDES, CURRENTS, SALINITIES, AND DYE DISPERSION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W78-10445

PROTECTION OF LAKE AREAS.
Mont. Rev. Code secs 89-3701 thru 89-3712 (Supp. 1975).

Descriptors: *Montana, *Lakes, *Permits, *Water conservation, *Local governments, Conservation, Protection, Control, Perservation, Natural resouces, Lake shores, Navigable waters, Habitats, Wildlife, Fish, Recreation, Water quality, Legislation, Penalties(Legal).

The conservation and protection of natural lakes is important for the continued value of lakeshore property and for recreational purposes. The purpose of this act is to give local governments the statutory power to protect their lake areas. Anyone who proposes work that may change the course, current or area of a lake or its lakeshore must secure a permit from the local governing body. The governing bodies shall adopt regulations for the issuance or denial of permit applications. Where planning boards exist, the governing bodies shall seek their recommendations as to regulations to adopt. Minimum criteria favoring issuance of permits set forth. However, local bodies may adopt stricter or additional regulations. To obtain a permit, the applicant must apply to the local governing body and shall pay a fee. Before issuing the permit, the governing body must seek the planning board's recommendation if there is a board. If not, they must determine for themselves if the work conforms to the regulations. Time limits for the consideration of applications, procedures for the granting of variances, areas for judicial review and enforcement and penalties for nonconformance with this act are listed. (Beamer-Florida)
W78-10490

5F. Water Treatment and Quality Alteration

MANUALLY OPERABLE REVERSE OSMOSIS APPARATUS,
Desalination Systems, Inc., Escondido, CA. (Assignee).
For primary bibliographic entry see Field 3A.
W78-09834

PREPARATION OF PYROGEN-FREE WATER,
A. Akcasu.
U.S. Patent No. 4,070,289, 6 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 966, No 4, p. 1493, January 24, 1978.

Descriptors: *Patents *Waste water treatment, *Water purification, Water quality control, Water pollution treatment, Heat treatment, Industrial wastes, *Pyrogens.

The method comprises placing contaminated water, that is, water suspected to contain pyrogenic material, into a sealable pressurizable container, sealing it, and then heating the sealed container to a temperature of from about 180 degrees to about 230 degrees C, preferably about 200 degrees C. The pressure created within the container, from about 15 to about 36 atmospheres, prevents the formation of steam while destroying all of the pyrogen substance. After heating for a brief period, the sealed container is cooled to room temperature in any suitable fashion. The water contained in it is then ready for use or storage as circumstances dictate. (Sinha-OEIS)
W78-09838

POWER GENERATION AND POTABLE WATER RECOVERY FROM SALINOUS WATER,
Universal Oil Products Inc., Des Plaines, IL. (Assignee).
For primary bibliographic entry see Field 3A.
W78-09849

AERATOR FOR BODIES OF WATER,
For primary bibliographic entry see Field 5D.
W78-09851

TRACE INORGANICS IN RURAL POTABLE WATER AND THEIR CORRELATION TO POSSIBLE SOURCES,
South Carolina State Coll., Orangeburg. Water Lab.
For primary bibliographic entry see Field 5A.
W78-09968

OREGON WATER SUPPLY PROGRAM EVALUATION.
Environmental Protection Agency, Seattle, WA.
For primary bibliographic entry see Field 6B.
W78-10032

FINAL ENVIRONMENTAL IMPACT STATEMENT: WATER QUALITY MANAGEMENT PLAN FOR EL PASO AND TELLER COUNTIES, COLORADO.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 113, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-908/5-77-004, May 1977, 35 p, 4 tab, 3 append.

Descriptors: *Colorado, *Environmental effects, *Waste water treatment, *Water management(Applied), Effluents, Monitoring, Land use, Water quality, Sludge treatment, Sludge disposal, Standards, Construction, Management, Population, *Section 208 Areawide Planning, *Environmental Impact Statements, Stream classification, El Paso County(CO), Teller County(CO), Non-point source pollution.

This EIS uses a modification of the standard EIS format because the water quality management plan developed by the Pikes Peak Area Council of Governments (PPACG) includes the requirements of NEPA as an integral part of the plan. NEPA requirements were integrated into the planning process, with EPA personnel participating in the plan's development. This EIS consists of the following documents: a summary of the significant environmental issues and EPA's recommended course of action; a summary of the PPACG water quality management plans; a study of land use alternatives considered in the plan; and a summary report of an environmental resource study prepared by PPACG. EPA's certification of the state's official water quality resource management plan for El Paso and Teller counties was conditioned on the resolution of the following issues: stream classification, sludge handling facilities, effluent monitoring, stream monitoring, reevaluation of stream classification and water quality criteria exceptions, state action on stream classification and water quality criteria, priorities for construction grants, population projections, the management agency for the Upper Fountain Subbasin, and local ratification of the 208 plan. The report presents in detail a statement of each issue relating to the water quality management plan for the two counties, and EPA's recommended action and rationale. Finally, comments on the draft EIS and EPA responses are included. (Zayac-NC)
W78-10033

WATER TREATMENT: HARDNESS.
Ground Water Age, Vol. 12, No. 10, p 17-19, June, 1978. 2 fig.

Descriptors: *Hardness(Water), *Water softening, *Ion exchange, *Water treatment, United States, Calcium carbonates.

Hardness is the most common water problem in the U.S. occurring in about 85 percent of private and public water supplies. It usually ranges from a low of 3 gpg to a high of 50 gpg. Above seven gpg untreated hardness causes problems such as the formation of an insoluble soap film, spots on dishware and scale on the inside of pipes, water, heaters, etc. Calcium bicarbonate and magnesium carbonate cause temporary hardness since they are transformed into insoluble solids upon boiling or evaporation of the water. It is customary to express hardness as the equivalent amount of calcium carbonate even though the hardness may be due to a different mineral. The commonest method of softening hard water involves ion exchange or removal of calcium and magnesium ions and replacing them with 'soft' sodium ions. Softeners are available in a wide variety of complexity and sizes. Properly sized and adjusted, an automatic softener will operate indenfinitely with little attention from the home ow- er. Large scale softening for municipal water supplies is done by means of lime-soda ash treatment. However, this method cannot reduce hardness to less than 5 gpg and a household softener may be required. (Purdin-NWWA)
W78-10083

SCALE DOWN ON HARD WATER PROBLEMS.
Processing, Vol. 24, No. 1, p 35, January, 1978, 2 fig.

Descriptors: *Scaling, *Chemical precipitation, *Hardness(Water), Food processing industry, *Water treatment.

A new type of water treatment device called COLLOID-A-TRON is evaluated. Dissolved solids are precipitated and discharged or dropped out in low velocity areas such as cooling tower basins. Colloid-A-Trons protect heat exchangers, condensors, and calorifiers from corrosion and scale, and can be used in place of chemical or manual descaling operations. In the past two years the number of recorded success stories more than bear out the claim that Colloid-A-Tron eliminates the problem of hard water scale in the process system. (Purdin-NWWA)
W78-10091

SURVIVAL OF THE SALMONID VIRUSES INFECTIOUS HEMATOPOIETIC NECROSIS (IHNV) AND INFECTIOUS PANCREATIC NECROSIS (IPNV) IN OZONATED, CHLORINATED, AND UNTREATED WATERS,
Naval Support Activity, Seattle, WA.
G. A. Wedemeyer, N. C. Nelson, and C. A. Smith.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 875-879, 1978. 5 fig, 1 tab, 16 ref.

Descriptors: *Viruses, *Viricides, *Chlorination, *Disinfection, *Ozone, Chlorine, Water treatment, Fish diseases, Animal pathology, Fish physiology, Hardness(Water), Alkaline water, Salmonids, Public health, Water treatment.

Ozone and chlorine inactivation curves were determined in three water types at 10C for the fish pathogenic viruses infectious hematopoietic necrosis (IHNV) and infectious pancreatic necrosis (IPNV). In phosphate-buffered, distilled water (PBDW) an ozone dose of 0.01 mg/l for 30 or 60 s inactivated IHNV or IPNV, respectively, suspended at a tissue culture 50% infective dose (TCID50) of 10 to the 4th power - 10 to the 5th power/mL. In hard (120 mg/l as CaCO3) and soft water (30 mg/l) lake waters, an ozone application rate of 70 mg h-1 l-1 for 10 min destroyed IHNV. IPNV inactivation in hard water water required 90 mg O3 h-1 l-1 for 10 min but only a 30 s contact time in soft water. The IHNV was also somewhat more resistant to chlorine. In PBDW, a residual of 0.1 mg/l with contact times of 30 and 60 s, respectively, destroyed IHNV and IPNV. In soft lake water IHNV was destroyed within 5 min at 0.5 mg/l, while in hard water a 10-min contact time was required. For IPNV disinfection in soft water, 0.2 mg/l for 10 min was sufficient but this chlorine residual had essentially no effect on IPNV in hard water. Increasing this dose to 0.7 destroyed IPNV in hard water within 2 min. In untreated waters, IPNV was stable for at least 8 wk in either distilled, soft, or hard lake waters. However, IHNV survived only about 2 wk in distilled and 7 wk in the soft or hard lake waters. We suggest the serious consideration of ozone as a fish control disease agent. (EIS-Deal)
W78-10126

A SLOW SAND FILTRATION WATER TREATMENT PLANT OF SIMPLE CONSTRUCTION AND EASY OPERATION FOR USE IN THE KWA ZULU HOMELANDS,
Kwa Zulu Government Service, Empangeni (South Africa), Div. of Water Supply.
R. C. Hazelhurst, and P. R. Retief.
Presented at Institute Water Pollution Control Meeting in Durban, May 1976, 8 p.

Descriptors: *Slow sand filtration, *Water treatment, Filter design, Process design, Chemicals feed rate, Chlorination, Costs, Developing countries, *Filtration, Waste water treatment, South Africa, Kwa Zulu Homelands.

To purify water, drawn from rivers and dams, for human consumption in the Kwa Zuly homelands, the authors had to design treatment plant of simple, economical and quick construction using standard equipment with which construction gangs were familiar. Details are given of the size and design of the treatment plants which provided for slow sand filtration, chemical dosing mixing and contacting and chlorination. The costs, power supply, storage and operation of these units are also discussed. (So Afr Water Info Center)
W78-10229

MUNICIPAL WATER MONITORING AND CONTROL BY TELEMETRY,
For primary bibliographic entry see Field 5G.
W78-10242

RECLAIMED WATER - A HEALTH HAZARD,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
W. H. Hattingh.
Water South Africa, Vol. 3, No. 2, p 104-112, 1977. 21 ref, 11 tab.

Descriptors: *Water reuse, *Health hazards, Water quality, *Potable water, Microbiological properties, Chemical properties, Sewage effluents, Nitrate, *Water reclamation, Quality criteria, Coliforms, Faecal coliform, *South Africa, Pretoria, Windhoek, Pseudomonas, Staphylococcus.

Describes the results of the first three years of a comprehensive survey of the microbiological and chemical quality of drinking waters in the Windhoek and Pretoria areas. Results indicated that all the potable waters analysed, were of a good quality and conformed to the criteria proposed by a number of organizations to ensure a safe, potable water. One of the potable waters analysed in this study was derived from a source receiving rather large volumes of purified sewage effluents. However, it was shown that this source could still be purified to potable water quality. The fact that most, if not all, of the other cities in South Africa obtain their water from better sources, leads to the belief that the quality of the other potable water in this country would be as good as, if not better than, the values reported in this paper. The microbiological quality of reclaimed water was shown to be good and chemically except for its nitrate content, it conformed to all criteria relating to the health of man. Ways and means of reducing the nitrate content are discussed. It is finally concluded that reclaimed water does not present a health hazard. (So Afr Water Info Center)
W78-10251

USE AND MISUSE OF CHLORINATION FOR THE PROTECTION OF PUBLIC WATER SUPPLIES AND THE TREATMENT OF WASTEWATER,
Ohio State Univ., Columbus. Dept. of Microbiology.
P. R. Dugan.
American Society for Microbiology News, Vol. 44, No. 3, p 97-102, 1978. 1 fig, 24 ref.

Descriptors: *Chlorination, *Disinfection, *Water treatment, *Toxins, *Organic compounds, Ureas, Proteins, Phenols, Chemical reactions, Bactericides, Viricides, Coliforms, Chlorine, Waste water treatment, Municipal wastes.

While chlorination of drinking water supplies is justified for removing coliforms, viruses, and other pathogens, chlorination of waste water is considered more hazardous than the pollutants the treatment seeks to reduce. The low BOD water that is disinfected with chlorine has fewer organics with which chlorine can react than raw waste water and sewage. Hypochlorous acid has been found to be an effective bactericide while the hypochlorite ion has potential viricidal properties. Chloramines, a combined chlorine residual formed by reaction with ammonia or other substances, have been found to cause methemoglobinemia in uremia patients, genetic mutations in Bacillus subtilis, and sterility in several species of marine invertebrates. Other compounds which may form chloramines are urea, amono acids, proteins, other amines, and whole cells. The chlorine demand of these compounds must be satisfied with break point chlorination before free residual hypochlorous acid or hypochlorite ion will predominate. Chlorination also produces toxic compounds that are often resistant to biological degradation. Polychlorinated phenols and cresols, chloranil, trichloroanaline, and non-aromatic oxidation products have been formed within 2 hrs of sodium hypochlorite contact with small concentrations of industrial waste products, such as phenol, meta-cresol, hydroquinone, analine, and dimethylamine. Ozonation and more efficient secondary and tertiary treatment of waste water are recommended as alternatives to chlorination. (Lisk-FIRL)
W78-10315

COST STUDIES FOR RENOVATED WASTEWATE,
Municipal Environmental Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W78-10359

NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5G.
W78-10378

5G. Water Quality Control

SEA CULTTER INVESTIGATIONS USING OIL SLICKS,
Bendix Aerospace Div., Ann Arbor, MI.
For primary bibliographic entry see Field 5B.
W78-09801

DEVELOPMENT OF A STREAMING-FIBER OIL SPILL CONTROL SYSTEM, STAGE II,
Seaward International, Inc., Falls Church, VA.
R. L. Beach, D. W. Durfee, and R. J. Powers.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 315, Price codes: A07 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Final Report No. CG-D-4-77, December 1976. 151 p, 39 fig, 4 tab, 7 ref.

Descriptors: *Water pollution control, *Pollution abatement, *Oil spills, Skimming, Models, Water quality control, Equipment.

Seaward International, Inc. has developed the streaming fiber oil spill control concept into a large-scale model, and tested it successfully under simulated field conditions. The program involved design and construction of the large-scale model, and testing at the EPA's OHMSETT test facility. Tests were conducted in a variety of conditions at speeds ranging from 2 to 6 knots. Tests results showed tha the concept works, although there are some performance limitations with he present design, principally in waves. Design of a full-scale prototype is presented, which includes features having the potential to overcome the present limitations and meet or exceed all design goals. (Sinha-OEIS)
W78-09802

DEVELOPMENT OF ADDITIONAL HAZARD ASSESSMENT MODELS,
Little (Arthur D.) Inc., Cambridge, MA.
For primary bibliographic entry see Field 5C.
W78-09804

REPORT OF THE SYMPOSIUM ON PREVENTION OF MARINE POLLUTION FROM SHIPS, HELD IN ACAPULCO, MEXICO, 22-31 MARCH 1976.
Coast Guard, Washington, DC. Office of Marine Environment and Systems; and Inter-Governmental Maritime Consultative Organization, London (England).
Report No. CG-WEP-1-77, April 1976. 697 p.

Descriptors: *Oil pollution, *Pollution abatement, *Water quality control, Ships, Waste water treatment, Chemical wastes, Environmental effects, Regulations, Equipment, Monitoring, Tankers, Noxiouds liquid wastes, International Conventions, International control.

The papers submitted to the Symposium by representatives from governments, institutions, and industries and other experts in their individual capacities are reproduced in this report. The papers address many areas in which research and study has been made or is in progress; and, provide information and advice on specific problems relating to marine pollution including such aspects as contingency planning and methods of dealing with spillages. (See W78-09806 thru W78-09821) (Sinha-OEIS)
W78-09805

INTERNATIONAL MEASURES FOR THE PREVENTION AND CONTROL OF POLLUTION FROM SHIPS,
Inter-Governmental Maritime Consultative Organization, London (England). Marine Environment Div.
Y. Sasamura.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p 1-22, 9 ref.

Descriptors: *Oil pollution, *Water quality control, *Pollution abatement, Ships, Chemical wastes, Sewage, Garbage, *Outer Continental Shelf, International control, International convention, Cargo oil.

A broad historical review of developments in the field of marine pollution from ships is presented. Reference is made to such events as the International Marine Conference held in 1889, which was the first conference of States to consider measures to control the activities of ships internationally. The growth in the transport of oil by sea and the growing awareness of oil pollution as a problem requiring international control is described. Mention is made of developments such as the increasing quantities of oil and other pollutants transported by sea, the size and types of ships in use, including tankers. These developments provide the background for the formulation, implementation and enforcement of control measures to prevent and control pollution not only from oil but also noxious chemical substances, sewage and garbage from ships as contained in the International Convention for the Prevention of Marine Pollution, 1973. (See also W78-09805) (Sinha-OEIS)
W78-09806

A REVIEW OF THE 1973 MARINE POLLUTION CONVENTION,
Coast Guard, Washington, D.C. Office of Marine Environment and Systems.
R. I. Price, and F. P. Schubert.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p. 23-54, 6 ref.

Descriptors: *Water pollution, *Water quality control, *Pollution abatement, Oil pollution, Liquid wastes, Sewage, Garbage, Ships, *International conventions, Outer Continental Shelf, Tankers.

The Convention is described as one of a comprehensive family of conventions relating to marine pollution. Certain shortcomings of the 1954 Oil Pollution Convention are described and a general overview of the 1973 Convention is provided including a description of general obligations, measures to minimize accidental pollution by oil, the control of intentional oil pollution, and measures to control pollution by noxious liquid substances, sewage and garbage. A table comaring certain provisions of the 1954 and 1973 Conventions is included. (See also W78-09805) (Sinha - OEIS)
W78-09807

VIEWS OF SHIPPING AND OIL INDUSTRIES ON THE 1973 CONVENTION,
C. A. Walder, and J. C. S. Horrocks.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p. 71-84.

Descriptors: *Oil industry, Pollution abatement, Water quality control, Ships, Outer Continental Shelf, International Conventions.

The shipping and oil industries strongly support the 1973 Convention and urge all governments to carry out the necessary legislative steps to bring the Convention into force at the earliest possible data. This paper reviews the annexes to the Convention and the practical problems that arise in complying with them, and considers the steps which will need to be taken before implementation of all parts of the Convention can be achieved. In addition, relevant technological developments and the efforts of the oil and shipping industries to overcome practical problems are analyzed. (See also W78-09805) (Sinha - OEIS)
W78-09808

POLLUTION PROBLEMS OF A COASTAL AND MARITIME STATE,
Department of Trade (England). Marine Div.
J. N. Archer.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p 85-96.

Descriptors: *Water pollution, *Water quality control, *Oil pollution, Coasts, Oil spills, Ships,

*Outer Continental Shelf, *United Kingdom, Chemical pollution.

The importance to the United Kingdom of minimizing pollution from ships and measures taken to this end is described. How existing services and facilities have been used to tackle the problem as cost effectively as possible is explained and a simple methodology of general application is given. (See also W78-09805) (Sinha - OEIS)
W78-09809

MARINE POLLUTION OFF BARBADOS'COASTS,
Ministry of Health and Welfare (Barbados).
A. B. Archer.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p 97-115, 4 fig, 6 ref.

Descriptors: *Water pollution sources, *Coral, *Reefs, Atlantic Ocean, Monitoring, Coasts, Beaches, Oil spills, Ships, Outer Continental Shelf, *Barbados.

Because of its geographical position Barbados is very vulnerable to marine pollution from ships as it drifts on the South Equatorial current from the Atlantic. There is definite evidence that crude oil discharged from ships in the Atlantic is harming the reef corals which almost surround the island as a protective coral reef structure. Barbados needs to be equipped with oil-spill clean-up facilities, either as a participant in a Caribbean oil-spill Clean-up Contingency Plan, or individually, if necessary with assistance from friendly cuntries with the available materials and expertise. A large oil-spill on the beaches of Barbados can cause incalculable damage to the country's tourist industry. Because of its strategic position at the Atlantic Ocean/Caribbean Sea interface, and lying in the direct path of the South Equatorial current as it travels westwards towards the coasts of South America, the Southern United States and Central America, Barbados is ideally located for monitoring oil pollution from the Atlantic, and carrying out marine biological and oceanographic research. (See also W78-09805)
W78-09810

PREPARATION FOR THE IMPLEMENTATION OF THE CONVENTION IN THE BALTIC SEA AS A SPECIAL AREA, ON THE EXAMPLE OF POLAND,
Morski Inst., Gdansk (Poland).
Z. Grzywaczewski.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p 116-141, 1 fig.

Descriptors: *Pollution abatement, *Water quality control, *Environmental effects, Oil pollution, Ships, Coasts, *Baltic Sea, *International Conventions, Poland, Noxious liquid wastes, Outer Continental Shelf.

The Baltic Sea Area is threatened with the effects of marine pollution from ships and other sources such as rivers, municipal sewages, industry, agriculture and air-borne pollutants. Tentative agreement among the Baltic States on cooperation in combatting the issues of increasing pollution of the sea resulted in the Helsinki Convention 1974 as an act of good will of seven Baltic States. Preparation is made for the practical implementation of both Conventions in respect to ships, ports, ship operating, sanitary problems, marine administration, combatting the substantial spillages of oil and other noxious substances. However there are questions still pending for solutions and research in scientific and technological cooperation among the Baltic States. The implementation of the Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area as a special area from the point of view of the IMCO Convention 1973 in respect to ships is discussed and conclusions concerning the time and conditions for effectiveness if the Convention enters into force are given. (See also W78-09805) (Sinha-OEIS)
W78-09811

PROCEDURES AND ARRANGEMENTS FOR THE DISCHARGE OF NOXIOUS LIQUID SUBSTANCES,
Norwegian Maratime Directorage, Oslo (Norway).
G. Stubberud.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p 175-191, 1 fig, 4 ref.

Descriptors: *Water quality control, *Water pollution, *Liquid wastes, Chemical wastes, Ships, Noxious liquid wastes, Ballast, Tankers, Outer Continental Shelf.

The 1973 Marine Pollution Convention has in Annex II laid down certain requirements with respect to the discharge of noxious liquid substances from chemical tankers in connection with tank cleaning operations. The present proposals to the procedures and arrangements for the discharge of noxious liquid substances are presented. The development of a formula to be used for calculation of the dilution capacity in the ship's wake is discussed. Possible ways of establishing the concentration of the substance in the discharge, the question of cargo residues left in the tank after unloading and the question of wash water to be used in the cleaning process are also discussed. The problems of how to treat soluble and insoluble products and certain practical methods related to these problems are given. (Sinha-OEIS)
W78-09812

SEGREGATED BALLAST TANKER ARRANGEMENTS FOR POLLUTION ABATEMENT DUE TO ACCIDENTS,
Exxon Research and Engineering Co., Linden, NJ. Logistics Dept.; Maritime Administration, Washington, DC. Div. of Ship Design; and Coast Guard, Washington, DC. Office of Merchant Marine Safety.
W. O. Grey, R. K. Kiss, and R. A. Sutherland.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p 285-313, 5 fig, 1 tab, 5 ref.

Descriptors: *Pollution abatement, *Water quality control, *Accidents, Ships, Oil spills, Tankers, Ballast, Outer Continental Shelf.

A study group composed of knowledgeable operating and technical professionals reviewed the issue of how best to utilize segregated ballast capacity specified for new tankers larger than 70,000 DWT in the 1973 International Convention for the Prevention of Pollution from Ships . Specifically, the study group wished to determine if there were preferable positions for placement of segregated ballast tanks which might serve as a defensive mechanism to mitigate or prevent accidental pollution and provide some measure of protection from other types of ship accidents. The group investigated twelve possible concepts for the locations of segregated ballast particularly in relation to ships of the 120,000 DWT to 250,000 DWT size. An evaluation of the merits of these twelve designs in comparison to a typical non-segregated ballast conventional tanker was conducted giving consideration to six types of accident circumstances of concern from the viewpoints of oil outflow, and safety of life and ship. The approach and primary findings of that study are presented in this report. The group wished to note that in its collective opinion the most effective measures for preventing accidental pollution and other types of major tanker accidents are those concerned with training and performance of ship's crew, and traffic and navigational improvements for ships of all types rather than further tanker design measures. (See also W78-09805) (Sinha-OEIS)
W78-09813

OIL-IN-WATER MONITORING ABOARD TANKERS,
F. J. Berto.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p 389-410, 6 fig.

Descriptors: *Monitoring, *Oil pollution, *Pollution abatement, *Water quality control, Ships, Water pollution, Ballast water, Deballasting, Tankers, Outer Continental Shelf.

A reliable, accurate oil-in-water monitor would assist tanker's 'Load on Top' deballasting operations by continuously indicating the oil contents of all water discharged overboard. The Inter-Governmental Maritime Consultative Organization (IMCO) 1973 'Internation Convention for Prevention of Pollution from Ships,' when ratified, will require installation and use of an oil-in-water monitor aboard tanks using 'Load on Top' or 'Retention on Board' deballasting procedures. The Oil Companies International Marine Forum (OCIMF) organized a task force in 1973 to accelerate the development of oil-in-water monitors suitable for use aboard tankers and to encourage early implementation and use. Considerable progress has been made in the past three years. Presently there are at least five different makes of oil-in-water monitors commercially available and approximately 200 are in service aboard tankers. Because of the lack of standard performance tests, the accuracy, response time, repeatability, and reliability of oil-in-water monitors are difficult to evaluate and there are problems with all of the current monitors. Regardless of the uncertainty about the exact performance characteristics, they are valuable as indicators of rising oil content in ballast water, and their intelligent use can assist in reducing inadvertent oil discharges from tankers. (See also W78-09805) (Sinha-OEIS)
W78-09814

SYSTEMS FOR MONITORING AND CONTROL OF DISCHARGED OIL--OIL CONTENT METERS,
Societe S.E.R.E.S. (France). Technical Div.
F. Guigues.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p 411-441, 5 fig, append.

Descriptors: *Monitoring, *Pollution abatement, *Waste water(Pollution), *Water quality control, Ships, Oil pollution, Coasts, Equipment, Ballast water, Outer Continental Shelf.

It is absolutely essential that choice of apparatus for use in measuring oil content of waste water discharged at sea should be suited to the objective in view. The specifications for this type of equipment embrace ten features including: measuring range; measuring frequency; oil quality; compliance with analysis standards; automatic continuous sampling apparatus; compliance with the 'intrinsic safety' condition; apparatus using no auxiliary solvent; precision of measurement; maintenance; and the possibility of connecting a black box for carrying out subsequent control. This paper gives an outline description of certain apparatuses which either are in fairly wide use or

which have made progress possible in studying ways of detecting oil content in ballast water from tankers. The ULTRA-RAPID RESPONSE DETECTOR (U.R.R.D.) has attracted particular notice because it meets the ten conditions listed above. Laboratory results from control loops are not being confirmed by those obtained on tankers in service. (See also W78-09805) (Sinha-OEIS)
W78-09815

CRUDE OIL WASHING,
R. Maybourn.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p. 507-521.

Descriptors: *Pollution abatement, *Water quality control, Oil pollution, Ships, Cleaning, Tankers, Crude oil, Outer Continental Shelf.

The use of water as the primary washing agent for tank cleaning has long been recognized as deficient in certain respects. In particular it contributes to the fundamental problem of bringing oil and water into contact and thereby helps to create certain pollution problems. For crude oil tankers, crude oil itself is a theoretically better washing agent. With the introduction of fixed washing systems and inert gas systems some time ago, crude oil washing has become feasible. The background to the research programme on crude oil washing undertaken by EP Tanker Company is discussed. The benefits of crude oil washing, both environmental and commercial, are analyzed and technical information on safety and other operation considerations are given. (See also W78-09805) (Sinha - OEIS)
W78-09816

REVISION OF 'CLEAN SEAS GUIDE FOR OIL TANKERS' WITH PARTICULAR REFERENCE TO PRODUCT TANKERS,
I. E. Le Cocq, and J. C. S. Horrocks.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p. 522-537.

Descriptors: *Oil pollution, *Water quality control, *Pollution abatement, Ships, Coasts, Regulations, Tankers, Oil tankers, Outer Continental Shelf.

In 1973 OCIMF and ICS jointly produced the 'Clean Seas Guide for Oil Tankers', Which was specifically designed to help shipboard personnel to comply with the oil discharge limits continued in the 1969 amendments to the 1954 International Convention for the Prevention of Pollution of the Sea by Oil. The Guide concerns itself with the processing of residues resulting from the carriage of persistent oils. The 1973 Convention, which deals with oils in any form but excluding petrochemicals, carries a footnote to Regulation 15, Annex I, which refers to the 'Clean Seas Guide for Oil Tankers' in connection with the operation manual for the retention of oil on board, approved by the Administration. A revised version of the Guide, which includes for the first time procedures for the retention on board of non-persistent oil residues, has now been prepared. (See also W78-09805) (Sinha - OEIS)
W78-09817

TECHNIQUES FOR CONTROLLING OIL DISCHARGE FROM PRODUCT OIL TANKERS,
Environmental Protection Agency, Washington, DC.; Federal Energy Administration, Washington, DC.; and Maritime Administration, Washington, DC.
H. D. Van Cleave, H. P. Santiago, and W. B. Chappel.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p. 557-588, 13 fig, 3 ref.

Descriptors: *Oil pollution, *Pollution abatement, *Water quality control, Water pollution, Ships, Cleaning, Tankers, Ballast water, Outer Continental Shelf.

Operation oil discharges into the ocean from tank cleanings of product oil tankers are a significant source of oceanic oil pollution. This fact was revealed in a United States study which was submitted to IMCO in October 1973. The impact of the 1973 Marine Pollution Convention on this trade is outlined and several possible solutions to comply with the new convention are discussed with particular emphasis on operational techniques, revealed as possibly suitable procedures by EPA and other studies. (See also W78-09805) (Sinha - OEIS)
W78-09818

FUEL FROM SLOP OIL,
W. H. Lockwood, Jr.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p. 589-607, 6 ref.

Descriptors: *Pollution abatement, *Water quality control, *Oil wastes, Ships, Water pollution, Cleaning, Equipment, Separation techniques, Tankers, Outer Continental Shelf.

Environmentally and economically the disposal of slop oils has been a problem for shipping companies. Increasing public awareness of pollution has resulted in more stringent laws and regulations. The best solution to the slop oil problem is onboard disposal and if this can be done in a manner benefitting the vessel owner as well as the environment, the solution becomes more acceptable. An answer has been found and is in use whereby the slop oil is separated from tank washing or ballast water through gravatation and the natural buoyance of the oil and problems such as emulsions and high salt content are solved by use of demulsifying chemicals and fresh water washes. This generally will yield a slop oil that is an acceptable fuel for the ships' main propulsion boilers. However, as this fuel may have a low viscosity (pumping considerations) and probably a low flash point (safety precautions) special piping, pumps, hardware and safety devices were developed to handle the slop oil. Laboratory tests, pilot plant data and actual operating experience has proven this system to be feasible. (See also W78-09805) (Sinha - OEIS)
W78-09819

HYDRAULIC TRANSPORTATION OF CARGO-TANK SLUDGE,
Japan Ships' Machinery Development Association, Tokyo; and Mitsubishi Heavy Industries Ltd., Nagasaki (Japan). Nagasaki Technical Inst.
S. Hasegawa, S. Fukuda, Y. Seike, and Y. Matsuo.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p 608-650, 14 fig, 6 tab, 6 photo.

Descriptors: *Pollution abatement, *Water quality control, Ships, Sludge disposal, Equipment, Coasts, Tankers, Cargo oil, Outer Continental Shelf.

A hydraulic sludge hauling device which offers far greater advantages in time and labor than the conventional method is described. The device eliminates the need for the washing of the ship deck fouled with sludge and thus contributes to the prevention of pollution of the sea by oil. With this device, the sludge in the bottom of the cargo tank is fluidized with water or cargo oil and transported by jet pump in a closed cycle to a sludge separator installed in a given cargo tank. The device is capable of handling about five times as much sludge as the conventional method and also permits the sludge in the separator to be discharged outboard with cargo oil when cargo oil is used as the fluidizing medium. All this results in a great reduction in the quantity of sludge to be disposed of at the time of repair docking, etc. The device has already been proved highly successful in extensive tests, and design work has been in progress for its marine application. (See also W78-09805) (Sinha-OEIS)
W78-09820

THE NEW DEBALLASTING AND WASHING STATION AT FOS/MARSEILLES,
Port Autonome de Marseille (France).
J. Graugeman, and P. Theobald.
In: Coast Guard Office of Marine Environment and Systems Report No. CG-WEP-1-77, April 1976. Symposium on Prevention of Marine Pollution from Ships, held in Acapulco, Mexico on 22-31 March 1976. p 651-683, 6 tab.

Descriptors: *Pollution abatement, *Water quality control, *Oil pollution, Ships, Oily water, Equipment, Coasts, Waste water treatment, Supertankers, Deballasting, Outer Continental Shelf, International Conventions, Marseilles, France.

The IMCO International Convention of 1973 introduced regulations governing special areas which are to come into force on 1 January 1977, and classified the Mediterranean Sea as a special area. These regulations prohibit any discharge of oil (and thus, in particular, any changing of ballast) in the Mediterranean. In order to satisfy the new needs arising out of the growing use of supertankers and the entry into force of the 1973 Convention, the Autonomous Port of Marseilles will in the course of 1977 put into service at Fos new facilities for the reception and treatment of oil mixtures or residues which will be more in relation to the scale of the problems posed. This station, which, since no comparable equipment exists, will represent a considerable innovation, in view of the standards envisaged and the difficulties peculiar to deballasting (great variations in discharge, salty effluents) will be served by a new berth which will be able to provide the nautical capacity essential for supertankers. (See also W78-09805) (Sinha-OEIS)
W78-09821

MANAGEMENT OF WATER QUANTITY AND QUALITY IN AN ARID URBAN ENVIRONMENT: A STUDY OF LAS VEGAS VALLEY, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-09826

POLYMERIC AND CELLULOSE FIBER MATERIAL FOR REMOVING OIL FROM WATER,
Conwed Corp., St. Paul, MN. (Assignee).
D. E. Wiegand, F. H. Riedel, and O. R. Videen.
U.S. Patent No. 4,070,287, 4 p, 8 ref; Official Gazette of the United States Patent Office, Vol 966, No 4, p 1492, January 24, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Oily water, WAter pollution treatment, Water quality control, *Cellulose, *Adsorption, Fibers, Separation techniques, *Polymeric fibers.

Material comprising a blend of polymeric fibers and cellulosic fibers is formed into a bonded or unbonded web or mat-like structure or merely blended and inserted into a fine mesh net-like enclosure. The primary material comprises polymer-

ic fiber and the secondary material comprises cellulosic fiber preferably wood fiber. The bonded mat-like structure finds particular use in removing oil from the surface of water because the mat-like structure permits its to float on the surface of the water. The unbonded structure retained in a net-like structure or bag finds particular use where the oil is contacted by floating oil sorbent booms formed by the filled net-like structures or bags which are removed when the oil is sorbed. (Sinha-OEIS)
W78-09837

BIOELECTRIC NEUTRALIZATION OF ACID WATERS,
Office of Secretary (Interior), Washington, DC. (Assignee).
For primary bibliographic entry see Field 5D.
W78-09852

ENVIRONMENTAL WATCHDOGS: WHO ARE THEY,
P. J. Kendrick.
Journal Water Pollution Control Federation, Vol. 49, No. 8, p 1759-1761 (August, 1977).

Descriptors: *Administrative agencies, *Institutional constraints, *Environment, *Organization, *Political constraints, Adjudication procedure, Administration, Coast Guard regulation, Ecology, Economic impact, Economics, Environmental control, Federal government, Institutions, Judicial decisions, Legal aspects, Political aspects, Social aspects, Water law, Natural resources.

With the rise in public concern for the natural environment and the passage of tough new environmental legislation in the 1970's, environmental public interest groups began subjecting the activities of government and business to a constant challenge. Organizations such as the National Resources Defense Council (NRDC), the National Wildlife Federation (NWF), and the Environmental Defense Fund (EDF) have emerged as vigorous and effective environmental watchdogs and have a great impact on the conduct of environmental programs. Lawsuits initiated by these groups have resulted in: (1) court ordered deadlines for promulgation of regulations by the Environmental Protection Agency (EPA); (2) tighter regulation of ocean dumping of wastes; (3) banning of the pesticide DDT; (4) court ordered promulgation of federal oil tanker standards by the United States Coast Guard; (5) court ordered extension of United States Army Corps of Engineers jurisdiction over dredge and fill operations to areas above the mean high tide mark; and (6) enlargement of EPA's list of toxic materials to include carcinogens, heavy metals and radionuclides. The experiences of NRDC, NWF, and EDF clearly illustrate the importance of the role such organizations play in influencing the course of public action and environmental protection. (Jordan-Florida)
W78-09854

THE MILWAUKEE CASE: CHANGING THE RULES FOR WATER CLEAN-UP,
P. S. Ward.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 188-190 (February, 1978).

Descriptors: *Common law, *Governmental interrelations, *Lake Michigan, *Municipal wastes, *Storm runoff, Eutrophication, Federal government, Federal Water Pollution Control Act, Great Lakes, Illinois, Judicial decisions, Law enforcement, Legal aspects, Legislation, Local governments, Public health, State governments, Water pollution control, Water pollution sources, Wisconsin.

Municipal and state officials, believing themselves safe from water pollution enforcement action because they are in compliance with the Federal Water Pollution Control Act and relevant state legislation, may find it a rude shock to learn that the common law on nuisance can dramatically change the rules for water clean-up. Illinois sued Milwaukee seven years ago, charging that wastewater discharged by the city into Lake Michigan endangered the health of Illinois citizens and accelerated eutrophication of the lake. The Chicago federal district court ruled, on the basis of the common law of nuisance, that Milwaukee must completely eliminate its combined storm overflow problem and must meet water standards stricter than those currently required by either the state of Wisconsin or the United States Environmental Protection Agency (EPA). Cleaning up Greater Milwaukee's water poses for Wisconsin its most serious financial problem for the balance of the century. The author warns that Milwaukee's decision has established a precedent that could become a problem in the future. The common law nuisance principle has the potential of wrecking havoc on the whole water pollution control system established by Congress and administered by the EPA. (Jordan-Florida)
W78-09855

MINERAL MINING AND PROCESSING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol. 42, No. 133, p 35843-35852, July 12, 1977.

Descriptors: *Permits, *Mine wastes, *Water pollution sources, *Mining, *Regulation, Water pollution, Water pollution control, Industrial wastes, Mine drainage, Sands, Phosphates, Gravels, Sediments, Administrative agencies, Water law.

The Federal Water Pollution Control Act (FWPCA) requires the Environmental Protection Agency (EPA) to issue rules to regulate the discharge of pollutants into the nation's waters. Contained herein are final rules promulgated by the EPA to limit the discharge of pollutants into navigable waters from existing crushed stone, construction sand and gravel, industrial sand, phosphate rock and mining operations. These limitations will be incorporated into the National Pollutant Discharge Elimination System (NPDES) permit program. Effluent limitations are established in these regulations for total suspended solids (TSS) and pH. The regulations govern discharges of process generated waste water pollutants and discharges of mine denaturing pollutants by existing sources in all four of the above industrial categories. The rules also contain supplementary information pertaining to the background, legal authority, summary and basis of regulations, summary of public participation, summary of major changes, economic analysis and Small Business Administration Loans. (Curran-Florida)
W78-09856

THE COST OF COMPLYING WITH FEDERAL WATER POLLUTION LAW,
B. A. Gelb.
The Conference Board Record, Vol. 12, No. 12, p 27-30, Dec. 1975. 2 tab.

Descriptors: *Federal Water Pollution Control Act, *Cost analysis, *Future planning(Projected), *Water quality control standards, *Economic impact, Discharge(Water), Waste water(Pollution), Pollutants, Waste disposal, Industrial wastes, Environmental effects, Regulation, Water quality control, Pollution abatement, Cost trends, Water law, Cost-benefit analysis, Waste water disposal.

A study by The Conference Board found that the cost impact of the 1972 amendments to the Federal Water Pollution Control Act was important to four out of the five major water-using manufacturing industries examined. The manufacturing sector accounts for most industrial pollution, discharging three times as much organic pollutants and twice as much suspended solids as municipal systems. In determining compliance costs, the economic impact on the industries was considered to be the incremental effects of the 1972 amendments, over and above developments that would have occurred if the law had not been passed. Estimates were limited to the impact on production costs and investment expenditures. Treatment of wastewater was not the only means of reducing pollutants considered; all aspects of productive activity that causes pollution were examined. The procedure did not cover the derived impacts on other industries and sectors, nor aspects other than investment and operating expenditures for the industries. For the five industries examined, estimated annual abatement costs in 1977 ranged between 0.3% and 1.6% of the value of shipments. After 1977 additional abatement costs ranging from 0.7% to 3.7% are expected. (Rule-Florida)
W78-09857

COASTAL ENERGY IMPACT PROGRAM ASSESSMENTS AND ENVIRONMENTAL IMPACT STATEMENTS.
National Oceanic and Atmospheric Administration, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-09858

THE COASTAL ZONE MANAGEMENT ACT AMENDMENTS OF 1976: TAILORING COASTAL ZONE PROTECTION TO EXPANDED OFFSHORE OIL PRODUCTION.
For primary bibliographic entry see Field 6E.
W78-09859

POUNDS OF CURE: GENERAL ELECTRIC AGREES TO PCB ABATEMENT, CLEANUP AND RESEARCH.
For primary bibliographic entry see Field 6E.
W78-09860

NATIONAL UNIFORMITY UNDER THE WATER ACT: TWO CIRCUITS UPHOLD EPA'S AUTHORITY TO ISSUE EFFLUENT LIMITATIONS UNDER SECTION 301.
For primary bibliographic entry see Field 6E.
W78-09862

RECENT STATE WETLANDS CASES: THE CONTINUING BATTLE OVER THE PROPER SCOPE OF REGULATION.
For primary bibliographic entry see Field 6E.
W78-09864

ENVIRONMENTAL IMPACTS OF DREDGING IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W78-09868

TRANSNATIONAL PETROLEUM COMPANIES AND NEW DEVELOPMENTS IN SEA LAW,
Illinois State Univ., Normal. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W78-09870

LEGISLATION, PROGRAMS AND ORGANIZATION.
Environmental Protection Agency, Washington, DC. Office of Resource Management.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 873, Price codes: A04 in paper copy, A01 in microfiche. January, 1977. 63 p.

Descriptors: *Environmental control, *Pollution abatement, *Water quality control, *Federal Water Pollution Control Act, Legislation, Water law, Federal government, Clean Air Act, Air pollution, Effluents, Water supply, Wastewater disposal, Permits, Municipal water, Solid wastes, Pesticides, Radioactive wastes, Toxins, Administrative agencies.

This document summarizes the programs of the Environmental Protection Agency (EPA). The history and present organization of the EPA is included along with the legislation authorizng its activities. Some detail is given concerning EPA's pollution control programs and budget. An organizational directory, as well as a list of the EPA's major facilities is given. The pollution control programs that are summarized are as follows: (1) air; (2) water quality; (3) water supply; (4) solid wastes; (5) pesticides; (6) radiation; (7) noise; (8) toxic substances; (9) research and development; (10) agency and regional management; and (11) program management and support. The emphasis of the water quality program has been on controlling discharge of pollutants into the nation's waterways from industrial and municipal sources. The three major methods of control used are: (1) issuing waste water discharge permits; (2) promulgating effluent guidelines; and (3) improving the coverage and efficiency of publicly owned waste treatment works. The primary objective of the water supply program is to provide safe drinking water. (Quarles-Florida)
W78-09873

NATIONAL WATER QUALITY INVENTORY 1975 REPORT TO CONGRESS.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 515, Price codes: A07 in paper copy, A01 in microfiche. 1975. 132 p.

Descriptors: *Water quality, *Water pollution control, *Environmental effects, *Eutrophication, *Federal Water Pollution Control Act, Coliforms, Nutrients, Phosphorus, Water pollution, Dissolved oxygen, Urban hydrology, Water supply, Data collections, State governments, Lakes, Project planning, Streams, Federal government, Administrative agencies, Pollutants.

The Environmental Protection Agency and state governments collaborated in this national water quality inventory. As for current water quality conditions, some improvements were reported but many problems still exist. The problems most frequently mentioned concerned dissolved oxygen, coliform bacteria, and nutrients. Phosphorus concentration in most lakes was also reported with predictions of eutrophication symptoms. Oxygen-demanding loads and coliform bacteria problems were showing signs of improvement as a result of control. However, nitrogen and phosphorus trends were reported to be worsening. Problems varied according to geographic region and land use. Higher levels of fecal coliform bacteria and nutrients were reported in municipal and industrial areas. Higher nutrient levels were found in agricultural regions. In order to meet the 1983 goals of the 1972 Federal Water Pollution Control Act Amendments, the states agreed on the need for increased emphasis to control both and rural runoff. There was disagreement on analysis of the costs versus the benefits of water quality programs. (Quarles-Florida)
W78-09874

IDENTIFICATION OF SELECTED FEDERAL ACTIVITIES DIRECTED TO CHEMICALS OF NEAR-TERM CONCERN.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 494, Price codes: A03 in paper copy, A01 in microfiche. July, 1976. 29 p.

Descriptors: *Chemicals, *Environmental effects, *Toxicity, *Federal government, Chlorides, Environment, Polychlorinated biphenyls, Asbestos, Arsenic compounds, United States, Pollutants, Water pollution, Water pollution sources, Water quality, Water pollution effects, Ecology, Air pollution, Air pollution effects, Environmental control, Technology, Water law.

The Office of Toxic Substances has prepared a report which lists ongoing research projects of the Environmental Protection Agency (EPA) concerning selected chemicals of near-term concern. Programs related to asbestos, arsenic, benzidine, ethylene dibromide, hexachlorobenzene, hexachlorobutadene, polybrominated biphenyls, polychlorinated biphenyls, vinyl chloride and vinylidene chloride are identified and discussed. Many of the programs deal directly with water law. A study of the use of asbestos/cement pipe in transporting drinking water is cited. Experiments are underway to determine the effects on aquatic life of the asbestos fiber content of Lake Superior. Research is continuing on the health effects of arsenic in drinking water. The toxicity of hexachlorobenzene (HBC) to aquatic organisms is being studied and HBC levels in drinking water are being monitored. The health effects of polychlorinated biphenyls in drinking water is the subject of another project. Other projects analyze methods for measuring toxic pollutant levels and various methods of removal. Studies related to water quality criteria are being conducted for polychlorinated biphenyls, hexachlorobenzene, arsenic and asbestos. As for vinyl chloride, EPA is determining what authority might be used to control leaching from equipment used in transporting drinking water. (Quarles-Florida)
W78-09877

CONTROL OF MARINE POLLUTION: AN ESSAY REVIEW,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
M. Waldichuk.
Ocean Development and International Law Journal, Vol. 4, No. 3, p 264-295 (1977).

Descriptors: *Law of the Sea, *Environmental control, *Marine geology, *Water pollution control, Marine animals, Legal aspects, International waters, International law, International commissions, Control systems, Economic impact, Economics, Environmental effects, Legislation, Political aspects, Water quality, Water pollution sources, United Nations.

This article reviews the pressing need for international control of marine pollution as dealt with in three books; Who Protects the Ocean, International Marine Environment Policy: The Economic Dimension, and Towards an Environmentally Sound Law of the Sea, and a report entitled Disposal in the Marine Environment--An Oceanographic Assessment. Emphasis is placed on segments of the books dealing with the Third United Nations Conference on the Law of the Sea. The documents reviewed deal mainly with the scientific, economic, legal and sociopolitical aspects of international protection of the marine environment. The underlying principles of marine pollution controls common to each publication are also discussed. Topics included are the effects and types of environmental contaminants, the scientific basis for marine pollution control, and the present status of international environmental agreements. A table listing international conventions and other agreements for the control of marine pollution is included. This table lists the pollutants concerned, the responsible body, and the status of each agreement as of September, 1976. (Howard-Florida)
W78-09878

WETLANDS: WHERE DEVELOPERS AND REGULATORY PROGRAMS MEET,
Washington State Dept. of Ecology, Olympia.
C. B. Roe.
Real Property, Probate and Trust Journal, Vol. 11, No. 4, p 701-10, Winter, 1976.

Descriptors: *Water pollution, *Regulation, *Legislation, *Administrative agencies, *Permits, Water pollution control, Water pollution sources, State governments, Federal government, Governmental interrelations, Inter-agency cooperation.

Prior to the Federal Water Pollution Control Act Amendments of 1972, states were independently responsible for eliminating pollution. The act established new programs which gave the Environmental Protection Agency (EPA) vast regulatory authority. Three of these programs are discussed in this article: (1) the National Pollutant Discharge Elimination System, (2) the section 208 planning program, and (3) the dredge and fill program of section 404. A detailed analysis of the latter program is included. Administration of these programs is the joint responsibility of the EPA and the U.S. Army Corps of Engineers. In implementing the newly expanded federal rule, the Corps has often issued overbroad policy statements. For example, the expansiveness of the Corps permit programs is shown by the definitions provided in two critical areas: (1) navigable waters and (2) dredge and fill materials. In addition, multiple permits are often required for simple alteration of farmlands. In recent years, the number of permits required before a development may be initiated has increased substantially. To eliminate these difficulties, the author suggests that a one-procedure mechanism, whereby all applications for permits are subjected to one public process, be implemented. (Thomas-Florida)
W78-09879

ALBRECHT V. DEPARTMENT OF ENVIRONMENTAL REGULATION (FLORIDA'S PARTIALLY SUBMERGED LAND FILL PERMIT APPLICATION AND REVIEW STATUTE PROCEDURALLY CONSTITUTIONAL).
For primary bibliographic entry see Field 6E.
W78-09886

PORTER COUNTY CHAPTER OF IZAAK WALTON LEAGUE OF AMERIKA, INCORPORATED V. COSTLE (STANDARDS FOR POLLUTION DISCHARGE PERMITS).
For primary bibliographic entry see Field 6E.
W78-09888

ENVIRONMENTAL DEFENSE FUND INC. V. EAST BAY MUNICIPAL UTILITY DISTRICT (UTILITY DISTRICT'S AUTHORITY TO CONTRACT FOR WATER PURCHASE FROM FEDERAL WATER PROJECT).
For primary bibliographic entry see Field 6E.
W78-09893

CONSERVATION COUNCIL OF NORTH CAROLINA V. FROEHLKE (IMPOUNDMENT OF WATER BEHIND DAM; PRIVATE PROPERTY RIGHTS SUBJECT TO NAVIGATIONAL SERVITUDE; NATIONAL ENVIRONMENTAL POLICY ACT SATISFIED).
For primary bibliographic entry see Field 6E.
W78-09897

TUG OCEAN PRINCE, INC. V. UNITED STATES (LIABILITY OF TUG BOAT OWNERS FOR CLEAN UP COSTS OF OIL SPILL CAUSED BY COLLISION WITH SUBMERGED ROCKS).
For primary bibliographic entry see Field 6E.
W78-09900

CENTRAL COLORADO WATER CONSERVANCY DISTRICT V. ENVIRONMENTAL PROTECTION AGENCY (WATER POLLUTION ELIMINATION REGULATIONS CHALLENGED).
For primary bibliographic entry see Field 6E.
W78-09904

PREDICTING EFFECTS OF SULFURIC ACID ON QUALITIES OF IRRIGATION AND DRAINAGE WATERS IN CALCAREOUS SOILS,
Texas A and M Univ. Agricultural Research Station El Paso.
S. Miyamoto.
Journal of Environmental Quality, Vol 6, No 1, p 12-18, January-March 1977. 3 fig, 4 tab, 24 ref.

Descriptors: *Sulfuric acid, *Calcareous soils, *Irrigation water, Drainage water, Water quality, Simulation analysis, Model studies, Path of pollutants, Water pollution, *Forecasting.

Considerable quantities of sulfuric acid are being utilized in the southwestern United States for soil and water treatment. Future acid production may exceed demand and thus require disposal in some manner. Acid application or disposal to soils and water raises a question concerning effects on wate quality. A numerical method is presented for predicting the effects of H2S04 on qualities of irrigation and drainage waters, excluding trace elements, in calcareous systems. The method is based on known relations between ion equilibria and the solubility of calcite, magnesite, and gypsum. Computed results are presented for acid applied to waters or to soils under several hypothesized conditions, and compared with some reported laboratory or lysimeter data. Results indicate: (1) the numerical method is a promising tool, but requires further experimental verification; (2) acid effects on water quality depend strongly on CO2 partial pressure and properties of soils and water, besides application rates; and (3) the assumption that acid application produces equivalent amounts of soluble salts is an oversimplification. (Skogerboe-Colorado State)
W78-09944

LOSS OF SPRAY AND PELLETED PICLORAM IN SURFACE RUNOFF WATER,
Agricultural Research Service, College Station, TX.; and Agricultural Research Service, Temple, TX.
For primary bibliographic entry see Field 5B.
W78-09965

PERSISTENCE OF TEBUTHIURON IN SURFACE RUNOFF WATER, SOIL, AND VEGETATION IN THE TEXAS BLACKLANDS PRAIRIE,
Agricultural Research Service, College Station, TX.
For primary bibliographic entry see Field 5B.
W78-09966

SOME RESEARCH AND INFORMATION NEEDS IN SURFACE WATER QUALITY.
American Water Resources Association, St. Paul, MN. Research Committee.
Water Resources Bulletin, Vol 14, No 3, p 517-523, June 1978.

Descriptors: *Research priorities, *Water quality, *Surface waters, Water pollution, Pollutants, Water pollution sources, Toxins, Eutrophication, Nitrification, Algae, Viruses, Erosion, Sedimentation, Organic compounds, Dissolved oxygen, Information exchange.

Although a large sum of money has been spent in the last decade on water pollution control, many of the country's surface water resources continue to be degraded and impaired. In some cases, the answer to achieving desirable water quality might be more treatment. However, in many cases, adequate knowledge is still lacking of basic aquatic processes and of suitable methods of resource assessment to determine the correct course of action. This article cited selected research and information needs in the field of surface water quality. The list reflected the views of the present AWRA Research Committee and, admittedly, is noninclusive. Moreover, the list relects an attitude that highest priorities should be placed on those needs that will aid the solution of important environment problems. (Sims-ISWS)
W78-09979

PERCOLATION RATES WITH SURFACE LAYERS OF GRAVEL OR CLAY FLOCS ON SOIL FED CLEAR AND TURBID WATERS,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 4B.
W78-09983

AQUIFER STORAGE OF HEATED WATER: PART I - FIELD EXPERIMENT,
Auburn Univ., AL. Dept. of Civil Engineering.
F. J. Molz, J. C. Warman, and T. E. Jones.
Ground Water, Vol. 16, No. 4, p 234-241, July-August 1978. 7 fig, 1 tab, 23 ref.

Descriptors: *Thermal pollution, *Heated water, *Underground storage, *Water storage, Aquifers, Aquitards, Pumping, Injection wells, Observation wells, On-site investigations, Powerplants, Energy, Energy loss, Groundwater, *Heated water storage.

Electrical power plant and solar heating systems have been proposed wherein confined groundwater aquifers are used as temporary storage reservoirs for thermal energy in the form of moderate to high temperature water. The Water Resources Research Institute of Auburn University has performed an aquifer storage experiment involving warm water (97F; 36C). The objectives of the experimental program were to begin actual testing of the concept of heat storage in aquifers and to provide data for calibration of mathematical models describing the simultaneous transport of water and heat. Phase I consisted of drilling an exploratory well at the selected field site near Mobile, Alabama. Phase II involved contruction of the central injection well, three observation wells, and performance of preliminary pumping tests. Phase III was devoted to construction of the remainder of the observation well field, performance of final pumping tests, and measurement of aquifer thermal properties; while Phase IV was devoted to a cycle of warm water injection, storage, and recovery. It was concluded that heat storage aquifers must have low natural pore velocities, and care must be taken not to clog the injection well with solids or precipitated chemicals. Swelling of clays in the storage formation must be minimized, and hydraulic pressures capable of breaching the confining layers must be avoided. Mechanical and chemical clogging problems may be minimized by using formation water as influent to the heating system. For a 36-day storage of 2 million gallons, the calculated energy recovery factor of 0.69 was considered promising. (Sims-ISWS)
W78-09986

ARSENIC CONCENTRATIONS IN SURFACE RUNOFF FROM SMALL WATERSHEDS IN TEXAS,
Agricultural Research Service, Temple, TX.
For primary bibliographic entry see Field 5B.
W78-09997

WATER RESOURCES AND EFFLUENT DISPOSAL - KEY FACTORS IN MIDDLE EASTERN DEVELOPMENT,
L. T. Cooper, and M. J. Harper.
Water Services, Feb 1976, p 83-86. 1 fig.

Descriptors: *Foreign trade, Export, *Effluents, *Middle East, *Piping systems(Mechanical), Sewage disposal, Marketing, Economic efficiency, Planning, Demand, Profit, Drainage systems, Conduits, Pipes, Pipelines.

British involvement in middle eastern development projects has done much recently to bolster her economically. The sale of water supply, sewage, and effluent pipelines as well as the addition to or replacement of existing facilities, provides a large market for British contractors and manufacturers. Many of the largest contracts involve exploiting natural resources or the construction of desalinization plants and their accompanying pipelines. Contracts for new drainage schemes involve every aspect of pipeline technology. Redland Pipes Ltd. has developed a new Fibaflo GRP pipe that has brought much attention to the British pipe industry. This new GRP pipe leads the industry in possessing all the essential properties demanded by working conditions in the Middle East. (Tickes-Arizona)
W78-10009

A LOW-SALT DIET FOR THE COLORADO RIVER,
Soil Conservation Service, Phoenix, AZ.
C. Williams, and A. Zack.
Soil Conservation, Vol. 42, No. 11, p 13-17, June, 1977.

Descriptors: *Irrigation efficiency, *Irrigation design, *Irrigation practices, *Irrigation programs, Return flow, Salinity, Federal government, Mexico, *Drip irrigation, Colorado River, Arizona, Colorado River Basin Salinity Control Program.

As part of the Colorado River Basin Salinity Control Program, the Soil Conservation Service is conducting an on-farm irrigation project designed to reduce salty return flows by increasing irrigation efficiency on farmland in the Wellton-Mohawk area of western Arizona. Local farmers sign contracts to develop and apply conservation plans that include practices such as drip irrigation, and precise land levelling as well as an enlargement and concrete lining of irrigation ditches. The project is evaluated by comparing the amount of water used on each farm before improvements are made to that used afterwards. As of the end of June, 1977, irrigation efficiency had increased to 85% on 865 acres of alfalfa; to 97% on 748 acres of cotton; and to 67% on 1,004 acres of wheat. (Russell-Arizona)
W78-10013

REHABILITATION OF COPPER MINE TAILING SLOPES USING MUNICIPAL SEWAGE EFFLUENT,
Arizona Univ., Tucson. School of Renewable Natural Resources; and Cyprus Pima Mining Co., Tucson.
T. R. Verma, K. L. Ludeke, and A. D. Day.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings of the 1977 Meetings of the Arizona Section, American Water Resources Assn.; and the Hydrology Section, Arizona Academy of Science, April 15-16, Las Vegas, Nevada, p 61-68. 5 fig, 3 tab, 4 ref.

Descriptors: *Reclamation, *Mine wastes, *Revegetation, Arizona, *Sewage effluents, Spoil banks, Desert plants, Mesquite, Alfalfa, Barley, Vegetation establishment, Irrigation effects.

The feasibility of rehabilitating copper mine tailing slopes with several species of trees, legumes, and grasses irrigated with municipal sewage effluent was examined at Cyprus Pima Mining Company south of Tucson, Arizona, in the Sonoran Desert. Various sprinkler and tree-well irrigation methods were tested, and a system developed for irrigating 1-acre test plots on a tailing slope with sewage effluent and a similar control plot using fresh well water. Results of plant growth over a 2-year period

were compared, showing that at the same rate of application, 2p4 inches per irrigation, irrigation with effluent resulted in higher yields than that with well water, with or without amendments. Survival rates and crown growth of trees were also higher. Tree species used in the trials included eucalyptus, mesquite, palo verde, as well as desert tobacco, barley, rye grass, alfalfa, and lupine. In critical water areas where mining activities generate mine spoils, the possibility of using sewage effluent for irrigation of tailing dumps is one which has extensions in other food growing situations. (Paylore-Arizona)
W78-10024

MANAGEMENT PROGRAMS, RESEARCH AND EFFECTS OF PRESENT LAND USE ACTIVITIES ON WATER QUALITY OF THE GREAT LAKES. VOLUME I.
International Reference Group on Great Lakes Pollution from Land Use Activities. U.S. Section of Task Group A.
For primary bibliographic entry see Field 5B.
W78-10026

MANAGEMENT PROGRAMS, EFFECTS OF RESEARCH AND PRESENT LAND USE ACTIVITIES ON WATER QUALITY OF THE GREAT LAKES. VOLUME II.
International Reference Group on Great Lakes Pollution from Land use Activities. U.S. Section of Task Group A.
For primary bibliographic entry see Field 5B.
W78-10027

REGIONAL OIL AND HAZARDOUS MATERIALS POLLUTION CONTINGENCY PLAN, REGION V (INLAND).
Environmental Protection Agency, Chicago, IL. Region V.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 640, Price codes: A07 in paper copy, A01 in microfiche. February 1972, 148 p, 13 annexes.

Descriptors: *Oil spills, *Oil pollution, *Water pollution control, *Accidents, *Spills, Regional analysis, Federal government, Federal jurisdiction, Local governments, State governments, State jurisdictions, Law enforcement, Legislation, Regulations, Economics, Cleaning, Personnel, Standards, *Marine transportation, *Hazardous substances.

The objectives of this plan were: to develop systems for discovering and reporting pollution spills of oil or other hazardous substances; to institute measures to restrict the spills' spread; to assure public health and welfare; to apply cleanup techniques; to recover cleanup costs; and to effect enforcement of Federal statutes. The plan represents an agreement among concerned federal departments and agencies to develop a system of coordinated and integrated response to discharges of such spills. The plan reviewed federal policy and both federal and non-federal responsibility in pollution spills. Planning and response elements were then outlined, including suggestions for both national response and regional response centers and teams. The objectives of the federal response plan are: discovery and notification; containment and countermeasures; protection of public health and welfare; cleanup and disposal; restoration; and recovery of damages and enforcement. Coordinating instructions were presented with authority delegated and multiregional actions outlined. Regulations for U.S. public vessels and federally operated facilities were presented, followed by a specific section on nuclear pollution. A general pattern of response action finalized the plan. (Zayac-NC)
W78-10029

WATER QUALITY WATER SUPPLY STUDY, ARKANSAS RIVER BASIN, JOHN MARTIN DAM, COLORADO TO GREAT BEND, KANSAS. DRAFT.
Environmental Protection Agency, Dallas, TX. Region VI.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 380, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Army Engineer District, Albuquerque, NM, January 1972, 42 p, 13 tab, 1 fig.

Descriptors: *Water quality, *Water supply, *Reservoir storage, *Groundwater resources, *Surface water availability, *Reservoirs, Kansas, Colorado, Groundwater availability, Cities, Irrigation, Industries, Management, *Arkansas River Basin, John Martin Dam(CO), Great Bend(KA).

The purpose of the study was to determine the need for and value of reservoir storage to the year 2070, both for water quality control purposes and for municipal and industrial water supply for those reaches of the Arkansas River Basin indicated. The planning area included five counties in Colorado and 16 counties in Kansas. The study found that reservoir storage for water quality control releases was no justified. Several municipalities in the study area would have benefitted from new sources of better quality water. Groundwater is crucial to the planning area because it supplies all municipal areas; but it is variable in quality, and quantity has been depleted because of heavy pumping. The report recommends proper control and regulation of groundwater pumping for mining and irrigation purposes; the Horse Thief Canyon Reservoir Project was also recommended in order to augment growing municipal and industrial water demands. Another suggestion was that the proper Federal and state agencies determine the safe yield of the area's groundwater reservoir and also define specific areas suitable for development of groundwater for municipal and industrial uses. Finally, the states were urged to develop a program for groundwater management, and only after so doing, begin to study the benefits of development of surface water for use. (Zayac-NC)
W78-10031

HYDROLOGIC DATA FOR THE COPPER BASIN AREA, A POTENTIAL MINING AREA IN YAVAPAI COUNTY, ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10040

RIVER QUALITY ASSESSMENT: IMPLICATIONS OF A PROTOTYPE PROJECT,
Geological Survey, Portland, OR. Water Resources Div.; and URS Co., Seattle, WA.
D. A. Rickert, and W. G. Hines.
Science, Vol 200, No 4346, p 1113-1118, June 1978. 2 fig, 2 tab, 17 ref.

Descriptors: *Water quality standards, *Rivers, *United States, *Evaluation, *Prototype tests, Oregon, *Willamette River(Ore), Water resources management.

The U.S. Geological Survey recently completed an intensive river quality assessment study of the Willamette River basin, Oregon. The most noteworthy finding was that across-the-board advanced waste treatment was not the answer to the problem of meeting stringent water-quality standards established for the Willamette River. This implies that rigid nationwide standards and regulations are likely to result in unneeded expenditures in some river basins and in unachieved standards in others. It was also found that existing water-quality data collected under monitoring-and surveillance-type programs are inadequate for defining the critical cause-effect relationships that control river quality problems. Intensive, synoptic surveys keyed to local problems and conditions are required to provide an adequate information base for making key management decisions. (Woodard-USGS)
W78-10052

AQUIFER STORAGE OF HEATED WATER: PART II - NUMERICAL SIMULATION OF FIELD RESULTS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-10080

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-10094

APPLICABILITY AND RELIABILITY OF TELEMETRIC NETWORKS FOR REAL-TIME WATER QUALITY CONTROL,
Association of Bay Area Governments, Berkeley, CA.
Y. J. Litwin, and E. F. Joeres.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 275-291, 1978. 5 fig, 2 tab, 10 ref.

Descriptors: *Water quaity control, *Reliability, *Telemetry, *Networks, *Real time, *Data requirements, Monitoring, Management, Sampling, Frequency, Measurement, Computer models, Linear dynamic systems, Stochastic-dynamic control, Missing data, Lower Fox River(Wis), Uncertainties, Equations, Systems analysis.

Continuous water quality records generated by telemetric surveillance networks are examined in light of their utility for identification and implementation of real-time systems. Such systems are possible in principle if two conditions are met: (1) the existence of a telemetric network capable of continuous transmittal to a central location of data from a large number of monitors, and (2) the availability of various management options for immediate quality improvement (i.e., flow augmentation, artificial reaeration, etc.). This paper investigates data requirements for identification of such real-time control systems. These requirements are then contrasted with the reliability of data generated during a three-year period by a five-station telemetric network on the Lower Fox River in Wisconsin. The discussion focuses on: (1) the problem of missing data, and (2) the representativeness of data, i.e., the adequacy with which they actually represent ambient water quality conditions. Some additional uncertainties involved in implementing real-time control systems also are briefly examined. (See also W78-10094) (Bell-Cornell)
W78-10110

KARMEX HERBICIDE WITH FERTILIZATION AND AERATION TO CONTROL FILAMENTOUS ALGAE IN HATCHERY PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
G. E. Kirby, and E. W. Shell.
In: Proceedings of the Twenty-Ninth Annual Conference, Southeastern Association of Game and Fish Commissioners, October 12-15, 1975, St. Louis, Missouri, p 279-281. 2 tab, 5 ref.

Descriptors: *Algae, *Herbicides, *Aquiculture, *Water quality, Control, *Dissolved oxygen, *Algicides, *Algal control, Fish farming, *Farm ponds, *Fouling, *Light penetration, Aquatic plants, Fish management, Phytoplankton, *Pithophora, Spirogyra, Karmex, *Filamentous algae.

Six 0.10-acre hatchery ponds containing striped bass fingerlings were treated with Karmex herbicide in an effort to control filamentous algae composed mainly of the genera Pithophora and Spirogyra. Ponds treated were fertilized and aerated immediately after applications of Karmex. Shortly after treatment with Karmex, large mats of filamentous algae floated to the surface, decayed, and were broken into fragments by agitation from aerators. The fragments settled to the pond bottoms. Dissolved oxygen concentrations dropped rapidly for several days following treatment, but remained above critical levels and then increased slowly. After 11 to 13 days dissolved oxygen concentrations at sunrise were above 8.0 mg/l and aeration was discontinued. Dense phytoplankton blooms, believed to be a result of both fertilization and release of nutrients tied up in the filamentous algae, developed 13 to 17 days after treatment with Karmex, and prevented new growths of filamentous algae. Draining of ponds 44 to 97 days after treatment revealed no significant growths of filamentous algae. (EIS-Katz)
W78-10146

POTENTIAL FOR SOFT SHELL CRAB PRODUCTION UTILIZING HEATED EFFLUENTS FROM POWER PLANTS IN THE GALVESTON BAY SYSTEM,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
M. C. Parker, R. Holt, and K. Strawn.
In: Proceedings of the Twenty-Ninth Annual Conference, Southeastern Association of Game and Fish Commissioners, October 12-15, 1975, St. Louis, Missouri, p 215-222. 1 fig, 7 tab, 7 ref.

Descriptors: *Crabs, *Aquiculture, *Commercial shellfish, *Water temperature, Environmental effects, *Growth rates, *Powerplants, *Heated water, Crustaceans, Invertebrates, Density, Aquatic habitats, Shellfish farming, Water quality, Equipment, Temperature, Callinectes, *Soft shell crabs, *Blue crabs.

Blue crabs (Callinectes sapidus) stocked in cages at two different densities both with and without artificial habitats were compared for growth and survival in a power plant discharge canal and in a pond. Survival was higher for crabs in the pond but growth was significantly greater for those in the discharge canal. Artificial habitats increased survival of crabs cultured in the discharge canal but had no effect on those aged in the pond. In the laboratory no significant differences were found in weight, carapace width, or survival of crabs selected at random in regards to molting cycle and placed in individual molting chambers at 30C and ambient temperatures. In 35 days the greatest increases in carapace width for individual crabs were 52, 33, and 14% for small, juvenile and subadult crabs, respectively. Crabs, all sizes pooled, molted earlier at 30C than at ambient temperatures. A raft holding wire cages with individual molting chambers is proposed for the commercial production of soft shell crabs in heated effluents. (EIS-Katz)
W78-10148

AQUATIC LIFE--WATER QUALITY RECOMMENDATIONS FOR HEAVY METAL AND OTHER INORGANIC TOXICANTS IN FRESH WATER,
Colorado Div. of Wildlife, Fort Collins.
P. H. Davies, and J. P. Goettl, Jr.
Prepared for Colorado Water Quality Standards Revision Committee and Colorado Water Quality Control Commission, (Denver), July 1976, 29 p. 1 tab, 36 ref.

Descriptors: *Water quality standards, Water quality, *Standards, Colorado, Hardness(Water), Bioassays, Freshwater fish, Warm-water fish, Cold-water fish, Ammonia, Aluminium, Arsenic, Benyllium, Cadmium, Chromium, Copper, Cyanide, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Sulfide, Thallium, Zinc, *Metals.

Water quality recommendations for protection of aquatic life are listed. Recommendations are for cold water fish species and warm water fish species in waters of varying hardness. Substances listed are ammonia, aluminium, arsenic, berylium, cadmium, chromium, copper, cyanide, iron, lead, manganese, mercury, nickel, selenium, silver, sulfides, thallium, and zinc. (EIS-Katz)
W78-10160

SOIL RENOVATION OF EFFLUENT FROM A SEPTIC TANK ON A LAKE SHORE,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
For primary bibliographic entry see Field 5B.
W78-10164

RECOLONIZATION OF ROCKY SHORES IN CORNWALL AFTER USE OF TOXIC DISPERSANTS TO CLEAN UP THE TORREY CANYON SPILL,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W78-10177

OILED SEABIRD RESCUE AND CONSERVATION,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-10179

OIL/WATER SEPARATION TECHNOLOGY: THE OPTIONS AVAILABLE - PART I,
American Cyanamid Co., Stamford, CT.
R. B. Tabakin, R. Trattner, and P. N. Cheremisinoff.
Water and Sewage Works, Vol. 125, No. 7, p 74-77, July, 1978. 7 fig, 1 tab, 19 ref.

Descriptors: *Oil wastes, *Oily water, *Separation techniques, *Emulsions, *Gravity, Hydraulic design, Stokes law, Design criteria, Dispersion, Oil industry, Oil pollution, Flotation, Centrifugation, Filtration, Oil-water interfaces, Waste water treatment, Industrial wastes.

The hydraulic design of gravity separators is discussed with respect to removing free, mechanically dispersed, chemically emulsified, or dissolved oils from water. Treatment of oily wastes often includes primary treatment by sedimentation, centrifugation, or flotation to remove oil wet solids and free oils. Secondary treatment, such as chemical treatment or filter coalescence, accommodates emulsions. Ultrafiltration, biological treatment, and carbon adsorption remove finely dispersed and soluble oil fractions during tertiary treatment. For gravity separation, the rise rate of oil globules larger than 150 microns is calculated with Stokes Law; the rate is used to calculate the detention time required for oil droplets to reach the fluid boundary. The rise rate is also translated into the design overflow rate. The American Petroleum Institute (API) separator design criteria specifies that the horizontal velocity may be 15-fold the rise rate, but no more than 3.0 ft/min. The separator depth of flow should be 3-8 ft, the width 6-20 ft, and the depth to width ratio within 0.3-0.5. Oil retention baffles should be located a minimum distance of 12 inches from a skimmer and have a maximum submergence 55% of the water depth. Other gravity separators include corrugated plate interceptors and parallel plate interceptors; gravity separation reduces effluent oil contents to an average of 20-100 ppm. (Lisk-FIRL)
W78-10196

GROOTVLEI GETS SECOND DRY COOLING TOWER.
For primary bibliographic entry see Field 3E.
W78-10222

PUMPING OF WATER FROM DEFUNCT MINES: A CASE STUDY.
South African Mining and Engineering Journal, Johannesburg, Vol. 88, No. 4, p 61, 63, 65, 67, 1977.

Descriptors: Pumping, *Acid mine water, Flooding, *Abandoned mines, Groundwater, Pumping plants, Water quality, Lime, Ventilation, Water treatment, South African.

An investigation initiated by Rand Mines many years ago revealed that intermine boundary pillars, major dislocations and dykes had either been mined or developed to such an extent that no possibility remained of containing the water in any compartments below in water table. It was known that ERPM could not prevent water flowing into its workings once the closed-down mines began flooding, and on the assumption that pumping costs would be lower on a working mine than on a mine which had ceased operations, it was accepted that ERPM was the logical position to site the pumping scheme to handle the total water from the central Witwatersrand compartment. Details are given of the mining lay-out pumping plant, mixing chambers, ventilation, lime plant and surface treatment. (So Afr Water Info Center)
W78-10228

THE NPES RESEARCH ACTIVITIES OF ENVIRONMENTAL SCIENCES,
Council for Scientific and Industrial Research, Pretoria (South Africa).
C. E. Cloete.
Veldtrust (Pretoria), No. Nov, p 14-16, 1976, 4 illustr.

Descriptors: *Marine ecosystems, *Research priorities, *Marine pollution, *Estuarine environment, Monitoring, South Africa.

The national programme for environmental sciences is one of a number of co-operative research programmes co-ordinated and administered by the council for Scientific and Industrial Research (CSIR) of South Africa. Its aims include the following. To identify environmental problems in South Africa which lend themselves to solution through co-operative research. To co-ordinate and promote research in South Africa which will contribute to the solution of environmental problems. To ensure effective publication and distribution of the findings of this research and to highlight any practical implications of these findings. To make provision for South Africa to participate in international scientific programmes in connection with the environment. In this article the author's attention is confined to research co-ordinated by NEPS in the fields of marine and air pollution and the impact area studies, coastal reference surveys, estuarine surveys and oceanic reference surveys are described. (So Afr Water Info Center)
W78-10239

HARTEBEESPOORT DAM-ASSET OR DISASTER, (IN AFRIKAANS),
For primary bibliographic entry see Field 2H.
W78-10241

MUNICIPAL WATER MONITORING AND CONTROL BY TELEMETRY,
H. L. Alexander.
Municipal Engineer, Vol. 8, No. 2, p 23-25, 1977, 1 fig.

Descriptors: *Telemetry, *Television monitoring, Data transmission, Water consumption,

*Municipal water supply, Water demand, Reservoirs, Electronic equipment, South Africa, Stellenbosch.

The accurate control and recording of the movement of water, supplied by any municipality is absolutely necessary if this limited resource is to be conserved. The article describes a recently completed water monitoring and control contract for the Municipality of Stellenbosch which utilized up-to-the-minute electronics to achieve maximum benefit from the available water in the area whilst at the same time requiring a bare minimum of supervision. Tremendous interest has been generated by this installation and three other contracts have recently been awarded to the company as a direct result of it. It seems the Cape will become a show piece of enlightened Municipalities employing less burdened Municipal Engineers. (So Afr Water Info Center)
W78-10242

ISCOR COOLING WATER NO THREAT TO SALDANHA BAY, (IN AFRIKAANS).
Scientiae, Pretoria, Vol. 17, No. 2, p 34-36, 1976.

Descriptors: *Thermal pollution, Industrial sites, Metal processing wastes, *Water temperature, *Waste heat, *Heat discharge, Heat transfer, Temperature tolerance, Lethal temperature, Ecology aspects, Marine pollution, Climatic factors, Temperature gradient, Marine ecosystems, Monitoring, *Saldanha Bay(South Africa).

The CSIR was called in by Iscor to determine the possible influence of cooling water, from their planned steelworks at Saldanha, on water temperatures in the bay with a view to the ecology of the Langebaan lagoon. By means of a mathematical model it was determined that the cooling water will have a negligible effect on the bay and within a few kilometers the difference in temperature will be barely a half degree centigrade. With the report in mind the Committee for ecological studies of the Langebaan lagoon area has decided to recommend to the department of water affairs that permission be granted to allow Iscor to release the cooling water into the bay. (So Afr Water Info Center)
W78-10245

STANDARD SPECIFICATION FOR ALGAECIDES FOR USE IN FRESH WATER SWIMMING POOLS.
South African Bureau of Standards, Pretoria.
Report SABS 1127 - 1976, 9 p.

Descriptors: Standard specifications, *Algicides, Freshwater, *Swimming pools, *Recreational water, *Water quality standards, Algae growth inhibition, South Africa.

A specification covering both liquid type and solid type algicide, suitable for fresh water swimming pools, covering packing and marking, sampling and compliance with the specification and Inspection and methods of test. (So Afr Water Info Center)
W78-10253

THERMAL PLUMES FROM SUBMERGED DISCHARGES AT ZION NUCLEAR POWER STATION: ADDITIONAL PROTOTYPE MEASUREMENTS OF INTERACTING PLUMES,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5B.
W78-10282

BENEVAL: HOW TO GET MORE FROM YOUR STORM DRAIN DOLLAR,
Los Angeles County Flood Control District, CA. Project Planning Div.
For primary bibliographic entry see Field 6C.
W78-10289

ALLOCATIONAL INEFFICIENCY OF BENEFIT/COST APPLIED TO WATER AND SEWERAGE SUPPLY: INTERACTIONS BETWEEN TIME-SERIES AND CROSS-SECTIONAL MODELS,
Pennsylvania State Univ., University Park. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-10348

MODELLING AND OPERATIONAL CONTROL OF WATER QUALITY IN RIVER SYSTEMS,
Australian National Univ., Canberra. Center for Resource and Environmental Studies.
P. G. Whitehead.
Water Research, Vol. 12, No. 6, p 377-384, 1978. 9 fig, 14 ref.

Descriptors: *Mathematical models, *Model studies, *Reaeration, *Dissolved oxygen, *Biochemical oxygen demand, Rivers, Treatment facilities, Sewage, Oxygen demand, Oxygen sag, Aeration, Nutrients, Waste water treatment, Water quality control, Municipal wastes.

BOD, dissolved oxygen (DO) and nitrogen models developed for the English Bedford-Ouse River System were applied to the control of instream aeration and nutrient levels. A basic differential mass balance was transformed into the discrete-time model incorporating two coupled first-order equations to describe BOD and DO at the output of a specific reach in a non-tidal river. The ratios of BOD and DO to the oxygen absorption potential at the output of the reach were expressed as a function of the volumetric flow rate in the stream, the volumetric hold-up of the reach, the upstream BOD or DO input, factors in algal growth, and a series of time-invarient coefficients. Reaeration rates, which can lead to low dissolved oxygen calculations in water months, could be incorporated into the model as coefficients determined from the volumetric flow rate and the river depth. Instream aeration to raise the DO concentration near sewage effluent outfalls could be controlled by locating DO probes downstream and upstream of the outfall. The models could be used to control instream aeration by incorporating coefficients to influence DO probe signals and prevent deviation from the desired DO level. The artificial aeration control model was applied to the River Cam; nutrient levels in the Bedford-Ouse were predicted with previously developed models. (Lisk-FIRL)
W78-10349

RECOVERY OF TWO POLLUTED RIVERS,
G. A. Best.
Effluent and Water Treatment Journal, Vol. 18, No. 6, p 267-271, 273, June, 1978. 4 fig, 5 tab, 2 ref.

Descriptors: *Rivers, *Water quality, *Treatment facilities, *Water pollution sources, *Pollution abatement, Biochemical oxygen demand, Ammonia, Suspended solids, Biota, Activated sludge, Waste water treatment, Industrial wastes, Municipal wastes.

The quality of two Scottish rivers, Black Cart Water and Lavern Water, was increased by improved sewage treatment and by the termination of some industrial waste discharges. Effluent quality improved significantly when the Johnstone sewage treatment works was completed in July, 1976. Black Cart Water, the receiving body for the effluent, was continuously monitored according to Chemical Quality Index (CQI) and Biotic Index (BI). The CQI, derived from BOD, suspended solids, ammonia, and dissolved oxygen concentrations, increased to 9 on a 1-10 scale for both upstream and downstream waters, within 9 mos after the plant was operational. The BI of the river, derived from aquatic invertebrate studies, improved more slowly due to the slow recolonization by clean water organisms. Construction of the Neilston sewage treatment plant and closure of the overloaded Barrhead plant improved the quality of the Levern Water. The CQI of the river in the vicinity of Neilston had improved to 9 both upstream and downstream within 4 mos of initiation of the activated sludge plant operation; downstream water quality had been as low as 3. The CQI in the Barrhead area of Levern Water increased to 8 from a low of 1 downstream and 6 upstream. Biological recovery was retarded by periodic tannery waste discharges and slow recolonization of the benthic substrate. (Lisk-FIRL)
W78-10351

WASTEWATER PLANT CONSTRUCTION.
Environmental Science and Technology, Vol. 12, No. 5, p 512-513, May, 1978.

Descriptors: *Legislation, *Grants, *Financing, *Treatment facilities, *Government finance, Specifications, Bids, Federal Water Pollution Control Act, Water quality act, Waste water treatment, Construction costs, Municipal wastes.

A three-year agreement between the EPA and the United States Army Corps of Engineers provides construction evaluation, management, and supervision of waste water treatment projects funded by the 1977 Clean Water Act. The Act will supply $24.5 billion in grants for municipal waste water treatment projects, incorporating a three-phase grant process. The process includes an initial facility plan developed locally, a more detailed plan with designs and specifications, and a final construction and operation phase. Corps personnel assigned to the EPA construction grant program are responsible for the engineering feasibility studies. Bid and construction plans are evaluated by the Engineers' assessment of the submitted plans and specifications. When a project is funded, Corps personnel will be maintained on-site to indirectly manage the construction projects, projects funded for more than $50 million will have a full-time Corps supervisor. (Lisk-FIRL)
W78-10354

ESTABLISHING GUIDELINES FOR LAND-BASED WASTE MANAGEMENT PLANNERS,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5E.
W78-10356

CURRENT STATUS OF ON-SITE WASTEWATER MANAGEMENT,
For primary bibliographic entry see Field 5D.
W78-10358

IWES 83RD SUMMER MEETING AND CONFERENCE, 1978.
Water Services, Vol 82, No 988, p 334-336, June, 1978. 1 tab.

Descriptors: Estuaries, *Estuarine environment, *Waste water disposal, *Water quality, *Pollutants, Tidal waters, Domestic wastes, Industrial wastes, Reservoirs, Sewage treatment, Waste water treatment, Sludge disposal, Municipal wastes.

The water quality of Welsh estuaries and coastal waters was one of the topics discussed at the 83rd IWES Conference. The Welsh Water Authority reported that about 65% of the 574,000 cu m/day sewage and 10,647,000 cu m/day industrial effluent produced in the area was discharged with little or no treatment to tidal waters. A 1975 survey indicated that of the 414.5 km of Welsh estuaries, 25.7 km were grossly polluted, 59.9 km were of poor quality, and 53.0 km were in need of some improvement. Wastes produced by about two-thirds of Wales population are discharged into the Severn Estuary and the Bristol Channel. Liverpool Bay receives domestic and industrial wastes from Lanchashire; the Menia Straits receive sewage

discharges totalling about 8,730 cu m/day at an average organic loading of 2,600 kg BOD/day. Guidelines were adopted by the Welsh Water Authority in 1975 for controlling domestic sewage and industrial waste discharges into tidal waters. The Working Party on Sewage Disposal concluded that screening and comminution of sewage rather than biological treatment was adequate for discharged waste water; suitable outfall design was also recommended. A directive on bathing water quality and a reservoir system on the River Dee for water augmentation were also discussed. (Lisk-FIRL)
W78-10361

RETROSPECTIVE ASSESSMENT OF WASTEWATER TECHNOLOGY IN THE UNITED STATES. 1800-1972,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of History.
J. A. Tarr, F. C. McMichael, J. McCurley, T. F. Yosie, and C. McShane.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 272, Price codes: A17 in paper copy, A01 in microfiche. Report NSF/RA-770351, October 1977. 367 p, 15 fig, 10 tab, 422 ref, 4 append.

Descriptors: *Water quality control, *Water resources development, *Water pollution control, *Water policy, *History, Technology, Engineering, Social impact, Economic impact, Social values, Adoption of practices, Public health, Planning, Federal government, Political aspects, Waste water treatment, Municipal wastes.

The historical development of water supplies and waste water treatment was examined by methods of retrospective and prospective analysis. It was hypothesized that initial attempts at instituting water quality standards and controls paralleled water quality developments since 1960. A review of technologies developed since 1800 includes: water-carriage collection systems, separate or combined sewerage, and waste water applications to land. Water quality policy and conflicts, social impacts and values regarding waste water management, federal roles, policy, programs relating to water quality, and health and economic impacts are examined. Relevant historical and contemporary technological comparisons are highlighted. The study concluded that waste water technology has transferred pollution sources from the municipalities due to the negative impacts of certain capital-intensive technologies on second parties; retrofit of in-place, capital-intensive technology has limited waste water treatment techniques; social values have been affected by the negative and positive aspects of waste water technology; and retrospective examination of water quality technology can be a useful instrument in formulating contemporary and future water policies and technologies. (Lisk-FIRL)
W78-10362

PROCEEDNGS OF RECONVENED SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE STATES OF CALIFORNIA, COLORADO, UTAH, ARIZONA, NEVADA, NEW MEXICO, AND WYOMING (7TH) HELD AT DENVER, COLORADO, APRIL 26-27, 1972.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 581, Price codes: A09 in paper copy, A01 in microfiche. 1972. 183 p.

Descriptors: *Colorado River basin, *Salinity, *Project planning, *Water quality, Water resources, Interstate rivers, California, Colorado, Utah, Arizona, Nevada, New Mexico, Wyoming, Water pollution.

The seventh session of the conference in the matter of pollution of the interstate waters and tributaries of the Colorado River was held in April, 1972. The conference dealt with tributaries located in California, Colorado, Utah, Arizona, Nevada, New Mexico, and Wyoming. The report gives a complete transcript of the proceedings, including various conclusions and recommendations following a general discussion. The conference focused on the salinity problem of the Colorado River. Delegates urged the adoption of a salinity policy for the Colorado River system which would attempt to maintain salinity concentrations at or below present levels found in the lower main stream. It is recommended that a program similar to the Department of Interior's 'Colorado River Water Quality Improvement Program' be implemented on an accelerated basis with the Bureau of Reclamation having primary responsibility for the plan. Several areas should be given high priority. The Office of Saline Water and the Environmenta Protection Agency should assist the Bureau. A turn of the century goal is recommended. The program should be as flexible as possible with an effort to develop new programs to decrease salinity. (Quarles-Florida)
W78-10368

EFFLUENT STANDARDS AND WATER QUALITY INFORMATION ADVISORY COMMITTEE--SECOND ANNUAL REPORT--PART 1--MARCH 1, 1974-MARCH 1, 1975,
Environmental Protection Agency, Washington DC. Effluent Standards and Water Quality Information Advisory Committee.
M. Sager, and M. Brossman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 439, Price codes: A07 in paper copy, A01 in microfiche. Report ESWQIA-2-A, May, 1975. 134 p.

Descriptors: *Administrative agencies, *Federal Water Pollution Control Act, *Inter-agency cooperation, *Mathematical models, Air pollution, Analytical techniques, Computer models, Effluents, Federal government, Industrial wastes, Laundering, Legislation, Mathematical studies, Pollutant identification, Legal aspects, Radioactive wastes, Water pollution sources, Management, Administration, Information exchange.

The Effluent Standards and Water Quality Information Advisory Committee (ES and WQIAC) was established by the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) to assist the Environmental Protection Agency (EPA) in fulfilling its responsibilities under the FWPCA. ES and WQIAC is required to provide, assess, and evaluate scientific and technical information concerning industrial point source discharge and toxic effluents. ES and WQIAC is involved in analyzing anc criticizing EPA's work on the Phase II industries. ES and WQIAC also holds workshops with the public and industry to discuss effluent limitation in a nonadversary environment; and arranges conferences with other agencies to locate pertinent expertise within the federal government which could assist the EPA in effluent limitation development. In addition, ES and WQIAC continues to work on the matrix method, a mathematical approach for developing effluent limitations, which presents an alternative to the contractor method now employed by EPA. ES and WQIAC also provides legal advice, congressional liason, review of EPA documents, information transfer between agencies, and other special projects and conferences in fulfilling its advisory functions for EPA. (Jordan-Florida)
W78-10369

DIGEST OF EPA'S MONITORING-RELATED STATUTORY AUTHORITY.
Environmental Protection Agency, Washington, DC. Office of Monitoring Systems.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 760, Price codes: A04 in paper copy, A01 in microfiche. 1974. 70 p.

Descriptors: *Monitoring, *Air pollution, *Water pollution, *Environmental effects, Control, Data collections, Measurement, Regulation, Operations, Legislation, Air pollution effects, Pollutant identification, Research and development, Analytical techniques, Projects, Noise pollution, Pesticides, Solid waste disposal, Sewage treatment, Radiation.

The purpose of this document is to help identify the Environmental Protection Agency's (EPA) environmental monitoring requirements as dictated by legislation. The document will also serve as a reference to all environmental monitor-related sections of the laws for which the EPA has implementation responsibility. EPA operates under the legislative authority of several acts, each dealing with a specific environmental problem. Rarely does the legislation specifically direct that certain monitoring be conducted. However, monitoring is necessary to effectively carry out much of the legislation, so the monitoring requirements are, for the most part, implied by the legislation. In each problem area covered by legislation EPA must identify the present state of the environment, determine the environmental quality necessary to protect public health and welfare, identify and develop methods of pollution control, as well as develop the necessary programs to ensure the attainment and maintenance of environmental quality standards. Both the pollution source and the transportation media must be monitored. In some cases, the net effects of pollution on plants, animals, and materials must be monitored. (Beamer-Florida)
W78-10371

BEST MANAGEMENT PRACTICES FOR NONPOINT SOURCE POLLUTION CONTROL SEMINAR (GUIDANCE FOR SECTION 208 PLANNERS AND IMPLEMENTING AGENCIES),
Environmental Protection Agency, Chicago, IL. Office of Great Lakes Coordination.
R. G. Christensen, and C. D. Wilson.
Available from National Technical Information Service, Springfield, VA 22161 as PB-265 731, Price codes: A15 in paper copy, A01 in microfiche. Report EPA-905/9-76-005, December, 1976. 322 p.

Descriptors: *Land management, *Great Lakes, *Pollution abatement, *Watershed management, Administration, Agricultural watersheds, Erosion control, Lake basins, Management, Sediment control, Watersheds(Basins), Surface runoff.

Nonpoint sources of water pollution now make up more than 50 percent of the total water quality problem in the Great Lakes. Public law 92-500 provides for grants to any state or public agency to develop preliminary plans for the control of pollution in Great Lakes watersheds. Such projects must demonstrate the engineering and economic feasibility of removing pollutants and preventing any further pollution of the Great Lakes. The grant program requires the input and cooperation of many levels of government, including: (1) the Environmental Protection Agency; (2) the federal Department of Agriculture; (3) conservation districts; (4) states; (5) counties; (6) agricultural extension services; (7) Congress; and (8) planning commissions. The subjects covered by the seminar included: (1) social factors that influence participation in soil conservation; (2) effects of red clay turbidity on the aquatic environment; (3) sediment reduction by streambank modification; (4) crop sequence and fall tillage effects on soil erosion; (5) sediment yields from an agricultural watershed; (6) culturally induced acceleration of mass wastage on red clay slopes; and (7) best management practices for urban storm and combined sewer pollution control. (Jordan-Florida)
W78-10373

WATER-ORIENTED OUTDOOR RECREATION IN THE LAKE SUPERIOR BASIN (MICHIGAN, MINNESOTA AND WISCONSIN).
Bureau of Outdoor Recreation, Ann Arbor, MI. Lake Central Regional Office.
For primary bibliographic entry see Field 6B.
W78-10375

DRAFT ENVIRONMENTAL IMPACT STATEMENT, GRAND STRAND REGION, SOUTH CAROLINA.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5D.
W78-10376

LEGISLATIVE REGULATION OF THE ENVIRONMENTAL IMPACT OF STRIP MINING,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
G. Fay, and D. C. Glenn-Lewin.
Available from the National Technical Information Service, Springfield, VA 22161 as IS-ICP-17, Price codes: A03 in paper copy, A01 in microfiche. Report IS-ICP-17, Energy and Mineral Resources Research Institute, May, 1976. 38 p.

Descriptors: *Mining, *Mine wastes, *Water pollution control, *Environmental effects, Strip mines, Coal mines, Water pollution sources, Regulation, Permits, Planning, State governments, Acid mine water.

The protection of the environment from strip-mining damage must be achieved through legislation. The Surface Mining Control and Reclamation Act (SMCRA) was passed by Congress in 1975, but vetoed by President Ford. The provisions of that bill are compared here with legislation from 11 states which regulate the environmental impact of surface mining. Although commonly associated with damage to land, strip-mining also results in damage to water quality. The SMCRA would have prohibited mine operators from upsetting water flow and aquifer recharge at the mine and at adjoining areas. Water flow is important because if insufficient, a waterway's ability to support life, as well as downstream users, will suffer, even if the water is clean. Measures designed to avoid surface and groundwater degradation during mining and reclamation were provided in the bill. Specific criteria for water impoundments were also included. Of the state laws surveyed, all but one require the mine operator to treat or drain runoff to avoid or reduce erosion, damage to land, and water pollution. Only Missouri's strip-mining law ignores water quality considerations. (Malefatto-Florida)
W78-10377

NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 630, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-570/9-76-003, 1976. 159 p.

Descriptors: *Water quality, *Radioactivity, *Monitoring, *Water pollution control, Water utilization, Regulation, Federal government, Legislation, Water supply, Administration, Safety, Pollutants.

The National Interim Primary Drinking Water Regulations were promulgated in accordance with the provisions of the Safe Drinking Water Act. Additional Interim Primary Regulations for radioactivity in drinking water were promulgated in 1976. These regulations become effective on June 24, 1977, and become the standards used to judge all public drinking water supplies. The standards were promulgated by the Office of Water Supply of the Environmental Protection Agency. They replace the Public Health Service Drinking Water Standards of 1962. The appendices of the document contain the background material on which the Maximum Contaminant Levels were based. The statement of basin and purpose also includes material on some contaminants which were omitted from the regulations. These omissions are explained. The regulations apply to all public water systems unless the system: (1) consists only of distribution and storage facilities; (2) obtains all its water from but is not owned or operated by, a public water system to which the regulations apply; (3) does not sell water to any person; and (4) is not a carrier which conveys passengers in interstate commerce. (Quarles-Florida)
W78-10378

AN ANALYSIS OF CURRENT AND PROPOSED FEDERAL LEGISLATION SEEKING TO CONTROL THE USE OF TOXIC MATERIALS,
Environmental Protection Agency, Washington, DC. Effluent Standards and Water Quality Information Advisory Committee.
M. Sager, M. Brossman, and E. Wilcox.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 656, Price codes: A03 in paper copy, A01 in microfiche. Report SWQIAC-4, November, 1975. 25 p.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Poisons, *Public health, *Toxins, Chemicals, Environmental sanitation, Federal government, Industrial wastes, Human pathology, Legal aspects, Pollutants, Pesticide toxicity, Safety, Standards, Toxicity, Industries, Regulation, Water quality, Water pollution.

One of the responsibilities of the Effluent Standards and Water Quality Information Advisory Committee (ES and WQIAC) under the Federal Water Pollution Control Act is to provide advice on the development of limitations on toxic substances discharged from industrial sources. Accordingly, an analysis of current and proposed legislation was undertaken to prepare a guidance document for implementing Section 307 of the Act. The analyzed legislation includes: (1) the Federal Water Pollution Control Act, (2) the Ocean Dumping Act, (3) the Safe Drinking Water Act, (4) the Federal Environmental Pesticide Control Act, (5) the Occupational Safety and Health Act, (6) the Federal Food, Drug and Cosmetics Act, and (7) the Federal Hazardous Substances Act. Each federal act was abstracted and catalogued in terms of the: (1) protectee, (2) goal, (3) definition, (4) selection criteria, (5) test protocols, (6) standards, (7) agency authority, (8) regulation agency, (9) enforcement agency, and (10) prohibition mechanism. The study directs attention to any and all provisions in the U.S. Code and the Code of Federal Regulation which have proven useful to ES and WQIAC in its attempt to work with Section 307 of the Water Pollution Control Act. (Jordan-Florida)
W78-10379

STATE ENVIRONMENTAL PROGRAMS: A COMPENDIUM OF FEDERAL AND STATE PROGRAMS PREPARED FOR THE CONGRESSIONAL DELEGATIONS.
Environmental Protection Agency, Kansas City, MO. Region VII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 663, Price codes: A09 in paper copy, A01 in microfiche. 1976. 192 p.

Descriptors: *Central US, *Administrative agencies, *Water quality control, *Planning, Water Quality Act, Kansas, Nebraska, Missouri, Iowa, Water resources planning, Regulation, Water pollution control.

The Environmental Protection Agency's (EPA) programs in Region VII, comprising Kansas, Missouri, Nebraska, and Iowa, are presented here. Several major problem areas involving water exist in the region. Agricultural and surface runoff has resulted in nutrients and bacteria entering waterways. Streams are polluted from feedlot sources. Fecal and ammonia wastes from nonpoint sources inhibit full compliance with water quality standards. Discharge of raw sewage into the Kansas and Missouri Rivers continues in several areas. Acidic mine drainage from strip mines in Southeastern Kansas continues. EPA's regional strategy is to attack point source pollution where it is most serious, and preserve existing high quality water. Region VII's water pollution control objectives in fiscal 1976 included funding of construction grant projects, completion of all basin water quality management plans, and monitoring of area-wide planning efforts. Enforcement objectives included full compliance with discharge permits and Section 303 of the 1972 Water Quality Act, dealing with spills of oil and hazardous substances. Goals in the area of drinking water included implementation of the national drinking water standards and providing technical assistance to state water supply programs. (Malefatto-Florida)
W78-10380

ACCOMPLISHMENT PLAN-REGION VIII, CHEYENNE RIVER BASIN.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 247, Price codes: A05 in paper copy, A01 in microfiche. December 4, 1972, 97 p.

Descriptors: *River basins, *Water quality, Water pollution, *South Dakota, Administration, Rivers, Water law, Management, Waste water(Pollution), Sewage, Industrial wastes, Water quality control.

The Environmental Protection Agency's basin accomplishment plan covers a number of river and shoreline miles and includes important river systems with pollution problems. The plan includes that portion of the Cheyenne River Basin from the western South Dakota border to the river's confluence with the Missouri River on the eastern basin border. Tributaries with major point source pollution problems are included. There consist of the Cheyenne River, Belle Fourche River, Whitewood Creek and Rapid Creek. The components of the plan include a narrative, a basin load summary, planned accomplishments, point source loads and locations, ambient water quality status, tactical solutions and point source reductions required. The objection of the plan are: (1) the water quality of the Cheyenne River Basin is to meet existing and proposed standards by fiscal year 1975; and (2) immediate reductions in pollution from municipalities and industries. These objectives are to be reached by utilizing eight program elements: (1) Municipal waste treatment construction grants; (2) Refuse Act permits; (3) Operation and maintenance; (4) Water quality planning; (5) Water quality monitoring and water pollution source surveillance; (6) Manpower training; (7) Public affairs; (8) Environmental impact statements review. (Quarles-Florida)
W78-10381

SELF-REGULATION OF ENVIRONMENTAL QUALITY: IMPACT ANALYSIS IN CALIFORNIA LOCAL GOVERNMENT,
Center for California Public Affairs, Claremont.
For primary bibliographic entry see Field 6G.
W78-10382

TO AMEND AND EXTEND AUTHORIZATIONS FOR THE FEDERAL WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 6E.
W78-10384

COAST GUARD EFFORTS TO PREVENT OIL POLLUTION CAUSED BY TANKER ACCIDENTS.
For primary bibliographic entry see Field 6E.
W78-10385

DIRECTORY OF FEDERAL AND STATE WATER POLLUTION STANDARDS,
Illinois Inst. for Environmental Quality, Chicago.
J. W. Patterson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 798, Price codes: A15 in paper copy, A01 in microfiche. IIEQ Report 77-06, Project No. 20.010, October, 1976, 327 p.

Descriptors: *Federal government, *Regulation, *State governments, *Water quality standards, Federal jurisdiction, Effluents, Jurisdiction, Legal aspects, Standards, State jurisdiction, Water law, Water policy, Water pollution, Water pollution control, Water quality, Water quality control, Water rights.

This directory is divided into five sections. The first section covers effluent guidelines promulgated by the Environmental Protection Agency (EPA) under the authority of the Federal Water Pollution Control Act of 1972. EPA has proceeded in the promulgation of standards on an industry by industry basis. The tables contained in this section report effluent limitations as converted to a concentration basis. The second section covers the effluent standards of the states, which usually apply equally to all point source discharges. Each table in this section relates to a specific process wastewater pollutant, and lists those states which regulate that pollutant as well as the effluent standards for that state. The third section is a summary tabulation of numerical criteria extracted from a document prepared by the National Academy of Sciences. The fourth section contains sumary tables for each of the fifty states and presents selected water quality standards from each state. The fifth section concerns the status of EPA effluent guidelines as of March 10, 1976. The tables in this section are divided by industry and are subdivided by manufacturing process. (Jordan-Florida)
W78-10386

COMPILATION OF FEDERAL, STATE AND LOCAL LAWS CONTROLLING NONPOINT POLLUTANTS. AN ANALYSIS OF THE LAW AFFECTING AGRICULTURE, CONSTRUCTION, MINING AND SILVICULTURE ACTIVITY.
Aspens Systems Corp., Germantown, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 791, Price codes: A22 in paper copy, A01 in microfiche. Report EPA-440/9-75-011, September, 1975, 400 p.

Descriptors: *Governmental interrelationships, *Agriculture, *Construction, *Forest management, *Mining, Concretes, Federal government, Fertilizers, Legal aspects, Legislation, Local governments, Pesticides, Pollutant identification, Pollutants, State governments, Water pollution sources, Water resources development.

The principal contaminant responsible for water pollution from nonpoint sources is sediment resulting from erosion. Most of the sediment can be attributed to agricultural activities, but construction and mining account for large quantities of sediment in somelocal areas. The control of water pollution from nonpoint sources necessarily involves regulation of the use of land, a matter traditionally left to the states and delegated by the states to local municipalities. Federal, state and local legislation often includes control of: (1) agriculture, (2) construction, (3) mining, (4) silviculture, (5) soil erosion and sedimentation control, (6) coastal zone management, (7) flood plain regulation and flood prevention, (8) wetlands protection, (9) grazing, (10) pesticides and herbicides, (11) construction of roads, (12) building code provisions, (13) authorization of citizens' suits to protect the environment, (14) financial incentives, (15) general health and welfare controls, (16) prevention of loads spilling on highways, (17) salting of roads, and (18) oil and gas wells. In reality, there is little direct legislation suitable to control water pollution from nonpoint sources, because most federal and state water pollution control laws are aimed at controlling point source pollution. (Jordan-Florida)
W78-10387

STATE ENVIRONMENTAL PROGRAMS: A COMPENDIUM OF FEDERAL AND STATE PROGRAMS PREPARED FOR THE CONGRESSIONAL DELEGATIONS.
Environmental Protection Agency, Kansas City, MO. Region VII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 045, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-907/9-77-002, 1977, 86 p.

Descriptors: *Water quality, *Air pollution, *Regional development, *Water pollution control, Federal government, State governments, Water pollution, Projects, Protection, Solid wastes, Administrative agencies, Toxins.

This document provides an overall perspective of Environmental Protection Agency (EPA) activities in Region VII, the Central Plains Region consisting of Iowa, Kansas, Missouri, and Nebraska. A very broad summary of major activities of the organizational cmponents involved in external programs is presented. Both regional and state discussions are included to give a more complete view of the combined federal, state and local effort necessary for a succesful pollution control program. It is noted that some federal functions have been delegated to state agencies. Following a regional overview, there is a summary of regional resources, an organization chart, and an explanation of the various regional offices. There is a statement of the legislative authority upon which the EPA operates. The major portion of the report summarizes various program activities. The water division deals with water quality management, construction grants and drinking water supplies. The activities of the air and hazardous materials division are discussed, as well as the enforcement division, the surveillance and analysis division, and various intermedia programs. Priority objectives and regional issues and problems are included. Appendices on each state complete the report. (Quarles-Florida)
W78-10388

A SYNOPSIS OF STATE LEGISLATION ON WATER POLLUTION CONTROL LAWS ENACTED DURING 1971.
Environmental Protection Agency, Washington, DC. Office of Intergovernmental Programs.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-257 590, Price codes: A05 in paper copy, A01 in microfiche. January 3, 1972. 83 p.

Descriptors: *Legislation, *State governments, *Water policy, *Water pollution control, Environmental control, Governmental interrelations, Legal aspects, Pollution abatement, State jurisdiction, Surveys, Waste water treatment, Water control, Water law, Water pollution, Environmental control, Water rights, Regulation, Administration.

Many states passed environmental legislation in 1971, including legislation strengthening water pollution control and other environmental protection programs through reorganization of state agencies. Legislation was also enacted providing for the examination and licensing of waste treatment plant operators, tax incentives to industries for capital investment in pollution control devices, and the financing of programs to assist municipalities in the construction of waste treatment works. In 1971, there was also state legislative emphasis upon the authorization of citizens' actions against industrial and other polluters. Thirteen states enacted such legislation in 1971, All of the fifty states are listed alphabetically and a brief description is set forth of the purpose and scope of each state's water pollution control laws. For example, the state of Alaska passed three statutes in 1971. The first created a Department of Environmental Conservation and an Environmental Advisory Board and set up rules and regulations. The second concerned the discharge of ballast water and the third related to geothermal resources. This document provides a useful reference for legislators, administrators of water pollution control programs and others interested in environmental legislation. (Jordan-Florida)
W78-10389

WATER QUALITY MANAGEMENT OF SUMMIT COUNTY, COLORADO.
Environmental Protection Agency, Denver, CO. Div. of Air and Water Programs.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-256 463, Price codes: A07 in paper copy, A01 in microfiche. 1972, 138 p.

Descriptors: *Colorado, *Regional development, *Federal government, *Water quality control, River basin development, Comprehensive planning, Land management, Waste water treatment, Wastes, Water pollution, Nitrogen compounds, Nutrients, Reservoirs, Water treatment, Planning, Administrative agencies, Alternative planning.

Summit County, Colorado and the Blue River Hydrologic Basin are experiencing a period of dramatic growth in the demand for water and sewer services, generated primarily by the growth of several recreation oriented communities and developments. This development has a significant impact on water quality. Projections indicate that construction of vastly expanded wastewater treatment facilities will be required, resulting in a dramatic rise in the concentration of nutrients within local reservoirs. Non-point sources of pollution from construction and leaching landfills also add to the nutrient levels. Projected inorganic nitrogen levels will result in a possible eutrophic condition in the reservoirs. Land use controls were investigated as an alternative to wastewater treatment and the EPA found this possibility inadequate. The report indicates the most desirable alternative is the exportation of wastes from the river basin. The final recommendations included maintenance of current nutrient levels and additional monitoring of pollutant discharges and their resultant effects on water quality. (Molly-Florida)
W78-10391

SECOND ANNUAL REPORT--EFFLUENT STANDARDS AND WATER QUALITY INFORMATION ADVISORY COMMITTEE, (PART II).
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 751, Price codes: A20 in paper copy, A01 in microfiche. March 1, 1975, 470 p.

Descriptors: *Industrial wastes, *Effluents, *Water pollution control, *Water quality standards, Abatement, Discharge(Water), Federal government, Industrial wastes, Waste water disposal, Waste water(Pollution), Waste water treatment, Regulation.

The Effluent Standards and Water Quality Information Advisory Committee was established to provide, assess, and evaluate scientific and technical information on effluent standards and limitation for the Environmental Protection Agency administrator. The industries covered by this com-

mittee report are: dairy products; grain mills; canned and preserved fruits and vegetables; beet sugar; liquid and crystalline cane sugar refining; insulated fiberglass; auto and other laundries; coal mining; oil and gas extraction; iron and steel; cement manufacturing; feedlots; organic chemicals; soap and detergent manufacturing; glass manufacturing; asbestos; pulp, paper and paperboard; builders' paper and roofing felt; and meat. Pertinent facts regarding the industries are given, such as size of the industry, geographical location, number of employees, variations in process used, and pertinent economics. Considerable time is spent in searching out the raw waste loads for each industry. The pollutant parameters for the particular industry are noted, and those included in the recommended limitation are listed. All the possible technologies that may be used by each industry are listed. (Jordan-Florida)
W78-10392

FEDERAL AND STATE EFFORTS TO CONTROL WATER POLLUTION CAUSED BY ACID DRAINAGE FROM MINES.
Comptroller General of the United States, Washington, DC.
Available from the National Techical Information Service, Springfield, VA 22161 as PB-257 291, Price codes: A04 in paper copy, A01 in microfiche. Report B-177011, August 14, 1973, 65 p.

Descriptors: *Mine drainage, *Mining engineering, *Water pollution sources, *Appalachian Mountain Region, *Cost analysis, Mine acids, Mine wastes, Acid mine water, Mining, Water pollution, Economics.

This report identifies and reviews the research, development, and demonstration programs to control acid drainage pollution from mining operations which currently are being conducted by several federal agencies. The Environmental Protection Agency (EPA) reports that the technology necessary to control acid drainage could be developed by 1980 if sufficient funds were made available. At the present rate of funding, complete technology development is not expected until the 1990's. According to the EPA, technology to treat acid-polluted water is 70% developed, while that nessary to prevent drainage into waterways is only 10%-50% developed. The states of Illinois, Kentucky, Maryland, Ohio, Pennsylvania, and West Virginia which have enacted permit programs to control water pollution from active mines, reported that federal funds were needed to support funds to the states to prevent pollution from abandoned mines, as of 1973 no such projects had been funded. The report concluded that significantly more funds must be appropriated before the technology to control water pollution from mine acid drainage can be developed. (Malefatto-Florida)
W78-10393

A SYNOPSIS OF STATE LEGISLATION ON WATER POLLUTION CONTROL LAWS ENACTED DURING 1970.
Environmental Protection Agency, Washington, DC. Water Quality Office.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 392, Price codes: A02 in paper copy. December 31, 1970, 69 p.

Descriptors: *Legislation, *State governments, *Water pollution control, *Water quality control, Governmental interrelationships, Legal aspects, Political aspects, Pollution abatement, Rivers, Sewages, State jurisdiction, Water law.

This report lists all 1970 state legislation that deals with the control of water pollution. The states that enacted water pollution control laws in 1970 were: Alaska; California; Colorado; Delaware; Florida; Georgia; Hawaii; Idaho; Illinois; Iowa; Kansas; Kentucky; Louisiana; Maine; Maryland; Massachusetts; Michigan; Mississippi; New Hampshire; New Jersey; New Mexico; New York; Ohio; Oklahoma; Pennsylvania; Puerto Rico; Rhode Island; South Carolina; Tennessee; Utah; Vermont; Virginia; Washington; West Virginia; and Wisconsin. Examples of state legislation in 1970 are laws which: (1) prohibit discharge of untreated wastes into the Mississippi River; (2) require the establishment of county plans for solid waste management; (3) authorize the acquisition of water impoundment sites to meet the future water resource needs of Massachusetts; (4) authorize any New Jersey local municipality to finance facilities for the collection, treatment and disposal of sewage; (5) regulate the construction, alteration and servicing of septic tanks and sewage systems in South Carolina; and (6) prohibit the sale of soap or detergent in New York unless the wrapper or container is plainly labeled as to its phosphate content. (Jordan-Florida)
W78-10394

NATIONWIDE EVALUATION OF COMBINED SEWER OVERFLOWS AND URBAN STORMWATER DISCHARGES. VOL. III: CHARACTERIZATION OF DISCHARGE,
American Public Works Association, Chicago, IL. Research Foundation.
For primary bibliographic entry see Field 5B.
W78-10397

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME III: DATA ELEMENT DICTIONARY. DEFINITION OF SYSTEM REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 862, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-570/9-76-002-3, June, 1976, 206 p.

Descriptors: *Federal government, *Water quality, *Water quality control, *Model studies, *Data processing, United States, Environmental control, Environment, Feasibility studies, Water, Water law, Water supply, State governments, Data storage and retrieval, Data collections, Administrative agencies, Administration, Management, Consumptive use.

The Safe Drinking Water Act of 1974 (SDWA) mandates the performance of minimum data management functions by both the states and the Environmental Protection Agency (EPA) regions. The Model State Information System (MSIS) is a computer-based information system which enables the states to meet these minimum standards. This is one of three documents which outline the basic concepts of an informational data management system to meet the water quality monitoring and reporting requirements of the SDWA. This third volume of the MSIS for the EPA Safe Drinking Water Program (SDWP) consists of a data element dictionary with a definition of system requirements. The other two documents produced are a feasibility study for the development and implementation of a MSIS for EPA's SDWP and an introduction to the MSIS. The MSIS consists of eight subsystems: (1) public water supply inventory; (2) water quality compliance; (3) regulations; (4) federal reporting; (5) variances and exemptions; (6) enforcement actions; (7) sanitary surveys; and (8) operator and mailing. The first four subsystems comprise the basic package required if any portion of the MSIS is to be used. States may select the base package and one or more optional subsystems. (Quarles-Florida)
W78-10398

ECONOMIC LAW ENFORCEMENT. VOLUME I. OVERVIEW.
Connecticut Dept. of Environmental Protection, Hartford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 531, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-901/9-76-003a, September, 1975. 80 p.

Descriptors: *Connecticut, *Law enforcement, *Administrative agencies, *Water quality control, Penalties(Legal), Environmental control assessments, Permits, Standards, Regulation, Remedies, Water resources development.

In 1972, Connecticut's Department of Environmental Protection (CDEP) created a task force to design an approach to meet its legal responsibilities. The method developed economic law enforcement, has been used by the Federal Environmental Protection Agency as a model for other state agencies. Basic to the system is an economic standard--how much a polluter has saved by noncompliance with regulations--for determining the penalty to be levied. Thus, the fine equals the cost to a violator of meeting his environmental requirements, and encourages clean-up. CDEP's Water Compliance Unit (WCU) has proposed economic assessment regulations for violation of an order or permit terms, for discharging without a permit, and for failing to submit requisite monitoring reports dealing with volume of water and pollutants discharged. WCU officials have proposed civil assessments to curb commercial and institutional filling in coastal and tidal waters. They feel illegal coastal feeling deserves priority because of the permanent environmental damage it causes. Once the enforcement system for coastal filling is instituted and perfected, WCU officials believe it can be extended to filling in inland and tidal wetlands. (See also W78-10400 thru W78-10402)
W78-10399

ECONOMIC LAW ENFORCEMENT. VOLUME III. STRENGTHENING ENVIRONMENTAL LAW ENFORCEMENT: WATER POLLUTION.
Connecticut Dept. of Environmental Protection, Hartford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 902, Price codes: A13 in paper copy, A01 in microfiche. September 1975, 299 p.

Descriptors: *Connecticut, *Water pollution control, *Law enforcement, *Penalties(Legal), Federal Water Pollution Control Act, Administration, Regulation, Permits, Water quality standards, Assessments, Pollution abatement, State governments.

How civil assessment penalties for water pollution are applied under Connecticut law is presented in this volume. Recently passed sections 502, 503, and 504 of the state's Civil Penalties Regulations use fines as an enforcement tool. These statutes are meant to provide a means of combatting frequently encountered enforcement problems. Section 502 applies to polluters who start or continue to discharge pollutants into state waters without a permit. Section 503 deals with violators of water polution control orders. Section 504 applies to parties who do not submit required discharge monitoring reports. Fine schedules are designed to eliminate any economic benefits which might result from non-compliance with regulations. The agency responsible for enforcement of these laws is the state Department of Environmental Protection's Water Compliance and Hazardous Substances Unit. The unit's enforcement experience before passage of the new sections is analyzed. Its efforts in issuing permits and monitoring discharges, and problems encountered in enforcing compliance orders, are described. An operating manual, including procedures and forms, designed to help unit personnal make full utilization of the new legislation is included. (See also W78-10399) (Malefatto-Florida)
W78-10400

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY.
Environmental Protection Agency, Washington, DC. Office of Air and Water Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 318, Price codes: A11 in paper copy, A01 in microfiche.
In: Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, p. 130-167, United States Environmental Protection Agency, Washington, DC., 1973, $2.30.

Descriptors: *Construction, *Erosion control, *Pollution abatement, *Storm runoff, Construction materials, Erosion, Oil pollution, Pollutant identification, Chemical wastes, Road construction, Sedimentation, Water pollution.

Each year the construction of new facilities such as highways, dams, powerplants, housing developments and other energy consuming or producing facilities uses up more than one million acres of land. In order to disrupt the environment as little as possible, information is presented and sought on processes, procedures and methods for controlling sediment, stormwater, and pollutants other than sediment which result from construction activities. Processes include: (1) site planning; (2) preliminary site evaluation and design; (3) use of planning tools; and (4) structural and vegetative design considerations. Methods include on-site erosion, sediment, and stormwater management control structures as well as soil stabilization practices useful for controlling pollutants resulting from construction activities. Predicting continued growth and construction as inevitable, at least for the next fifty years, the authors recommend that communities presently at the threshold of development plan now for coping with non-point sources of construction-related pollution. The authors note, however, the inability of political institutions to recognize that certain laws and procedures have been outflanked by technological advances. (Jordan-Florida)
W78-10403

THE MISSOURI RIVER BASIN WATER RESOURCES PLAN.
Missouri River Basin Commission, Omaha, NE.
For primary bibliographic entry see Field 6B.
W78-10406

MISSOURI STATE LAWS PERTAINING TO WATER AND RELATED LAND RESOURCES,
Missouri Dept. of Natural Resources Jefferson City. Clean Water Commission.
For primary bibliographic entry see Field 4A.
W78-10408

ROLE OF INTERSTATE WATER POLLUTION CONTROL COMMISSIONS.
Blaser, Zeni and Co., Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 759, Price codes: A07 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., Div. of Water Planning. February, 1975, 141 p.

Descriptors: *Governmental interrelations, *Water pollution control, *Federal Water Pollution Control Act, *Administrative agencies, Interagency cooperation, Planning, Water quality control, Federal project policy, Water Quality Act, Cost allocation, Pollution abatement, Management.

Six Interstate Water Pollution Control Compact Commissions (IWPCCC) were created in the Northeastern United States before the Federal Water Pollution Control Act was adopted. While under the federal act each state is responsible for a comprehensive water pollution control program, the IWPCCC's operate programs which only cover related functions. To clarify the issues and responsibilities associated with state and interstate agencies so that optimal use could be made of available resources, the federal Environmental Protection Agency (EPA) authorized this study. The existence and performance of certain control functions were examined to determine what extent they were done by the IWPCCC's as part of a comprehensive program, and to what extent they duplicated state functions. It was found that while IWPCCC's have had and would continue to have a valuable role to play in water pollution control, some operational changes were needed. It was recommended that the EPA not directly fund the IWPCCC's for: standard setting; permitting; surveillance; enforcement; operator training; sample collection and analysis; and planning. Instead, the study concluded that the states should be funded individually for these functions, thus allowing them to decide which IWPCCC operation to support. (Malefatto-Florida)
W78-10411

STATE LIABILITY TO PRIVATE PROPERTY OWNERS AS A RESULT OF THE REDIVERSION OF THE KISSIMMEE RIVER,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W78-10413

FOURTH SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN IN THE STATES OF WISCONSIN, ILLINOIS, INDIANA, AND MICHIGAN, VOLUME 2.
Environmental Protection Agency, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 337, Price codes: A13 in paper copy, A01 in microfiche. Conference held September 19-21, 1972, Chicago, Illinois, 491 p.

Descriptors: *Lake Michigan, *Drainage patterns(Geologic), *Eutrophication, *Phosphorus, *Polychlorinated biphenyls, Analytical techniques, Bioindicators, Fertilizers, Fish, Illinois, Indiana, Michigan, Pesticides, Runoff, Watersheds(Basins), Watershed management, Wisconsin, Conferences, Water pollution sources, Water pollution effects.

Possibly the single most urgent problem concerning Lake Michigan is accelerated eutrophication due to man's introduction of an abundance of nutrients in a quantity fantastically beyond nature's input. Human sewage, industrial waste and drainage from farm land are significant sources of nutrients that contribute to the eutrophication of Lake Michigan. High concentrations of phosphorus favor the blue-green algae which are capable of using nitrogen from the atmosphere as a source of nutrition. Phosphorus removal technology is both well known and readily available. Consideration can also be given to banning phosphates in detergents. Chloride is important because it is a major component of total dissolved solids from man-made sources. A few large Michigan industries contribute much of the chloride in Lake Michigan. Another major source of chloride is the amount added to urban runoff through the use of highway de-icing salt. The effects of salt are cumulative, and in some cases, irreversible. Control of chloride discharges into Lake Michigan is one of the best methods available to limit the increase in total dissolved solids to protect the water quality of the Great Lakes. (Jordan-Florida)
W78-10414

HANDBOOK OF WATER QUALITY MANAGEMENT PLANNING.
TenEch Environmental Services, Inc., Louisville, KY.
Van Nostrand Reinhold Environmental Engineering Series, Van Nostrand Reinhold Company, New York, N.Y., 1977. 419 p, 52 fig, 69 tab, 357 ref. Pavoni, J. L., (Ed.).

Descriptors: *Water quality, *Management, *Planning, *Methodology, *Analytical techniques, *Legislation, *Environment, Systems analysis, Equations, Land use, Simulation analysis, River basins, Water resources development, Mathematical models, Cost effectiveness, Public participation, Impact statements.

A practical introduction to water quality management, this book discusses the various multidisciplinary aspects of the planning process. Fifteen contributing authors have combined their specialized knowledge as a step toward accomplishing the goals of the Federal Water Pollution Control Act Amendments of 1972. Chapter 1 outlines the development of water quality management planning in the United States, and it describes the purpose, scope and approach of various planning studies, from turn-of-the-century legislative attempts to contemporary levels of planning. Chapter 2 discusses the intricate relationships between water quality management planning and land use planning; included are federal versus local control and the water quality impact of urban development. Chapter 3 describes wastewater treatment alternatives that can be used in water quality management studies and a method of evaluating them on a cost effective basis; thorough information is presented on developing cost estimates--tabular data, cost indices, cost curve analyses, and more. Chapter 4 discusses the use of computer modeling in water quality management studies, models available for various types of planning studies, and the relationship of modeling results to the devision-making process. Chapter 5 outlines the management and institutional requirements and constraints that must be considered in water quality management planning; legal, financial and regulatory considerations are covered. Chapter 6 discusses the requirements for public participation in the planning process, methods available for public participation and alternatives evaluation, and the applicability of these methods to various planning studies. Finally, Chapter 7 describes the role of environmental assessment in water quality planning studies and various available methodologies. (See W78-10417 thru W78-10423) (Bell-Cornell)
W78-10416

DEVELOPMENT OF WATER QUALITY MANAGEMENT PLANNING IN THE UNITED STATES,
Weston (Roy F.), Inc., Wilmette, IL.
G. Noble, and E. L. Findley.
In: Handbook of Water Quality Management Planning. Joseph L. Pavoni (Ed.), Van Nostrand Reinhold Environmental Engineering Series, Van Nostrand Reinhold Company, New York, N.Y., p 1-46, 1977. 1 fig, 5 ref.

Descriptors: *Water quality, *Planning, *Management, *United States, *Legislation, *River basins, Water pollution control, Environmental control, Regional planning.

This introductory chapter outlines the development of water pollution control planning in the United States and the purpose, scope, and approach used in various planning studies. Discussed are the following early major legislative attempts: (1) The Rivers and Harbors Act of 1899; (2) The Oil Pollution Act of 1924; (3) The Water Pollution Control Act of 1948; (4) The Water Pollution Control Act Amendments of 1956 and of 1961; (5) The Water Quality Act of 1965; and (6) The Clean Waters Restoration Act of 1966. Next, the new bill--The Federal Water Pollution Control Act Amendments of 1972--is considered and compared with earlier legislation. Presented is the hierarchy of new, distinct levels of planning established by the Act: The Basin Plan; Areawide Planning; Facilities Planning; and River Basin Planning Strategy. The remainder of the chapter discusses in detail: (1) The River Basin Planning Process; (2) The 208 Planning Process; and (3) The 201 Facility Plan. These are considered in terms of specific ob-

jectives, major preparatory activities, content, and implementation approaches. (See also W78-10416) (Bell-Cornell)
W78-10417

RELATIONSHIPS BETWEEN WATER QUALITY MANAGEMENT PLANNING AND LAND USE PLANNING,
Bartholomew (Harland) and Associates, St. Louis, MO.
R. G. Alderfer, and E. Lovelace.
In: 'Handbook of Water Quality Management Planning.' Joseph L. Pavoni (Ed.), Van Nostrand Reinhold Environmental Engineering Series, Van Nostrand Reinhold Company, New York, N.Y., p 47-86, 1977. 19 tab, 62 ref.

Descriptors: *Water quality, *Management, *Planning, *Land use, *Environmental effects, Legislation, Urban development, Impact, Mathematical models, Cost effectiveness.

Land use profoundly affects water quality in streams, rivers, lakes, and shallow aquifers. Finding specific cause-effect relationships is seldom simple because: (1) water courses usually assimilate materials from widely dispersed land areas; (2) land areas drained by a common waterway nearly always have mixed uses; (3) soils vary significantly in properties affecting infiltration, chemistry, etc.; and (4) movements from land areas to waterways vary greatly with time and local precipitation pattern. Understanding the interaction between land use and water quality is vital. Considered is how existing Federal water quality management planning legislation affects land use planning in the United States. Discussed are facilities planning, areawide waste treatment management planning (given are generalized flow charts for the 201 and 208 planning processes), and criticisms of land use planning as required by Federal Water Quality Guidelines. Considered next is what is known about the impact of specific land uses on the quality and quantity of water resources. The effects of runoff volume, sediments, nutrients, pesticides, organic loads, and pathogens are viewed for agriculture, silviculture, and recreational and mining areas. Discussed is the water quality impact of urban development (point and nonpoint pollution sources). Information is given on modeling applications, including the Storm Water Management Model, and a summary is given of land-use water quality studies. Finally, conclusions are drawn regarding the future course of land use planning properly adjusted to minimize degradation of water resources. (See also W78-10416) (Bell-Cornell)
W78-10418

EVALUATION OF WASTEWATER TREATMENT ALTERNATIVES,
TenEch Environmental Services, Inc., Louisville, KY.
J. L. Pavoni, and J. R. Perrich.
In: 'Handbook of Water Quality Management Planning.' Joseph L. Pavoni (Ed.), Van Nostrand Reinhold Environmental Engineering Series, Van Nostrand Reinhold Company, New York, N.Y., p 87-207, 1977. 26 fig, 29 tab, 85 ref, 3 append.

Descriptors: *Waste water treatment, *Evaluation, *Alternative planning, *Cost analysis, *Methodology, *Effluents, Water quality, Management, Environmental effects, Domestic wastes, Treatment techniques, Cost effectiveness, Pollutants, Equations.

This chapter provides a source of reference for water quality control planners, outlining process technologies, effectiveness, and costs of currently available wastewater treatment techniques. The first section is a general description of wastewater treatment methods, focusing on: the origin, nature, and characteristics of domestic wastewaters; the effect of these specific pollutants on the environment; and currently available treatment techniques, which are described at length. The second section, a reference source and starting point for engineering consultants and planners, describes effluent quality classifications and alternative wastewater treatment schemes, as well as presenting cost data for currently available wastewater treatment techniques and schemes. Specific qualities of effluents ranging from the minimum acceptable according to federal law to the maximum achievable with current technology are identified and classified alphabetically according to the degree of treatment they represent. Cost data for various treatment techniques are summarized from the literature and presented in graphical form as a function of wastewater volume treated. The final section provides an example of how the information and data herein can be utilized in water quality management planning. A rational methodology is presented for evaluating alternative water quality management plans on the basis of wastewater treatment costs within a given study. (See also W78-10416) (Bell-Cornell)
W78-10419

UTILIZATION OF MODELING IN WATER QUALITY MANAGEMENT STUDIES,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
E. G. Foree, and J. S. Tapp.
In: 'Handbook of Water Quality Management Planning.' Joseph L. Pavoni (Ed.), Van Nostrand Reinhold Environmental Engineering Series, Van Nostrand Reinhold Company, New York, N.Y., p 208-311, 1977. 14 fig, 6 tab, 152 ref, 1 append.

Descriptors: *Water quality, *Management, *Planning, *Computer models, *Simulation analysis, *Decision making, *Dissolved oxygen, *Streams, Digital computers, Equations, Systems analysis.

For water quality simulation modeling of significant scope, a digital computer is usually the most effective tool. This chapter discusses the use of computer modeling in water quaity planning studies, models available for various types of planning studies, and the relationship of modeling results to the decision-making process. Most water quality management studies are complex in nature, and the models discussed herein are those which can be utilized in such studies to focus in on the problems normally encountered, and they can be solved most optimally by using a digital computer. After a general introduction which covers the objectives of computer modeling in water quality management studies, general mathematical formulations are presented. Dissolved oxygen (DO) as a primary parameter is then considered, and the determination of parameters for stream DO modeling is discussed. An example is given of the application of a one dimensional steady-state DO model to water quality management, and modeling of water quality parameters other than DO is considered. Discussed are available stream, estuary, lake/reservoir, nonpoint source/urban runoff, and multiple function models. Finally, a systems approach to water quality management is suggested; type of data, necessary models, and potential applications are described. A table displays common deficiencies of applied river quality models and suggestions for improvements. (See also W78-10416) (Bell-Cornell)
W78-10420

MANAGEMENT-INSTITUTIONAL ASPECTS OF WATER QUALITY MANAGEMENT PLANNING,
Bartholomew (Harland) and Associates, St. Louis, MO.
E. Lovelace, and T. S. Cantine.
In: 'Handbook of Water Quality Management Planning.' Joseph L. Pavoni (Ed.), Van Nostrand Reinhold Environmental Engineering Series, Van Nostrand Reinhold Company, New York, N.Y., p 312-335, 1977. 1 fig, 1 tab, 9 ref.

Descriptors: *Water quality, *Management, *Planning, Institutional aspects, *Constraints, Water utilization, Legal aspects, Water treatment, Land use, Local governments, Costs, Legislation, Regulation, Programs.

This chapter outlines the management and institutional requirements and constraints that must be considered in water quality management planning. The recent advent of water quality management from a national perspective is more effective than the typical wastewater management agency which has limited political and geographical jurisdiction. The newer approach provides for an areawide administration to exercise water quality management over an entire areawide problem. Its effectiveness, however, is dependent upon the concurrent development of management, legal, and financial system elements with facility and regulatory programs. The management system, with its many parts, is an important key to the success of the Overall Wastewater Management Program. Discussed herein are management aspects of the statutes and EPA management guidelines. Aspects of the Section 208 management system are considered and an overview of salient issues is given. Discussed are institutional-legal considerations, including the relation to the system of local government and land use relationships; measures required to produce clean water; requirements of the management system and guidelines for development; financial and regulatory considerations; and management system options. (See also W78-10416) (Bell-Cornell)
W78-10421

PUBLIC PARTICIPATION IN WATER QUALITY MANAGEMENT PLANNING,
Schimpeler--Corradino Associates, Louisville, KY.
C. C. Schimpeler, M. Gay, and A. L. Roark.
In: 'Handbook of Water Quality Management Planning.' Joseph L. Pavoni (Ed.), Van Nostrand Reinhold Environmental Engineering Series, Van Nostrand Reinhold Company, New York, N.Y., p 336-372, 1977. 7 fig, 4 tab, 9 ref.

Descriptors: *Water quality, *Management, *Alternative planning, *Analytical techniques, *Public participation, Programs, Education, Evaluation, Methodology, Value, Rating curves, River basins, Kentucky, Statistical tests, Equations, Systems analysis.

Urban planning and engineering must consider public participation in the effective selection of programs to be implemented. Public participation herein is defined as an open process in which the community's rights to be informed and to interact with the governing body are exercised through the communication of a cross section of affected citizens with appointed and elected officials on policies under consideration. This chapter discusses the requirements for public participation in the planning process, methods available for public participation and alternatives evaluation, and the applicability of these methods to various planning studies. Specific technical aspects of each structural component of a citizen participation program are considered. Of particular importance are analytical procedures used to determine the relative utilities of various criteria applied to water quality planning and how the utilities will be used in the total cost effectiveness evaluation. The chapter concludes with a discussion of two specific water quality management planning studies in which these procedures have been applied: a 201 facilities planning study and a 303(e) river basin planning study. (See also W78-10416) (Bell-Cornell)
W78-10422

ENVIRONMENT ASSESSMENTS IN WATER QUALITY MANAGEMENT PLANNING,
Louisville Univ., KY. Dept. of Civil Engineering.
J. E. Heer, Jr., and D. J. Hagerty.

In: 'Handbook of Water Quality Management Planning.' Joseph L. Pavoni (Ed.), Van Nostrand Reinhold Environmental Engineering Series, Van Nostrand Reinhold Company, New York, N.Y., p 373-410, 1977. 3 fig, 35 ref.

Descriptors: *Environment, *Assessment, *Water quality, *Management, *Planning, *Legislation, Methodology, Projects, History, Impact statements, National Environmental Policy Act, Water resources development.

Described is the role of environmental assessment in various water quality management planning studies and various assessment methodologies available to the planner. The history, most important features, and the consequences of the National Environmental Policy Act are described. The development of the Environmental Impact Statement is discussed in terms of the enforcement of NEPA and impact statement contents. Considered is impact assessment preparation: the general sequence of preparation, methods of impact assessment, and organizing the assessment team. Finally, the chapter deals with environmental assessments of water management activities; discussed are NEPA planning implications and assessments for specific projects. It is concluded that the NEPA of 1969 has proven to be one the most significant legislative tools for environmental protection and resource conservation yet created in the United States. Some of the most important provisions of the Act include the requirement for an impact statement directed toward all federally funded activities considered to have a significant effect on the environment. A number of different methodologies has been developed for use in impact assessment, from graphical representation techniques and checklists to extremely complex quantitative methods. Environmental impact statements will have great significance in overall environmental planning and with regard to public participation in the development of water management plans. (See also W78-10416) (Bell-Cornell)
W78-10423

ASSESSMENT OF THE MACROBENTHOS IN AN ANTARCTIC ENVIRONMENT FOLLOWING RECENT POLLUTION ABATEMENT,
British Antarctic Survey, Cambridge (England).
For primary bibliographic entry see Field 5C.
W78-10430

SHIPBOARD OIL IN WATER CONTENT MONITOR BASED ON LIGHT SCATTERING AT 45 DEGREES, 90 DEGREES AND 135 DEGREES AND TURBIDITY AT 0 DEGREES,
Enviro Control, Inc., Rockville, MD.
For primary bibliographic entry see Field 5A.
W78-10437

SPILL RISK ANALYSIS PROGRAM: METHODOLOGY DEVELOPMENT AND DEMONSTRATION - FINAL REPORT, VOL II,
Operations Research, Inc., Silver Spring, MD.
W. D. White, and L. A. Stoehr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A042 978, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Coast Guard Office of Research and Development Technical Report CG-D-22-77, April 1977. 110 p, 16 fig, 10 tab, 3 append. DOT-CG-31571-A.

Descriptors: *Oil spills, *Hazards, *Accidents, *Water quality control, Pollutants, Baseline studies, Resources development, Safety, *Outer Continental Shelf, Hazardous materials, Ship collisions, Safety regulations.

The research and results in the development and demonstration of systematic methods of assessing the effectiveness of either proposed or recently implemented merchant marine safety regulations are described. The methods have been designed primarily to assest Coast Guard regulatory decision-makers in their selection of alternative means of reducing marine transportation casualties and spills of hazardous or polluting materials. The methodology involves both analytical and logical modeling of ship collisions in terms of the physical parameters (e.g., vessel size, speed, maneuverability) but human response parameters are also considered. Logical modeling of casualties addresses the effects of changes in regulations and involves structured conduct of quasi-experiments using the Coast Guard data base of marine casualty reports. A preliminary analysis of the Coast Guard Pollution Incident Reporting System (PIRS) is also included. CG-D-15-75, Spill Risk Analysis Program Phase II Methodology Development and Demonstration. (Sinha - OEIS)
W78-10439

STRATEGIC PETROLEUM RESERVE. SULPHUR MINES SALT DOME, CALCASIEU PARISH, LOUISIANA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of Energy Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as DOE/EIS-0010, Price codes: A08 in paper copy, A01 in microfiche. Department of Energy Final Environmental Impact Statement, DOE/EIS-0010, March 1978, 608 p.

Descriptors: *Water pollution, *Oil pollution, Louisiana, Transportation, Gulf of Mexico, Water quality, *Outer Continental Shelf, *Environmental impact, Crude oil, Salt domes, Petroleum.

This document is a site specific environmental impact statement (EIS) for the proposed storage of 24 million barrels of crude oil at the Sulphur Mines salt dome located in Calcasieu Parish, Louisiana. This site-specific EIS has identified particularly sensitive environmental parameters. The most sensitive parameters to be affected by oil storage development at this site appear to be water quality and air quality. However, the use through several cycles at the Sulphur Mines site would be limited due to the close proximity of the caverns to the periphery of the dome. Some of the adverse impacts to the physical environment that could result include: degradation of surface water quality due to sedimentation from runoff and erosion during pipeline construction activities which would increase the amount of suspended particulates, toxic sulfides, heavy metals, arsenic, pesticids and other toxic hydrocarbons. Brine disposal into subsurface aquifers appears to have the necessary total capacity to accommodate the total volume of brine to be disposed. A total of 453 barrels of oil are projected to be spilled during the project lifetime in transporting the crude oil. The maximum credible spill size is 400,000 barrels for tankers and 10,000 barrels from the pipeline system. A spill of this size could severely pollute hundred acres, depending on location, but the probability of occurrence is extremely low. (Sinha-OEIS)
W78-10443

RESPONSE OF COASTAL WATERS OF ATMOSPHERIC FRONTAL PASSAGE IN THE MISSISSIPPI DELTA REGION,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W78-10444

THE MARINE RESOURCES OF ANAHEIM BAY,
Department of the Environment, Edmonton (Alberta).; and California State Univ., Long Beach. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W78-10446

THE WATER ELEMENT OF THE FLORIDA STATE COMPREHENSIVE PLAN.
For primary bibliographic entry see Field 6B.
W78-10449

WILL WE SAVE OUR COASTS,
Senate, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-10450

SHIPOWNERS' LIABILITY FOR POLLUTION REMOVAL EXPENSES UNDER A STATE STATUTE LIMITED BY FEDERAL LIMITATION OF LIABILITY ACT, BUT NOT LIMITED BY FEDERAL WATER POLLUTION CONTROL ACT,
J. D. Kimball.
Journal of Maritime Law and Commerce, Vol 9, No 3, p 397-401 (April, 1978).

Descriptors: *Federal jurisdiction, *Judicial decisions, *State jurisdiction, *Oil spills, Disasters, Legal aspects, Legislation, Oil pollution, Transportation, Ships, Governmental interrelations, Law enforcement.

One of the principal issues left undecided by the Supreme Court in Askew v. American Waterways Operators and which has resulted in great and uncertainty in actions for the recovery of oil spill removal expenses is what overall limit of liability is applicable where both state and federal claims are involved. The Court in Askew specifically declined to decide whether such liability imposed by a state statute would be subject to the limits of liability provided by a federal pollution act--now the 1972 Federal Water Pollution Control Act (FWPCA)--or the Federal Limitation of Liability Act. Two recent decisions address these issues. In re Steuart Transportation Company, the District Court held that the state is not limited by the FWPCA. However, in In re Oswego Barge Corporation, the District Court held that the state is limited by the Federal Limitation of Liability Act. Also, the Supreme Court of Maine has upheld the validity of the Maine Pollution Control Act which imposed unlimited vicarious liability for oil spills. Until the Supreme Court rules further on this question, the conflict in court decisions will continue. (Jordan-Florida)
W78-10451

RESTORATION AS A FEDERAL REMEDY FOR ILLEGAL DREDGING AND FILLING OPERATIONS,
D. A. Haagensen.
University of Miami (Florida) Law Review, Vol 32, No 1, p 105-135 (Fall, 1977).

Descriptors: *Federal Water Pollution Control Act, *Wetlands, *Rehabilitation, *Dredging, Common law, Environment, Judicial decisions, Legislation, Navigable waters, Rivers and Harbors Act, Landfills, Federal jurisdiction.

Total destruction of wetland areas often results from illegal dredging and filling operations. As a result of these illegal activities, the developer could be subject to criminal sanctions. Criminal penalties, however, afford no relief for the injuries caused to the public rights in the wetland area. Some method must be available to salvage these illegally altered areas and to help restore them as functioning environmental units of the public domain. Judicially imposed restoration is not capable of returning a damaged area to pristine condition, but it can put the area in a condition more susceptible to rapid natural restoration. Federal common law principles can provide a possible basis for granting restorative relief, especially where an interstate effect from illegal activity can be shown. The Rivers and Harbors Act can provide a jurisdictional basis for an order requiring restoration where the illegal dradge and fill has altered navigable waters. The Federal Water Pollu-

tion Control Act Amendments of 1972 establishes a substantive basis for removal of illegal dredge and fill. With nearly 50 percent of the nation's wetlands filled, restoration has become a significant judicial remedy. (Jordan-Florida)
W78-10454

FEDERAL WATER POLLUTION ACT AMENDMENTS OF 1972,
S. A. Taylor, and S. Wayland.
Natural Resources Journal, Vol. 17, No. 3, p 511-519 (July, 1977).

Descriptors: *Federal Water Pollution Control Act, *Judicial decisions, *Legal review, *Standards, Administration, Administrative agencies, Administrative decisions, Law enforcement, Legislation, Permits, Regulation, Water pollution control.

Because Dupont v. Train involves major portions of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA), it is a landmark case in environmental law. The United States Supreme Court determined by a process of statutory construction that: (1) the Environmental Protection Agency (EPA) has authority to issue regulations setting uniform effluent limitations for both 1977 and 1983, provided some allowance is made for variations in individual plants: (2) FWPCA section 509(b)(1)(E) clearly authorizes only courts of appeal to review EPA actions; and (3) variances for new point sources unable to comply with new source standards are not authorized. The Court's decision focused on resolving the ambiguity in FWPCA section 301, which was the source of the conflict between EPA and the plaintiff. The authors note that the Court's decision will aid the EPA in enforcing FWPCA provisions. However, the Court did not decide questions of presumptive validity and the standard of review. The authors suggest that when question of presumptive validity arises in subsequent litigation, it can be handled by applying the Court's holding that new source regulations are absolute prohibitions. However, the question of the standard of review remains open. (Jordan-Florida)
W78-10459

PL 92-500: PROSPECTS FOR CHANGE,
S. J. Hadeed.
Journal Water Pollution Control Federation, Vol. 49, No. 11, p 2204-2208 (November, 1977).

Descriptors: *Federal Water Pollution Control Act, *Water Pollution Control Federation, *Water policy, *Political aspects, Administrative agencies, Legislation, Utilities, Waste water(Pollution), Waste water treatment, Water pollution, Water pollution control, Economic impact.

The 'National Issues' session of the Water Pollution Control Federation's Philadelphia Conference was held recently. Representatives from the Environmental Protection Agency (EPA), League of Women Voters, Council on Environmental Quality and the United States House of Representatives Water Resources Committee presented their views on amendments to the Federal Water Pollution Control Act (FWPCA). The EPA expressed concern over allegations made by some environmental organizations that the EPA is myopically disregarding the adverse environmental consequences of the construction grants program in the interest of getting money obligated and plants built. The League of Women Voters voiced citizen concern that before more substantial investments of public funds are made in water resources development, national policies should be clearer and more evident to the public. Major issues such as noncompliance and enforcement action, construction grants funding, management and operation, planning, best available technology standards, and the toxic substances control program are all awaiting legislative action. Another issue considered was the economic impact on industry of removing an extra 6% of pollutants from industrial discharges. The economic impact of that additional 6% is as significant as the first 90% covered by 1977 FWPCA standards. (Jordan-Florida)
W78-10462

MUNICIPAL PROBLEMS WITH PL 92-500 M: CONFORMANCE VERSUS PERFORMANCE,
A. V. Vondrick.
Engineering Issues (Proceedings of the American Society of Civil Engineers), Vol. 103, No. E11, p 5-15 (January, 1977).

Descriptors: *Economic justification, *Engineering, *Federal Water Pollution Control Act, *Governmental interrelations, Administrative agencies, Administrative decisions, Arizona, Cities, Decision making, Water pollution control, Local government, Public health.

The expressed intent of Congress in passing the Federal Water Pollution Control Act (FWPCA) was to restore and maintain the chemical, physical and biological integrity of the nation's waters. However, the federal Environmental Protection Agency (EPA) does not seem to be focusing on that issue. Instead, the EPA seems to be preoccupied with side issues, like demanding blanket performance by conformance that fails to further the FWPCA objective. In modern times, Phoenix, Arizona, has never polluted a stream, but it may discharge unacceptable effluents by 1980. EPA officials do not seem to consider this possibility important, apparently choosing to regard 201 and 208 plans as more important. Everyone can recognize the wisdom of Congress in passing laws to sensibly control the pollution of our environment. But no one can imagine that Congress intended to create a bureaucratic monster. The process for comments and public hearings are becoming a farce, because few significant changes in proposed regulations are made despite logical and persuasive arguments from the public sector. The concrete value of some pollution control programs becomes suspect when the long administrative procedure is considered. (Jordan-Florida)
W78-10466

THE PENALTY FOR VIOLATION OF SECTION 1161(B)(5) OF THE WATER QUALITY IMPROVEMENT ACT IS CIVIL IN NATURE,
D. R. Richardson.
Tulane Law Review, Vol. 51, No. 3, p 742-749 (April, 1977).

Descriptors: *Judicial decisions, *Navigable waters, *Pollution abatement, *Oil spills, Federal Water Pollution Control Act, Ships, Penalties(Legal), Damages, Remedies, Water pollution control, Water quality, Legislation.

In United States v. Le Beouf Brothers Towing Company, defendant towing company's vessel spilled gasoline into a navigable waterway. The company reported the spill as required by the Water Quality Improvement Act of 1970. The Coast Guard assessed a civil penalty. When the company refused to pay, the United States brought action in federal district court. That court held that the nominally civil penalty was in fact a criminal penalty from which the company was insulated by a statutory grant of immunity. The Fifth Circuit Court of Appeals reversed and held that the penalty was civil and that no immunity obtained as to corporate defendants. The authors notes the availibility of the Refuse Act of 1899 as a means of imposing sanctions against water pollution. Cases which influenced the Le Beouf Bros. decision are discussed and the court's use of statutory construction and resort to legislative history is examined. The author concludes by noting that the possible adverse impacts of a co ntrary decision were diminished by the passage of the 1972 Federal Water Pollution Control Act Amendments. (Hoofman-Florida)
W78-10467

HIGH COURT CONCLUDES WATER ACT WAS NOT INTENDED TO AFFECT NUCLEAR REGULATORY COMMISSION'S JURISDICTION.
Environmental Law Reporter, Vol. 6, p 10169-10170 (August, 1976).

Descriptors: *Effluents, *Federal Water Pollution Control Act, *Judicial decisions, *Nuclear powerplants, *Radioactive wastes, Administrative agencies, Discharge(Water), Electric powerplants, Jurisdiction, Legal aspects, Legal review, Legislation, Nuclear energy, Radioactivity, Regulation, Thermal pollution, Water law, Water pollution, Nuclear wastes, Permits.

In Train v. Colorado Public Interest Group, Inc., the Supreme Court held that Congress did not intend the 1972 Federal Water Pollution Control Act Amendments (FWPCA) to transfer regulatory authority over nuclear materials in nuclear power plant effluents from the Nuclear Regulatory Commission (NRC) to the Environmental Protection Agency (EPA). The Atomic Energy Act of 1954 gave the NRC broad regulatory authority over all the substances involved in nuclear power plants. The FWPCA empowered the EPA to regulate the discharge of all pollutants, including radioactive materials, into the nation's waters. Plaintiff, a Colorado-based environmental group, sued to compel the EPA to assume the responsibility of regulating the discharge of nuclear materials from nuclear power plants. The Supreme Court noted that the legislative history of the FWPCA spoke with controlling force on the question. If the transfer of regulatory jurisdiction issue turned solely on the legislative history, the authors note that there would be little basis to fault the Supreme Court's conclusion that Congress did not intend EPA to displace NRC. The authors conclude that the result reached by the Court was correct, but the Court's reasoning remains open to question. (Jordan-Florida)
W78-10469

OCEAN DUMPING, THE REVISED EPA CRITERIA, AND THE NATIONAL SOIL FERTILITY PROGRAM.
Environmental Law Reporter, Vol 6, p. 10144-10147 (July, 1976).

Descriptors: *Domestic wastes, *Garbage dump, *Oceans, *Recycling, *Soil management, Administrative agencies, Agriculture, Disposal, Fertilizer, International law, Legislation, Municipal wastes, Pollution abatement, Public health, Radioactive wastes, Regulation, Waste disposal, Waste dumps, Waste treatment, Wastes.

Public health measures long ago banned garbage in the streets. The last remaining convenient commons are the oceans, which have begun receiving increasingly voluminous and toxic human garbage. Ocean dumping has increased in the face of domestic and international law. These laws prohibit ocean dumping of all radioactive materials, oil, and highly toxic wastes, and strictly regulate the dumping of heavy metals, pesticides, and other wastes. Recent administrative, judicial, and legislative actions promise movement at last to implement these laudatory pronouncements. Moreover, the announcement of a National Soil Fertility Program suggests that wide attention has now been attracted to the ultimate long-term solution to dumping, i.e. recycling waste metals and employing sewage sludge as fertilizer and strip mine reclamation fill. Even with assiduous oversight of the Ocean Dumping Act by citizen suits, the demise of ocean dumping will occur only through source reduction, either by eliminating waste or finding better uses for it. The major problem is to obtain clean sludge. Presently sewage normally contains traces of heavy metals from inadequately treated industrial wastes which make it dangerous for agricultural uses. (Jordan-Florida)
W78-10470

WATER ACT AMENDMENTS: DEJA VU IN THE HALLS OF CONGRESS,
For primary bibliographic entry see Field 6E.
W78-10471

MOTORISATION OF PENSTOCKS.
Water and Waste Treatment, Vol. 21, No. 4, p 43, April, 1978.

Descriptors: *Penstocks, *Mechanical control, *Aerated lagoons, *Manual control, *Equipment, Design criteria, Flow rates, Flow control, Remote control, Hydraulic structures, Waste water treatment, Municipal wastes.

Manually operated penstocks controlling aeration basin influent in the North London Beckton Sewage Treatment Works were motorized by the Retrofit Division of Rotork Controls Ltd. of Bath, England. Opening and closing of the eight manual penstocks required 40 min to accomplish the 118 penstock turns required. Actuators were installed on each of the eight tank walls using a specially designed bracket that permitted remote operation to conform with safety procedures. Mounting of the actuators for monitorizing the penstocks utilized the existing penstock stem and position indicator. The push-button controlled penstocks required 6 min to open or close; future plans include the installation of remote control devices to operate the penstocks. Flow balancing in the aerators, as well as cleaning and maintenance operations, have been facilitated by the motorization of the penstocks. (Lisk-FIRL)
W78-10477

HISTORY OF FLORIDA OIL SPILL LEGISLATION,
Barrett, Boyd and Holder, Tallahassee, FL.
D. A. Barrett, and C. M. Warren.
Florida State University Law Review, Vol. 5, No. 3, p 309-359 (Summer, 1977).

Descriptors: *Damages, *Florida, *Legislation, *Oil spills, Disasters, Judicial decisions, Oil industry, Oil pollution, Pollution abatement, Water pollution control, Transportation.

The fouling of Tampa Bay, a rich tourist area, by oil from the tanker Delian Apollon precipitated considerably more than rhetoric in a comparatively short period of time. Then the Florida Legislature convened only six weeks after the spill, government action to prevent spills and to punish their perpetrators was imminent. The toughest aspect of the Florida Oil Spill Prevention and Pollution Control Act (FOSPPCA) made the spiller absolutely liable for all cleanup costs and damages, and provided for unlimited liability. The Act was amended four years later to limit liability to $8 million. Persons damaged by oil spills may also recover damages under tort law and admiralty law. The FOSPPCA was challenged in federal court soon after its passage. The oil shippers, in Askew v. American Waterways Operators, Inc., contended that the Florida law Conflicted with its federal counterpart, that it intruded into federal maritime jurisdiction, and that it unconstitutionally regulated foreign commerce. The Supreme Court found the Act to be constitutional. While some legal issues remain to be settled, the FOSPPCA offers an appealing model for future legislation in other states. (Jordan-Florida)
W78-10479

ENVIRONMENTAL PROTECTION AGENCY V. CENTRAL ILLINOIS LIGHT COMPANY (POWER COMPANY'S RIGHT TO MAINTAIN WASTEWATER SOURCE WITHOUT PERMIT).
For primary bibliographic entry see Field 6E.
W78-10485

COUNTY PLANS FOR PUBLIC WATER SUPPLY, SEWERAGE AND SOLID WASTE DISPOSAL SYSTEMS.
Md. Ann. Code, Art. 43, Section 387C (Supp. 1976).

Descriptors: *Maryland, *Local governments, *Planning, *Sewage disposal, Legislation, Public utilities, Sewerage, Solid wastes, Waste treatment, Waste disposal, Water supply development, Waste water disposal.

The governing body of each county shall adopt, and submit to the Maryland Department of Health and Mental Hygiene (MDHMH) a county plan dealing with water supply systems, sewerage systems, solid waste disposal systems, and solid waste acceptance facilities. The county plan shall deal with a systematic program for the collection and disposal of litter, refuse and other solid wastes. County plans shall incorporate all or part of subsidiary plans of local governments and governmental agencies to the extent that such inclusion shall promote the public health, safety and welfare. Each county plan shall delineate those areas where: (1) community water supply systems must be provided; (2) multiuse water supply systems may be installed; (3) individual water systems may be used; (4) community sewerage systems must be provided; (5) multiuse sewerage systems may be installed; and (6) individual sewerage systems can be used. The MDHMH shall adopt regulations which will provide for control, limitation or prohibition of installing or using individual or community water supplies or sewerage systems. No state or local authority shall grant any permit or record any plat, map, or plan if not in conformance with the county plan. (Jordan-Florida)
W78-10492

THERMAL DISCHARGES (E.P.A. REGULATIONS).
For primary bibliographic entry see Field 6E.
W78-10493

TUG OCEAN PRINCE, INC. V. UNITED STATES (MITIGATION OF PENALTY IMPOSED BY FEDERAL WATER POLLUTION CONTROL ACT FOR OIL SPILLS).
For primary bibliographic entry see Field 6E.
W78-10494

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

AN APPLICATION OF MULTIDISCIPLINARY WATER RESOURCES PLANNING FOR THE SAN CARLOS APACHE INDIAN RESERVATION: GILA RIVER CASE,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6B.
W78-10017

RISK ANALYSES FOR A WATER-SUPPLY SYSTEM--OCCOQUAN RESERVOIR, FAIRFAX AND PRINCE WILLIAM COUNTIES, VIRGINIA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-10048

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
Proceedings, Volume 1, June 26-28, 1978, University of Waterloo, Ontario, Canada, 1978. 470 p, 119 fig, 36 tab, 397 ref. McBean, E.A., Hipel, K. W., and Unny, T.E., (Eds.).

Descriptors: *Risks, *Reliability, Water resources, *Analytical techniques, *Reservoir storage, *Design, *Water management(Applied), *Floods, *Socio-economic aspects, Probability, Streamflow, Stochastic processes, Projects, Programs, Methodology, Planning, Hydrology, Hydraulics, Mathematical models, Equations, Systems analysis, Simulation analysis, Optimization, Uncertainty, Deterministic modeling.

The papers presented at this Symposium emphasize the application of systems analysis techniques to the problems of risk and reliability in water resources operations, planning, and management. Volume 1 contains those articles concerned with socioeconomic aspects, storage reservoirs, design management, water resources management, reliability analyses, and flood probability analyses. Numerous modeling techniques are illustrated by many authors from different regions in the United States, by some from Germany and Canada, and by a few individuals from such countries as Yugoslavia, Turkey, and Brazil; many of the articles present highly detailed illustrations. Volume 2 of this Proceedings considers such subjects as reservoir management and the failure of hydraulic structures. (See W78-10095 thru W78-10123) (Bell-Cornell)
W78-10094

RISK AND RELIABILITY -- A BIO-SOCIO-TECHNOLOGICAL VIEW,
Polytechnic Inst. of New York, Brooklyn.
For primary bibliographic entry see Field 6B.
W78-10095

SOCIO-ECONOMIC CONSIDERATIONS TO RISK AND RELIABILITY IN WATER RESOURCES,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 6B.
W78-10096

INTERACTIVE MULTIOBJECTIVE WATER RESOURCES PLANNING: AN APPLICATION AND SOME EXTENSIONS,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
D. P. Loucks.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean et al (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 30-40. 4 fig, 2 ref.

Descriptors: *Water resources development, *Irrigation efficiency, *Optimization, *Multiobjective planning, Decision making, Projects, Alternative planning, Pipelines, Reservoirs, Constraints, Design, Mathematical models, Systems analysis, Northern Africa, Conflicting objectives, Water yield maximization, Reliability maximization, Cost minimization, Iterative process.

Considerable uncertainty in water resources planning stems from the existence of conflicting multiple objectives and a lack of knowledge about what the acceptable tradeoffs may be among those conflicting objectives. This paper outlines a study involving the application of a dynamic multiobjective planning model to water resources planning in a country in northern Africa. The problem involved four different, conflicting objectives: maximization of water yield and reliability, and minimization of capital and annual operating maintenance costs associated with irrigation development. An interactive process was developed wherein efficient solutions were generated in

response to reactions of decision makers, who in turn often changed their goals and preferences at each iteration. This method of reducing the uncertainty regarding objectives, preferences and tradeoffs is being extended for use with other water resources optimization and simulation models on an interactive computer graphics system. (See also W78-10094) (Bell-Cornell)
W78-10097

EMERGENCY PREPAREDNESS FOR WATER SYSTEMS: MEASURES TO MINIMIZE DISRUPTIVE IMPACTS,
California Univ., Irvine. School of Engineering.
R. Schinzinger, H. Fagin, G. Urbach, and T. G. Edwards.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean et al (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. p 41-61. 11 fig, 2 tab, 40 ref.

Descriptors: *Water allocation(Policy), *Water management(Applied), *Analytical techniques, *Networks, *Emergency planning, *Vulnerability analysis, Water supply, Water shortage, Disasters, Floods, Reliability, Risks, Mathematical models, Systems analysis.

Preparations must be made for all conceivable kinds of system failures, even if their likelihood is remote. Wherever complete physical protection is not feasible, adequate groundwork must be laid for standby operation and administrative processes which will tend to minimize the impacts of potential emergencies. This paper first reviews steps necessary to implement an emergency allocation plan for scarce water and restoration resources. It then describes methods for analyzing the vulnerability of a network and for pinpointing critical elements that warrant strengthening or for which redundant paths should be provided. These analytical and operation procedures, including fault tree analysis, reliability analysis, and graph-theoretic analysis, provide the tools necessary for vulnerability minimization. The San Diego region and one local water agency within it serve throughout as an illustrative case. (See also W78-10094) (Bell-Cornell)
W78-10098

REGIONAL ASSESSMENT OF WATER RESOURCES,
Thames Water Authority, Reading (England).
For primary bibliographic entry see Field 6B.
W78-10099

WAITING TIME TO FIRST ACHIEVEMENT OF SPECIFIED LEVELS IN RESERVOIRS SUBJECT TO SEASONAL MARKOVIAN INFLOWS,
Lancaster Univ. (England).
For primary bibliographic entry see Field 4A.
W78-10100

A METHOD TO INCLUDE RISK EXPLICITLY IN OPTIMAL RIVER BASIN PLANNING,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
M. H. Houck.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 119-126. 13 ref.

Descriptors: *River basins, *Planning, *Risk, *Linear programming, *Constraints, *Streamflow, *Forecasting, Optimization, Reservoir operation, Management, Probability, Hydrology, Equations, Mathematical models, Systems analysis, Methodology.

A new optimization model useful for river basin planning and management is developed, an example is presented, and extensions are discussed. The model, which accomodates forecasting, is a chance constrained linear program. Risk associated with predictions or forecasts of future streamflows is explicitly included in the model, and the forecasts are used to condition reservoir operations. The risk is incorporated by conditioning operations on forecasted streamflows, past streamflows and past operations. The method and timing of the forecasting are unrestricted: Any data, including previous streamflows, soil moisture, snow pack, and weather predictions, may be used to formulate the streamflow forecast. The forecast may be made at whatever time is necessitated by the planning or management situation. The model also explicitly considers the risks or probabilities of failing to meet performance levels (e.g. reservoir storage and release, economic benefits, etc.). It can be used to analyze design as well as management questions for multiple-purpose, multiple-reservoir systems, and the model formulation does not artificially restrict the set of feasible designs and management schemes prior to solution. (See also W78-10094) (Bell-Cornell)
W78-10101

THE UNRELIABILITY OF RELIABILITY ESTIMATES OF STORAGE RESERVOIR PERFORMANCE BASED ON SHORT STREAMFLOW RECORDS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 4A.
W78-10102

ON THE RELIABILITY OF RELIABILITY CONSTRAINTS,
IBM Thomas J. Watson Research Center, Yorktown Heights, NY.
For primary bibliographic entry see Field 4A.
W78-10103

RISK IN RESERVOIR DESIGN AND OPERATION: A STATE-OF-THE-ART REVIEW,
Iowa Univ., Iowa City. Iowa Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4A.
W78-10104

A SYSTEMATIC APPROACH TO FLOOD RISK MAPPING,
Acres Consulting Services Ltd., Niagara Falls, (Ontario).
For primary bibliographic entry see Field 6F.
W78-10105

REGIONAL MODELLING OF ANNUAL PRECIPITATION: LONG-TERM PERSISTENCE OR NON-CLIMATIC VARIABILITY.,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
For primary bibliographic entry see Field 2B.
W78-10106

THE VARIABILITY OF WATER QUALITY DATA AND ITS SIGNIFICANCE IN WATER QUALITY SIMULATION,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5A.
W78-10107

RISK ASSESSMENT IN WATER QUALITY SAMPLING FOR CALIBRATION/VERIFICATION ANALYSES,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-10108

INVESTIGATION OF STRUCTURAL RISKS BASED ON EXTREME-VALUE STATISTICS,
Technische Univ., Munich (West Germany). Inst. fuer Bauinzenieurwesen III.
For primary bibliographic entry see Field 8B.
W78-10109

APPLICABILITY AND RELIABILITY OF TELEMETRIC NETWORKS FOR REAL-TIME WATER QUALITY CONTROL,
Association of Bay Area Governments, Berkeley, CA.
For primary bibliographic entry see Field 5G.
W78-10110

ACCURACY OF HYDROLOGIC MODEL PARAMETERS ESTIMATED USING REMOTELY SENSED DATA,
Agricultural Research Service, Beltsville, MD. Hydrograph Lab.
For primary bibliographic entry see Field 7B.
W78-10111

RISK AND RELIABILITY IN THE DEVELOPMENT OF WATER RESOURCES FOR AGRICULTURE,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 3F.
W78-10112

OPTIMAL RISK-BASED DESIGN OF WATER RESOURCE PROJECTS,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-10113

SAFETY FACTOR IN HYDROLOGIC AND HYDRAULIC ENGINEERING DESIGN,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-10114

A STATISTICAL ANALYSIS OF RAINFALL - RUNOFF RELATIONSHIP,
George Washington Univ., Washington, DC. School of Engineering and Applied Science.
For primary bibliographic entry see Field 2A.
W78-10115

RISK AND RELIABILITY ANALYSIS IN HYDROLOGIC DESIGN,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulics and Water Power.
For primary bibliographic entry see Field 8B.
W78-10116

THE RELIABILITY OF PUMPED STORAGE YIELD INVESTIGATED BY SYNTHETIC DATA GENERATION FOR SIX BRITISH RIVERS,
Water Research Centre, Marlow (Bucks). Medmenham Lab.
For primary bibliographic entry see Field 4A.
W78-10117

RELIABILITY CONCEPTS IN PLANNING STORM-DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-10118

UNCERTAINTIES IN DETERMINATION OF FLOOD PROFILES,
Dames and Moore, Washington, DC.
For primary bibliographic entry see Field 6F.
W78-10119

SIMULATION OF FLOOD HYDROGRAPHS,
Technische Univ., Munich (West Germany). Inst. of Hydraulics and Hydrology.
For primary bibliographic entry see Field 2E.
W78-10120

ON RELIABILITY OF MATHEMATICAL MODELS FOR FLOOD LEVEL PREDICTION IN RIVERS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-10121

INFORMATION ON FLOOD PEAKS IN DAILY FLOW SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-10122

ON THE RELIABILITY STUDIES FOR OPERATION OF WATER RESOURCES SYSTEMS,
Universidade Federal do Rio de Janeiro, (Brazil). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W78-10123

HANDBOOK OF WATER QUALITY MANAGEMENT PLANNING.
TenEch Environmental Services, Inc., Louisville, KY.
For primary bibliographic entry see Field 5G.
W78-10416

RELATIONSHIPS BETWEEN WATER QUALITY MANAGEMENT PLANNING AND LAND USE PLANNING,
Bartholomew (Harland) and Associates, St. Louis, MO.
For primary bibliographic entry see Field 5G.
W78-10418

UTILIZATION OF MODELING IN WATER QUALITY MANAGEMENT STUDIES,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-10420

ENVIRONMENT ASSESSMENTS IN WATER QUALITY MANAGEMENT PLANNING,
Louisville Univ., KY. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-10423

6B. Evaluation Process

MANAGEMENT OF WATER QUANTITY AND QUALITY IN AN ARID URBAN ENVIRONMENT: A STUDY OF LAS VEGAS VALLEY, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
G. F. Cochran, D. L. Fitzsimmons, D. D. Fowler, J. R. Garrett, and J. Leland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 490, Price codes: A16 in paper copy, A01 in microfiche. Technical Report Series H-W, Hydrology and Water Resources Publication No. 33, 1977. 339 p, 59 fig, 66 tab, 89 ref, 9 append. OWRT C-3254(No. 3707)(1).

Descriptors: *Management, *Urbanization, *Water utilization, Socioeconomic aspects, *Nevada, *Cities, *Water supply, *Water quality, Attitudes, Planning, *Model studies, *Arid-urban environment, Legal aspects, Arid lands, *Conjunctive use, Operation costs, *Las Vegas Valley(Nev).

This interdisciplinary study of conjunctive ground and surface water management in Las Vegas Valley, Nevada addresses area history, physical resources and problems, laws and institutions, water price elasticity, water user perceptions, attitudes and behavior towards water problems, and water resource system simulation and management optimization. Area resource development, economy and population growth are traced from 1844 to 1970. By 2020, population is projected to be 645,000 with water requirements about 410,000 ac.-ft./yr. This is in contrast to supplies of about 335,000 ac.-ft./yr. not including reclamation or Colorado River return flow credit. Quality and physical characteristics of supplies are examined with some focus on the Colorado River salinity problem. It is concluded, by use of model studies, that changes in management agencies and authorities would be desirable to allow more efficient integration of available resources to meet projected requirements and provide highest water quality at minimum costs with equitable allocation and recovery of costs. Through a personal interview questionnaire on a stratified random sample of 189 water customers, a residential water price elasticity of -0.335 was estimated. Socio-economic data from 623 personal interviews probed residential water users knowledge and perceptions of water problems, quality, sources, costs and related matters. (See also W72-01333; W74-01662 and W76-00608). (Smith-Nevada)
W78-09826

OUTDOOR RECREATION IN FLORIDA 1976.
Florida Dept. of Natural Resources, Tallahassee. Div. of Recreation and Parks.
May, 1976. 144 p, 17 fig, 63 tab.

Descriptors: *Florida, *Recreation, *Planning, *Parks, *Land use, Local governments, State governments, Federal government, Surveys, Geology, Climates, Hydrology, Soils, Pollution, Economics, Resource allocation, Fish, Forestry, Agriculture, Environment, United States, Urbanization, Eminent domain.

Outdoor recreation in Florida is crucial to the well-being of the state, both for the health of its own population and for its tourist oriented economy. This document stresses the importance of planning in the use of the state's natural assets of water, land, and other abundant natural resources. The demand for outdoor recreation continues to grow while the supply of natural resources is fixed and, in some cases, declining. The Division of Recreation and Parks has inventoried over eight million acres of publicly owned land used for outdoor recreation and found it insufficient to meet the demand. Acquisition of more land and development of land are needed. A suitable distribution of recreational areas throughout the state should be planned. A coordinated planning effort from all levels within the state is necessary to achieve this goal. In addition to determining future commitments of outdoor recreation resources, the report includes an inventory of current resources and demands and projected need. The needs were determined within each of the state's ten official planning regions. A summary of eighteen major recommendations is included. (Quarles-Florida)
W78-09872

PROPERTY RIGHTS TO GEOTHERMAL RESOURCES (PART TWO),
California Univ., Berkeley. School of Law.
S. Sato, and T. D. Crocker.
Ecology Law Quarterly, Vol. 6, No. 3, p 484-569 (1977).

Descriptors: *Geothermal studies, *Energy, *Heated water, *Resource allocation, Resources, Technology, Rocks, Land, Fuels, Economics, Oil, Land use, Percolating water, Groundwater, Administrative agencies, Resource development, Legal aspects, Real property, Judicial decisions, Groundwater resources, Appropriation, Model studies, Governments, Administration, Regulation.

This article, the second of two parts, examines the allocation of geothermal resources. Geothermal energy, or heat energy of the earth, is currently exploited only in areas where fluid contacts hot rock formations beneath the earth's surface. The author examines the status of the property regime governing geothermal resources and investigates alternative regimes to determine which system should govern allocation of geothermal resources. The authors summarize part one, which dealt with technical geological information and with federal and state geothermal resources law, before discussing pertinent cases decided after publication of part one. The authors then examine the allocative regimes for geothermal resources of several western states. Several states have adopted the appropriation system, but in many states the law is either ambiguous or based on a rule of capture. A number of regimes for allocation are considered in light of economic efficiency, ranging from exclusive governmental exploitation to no governmental involvement except for defining property rights. This last regime is further developed by an analysis of four models: (1) rule of capture; (2) reasonable use rule; (3) correlative rights doctrine; and (4) appropriation. The author concludes that appropriation is the most efficient. A proposed appropriation system is detailed. (Quarles-Florida)
W78-09881

OXYGENATION OF DREDGED MATERIAL BY DIRECT INJECTION OF OXYGEN AND AIR DURING OPEN-WATER PIPELINE DISPOSAL,
JFB Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 2J.
W78-10002

EVALUATION OF THE BENEFITS OF RURAL WATER SUPPLY PROJECTS IN TANZANIAN VILLAGES,
Duke Univ., Durham, NC. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3F.
W78-10008

AN APPLICATION OF MULTIDISCIPLINARY WATER RESOURCES PLANNING FOR THE SAN CARLOS APACHE INDIAN RESERVATION: GILA RIVER CASE,
Arizona Univ., Tucson. Office of Arid Lands Studies.
M. E. Norvelle, D. J. Percious, and N. G. Wright.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings of the 1977 Meetings of the Arizona Section, American Water Resources Assn. and the Hydrology Section, Arizona Academy of Science, April 15-16, Las Vegas, Nevada. p 219-226. 14 ref.

Descriptors: *Systems analysis, *Non-structural alternatives, *Indian reservations, Methodology, Design, Management, Cost analysis, *Cost comparisons, Evaluation, *Cost-benefit analysis, Planning, *Water management(Applied), Decision making, Technology transfer, Technical assistance, *Gila River, *San Carlos Apache Indian Reservation.

The Laboratory of Native Development, Systems Analysis and Applied Technology (NADSAT) was established to provide technical assistance to southwestern Indian Tribes as an aid in the development and use of their natural resources according to their goals and objectives. NADSAT's role is assistance and technology transfer, with an emphasis on alternative formulation and performance analysis and communicating the technological approach to tribal decision makers.

The cost-effectiveness methodology provides a coherent framework and affords a mechanism for technology transfer, which makes it a useful tool in achieving tribal goals. This method was applied to the formulation of possible alternatives for use of the land and water resources of the Gila River Basin within the San Carlos Apache Indian Reservation. Criteria for devising various alternative utilization schemes are discussed, and the advantages of the cost effectiveness methodology. (Payton-Arizona)
W78-10017

ALASKA VILLAGE DEMONSTRATION PROJECTS: FIRST GENERATION OF INTEGRATED UTILITIES FOR REMOTE COMMUNITIES,
Environmental Protection Agency, College, AL. Arctic Environmental Research Lab.
For primary bibliographic entry see Field 5D.
W78-10030

OREGON WATER SUPPLY PROGRAM EVALUATION.
Environmental Protection Agency, Seattle, WA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 100, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-910/9-76-019, Jan 1976, 169 p, 5 tab, 1 fig, 5 append.

Descriptors: *Water supply, *Water management(Applied), *Legal aspects, *Oregon, Water distribution(Applied), Water policy, Institutions, Organizations, Inter-agency cooperation, Budgeting, Regulation, Jurisdiction, Municipal water, Legislation, Public utilities, Standards, Potable water, Safe Water Drinking Act of 1974, Interdisciplinary cooperation, Staffing, Bottled water.

The objectives of this evaluation were to determine the adequacy of the State Water Supply Program in fulfilling its responsibilities; to propose recommendations for maintaining an effective State Water Supply Program; and to make a current determination of the general condition of Oregon's public water supplies. Basic criteria considered to be essential elements of the evaluation included a review of legal authority, program elements and activities, and inter-agency or interdisciplinary elements of the drinking water supply program. The evaluation concludes that the Public Water Supply Program was not adequately staffed or budgeted to meet its responsibilities. The following recommendations were made: (1) consideration should be given to the enactment of legislation to correct Oregon's relatively inadequate statutory authority over drinking water supplies; (2) administrators in the Oregon Health Division should be encouraged to continue to initiate development of new drinking water regulations consistent with regulations under the Safe Drinking Water Act of 1974; (3) a staff of 24 professional engineers was recommended to provide annual sanitary survey and inspection services and to provide technical assistance; (4) water supply surveyors should be informed of their responsibility for seeing that water quality standards are met, and the state budget should be increased to enable the state to carry out improved quality control chemical and bacteriological surveillance; (5) both the state bacteriological and chemical laboratories and surveillance techniques should be improved; (6) the arrangements for training both professional staff and water treatment plant and system operators must be upgraded; (7) one state staff organizational unit should be responsible for all public water supply activities including community and non-community supplies. (Zayac-NC)
W78-10032

RISK AND RELIABILITY -- A BIO-SOCIO-TECHNOLOGICAL VIEW,
Polytechnic Inst. of New York, Brooklyn.
G. Bugliarello.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 2-9. 2 fig, 3 ref.

Descriptors: *Risks, *Reliability, *Technology, Projects, Human factor, Biological risk, Societal risk, Assessment, Flood plains, Flooding, Effects, Design.

Society and technology are extensions of biological organisms. In dealing with technology in this broader framework, it is desirable to consider three essential components of risk: biological risk, project risk and societal risk. The relation among these three components changes with the degree of technological development. As technology becomes more advanced, we are placed relatively less at risk biologically from disease and hostile environments, but relatively more at risk by failures of specific projects and by society's general dependence on technology. At the same time, human factors come to play a greater role in technological failures. We have reached a point where in dealing with risk situations it becomes imperative to consider biological perceptions of risk and the role of human factors to be as important as 'rational' assessments and plans, designs, and operating procedures. We must progress from a technological view of risk to a bio-socio-technological one. (See also W78-10094) (Bell-Cornell)
W78-10095

SOCIO-ECONOMIC CONSIDERATIONS TO RISK AND RELIABILITY IN WATER RESOURCES,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
P. J. Reynolds.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 10-28. 5 fig, 31 ref.

Descriptors: *Water resources development, *Planning, *Risk, *Reliability, *Uncertainty, *Socioeconomic impact, Sensitivity, Discount rate, Water utilization, Flood control, Investment, Cost effectiveness, Economic efficiency, Political aspects, Methodology, Assessment, Decision making, Prediction.

Planning water resource developments is complicated by the number of intangibles which are not so obviously quantifiable as are tangible aspects. Moreover, the world is probabilistic, presenting risks, uncertainties, and degrees of confidence. Conventional analysis tends to ignore risk. The magnitude and irreversibility of water resource investments demand that we define the development objectives, especially where risk is involved. This paper attempts to broaden the planning process by considering the changing nature of the environment and to provide a framework in which to recognize 'risk' and 'uncertainties' and anticipate their impacts prior to a decision to implement any specific action. Considered are sources of uncertainty in water management. The remainder of the paper focusses on the types of problems associated with these sources and on methods presently available for dealing with the associated risks. Discussed are: Data requirements; population, hydrologic risk in investment decisions; discount rate; sensitivity to uncertainty; cost of uncertainty; cost-effectiveness; reliability analysis; decision theory; and prediction of future events. In conclusion, our analytical capabilities for hydrologic and economic evaluation far exceed our present capability to analyze social and institutional problems. Needed are more guidance on planning nonstructural measures, better methods of social impact assessment (particularly in the use of flood plains), and better ways of reducing the amount of data and information required in decision making. (See also W78-10094) (Bell-Cornell)
W78-10096

REGIONAL ASSESSMENT OF WATER RESOURCES,
Thames Water Authority, Reading (England).
D. G. Jamieson.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 62-71. 1 fig, 5 ref.

Descriptors: *Reservoir storage, *Regional analysis, *Assessment, *Simulation analysis, *Reliability, Water supply, Analytical techniques, Water resources, Design, Monte Carlo method, Optimization, Mathematical models, Systems analysis, Thames Basin(England).

Most traditional techniques for evaluating the performance of reservoirs are derived from those developed for a simple direct-supply reservoir, essentially a three-parameter problem. An alternative approach based on simulation is outlined which is more efficient for assessing the complex water resource systems now being considered. This has led to a redefinition of terms and phrases commonly associated with security of supply. The application of these techniques to a regional water-resource system serving a population of 11.5 million is described. (See also W78-10094) (Bell-Cornell)
W78-10099

A METHOD TO INCLUDE RISK EXPLICITLY IN OPTIMAL RIVER BASIN PLANNING,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-10101

SOLAR ENERGY, WATER, AND INDUSTRIAL SYSTEMS IN ARID LANDS, TECHNOECOLOGICAL OVERVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
C. Duffield.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 129, Price codes: A08 in paper copy, A01 in microfiche. Arid Lands Resource Information Paper No. 12. 1978 151 p, 2 fig, 1 tab, 233 refs. OWRT W-211(No. 6254)(1).

Descriptors: *Solar energy, *Arid lands, *Technoecology, *Bibliographies, *Water requirements, *Solar radiation, *Water utilization, Fossil fuels, Desalination, Engineering structures, Multiple purpose projects, Developing countries, Diversity, Trophic pyramids, Ecosystems, Ecology, Solar cells, Electric power production, Niches, Environmental effects, Limiting factors, Adaptation, Evolution, Succession, Economics, Competition, Distribution patterns, Solar distillation, Greenhouses, Industrial systems, Hydroelectric power, Wind energy, Climate modification, Seawater irrigation, Evaporation, Pumping, Desert plants, Water conservation, Desertification.

Technoecology, study of large complex industrial systems (technoecosystems) by analogy to biological ecosystems, is a new framework within which diverse solar technologies can be holistically comprehended and managed. Solar energy technoecosystems and sun-powered bioecosystems have many parallels at organismic and ecosystem levels. Solar collectors are analogous to plants in design, organization, and arid adaptations. Solar technologies for water processing (pumping, treatment, storage, conservation, desalination, evaporation) and use (solar energy collection, storage, and distribution; cool-

ing; and heliohydroelectric and salinity gradient powerplants) are reviewed. Water scarcity makes large biomass systems (except those using desert plants, seawater irrigation, or greenhouses) impractical in arid lands. Large solar technoecosystems could counteract desertification and atmospheric CO2 increase. Solar technologies are vital to future survival of arid oil countries; other developing countries need them now, at appropriate scale. Photovoltaic solar cells, analogous to chloroplasts, but water independent (ideal for deserts), could be the new base of technoecosystem trophic pyramid. Impending self-accelerating solar cell cost plummet, already begun, may drive complete global succession from fossil fuel to solar energy niche in the next few decades.
W78-10288

ALLOCATIONAL INEFFICIENCY OF BENEFIT/COST APPLIED TO WATER AND SEWERAGE SUPPLY: INTERACTIONS BETWEEN TIME-SERIES AND CROSS-SECTIONAL MODELS,
Pennsylvania State Univ., University Park. Dept. of Economics.
S. P. Coelen, R. W. Bahl, and J. J. Warford.
Water Supply and Management, Vol. 2, No. 3, p 265-274, 1978. 1 fig, 3 tab, 13 ref.

Descriptors: *Model studies, *Cost-benefit-analysis, *Property values, *Prices, *Sewerage, Water supply development, Time series analysis, Cross-sections, Mathematical models, Statistical methods, Waste water treatment, Municipal wastes.

Time-series, cost-benefit models to evaluate water facilities and sewerage projects are derived on the basis of increased property values associated with these projects. Both cross-sectional techniques, incorporating existing housing away from municipal areas, and time-series techniques, which estimate the increasing value of existing residential properties, are considered relevant for developing countries. The empirical cost-benefit analysis compares property value increases in a sewered or water-supplied control area to those in the proposed project area using time-series analysis; the average subset property sales within a given period of time are also compared to the control area indices. The time-series technique is considered analogous to cross-sectional analyses. The model is applied to a case study in Nairobi, Kenya, to verify that unpaid for benefits from investments in public sewerage and water facilities are reflected in increased land values. (Lisk-FIRL)
W78-10348

WATER-ORIENTED OUTDOOR RECREATION IN THE LAKE SUPERIOR BASIN (MICHIGAN, MINNESOTA AND WISCONSIN).
Bureau of Outdoor Recreation, Ann Arbor, MI. Lake Central Regional Office.
Available from National Technical Information Services, Springfield, VA 22161 as PB-255 148, Price codes: A11 in paper copy, A01 in microfiche. October, 1970. 243 p.

Descriptors: *Lake Superior, *Demand, *Water resources development, *Comprehensive planning, Water utilization, Water sports, Social aspects, Recreation facilities, Natural resources, Water pollution control, International waters, Water quality standards.

The Interior Department's Bureau of Outdoor Recreation conducted this study to plan for the orderly development of outdoor recreation in the Lake Superior Basin. It is part of a comprehensive Federal Water Quality Administration project on the Great Lakes-Illinois River Basins. Emphasis was placed on public beaches, campgrounds, ski resorts, trails, interpretive areas, hunting and fishing. It was found that recreation demand in the basin would probably increase 3.5 times by the year 2000, requiring 22,000 acres of additional developed recreation land. Social controls, particularly easements and zoning, were suggested to protect Lake Superior's natural environment. While the basin's water was generally found to be good, there were areas contaminated by municipal and industrial pollution. Enactment of recommendations for pollution abatement made at the 1969 Lake Superior Water Pollution Enforcement Conferences was suggested as a solution. A policy of not permitting degradation of water quality where it exceeded established standards was recommended. It was noted that current standards may not prove adequate in the future, and may therefore require strengthening. Finally, future studies and programs were recommended to be conducted in coordination with similar Canadian activities. (Malefatto-Florida)
W78-10375

•/ATER QUALITY MANAGEMENT OF SUMMIT COUNTY, COLORADO.
Environmental Protection Agency, Denver, CO. Div. of Air and Water Programs.
For primary bibliographic entry see Field 5G.
W78-10391

THE MISSOURI RIVER BASIN WATER RESOURCES PLAN.
Missouri River Basin Commission, Omaha, NE.
August, 1977, 206 p.

Descriptors: *Missouri River, *Water management(Applied), *River basin commissions, *River basin development, Planning, Land resources, Management, Conservation, Water resources development, Land use, Water utilization.

A plan for the development, management, utilization, and conservation of the Missouri River Basin's water and related land resources is presented. The plan coverage extends through 1985 and is intended to serve as a guide for planners at all levels. The plan encompasses only water and water-related land resource programs. Among the issues examined are: (1) the functional use of water and related land resources for rural, municipal, and industrial water supply; (2) irrigation; (3) flood damage abatement; (4) land conservation and management; (5) outdoor recreation; (6) water quality management; (7) power and energy development; (8) transportation; (9) the maintenance of instream flows for fish and wildlife; (10) the preservation and enhacement of natural, historic, and cultural features; and (11) pertinent legal and institutional issues. The components of the plan are summarized. Conclusions and recommendations are set forth. Broad planning objectives are included along with a description of the Missouri River Basin area. The report contains the basinwide and individual elements which comprise integral components of the plan. There is a description of each of the eight subbasins and each subbasin's plan elements. The costs of the plan elements are provided where available. (Quarles-Florida)
W78-10406

HANDBOOK OF WATER QUALITY MANAGEMENT PLANNING.
TenEch Environmental Services, Inc., Louisville, KY.
For primary bibliographic entry see Field 5G.
W78-10416

DEVELOPMENT OF WATER QUALITY MANAGEMENT PLANNING IN THE UNITED STATES,
Weston (Roy F.), Inc., Wilmette, IL.
For primary bibliographic entry see Field 5G.
W78-10417

EVALUATION OF WASTEWATER TREATMENT ALTERNATIVES,
TenEch Environmental Services, Inc., Louisville, KY.
For primary bibliographic entry see Field 5G.
W78-10419

MANAGEMENT-INSTITUTIONAL ASPECTS OF WATER QUALITY MANAGEMENT PLANNING,
Bartholomew (Harland) and Associates, St. Louis, MO.
For primary bibliographic entry see Field 5G.
W78-10421

PUBLIC PARTICIPATION IN WATER QUALITY MANAGEMENT PLANNING,
Schimpeler--Corradino Associates, Louisville, KY.
For primary bibliographic entry see Field 5G.
W78-10422

THE WATER ELEMENT OF THE FLORIDA STATE COMPREHENSIVE PLAN.
In: The Florida State Comprehensive Plan, published by the Office of the Governor, Tallahassee, Florida, p 173-188 (February, 1978).

Descriptors: *Comprehensive planning, *Florida, *Water management(Applied), *Water resources development, Management, Water conservation, Water permits, Water pollution control, Water resources, Water policy, Water supply development, Water quality control.

From 1850 until very recently, water resource development in Florida has been heavily characterized by widespread drainage, flood control and navigation projects. Around 1970 it became evident that these large-scale water resource projects should be managed comprehensively to achieve much broader objectives such as protection and enhancement of water quality, maximum conservation of water, and the protection of fish and wildlife. The Water Element of the State Comprehensive Plan provides management strategy that will enable the state to manage its natural resouces wisely and thereby provide for the long-term economic and environmental health of the state. The Water Element provides: (1) guidance for public and private water resource development; (2) a basis for executive and legislative decision making; (3) the policy basis for the Florida Water Plan, which will consist of the Water Use Plan and Water Quality Plan; (4) a broad framework that local, state, and federal agencies can use in land use and water planning; and (5) a basis for the systematic continuaton of research, analysis, and problem solving for water management problems in Florida One major Water Element policy is to restore natural hydrologic conditions and groundwater levels where practicable. (Jordan-Florida)
W78-10449

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

CAUTION: RURAL WATER DISTRICTS,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 6E.
W78-10086

BENEVAL: HOW TO GET MORE FROM YOUR STORM DRAIN DOLLAR,
Los Angeles County Flood Control District, CA. Project Planning Div.
J. Tettemer, and H. A. Vance.
Public Works, Vol 109, No 1, p 43-44, January, 1978.

Descriptors: *Storm drains, *Analytical techniques, *Costrbenefit analysis, *Project planning, *Flood damage, Flood control, Storm water, Urban runoff, Mathematical models, Waste water disposal, Municipal wastes.

The Benefit Evaluation of Urban Storm Drains (BENEVAL) process, developed by the Los Angeles County, California, Flood Control District, utilizes a regression analysis equation for establishing priorities in vote-approved storm water drain projects. The BENEVAL equation incorporates the impacts of storm damage, traffic improvement, and pedestrian convenience in terms of public opinion and values. Initially, data is collected on approved storm drain projects; drainage impact parameters are defined; and the effect of each parameter on storm drain values is calculated. The final project value in dollars is then computed as a function of the flooding potential alleviated by the drain, the slope of the flood area, the length of the flow path, the flood plain population, the average daily traffic, and the assessed valuation along the flow path. The analytical technique is considered superior to straight cost-benefit and point system analyses. (Lisk-FIRL)
W78-10289

ECONOMIC LAW ENFORCEMENT. VOLUME I. OVERVIEW.
Connecticut Dept. of Environmental Protection, Hartford.
For primary bibliographic entry see Field 5G.
W78-10399

6D. Water Demand

ANALYSIS OF WATER REQUIREMENTS FOR AGRICULTURAL IRRIGATION IN PENNSYLVANIA,
Pennsylvania State University, University Park. Inst. for Research on Land and Water Resources.
D. F. Kibler, D. D. Fritton, E. L. White, R. J. Trotter, and D. F. Tandy.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-276 061, Price codes: A11 in paper copy, A01 in microfiche. Research Publication 99, September 1977. 228 p, 28 fig, 35 tab, 6 ref.

Descriptors: Irrigation, *Crop production, *Climates, *Irrigation water, Crops, Application methods, *Soil moisture, *Water demand, *Water requirements, *Pennsylvania.

The objective is to identify the crops which are likely to be irrigated under Pennsylvania's climatic conditions. The decisions are made on the basis of the historical use of irrigation for crops as documented in census records and on the basis of published irrigation research experiments and other carefully documented investigations which apply. The attempt is to base decisions on documented yield increases of a crop under irrigated conditions when compared to yields produced by natural rainfall. The specific purpose of this investigation has been to develop quantitive estimates of expected irrigation demand by analyzing the frequency distribution of rainfall, effective precipitation and soil moisture deficit as they vary by crop and location throughout the State. Frequency analysis of these irrigation parameters is based upon an extensive data base describing the hydrologic, climatologic, and agronomic conditions found at 65 potential irrigation sites located in the primary agricultural areas of the State. All data were analyzed by computer methods to obtain frequency estimate of soil moisture deficit by crop and region. The soil moisture deficit is a primary indicator of irrigation need which can be used to project future irrigation demands in Pennsylvania. (Skogerboe-Colorado State)
W78-09827

WATER QUALITY WATER SUPPLY STUDY, ARKANSAS RIVER BASIN, JOHN MARTIN DAM, COLORADO TO GREAT BEND, KANSAS. DRAFT.
Environmental Protection Agency, Dallas, TX. Region VI.
For primary bibliographic entry see Field 5G.
W78-10031

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN BOLIVAR, CARROLL, LEFLORE, SUNFLOWER, AND TALLAHATCHIE COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 3E.
W78-10041

THE WINTERS DOCTRINE: HISTORICAL PERSPECTIVE AND FUTURE APPLICATIONS OF RESERVED WATER RIGHTS IN ARIZONA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6E.
W78-10074

RISK AND RELIABILITY IN THE DEVELOPMENT OF WATER RESOURCES FOR AGRICULTURE,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 3F.
W78-10112

APPRAISAL REPORT, WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING, KERN RIVER BASIN, CALIFORNIA.
Federal Power Commission, Washington, DC. Bureau of Power.
For primary bibliographic entry see Field 8C.
W78-10278

WATER-ORIENTED OUTDOOR RECREATION IN THE LAKE SUPERIOR BASIN (MICHIGAN, MINNESOTA AND WISCONSIN).
Bureau of Outdoor Recreation, Ann Arbor, MI. Lake Central Regional Office.
For primary bibliographic entry see Field 6B.
W78-10375

6E. Water Law and Institutions

INTERNATIONAL MEASURES FOR THE PREVENTION AND CONTROL OF POLLUTION FROM SHIPS,
Inter-Governmental Maritime Consultative Organization, London (England). Marine Environment Div.
For primary bibliographic entry see Field 5G.
W78-09806

A REVIEW OF THE 1973 MARINE POLLUTION CONVENTION,
Coast Guard, Washington, D.C. Office of Marine Environment and Systems.
For primary bibliographic entry see Field 5G.
W78-09807

VIEWS OF SHIPPING AND OIL INDUSTRIES ON THE 1973 CONVENTION,
For primary bibliographic entry see Field 5G.
W78-09808

PREPARATION FOR THE IMPLEMENTATION OF THE CONVENTION IN THE BALTIC SEA AS A SPECIAL AREA, ON THE EXAMPLE OF POLAND,
Morski Inst., Gdansk (Poland).
For primary bibliographic entry see Field 5G.
W78-09811

ENVIRONMENTAL WATCHDOGS: WHO ARE THEY,
For primary bibliographic entry see Field 5G.
W78-09854

THE MILWAUKEE CASE: CHANGING THE RULES FOR WATER CLEAN-UP,
For primary bibliographic entry see Field 5G.
W78-09855

MINERAL MINING AND PROCESSING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-09856

THE COST OF COMPLYING WITH FEDERAL WATER POLLUTION LAW,
For primary bibliographic entry see Field 5G.
W78-09857

THE COASTAL ZONE MANAGEMENT ACT AMENDMENTS OF 1976: TAILORING COASTAL ZONE PROTECTION TO EXPANDED OFFSHORE OIL PRODUCTION.
Environmental Law Reporter, Vol. 6, No. 8, p 10193-95, August, 1976.

Descriptors: *Supervisory control(Power), *Oil industry, *Continental shelf, *Government finance, State governments, Federal government, Coasts, Shores, Deep water, Water law, Administration, Legislation, Environmental effects, Financing, Grants, Loans, Bond issues, Governmental interrelationships, Management, Planning.

The Coastal Zone Management Act Amendments of 1976 were a Congressional attempt to provide coastal states and communities with means of coping with the impact of increased federal plans for outer continental shelf (OCS) oil and gas production. The Act, when first passed in 1972, did not reflect the national energy self-sufficiency policy because it pre-dated the 1973 oil embargo and energy crisis. The Amendments provide federal financing aid at 80% of costs for development and implementation of state coastal zone management programs, while the Act provided only 67% assistance. A Coastal Energy Impact Program was also established, which offers federal assistance in the form of loans, bond guarantees, and direct grants for costs of expanding public facilities and services, and repairing or mitigating the unavoidable adverse environmental impacts caused by the development associated with expanded OCS activity. The Amendments give the coastal states added financial assistance for coping with as well as planning for the impacts of expanded OCS activities. However, the Amendments take away the leverage against particular OCS activities that coastal states possessed under the 1972 Act's requirement of separate state consistency certification for each federally licensed or permitted activity. (Rule-Florida)
W78-09859

POUNDS OF CURE: GENERAL ELECTRIC AGREES TO PCB ABATEMENT, CLEANUP AND RESEARCH.
Environmental Law Reporter, Vol 6, No 4, p 10225-10228 (April, 1976).

Descriptors: *Polychlorinated biphenyls, *Industrial wastes, *Cost allocation, *Electric power industry, Federal Water Pollution Control Act, Water pollution sources, Pollutants, Water law, Abatement, Water pollution control, Pollution abatement, Compensation, Wastes, Permits, Toxins, Chemical wastes.

Both state and federal authorities were slow to show official response to growing findings of the danger of the use of polychlorinated biphenyls (PCB's). It was not until 1975 that the New York State Environmental Conservation Department (NYSECD) objected to a General Electric Company's (GE) long-time PCB discharges into the Hudson River. This discharge was authorized by the Environmental Protection Agency which issued a national pollution discharge elimination permit to GE. Pursuant to Section 401 of the Federal Water Pollution Control Act, the NYSECD certified the permit. The outcome of the enforcement action was a negotiated settlement of remedial issues which may serve as a model for future handling of similar toxic chemical use problems. The NYSECD agreed to drop claims for civil penalties and for immediate total abatement, in return for which GE agreed to spend approximately $3 million on treatment facilities to achieve a discharge level of 1 gram per day within 5 months, and eventually to phase out PCB use entirely. The NYSECD also dropped its demand that GE completely clean up discharged PCB's, while GE agreed to contribute $3 million to a cleanup program and to spend $1 million on research. (Rule-Florida)
W78-09860

THE PROMISE OF FEDERAL CONSISTENCY UNDER SECTION 307 OF THE COASTAL ZONE MANAGEMENT ACT,
M. C. Blumm, and J. B. Noble.
Environmental Law Reporter, Vol. 6, p 50047-65, January-December, 1976.

Descriptors: *Federal jurisdiction, *Federal-state water rights conflicts, *Coasts, *State jurisdiction, Federal government, Administration, Political aspects, Legal aspects, Legislation, Water law, Regulation, Decision making, Planning, Grants, Water control, Water resources, Governmental interrelations.

The Coastal Zone Management Act of 1972 (CZMA) has not yet had an on-the-ground impact on land and water use decisions in the nation's coastal areas. Since all of the coastal states have applied for and received federal grants to develop coastal zone management programs, they must soon decide whether to implement them. One of the major factors in the decisions will be the amount of leverage the federal consistency provisions will provide over federal activities once the programs are implemented. The promises of federal consistency made in the CZMA are characterized by uncertainty, ambiguities, and loopholes. Future regulations implementing the provisions may fill in some of the gaps. The mechanisms provided in the CZMA to stimulate federal-state coordination before the various state programs are approved may also help clarify gray areas. However, many of the uncertainties revolve around allocation of decision-making authority over the nation's land and water resources, so it is doubtful whether administrative regulations or mechanisms to foster intergovernmental coordination will adequately resolve the questions left unanswered by the CZMA. (Rule-Florida)
W78-09861

NATIONAL UNIFORMITY UNDER THE WATER ACT: TWO CIRCUITS UPHOLD EPA'S AUTHORITY TO ISSUE EFFLUENT LIMITATIONS UNDER SECTION 301.
Environmental Law Reporter, Vol. 6, No. 1, p 10008-10011 (January, 1976).

Descriptors: *Federal Water Pollution Control Act, *Industrial wastes, *Administrative agencies, *Industrial water, Legislation, Judicial decisions, Clean Air Act, Effluents, Regulation, Standards, Industries, Federal government, Discharge measurement, Permits, Pollution abatement, Water pollution sources, Water law.

Several ambiguities exist in the Federal Water Pollution Control Act Amendments of 1972. Two courts of appeals have recently held that the Environmental Protection Agency (EPA), under Section 301 of the statute, may issue a uniform single number nationwide effluent limitation applicable to all existing point sources within a particular industrial class or category. These holdings were in direct conflict with a prior ruling which held that limitations must be established on a case by case basis. When this question is ultimately resolved, the achievability of nationally uniform effluent limitations will be decided. Uniformity of standards within point source categories is considered crucial by Congress. The decisions in American Iron and Steel Institute v. EPA and American Meat Institute v. EPA are important because they shift the judicial balance in favor of EPA's interpretation of its authority. A second noteworthy feature of these cases is that they require deference to EPA's interpretation of its own authority under complex and ambiguous environmental legislation. The dispute is not over, but a turning point may have been reached. Judicial momentum seems to have shifted in EPA's favor. (Spiegel-Florida)
W78-09862

IMPLIED RESERVATION OF WATER RIGHTS IN THE AFTERMATH OF CAPPAERT V. UNITED STATES,
Western New England Coll., Springfield, MA. School of Law.
R. H. Abrams.
Environmental Law Reporter, Vol. 7, No. 5, p 50043-55, May, 1977.

Descriptors: *Groundwater(Resources), *Groundwater(Availability), *Federal reservations, *Reservation doctrine, Subsurface waters, Groundwater, Water supply, Water resources, Pumping, Water rights, Legal aspects, Water law, Federal jurisdiction, National monuments, Judicial decisions, Water rights, Public lands.

In 1976, the United States Supreme Court extended the Winters doctrine of implied federal reservation of water to subterranean as well as surface water in Cappaert V. United States. The Cappaert ranch began significant groundwater irrigation pumping in 1968, causing a decline in the water level of a pool in a nearby limestone cavern, which endangered its unique pupfish population. The United States, which had in 1952 declared the cavern a detached portion of the Death Valley National monument, claimed that the 1952 proclamation reserved unappropriated waters in an amount sufficient to accomplish the purposes of the reservation. The Supreme Court affirmed lower court judgments which applied the Winters doctrine to protect the claimed rights. The decision indicates that doctrine can be applied to virtually all types of federal reservation in the arid west. Although decidked on narrow grounds, it seems that reserved rights to water can exist in furtherance of a purpose which requires that water be left in place for its fulfillment. These reserved rights may be protected by injunction, even if they have not been explicitly quantified. In addition, the Court held that the existence and quantification of the rights present justiciable federal questions. (Rule-Florida)
W78-09863

RECENT STATE WETLANDS CASES: THE CONTINUING BATTLE OVER THE PROPER SCOPE OF REGULATION.
Environmental Law Reporter, Vol. 6, p 10125-10128 (June, 1976).

Descriptors: *Wetlands, *Coastal marshes, *Land use, *Dredging, *Landfills, Legal aspects, Regulation, Marshes, Water pollution control, Fisheries, Federal government, State governments, Massachusetts, Rhode Island, Georgia, Permits, Navigable waters, Rivers and Harbors Act, Federal Water Pollution Act, Judicial decisions.

Recent cases out of Georgia, Rhode Island and Massachusetts are examined in an effort to illustrate the diversity of judicial thought in the area of wetlands. The author argues that the cases examined fail to advance any takings or land use doctrinal refinements. The Massachusetts case is seen to have a chilling effect on administrative action in environmental regulation, despite the court's claim that its decision would not frustrate the implementation of other environmental laws. The Rhode Island case under scrutiny may affect the willingness of other states to find innovative alternatives to eminent domain. The Rhode Island court held that the state Fresh Water Wetlands Act's alternative compensation provision, which allows a landowner to compel the state to acquire his land at its value as a wetland, was not confiscatory. The author notes that the Georgia case may provide a tremendous opportunity for effective coastal management. In conclusion, the author points out that while coastal and inland wetlands offer great ecological and economic potential, the growth of land use law in this area continues to be sporadic. (Quarles-Florida)
W78-09864

IMPACT OF THE FAILURE OF THE SEA CONFERENCE ON LOUISIANA,
Louisiana State Univ. Law Center, Baton Rouge.
H. G. Knight.
Available from Sea Grant Legal Program, 56 Law Center, Louisiana State University, Baton Rouge, Louisiana, 70803. Louisiana Coastal Law Report Number 29, p 1-3 (1978).

Descriptors: *Louisiana, *Law of the Sea, *International law, *International waters, *Continental shelf, United Nations, State governments, Oceans, Economics, Political aspects, Fisheries, Navigation, Transportation, Exploration, Manganese, Mining, Oil, Gulf of Mexico, Legislation, Exploitation.

The outcome of the Third United Nations Conference on the Law of the Sea will greatly affect states, such as Louisiana, whose economic life depends in part upon ocean resources. Many issues are still to be resolved by the Conference and it appears that little relief is in sight. Among the important issues to be considered are fisheries management, continental shelf jurisdiction, navigation and transportation on the high seas, oceanographic research, protection of the marine environment, and military use of the sea. The major obstacle appears to be the exploitation of deep seabed mineral resources beyond the continental shelf of any nation. The value of manganese nodules makes this a crucial issue. The predicted failure of the Conference to reach agreement on many issues has prompted this analysis of how the law will develop and what impact it would have on the United States maritime interests, with emphasis on Louisiana. The areas explored on this topic include fisheries, navigation, continental shelf oil and gas, and oceanographic research. The aftermath of the failure of Louisiana's coastal zone management plan to receive federal approval is also discussed. (Quarles-Florida)
W78-09865

SHORELINE GUIDELINE REFINEMENT AND MARINE AQUATIC MANAGEMENT,
Washington State Dept. of Ecology, Olympia.
D. M. Peterson.
In: Shorelines Management '77 Performance and Prospects, Conference Proceedings, September 22-23, 1977, University of Washington, Seattle; Washington Sea Grant, Division of Marine Resources, University of Washington, Seattle, 98195. p 50-57.

Descriptors: *Project post-evaluation, *Water management(Applied), *Legislation, *Washington, Research and development, Aquatic environment, Surface waters, Coasts, Planning, Maps, Management, Shores, Administrative agen-

cies, Project planning, Water law, Permits, Land use, Ecology.

In 1971, the Shoreline Management Act (SMA) was created and the Department of Ecology was given 120 days to develop guidelines for the project. Since that time, local shoreline master programs and the permit systems have used the guidelines as their interim bases. After a considerable passage of time, there now appears to be a need to change and refine the guidelines. A considerable amount of data which has been collected in the shoreline management area should be used in the reevaluation. Management of bedlands and surfaces of marine waters are areas which require significant amount of change. In the original SMA program, emphasis was placed on land use issues. This was due to the lack of both information and experience in the aquatic area. The Coastal Atlas was formulated, along with other studies, to deal with this deficiency. In preparation for guidelines refinement, a consulting firm has prepared a Coastal Area Aquatic Management Study. This study deals with management of Puget Sound and the Straits water area. The Department of Ecology envisions lengthy guideline refinement process in order to assure involvement from public agencies and interest groups. (Spiegel-Florida)
W78-09866

FEDERAL CONSISTENCY--A PAPER TIGER, (COASTAL ZONE MANAGEMENT ACT OF 1972: ANALYSIS OF FEDERAL CONSISTENCY PROVISIONS),
Washington Univ., Seattle. Inst. of Marine Studies and Law.
M. J. Hershman, and B. Williamson.
In: Shorelines Management '77 Performance and Prospects, Conference Proceedings, September 22-23, 1977, University of Washington, Seattle, Washington Sea Grant Program, Division of Marine Resources, University of Washington, Seattle, 98195, p 120-127.

Descriptors: *Coasts, *Land management, *Administrative decisions, *Federal-state water rights conflicts, *Governmental interrelations, Management, United States, Administrative agencies, Planning, Permits, Land use, Water utilization, Legislation, Washington, California.

It is unclear what power is contained in the federal consistency provisions of the Coastal Zone Management Act of 1972 (CZMA). The author explores the possibilities and practicalities of federal consistency. Federal consistency is an attempt to correlate state and federal considerations in the development of a state's coastal zone management program. This is accomplished by the CZMA federal-state balance consisting of a pre-approval as well as a post-approval bargain between federal and state interests. The many restrictions on federal consistency are examined in detail. If courts construe the provisions broadly, they may lose much of their effectiveness. On the other hand, the provisions could be used as a powerful tool favoring state and local government action over federal action. The major points of this argument are outlined. The author concludes with an argument favoring the use of the consistency provisions to force cooperative federal-state planning. Two of the provisions could be interpreted to require federal agencies to incorporate state policies into federal planning at the earliest practical time. (Quarles-Florida)
W78-09867

ENVIRONMENTAL IMPACTS OF DREDGING IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
K. J. Williamson, and D. A. Bella.
In: Shorelines Management '77 Performance and Prospects, Conference Proceedings, September 22-23, 1977, University of Washington, Seattle; Washington Sea Grant Program, Division of Marine Resources, University of Washington, Seattle, 98195, p 69-75.

Descriptors: *Estuaries, *Environmental effects, *Dredging, *Water policy, *Estuarine environment, Balance of nature, Environmental control, Fish management, Mortality, Institutional constraints, Administration, Governments, Aquatic environment, Management, Methodology, Analytical techniques, Water quality control, Water chemistry.

Environmental impacts of dredging in estuaries are numerous. They include habitat disruption, alteration of geotechnical and chemical sediment properties, animal kills, change in circulation patterns, and release of chemicals and sediment to the water column. This article introduces two manuals specifically prepared to assist reviewers of Environmental Impact Statements (EIS's) which have been prepared for dredging actions in estuaries. The manuals provide guidelines for a thorough and critical examination of whether the provisions of the National Environmental Policy Act and Council of Environmental Quality have been met within an EIS. Both manuals can be obtained from the Engineering Experiment Station, Oregon State University. The article itself offers tips to reviewers of EIS's on how to confront massive technical information, and how to assess both the adequacy of the questions addressed and the significance and importance of impacts. A broad environmental strategy is offered because unforseeable impacts are inevitable. The strategy includes: (1) avoiding large scale irreversible changes, (2) preserving options, (3) closely monitoring changes so that adverse impacts are quickly corrected, and (4) confining potential widespread environmental impacts. (Baumbach-Florida)
W78-09868

TIDELAND AND HARBOR AREA LEASING POLICIES,
Washington State Dept. of Natural Resources, (Olympia). Div. of Marine Land Management.
W. A. Johnson.
In: Shorelines Management '77 Performance and Prospects, Conference Proceedings, September 22-23, 1977, University of Washington, Seattle; Washington Sea Grant Program, Division of Marine Resources, University of Washington, Seattle, 98195.

Descriptors: *Washington, *Coasts, *Harbors, *Optimum development plans, *Leases, Aquatic habitats, Shore protection, Shores, Coastal structures, Coastal engineering, Littoral, Decision making, Optimization, Comprehensive planning, Administration, Multiple-purpose projects, Land use, Land management, Legal aspects, Rent, Social needs, Recreation demand, Environmental control.

Since 1971, the State of Washington has prohibited the sale of tidelands except to public entities. The Washington Department of Natural Resources manages these lands as a public trust to produce the 'greatest long term public benefit.' This article outlines in detail the statutory and departmental policies for the leasing of these valuable lands. These policies are designed to provide for the best combination of marine uses that are compatible, yet minimize adverse environmental impacts. Under careful planning and multiple use management, a variety of uses and activities, such as navigation, public recreation, production of food, minerals and chemicals, and improvement of marine plant and animal habitat can occur simultaneously or seasonally. The policies include: (1) varying lease rates depending upon the degree to which the use interferes with the public use of the land, (2) giving priority consideration to the expanding navigation and commerce needs, (3) selecting second class tracts to be managed for public use, (4) protecting areas valuable for food, mineral and chemical production from conflicting uses, (5) making specific tidelands available for use by abutting landowners, and (6) requiring leases to contain provisions for protecting the natural marine environment. (Baumbach-Florida)
W78-09869

TRANSNATIONAL PETROLEUM COMPANIES AND NEW DEVELOPMENTS IN SEA LAW,
Illinois State Univ., Normal. Dept. of Political Science.
R. J. Payne.
Howard Law Journal, Vol. 20, No.2, p 444-63, 1977.

Descriptors: *International law, *International waters, *Oil industry, *Political aspects, *Exploitation, Oil pollution, Boundaries(Properly), United Nations, Conferences, Coasts, Treaties, Jurisdiction, Water resources development, Water rights, Legal aspects, Water law, Beds under water, Water pollution control, Foreign waters, Law of the sea, Political constraints, Canada, Oceans, Continental Shelf.

Since 1945, interest in exploitation of ocean bed resources, enhanced and increased in scope by developing technology, has led transnational petroleum companies to take a dynamic role in the development of transnational law. The continental shelf doctrine which extended coastal state economic jurisdiction from the shoreline to a 600 foot depth line became international law at the 1958 Geneva conference on the law of the sea. Between 1958 and 1966, oil companies were granted leases by the Interior Department at increasing distances from the United States' coastline, in accordance with its interpretation of the Continental Shelf Convention. Activities of other nations and the United Nations concerning ocean floor jurisdiction are discussed. United States seabed policy in 1970 favored an international regime to govern exploitation beyond a narrow continental shelf. But by the time of the 1974 Law of the Sea Conference, United States' policy supported a 200 mile economic zne in response to petroleum interests, the oil crisis, and developing nations's claims of 200 mile exclusive jurisdiction. Sources of ocean oil pollution are listed and shortcomings of international attempts to prevent pollution are contrasted with Canada's 100 mile antipollution zone. (Hoofman-Florida)
W78-09870

THE OPERATION OF THE FEDERAL COASTAL ZONE MANAGEMENT ACT AS AMENDED,
San Diego Univ. CA. School of Law.
R. G. Hildreth.
Natural Resources Lawyer, Vol. 10, No. 2, p 211-224 (1977).

Descriptors: *Land management, *California, *Legislation, *State governments, *Coasts, Management, Energy, Grants, Continental shelf, Oil, Federal government, Gasoline, Water utilization, Land use, Permits, Leases, Planning, Governmental interrelations, Shore protection, Decision making.

The Coastal Zone Management Act (CZMA) was amended in 1976 in an attempt to resolve problems arising in connection with energy development in the coastal zone. Additionally, California enacted legislation providing for a permanent coastal zone management program for the state. This article focuses on the impact of the 1976 amendments to the CZMA on coastal states such as California. One aim of the CZMA amendments is to expedite outer continental shelf oil and gas development. This will be accomplished by offering states compensation for the impacts of energy development on their coastal zones. Also, the application of the federal consistency requirement to outer continental shelf leasing has been clarified and has been somewhat diluted. Further clarification of the operation of other consistency requirements, the federal lands exclusion, and the facilities siting

obligation is expected to be forthcoming. The author suggests that use of the CZMA process for coastal energy issue will test the workability of federalism in energy decision making. The general requirements of the CZMA are set forth along with the 1976 amendments. (Quarles-Florida)
W78-09871

OUTDOOR RECREATION IN FLORIDA 1976.
Florida Dept. of Natural Resources, Tallahassee. Div. of Recreation and Parks.
For primary bibliographic entry see Field 6B.
W78-09872

LEGISLATION, PROGRAMS AND ORGANIZATION.
Environmental Protection Agency, Washington, DC. Office of Resource Management.
For primary bibliographic entry see Field 5G.
W78-09873

NATIONAL WATER QUALITY INVENTORY 1975 REPORT TO CONGRESS.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W78-09874

ECONOMIC IMPACTS OF EXTENDED FISHERIES JURISDICTION,
Delaware Univ., Newark.
L. G. Anderson.
Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan (1977). 428 p.

Descriptors: *Boundary disputes, *Commercial fishing, *Fish management, *Law of the Sea, *Marine fisheries, Boundaries(Property), Commercial fish, Fish, Fish conservation, Fisheries, International law, International waters, Legal aspects, Management, Reasonable use, Regulation, Treaties, Water law, Water policy, Water rights, Wildlife management, United States.

The Fishery Conservation and Management Act of 1976 extended the United States' exclusive fishery management authority to 200 miles. The addition of this vast amount of territory and the resources it contains places a tremendous strain on management capabilities. The management problem has many facets, including: (1) international aspects of extended jurisdiction, (2) attainment of optimum economic yield, (3) industry aspects, (4) practical management problems, and (5) optimal control and fisheries management. Some of the topics covered in this volume include: (1) production relationships among interrelated fisheries, (2) Law of the Sea negotiations, (3) anadromous species, (4) optimal timing of intraseasonal catch, (5) fishing boat income, capital and labor, and (6) domestic investment in harvesting and processing sectors required to utilize fish stocks available under extended jurisdiction. The author concluded that the real problem facing nations with extended fishery management authority is determining the correct management objectives and regulations, especially in view of the widely differing biological, technical, economic, and social aspects of the different fisheries involved. (Jordan-Florida)
W78-09875

IDENTIFICATION OF SELECTED FEDERAL ACTIVITIES DIRECTED TO CHEMICALS OF NEAR-TERM CONCERN.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W78-09877

CONTROL OF MARINE POLLUTION: AN ESSAY REVIEW,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5G.
W78-09878

WETLANDS: WHERE DEVELOPERS AND REGULATORY PROGRAMS MEET,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5G.
W78-09879

METHOD AND BASIS OF SEAWARD DELIMITATION OF CONTINENTAL SHELF JURISDICTION,
F. A. Eustis, III.
Virginia Journal of International Law, Vol. 17, No. 1, p 107-130 (Fall, 1976).

Descriptors: *Continental shelf, *Oceans, *Boundary disputes, *International law, *United Nations, Jurisdiction, Continental slope, Continental margin, Marine geology, Legal aspects, Water law, Political aspects, Water rights, Geomorphology, Oceanography, Governmental interrelations, Beds under water, Ownership of beds, Exploitation.

The continental shelf doctrine recognizes the right of coastal states to control limited areas of the seabed off their coasts. Determining the bounds of these areas, however, has been a sensitive and difficult issue in international law and at the current United Nations Conference on the Law of the Sea. The crux of the problem is that the legal and geologic definitions of the continental shelf differ substantially. The geologic definition is based upon chemical and physical differences, but the legal meaning has been tied to depth, distance from coastline, and exploitability. Some commentators consider the concept of sovereignty over the continental landmass to derive from the fact that the shelf is a natural prolongation of the coastal state. Despite the potential difficulties in locating with precision the geologic break between the continental and oceanic crists, it is this feature of the seabed which the author suggests should be used as the basis for determining the geographic extent of coastal state jurisdiction over subsea resources. Use of the geologic break would maximize coastal state control over shelf resources while minimizing state control of the deep seabed. (Jordan-Florida)
W78-09880

PROPERTY RIGHTS TO GEOTHERMAL RESOURCES (PART TWO),
California Univ., Berkeley. School of Law.
For primary bibliographic entry see Field 6B.
W78-09881

UNITED STATES V. 202.76 ACRES OF LAND, MORE OR LESS, IN THE COUNTY OF MERCER, STATE OF NORTH DAKOTA (OWNERSHIP OF ACCRETED LAND ON NON-NAVIGABLE STREAM GIVEN TO ADJACENT RIPARIAN OWNERS).
439 F. Supp. 483-486 (D.N.D., 1977).

Descriptors: *North Dakota, *Non-navigable waters, *Riparian rights, *Deposition(Sediments), *Accretion(Legal aspects), Alluvium, Flow characteristics, Missouri River, Ownership of beds, Water law, Land forming, Eminent domain, History, Boreholes, Sand bars, Sediments, Soil analysis.

Plaintiff initiated an action to condemn land with respect to which there were competing ownership claims. The trial court ruled that the accreted land in question, lying on the east side of a non-navigable stream, was owned by the owners of and adjacent lots situated on the west side of the stream since under North Dakota law, riparian owners own the bed of a non-navigable stream. A claim to ownership of the southern one-half of the accreted land by the owner of the northern one-half, based on a claim that the southern one-half was accreted to the northern one-half and not to the adjacent western lot, was denied. The court based this conclusion on the inconsistency of alluvial deposits with the claim, as evidenced by soil borings in the southern accreted lot that concluded the soil deposition in the area was from the west, rather than from the north. In addition, the court found that the Missouri River, the eastern boundary of both accreted lots, has not historically adhered to a discernably consistent accretion pattern in the area in question. (Easterbrook-Florida)
W78-09882

MCCUEN V. MCCARVEL (RIGHTS OF LANDOWNER SEEKING TO COMPEL ADJOINING PROPERTY OWNER TO CEASE OBSTRUCTION OF NATURAL FLOW OF DRAINAGE).
263 N.W. 2d 64-66 (Minn., 1978).

Descriptors: *Minnesota, *Drainage, *Easements, *Drainage water, *Obstruction to flow, Surface waters, Landfills, Ditches, Road construction, Flow, Natural flow, Damages, Precipitation(Atmosphere), Adverse possession, Water law, Adjacent land owners, Remedies, Judicial decisions, Prescriptive rights, Legal aspects.

Plaintiffs, farm owners, brought an action against adjoining landowners claiming that the defendants had wrongfully obstructed drainage of surface water from plaintiff's farm. Plaintiff sought an order requiring the defendants to reestablish drainage. A 100 year old town road ran along the east line of plaintiffs' property. Surface waters drained from the property into a ditch along the road which ran along defendants' land. Construction of a interstate highway dead-ended the town road and proceedings were begun to vacate the road. A town board order vacating the road did not require preservation of the ditches along the road. After issuance of the order, defendants filled the ditches and leveled the road. Plaintiffs contended they had acquired an easement by prescription over defendants' property that contained the ditch. Plaintiffs also contended that defendants' action constituted an unreasonable interference with the flow of surface water from the land. The Supreme Court of Minnesota held that the plaintiffs presented no evidence that an easement had been acquired. The court also held that the lower court's findings that the defendants' acts did not obstruct the natural flow of water were not clearly erroneous and therefore affirmed the lower court's decision in favor of defendants. (Quarles-Florida)
W78-09883

SOUTH CAROLINA STATE PORTS AUTHORITY V. SOUTH CAROLINA COASTAL COUNCIL (SOUTH CAROLINA PORTS AUTHORITY'S WANDO RIVER PROJECT HELD EXEMPT FROM STATE COASTAL COUNCIL'S PERMIT-ISSUING JURISDICTION).
242 S.E. 2d 225-227 (S.C., 1978).

Descriptors: *South Carolina, *Port authorities, *Permits, *Land use, *Jurisdiction, Administrative decisions, Rivers, Legislation, State governments, Federal government, Navigable waters, Harbors, Legal aspects, Channel improvement, Dredging, Coasts, Governmental interrelations, Regulation, Judicial decisions, Administration.

Plaintiff, South Carolina State Ports Authority, sought a declaratory judgment construing the permit statute and setting aside the decision of the defendant, State Coastal Council, concerning the Wando River Project. Plaintiff contended that the project was exempt from the defendant's permit-issuing jurisdiction. Defendant insisted that the exemption provision of the statute at issue should apply only to projects that had actually broken ground by the date of the statute's effectiveness. Three years before the enactment of the statute creating the Coastal Council, plaintiff applied for

and received state and federal permits for the Wando River project. The statute later enacted provided that no alteration could be made to any critical area of the state without a permit from the Coastal Council. An exemption from this permit requirement was provided for in the statute. Defendant contended that plaintiff failed to qualify under the exemption clause and therefore fell under the defendant's jurisdiction. The Supreme Court of South Carolina held that Plaintiff Ports Authority had legally commenced a use within the meaning of the statute and therefore was entitled to an exemption from the Council's permit-issuing jurisdiction. (Quarles-Florida)
W78-09884

STEVENSON V. BOARD OF LEVEE COMMISSIONERS OF TENSAS BASIN LEVEE DISTRICT (EMINENT DOMAIN FOR FLOOD CONTROL).
353 So. 2d 459-462 (La. Ct. App., 1977) (Rehearing denied January 12, 1978).

Descriptors: *Levee districts, *Eminent domain, *Compensation, Riparian land, Alteration of flow, Condemnation, Damages, Dikes, Diversion, Drainage districts, Flood control, Flood protection, Land tenure, Legal aspects, Legislation, Levees, Riparian rights, Water law, Remedies.

Plaintiff landowners sued the levee district for wrongful appropriation of their land for levee purposes. The levee was first built in 1973, with the landowners' permission, to protect the town of Jonesville. The landowners gave their consent provided the emergency levee would be only temporary. In 1974, the levee district passed a resolution appropriating plaintiffs' land. The defendant levee district contends that since the lands are riparian they are subject to a servitude, under a Louisiana statute, for the levee in question, and that plaintiffs are entitled to only the assessed value of the lands. The trial court found that while the land is riparian to navigable streams, the statutory servitude is not applicable because the levee in question was not built to hold those navigable streams within their banks. Since all parties agreed that the levee was necessary, the court granted the landowners $2070 per acre compensation. The defendant levee district appealed and the appellate court affirmed. The appellate court held that in order for the statutory servitude to apply, the levee must be necessary for the control of flood water from the river to which the land taken is riparian. (Jordan-Florida)
W78-09885

ALBRECHT V. DEPARTMENT OF ENVIRONMENTAL REGULATION (FLORIDA'S PARTIALLY SUBMERGED LAND FILL PERMIT APPLICATION AND REVIEW STATUTE PROCEDURALLY CONSTITUTIONAL).
353 So 2d 883. Dec 1977 (rehearing denied Jan. 1978).

Descriptors: *Florida, *Permits, *Marine biology, *Environmental control, *Environmental effects, Mangrove swamps, Navigable waters, State jurisdiction, Marine animals, Marine plants, Legislation, Ecosystems, Hydrography, Fish, Water law, Landfills, Natural resources, Surveys.

Plaintiff, private owners of partially submerged lots, applied to their county commission for a fill permit. The application was conditionally approved subject to defendant Department of Environmental Regulation's review and concurrence. A department hearing office, applying statutory criteria for fill permits recommended that the application be denied, and the defendant adopted this recommendation. On appeal, the court ruled that the defendant is properly authorized by statute to fill permits. In addition, the defendant is authorized to review findings as to whether a proposed project would detrimentally affect wildlife, fish or other marine life or natural resources and whether destruction of oyster beds, clam beds or marine productivity will result to such an extent as to be contrary to the public interest. The appellate court also concluded that the defendant's reviewing authority is not unconstitutional as an exercise of 'unbridled discretion' in enforcing the statute. The court found that the required biological surveys, ecological studies and hydrographic surveys, and array of procedural safeguards lessen the need for stricter statutory standards in the legislative delegation of power to the defendant. (Easterbrook-Florida)
W78-09886

STATE OF NEW MEXICO EX REL. REYNOLDS V. MOLYBDENUM CORPORATION OF AMERICA (WATER USE PERMIT LIMITATIONS APPLICABLE TO WELLS STARTED BEFORE EXTENSION OF BASIN TO AREA WHERE THEY WERE LOCATED).
570 F2d 1364-70 (10th Cir. 1978).

Descriptors: *New Mexico, *Water rights, *Watershed management, *Permits, *River basins, Surface waters, Groundwater, Rivers, State jurisdiction, Surface-groundwater relationships, Wells, Diversion, Judicial decisions, Underground, Basins, Regulation, Riparian rights, Remedies, Water law.

Plaintiff state instituted a general water adjudication suit in federal court requiring all water users of the Red River and its tributaries, all of which are located in New Mexico, to assert their clams to the water in order to determine all existing rights. Defendant corporation's attempt to have its rights detemined in state courts was denied procedurally. The federal appellate court ruled that wetted acreage limitations imposed by the state engineer on the defendant in its application for alternate diversion points, were within the engineer's authority and binding on the defendant because the drilling and use of the wells did not create a new right independent of initial permit depletion limitations. The court also ratified the engineer's conclusion that where a private water user applied for a permit to complete unfinished wells, to be used not as sources of new rights but as alternate diversion points for permits water, such alternate points were subject to initial permit limitations, even though the wells were started prior to the extension of the Rio Grande underground water basin to include the area in question. (Easterbrook-Florida)
W78-09887

PORTER COUNTY CHAPTER OF IZAAK WALTON LEAGUE OF AMERIKA, INCORPORATED V. COSTLE (STANDARDS FOR POLLUTION DISCHARGE PERMITS).
571 F. 2d 359-370 (7th Cir. 1978) (Rehearing denied March 20, 1978).

Descriptors: *Water quality standards, *Indiana, *Permits, *Federal Water Pollution Control Act, *Water pollution control, Administrative agencies, Air pollution, Environment, Environmental control, Legal aspects, Legislation, Recreation, Standards, Water law, Water pollution, Conservation, Electric powerplants, Water pollution sources, Judicial decisions.

The Environmental Protection Agency (EPA) granted a seemingly legal National Pollutant Discharge Elimination System (NPDES) permit to an Indiana power company under the Federal Water Pollution Control Act (FWPCA). The plaintiff environmental group contended that the NPDES permit was unlawful because EPA ignored a higher standard established for pollution control in the area under Public Law 89-298 (PL89-298). EPA argued that PL89-298 applied only to the Army Corps of Engineers and was not applicable to the NPDES permit at issue. PL89-298 provided that Indiana was to furnish assurances satisfactory to the Secretary of the Army that water and air pollution sources would be controlled to the maximum extent feasible in order to minimize any adverse effects on the public recreational areas in the general vicinity. The federal appellate court held that PL89-298 did not articulate any specific standard and certainly not a standard more precise or stringent than that required by the FWPCA. The court also held that PL89-298 did not require or authorize the Corps or EPA to promulgate standards stricter then those under the FWPCA. (Jordan-Florida)
W78-09888

VERMILLION CORPORATION V. VAUGH (RIGHT OF PUBLIC TO USE MAN-MADE NAVIGABLE CANALS ON PRIVATE CONSTRUCTED AND MAINTAINED WITH PRIVATE FUNDS).
356 So 2d 551-56 (La. Ct. App. 1978).

Descriptors: *Louisiana, *Artificial watercourses, *Canals, *Public access, *Proprietary power, Public rights, Inland waterways, Navigable waters, Navigation, Water law, Bodies of water, Trespass, Channel flow, Natural flow, Water rights, Watercourses(Legal aspects), Judicial decisions, Water law, Commercial fishing, Legal aspects, Riparian rights.

Plaintiff lessee of private property brought suit to enjoin the defendants from trespassing on property and travelling in a private canal system to engage in commercial shrimping and fishing. The man-made canals, constructed and maintained with private funds, were approximately 60 feet wide and 8 feet deep, were subject to tidal fluctuations, and were navigable. The canals entered other naturally navigable waterways. Defendants claimed that plaintiff's system of artificial waterways destroyed the navigability of surrounding natural waterways, and thus was substituted for the pre-existing natural system and was not private property. The appellate court granted the injunction and held that the diversion of water from a natural channel by a private man-made waterway does not give rise to a right of the public to use the waterway. The court also held that a canal on private property constructed and maintained with private funds for private purposes was a private canal, the use of which may restricted by landowner of his assigns under both state and federal law. (Rule-Florida)
W78-09889

THOMPSON V. COLORADO GROUND WATER COMMISSION (PERMITS FOR GROUNDWATER APPROPRIATION).
575 P. 2d 372-382 (Colo., 1978) (Rehearing denied February 21, 1978).

Descriptors: *Colorado, *Prior appropriation, *Groundwater availability, *Permits, *Administrative agencies, Beneficial use, Priorities, Preferences(Water rights), Water law, Water rights, Legal aspects, Groundwate mining, Groundwater, Water supply, Water table, Groundwater resources, Safe yield, Supply, Groundwater basins, Groundwater recharge, Water permits, Water management(Applied), Administrative decisions.

The defendant ground water commission denied the plaintiff a permit to construct a well and appropriate groundwater from a certain basin. The plaintiff appealed and the trial court also denied the permit on grounds that unappropriated water was not available. Plaintiff again appealed. The state supreme court remanded finding that although the commission was justified in applying a basin-wide test to determine appropriation levels, an applicant seeking an appropriation permit must be allowed to submit evidence that local values should be substituted for the more general basin values. When an applicant presents such evidence, the reviewing body must make findings of fact as to each challenged factor. The trial court failed to make these findings in this case. Other

commission procedures for determining appropriation levels were upheld by the supreme court. The court found that the three-mile test as modified by the state line policy was a reasonable proportional reduction of figures for water on the Nebraska portion of the three mile area. Such tests insured that the commission did not exceed its jurisdiction and authorize appropriation of Nebraska water. Also, application of the tests as of the application date was consistent with the legislative directives. (Baumbach-Florida)
W78-09890

DOUGAN V. ROSSVILLE DRAINAGE DISTRICT (DISTRICT'S FLOODING OF DOWNSTREAM LAND WAS NOT PERMITTED IF SERIOUS DAMAGE RESULTED).
575 P. 2d 1316-1320 (Kan. Ct. App., 1978).

Descriptors: *Kansas, *Water management(Applied), *Floodways, *Damages, *Natural flow doctrine, Drainage systems, Flood routing, Water spreading, Routing, Administration, Flood control, Water law, Discharge(Water), Diversion, Flood discharge, Overflow, Water rights, Riparian rights, Legal aspects, Alteration of flow.

The plaintiff, a lower landowner, sued the defendant drainage district, an upper landowner, for damages caused to his farm by flooding. The trial court granted summary judgment favoring the district after finding that the plaintiff's claims were barred by the state statute of limitations. The appellate court reversed, citing permanency and recurrence of damage as material facts still at issue. The court held that these facts were determinative of when the statute of limitations period began. Because of the nature of these damages, the amount and substantiality of the injury may not have been capable of judicial ascertainment within the two year limitations period for bringing suit. The point at which injury became reasonably ascertainable is the point at which the action accrued for limitations purposes. The case was remanded for findings as to when the limitations period began. The appellate court also found that an upper landowner may not gather and divert surface water from its natural course of flowage and thereby exceed natural watercourse capacity if that action causes serious damage to a lower landowner's land. (Baumbach-Florida)
W78-09891

UNDLIN V. CITY OF SURREY (LANDOWNER'S RIGHT TO COMPENSATION FOR INVERSE CONDEMNATION).
262 N.W. 2d 742-47 (N.D. 1978).

Descriptors: *North Dakota, *Wells, *Percolating water, *Condemnation, *Water rights, Beneficial use, Water resources, Regulation, Legal aspects, Water law, Economics, Value, Condemnation value, Riparian rights, Aquifers, Groundwater resources, Resources, Groundwater movement.

The plaintiff landowner sought to recover damages from the defendant city, under the theory of inverse condemnation, for the loss of use of well water. Both plaintiff and her predecesors in title had wells on the land which had been used for many years for domestic and livestock purposes. The city acquired ownership of two small parcels of land on a small coulee which ran through the plaintiff's land and commenced with drawing water from wells in the land in 1967. The plaintiff's and the defendant's well were in close proximity indicating the possibility that a common source of groundwater was being tapped by both parties. When the defendant commenced withdrawal of well water, the quality and quantity of the plaintiff's water decreased. The district court granted the city's motion for a directed verdict at the conclusion of the landowner's case. On appeal, the supreme court held that the evidence presented on the issue of whether the city had effected an inverse condemnation of the plaintiff's property rights in subterranean water created a question for the jury. (Beamer-Florida)
W78-09892

ENVIRONMENTAL DEFENSE FUND INC. V. EAST BAY MUNICIPAL UTILITY DISTRICT (UTILITY DISTRICT'S AUTHORITY TO CONTRACT FOR WATER PURCHASE FROM FEDERAL WATER PROJECT).
Sup., 142 Cal. Rptr. 904-18 (1977).

Descriptors: *California, *Federal-state water rights conflicts, *Federal reclamation law, *Supply contracts, *Diversion, Reclaimed water, Reasonable use, Natural resources, Recreation demand, Wild rivers, Water pollution, Alternative costs, Water costs, Administrative agencies, Social aspects, Canals, Public utilities.

Defendant, East Bay Municipal Utility District (EBMUD), had contracted with the United States Bureau of Reclamation (Bureau) for purchase of water from a federal project on the American River in return for EBMUD's construction of a canal needed for the Bureau's nearby Hood-Clay Connection. Plaintiffs were customers of EBMUD and residents of the American River Valley who objected to the higher cost of water to be obtained to the diversion of water from the American River which would be caused by the contract diversion point and by the new canal. Accordingly, plaintiffs sought invalidation of the contract on the grounds that construction of the canal and placement of the contract diversion point constituted an unreasonable use of water prohibited by California law. The Supreme Court of California ruled that the Federal Reclamation Act of 1902 preempted state law where the application of state law could disrupt a federal water project. The court further held that plaintiffs must first seek relief from the appropriate administrative agency before the court could compel EBMUD to reclaim its wastewater. (Anderson-Florida)
W78-09893

KILLIAN V. TOWN OF BRIMFIELD (TOWN'S RIGHT TO MAINTAIN A MILLPOND).
Mass. App., 372 N.E. 2d 270-71 (1978).

Descriptors: *Massachusetts, *Prescriptive rights, *Dams, *Watercourses(Legal aspects), Legal aspects, Water law, Mill dams, Damsites, Easements, Sluice gates, Sluices, Ponds, Bodies of water, Judicial decisions, Land use, Marshes.

Landowners appealed the dismissal of an action in which they sought to enjoin the town from maintaining a millpond, the water of which affected nearby landowners. The appellated court agreed with the lower court, holding that the action should be dismissed on the basis of the master's report. The master found that the scope of the highway easement acquired by the town in 1876, which included the 'right and duty to maintain the dam and all parts of it,' necessarily imported a right to retain the water behind the dam in order to protect that easement. The master concluded that the easement taken included the right and duty to maintain the dam, sluice and flashboards. In addition, appellate court found that there existed all the elements necessary to establish the fact that the town had acquired an easement by prescription to maintain water in and on the fifty four acres of land covered by the pond as well as in the adjacent marsh areas created by the pond.
W78-09894

COASTAL RESOURCES MANAGEMENT COUNCIL.
R.I. Gen. Laws secs 46-23-1 through 46-23-15 (1976 Supp.).

Descriptors: *Rhode Island, *Coasts, *Law enforcement, *Regulation, *Shore protection, Administrative agencies, Beach erosion, Coastal structures, Commercial fishing, Fishing, Judicial review, Legislation, Planning, Recreation, Shellfish, Shores, Water law, Administration, Natural resources, Environmental control, Permits.

The general assembly declares that preservation and restoration of ecological systems shall be the primary guiding principle upon which environmental alteration of coastal resources will be measured, judged and regulated. There is created the coastal resources management council (CRMC). The primary responsibility of the CRMC shall be the continuing planning for and management of the resources of the state's coastal region, including water, submerged land, air space, fin fish, shellfish, minerals, and other natural resources. Any person proposing any development seaward of the mean high water mark shall be required to demonstrate that his proposal will not result in the following conditions: (1) conflict with any resources management plan; (2) make any area unsuitable for the uses to which it is allocated; or (3) significantly damage the environment of the coastal region. The CRMC shall issue, modify or deny permits for any work in the water areas under its jurisdiction. The CRMC is authorized to prosecute any violators of the coastal resource management program, or any violation of the regulations or decisions of the CRMC, by bringing enforcement action in the district courts of Rhode Island. (Jordan-Florida)
W78-09895

PAWTUXET RIVER AUTHORITY.
R.I. Gen. Laws secs 46-24-1 through 46-24-10 (1976 Supp.).

Descriptors: *Rhode Island, *Flood control, *Government finance, *Local governments, *River regulation, Dams, Legal aspects, Legislation, Levees, Operating costs, Public utilities, Regulation, River basin commissions, Taxes, Water law, River basin development, Water pollution control, Conservation, Recreation, Preservation.

A board to be known as the Pawtuxet River Authority (PRA) is hereby created. Such board shall be a body corporate and politic constituting a public benefit corporation. The board shall consist of fifteen members, three each from the municipalities of Coventry, Cranston, Scituate, Warwick and West Warwick. The PRA shall have the usual powers of public corporations and the power to: (1) negotiate payments between two or more of the participating communities; and (2) fix rates and collect charges for the use of the facilities of or services rendered by the PRA to each of the participating towns. The PRA is expressly authorized to provide for land and water conservation and for the construction and maintenance of hiking and biking trails, flood control and water pollution control facilities, preservation of wetlands, dam construction, diversion of streams, dikes, walls and pumping stations and to encourage tax relief for landowners in the construction of facilities for such purposes. The PRA will perform an essential governmental function and the State of Rhode Island covenants that the PRA shall be required to pay no taxes. (Jordan-Florida)
W78-09896

CONSERVATION COUNCIL OF NORTH CAROLINA V. FROEHLKE (IMPOUNDMENT OF WATER BEHIND DAM; PRIVATE PROPERTY RIGHTS SUBJECT TO NAVIGATIONAL SERVITUDE; NATIONAL ENVIRONMENTAL POLICY ACT SATISFIED).
435 F. Supp. 775-797 (M.D.N.C., 1977).

Descriptors: *North Carolina, *Federal government, *Impounded waters, *Water rights, *Riparian rights, Dams, Fishing, Judicial decisions, Impoundments, Legal aspects, Municipal wastes, Navigation, Recreation, Reservoirs, Standing waters, Water supply, Rivers, Waste water disposal, Natural flow, Water policy.

Plaintiffs, several municipalities and an environmental group, brought suit challenging the Army Corps of Engineers (Corps) decision to build a multipurpose dam on the New Hope River for flood control, water supply enhancement, and general recreation. The plaintiffs' objections centered on two propositions: (1) that the quality of the water in the proposed lake would be unsuitable for its intended use; and (2) that the Corps failed to consider the alleged costs to the municipalities for the removal of phosphorus from their waste treatment effluent. The plaintiffs contended that the defendant's decision to impound water and create a permanent lake was arbitrary, capricious, abusive of agency discretion, and otherwise not in accordance with common law and the National Environmental Policy Act (NEPA). The federal district court held that the municipalities were not entitled to compensation for the increased waste water treatment costs, because there is no private property right in the flow of a stream which is subject to the United States navigational servitude. The court also held that the Corps' decision was made in good faith after a consideration of all relevant factors, including possible alternatives or mitigating measures, and therefore satisfied the requirements of NEPA. (Jordan-Florida)
W78-09897

THIBODEAUX V. LANDRY (NO RIGHT TO CLEAN OUT DRAINAGE CULVERT ON SERVIENT ESTATE ABSENT CONCLUSIVE PROOF OF SERVITUDE OF DRAIN ACQUIRED BY PRESCRIPTION OR CONVENTION).
351 So. 2d 522-526 (La. App., 1977).

Descriptors: *Louisiana, *Adjacent land owners, *Easements, *Drainage practices, *Culverts, Surface drainage, Ditches, Trespass, Legal aspect, Right-of-way, Drainage water, Judicial decisions, Water rights, Land tenure, Drainage, State jurisdiction, Adjudication procedure.

Plaintiff sought injunction to prevent disturbance in the possession of his property and associated damages. The parties own adjoining tracts of land divided by a fence. A drainage ditch parallels the fence on plaintiff's land, and defendant entered to clean the ditch and install culverts to facilitate the draining of water from defendant's land onto plaintiff's property. The trial court found that the defendant had a natural servitude of drain across the drainage ditch, based on Louisiana statutes. Defendants were not entitled to enter at will on plaintiff's property to clean out the ditch. The natural servitude of drain was found to be unique and different from voluntary and conventional servitudes of drain. Defendants may alter their own property to facilitate drainage, and may compel plaintiff by court order to clean out the ditch. Plaintiff was entitled to a preliminary injunction barring defendants from trespass to the land and especially to the drainage ditch in question. Without conclusive proof that they obtained a servitude of drain by prescription or convention, defendants may not enter plaintiff's property without his or court's authorization. (Molloy-Florida)
W78-09898

COLE V. MOTT (SERVIENT ESTATE'S DUTY TO ACCEPT DOMINANT ESTATE'S NATURAL DRAINAGE IS ABSOLUTE).
351 So. 2d 1326-1331 (La. App., 1977).

Descriptors: *Louisiana, *Drainage practices, *Flood damage, *Easements, Surface drainage, Surface waters, Damages, Levees, Ditches, Farms, Adjacent landowners, Drainage, Diversion, Damages, State jurisdiction.

Plaintiff private property owner sought damages and injunctive relief for flooding of soybean crops caused by levees constructed by defendant on his lower or servient land. The court noted that Louisiana statutes provide for a servitude of drainage by the lower estate for the higher estate, with reciprocal obligations to neither hinder natural drainage nor increase the burden of the natural drainage. Since the trial court found such a natural servitude imposed on defendant's land, and found plaintiff damaged because defendant's levees impeded the natural drainage and substitute ditches provided by defendant were inadequate to properly drain plaintiff's lands, plaintiff was entitled to damages. The Court also noted that while compensatory damages may be an adequate remedy, the servitude of drain has historically been enforced by injunction. The court then concluded that the servient estate's duty to the dominant estate to receive waters which flow naturally upon it is absolute, and the servient estate is not entitled to obstruct natural drainage after payment of damages. Plaintiff was thus granted injunctive relief in addition to the compensatory damages. (Molloy-Florida)
W78-09899

TUG OCEAN PRINCE, INC. V. UNITED STATES (LIABILITY OF TUG BOAT OWNERS FOR CLEAN UP COSTS OF OIL SPILL CAUSED BY COLLISION WITH SUBMERGED ROCKS).
436 F. Supp. 907-26 (S.D.N.Y., 1977).

Descriptors: *Oil spills, *Penalties(Legal), *Negligence, *Cost allocation, Federal government, Hudson River, Navigation, Oil pollution, Law enforcement, New York, Accidents, Hazards, Legislation, Buoys, Ice jams, Navigable waters, Costs, Oily water.

Plaintiff barge and tug owners sought exoneration or limitation of liability for oil spill damage resulting from a barge colliding with submerged rocks in the Hudson River. The court concluded that the grounding was due to a navigational error on the part of the crew, and this negligence prevented the plaintiffs from being entitled to exoneration from liability. The court noted that the plaintiffs had the burden of establishing their own lack of privity of knowledge of the negligence in order to limit their liability. Since the negligence was the result of the neglect of an otherwise competent officer, an event which is not an unseaworthy condition imposing owner responsibility, the court found that the owner-plaintiffs were entitled to limit their liability. The court also found that the Coast Guard was not liable for negligent maintenance of navigational aids absent specific knowledge of a buoy out of place. The court limited the tug owners liability for cleanup costs to $100 per gross ton of tug under the Water Quality Improvement Act, and permitted the absence of culpability of the owners to initiate additional penalties. (Moiloy-Florida)
W78-09900

WYOMING V. HOFFMAN (REGULATORY JURISDICTION OF FEDERAL GOVERNMENT OVER WATERS WHICH DO NOT MEET TRADITIONAL TEST OF NAVIGABILITY),
437 F. Supp. 114-118 (D. Wyo., 1977).

Descriptors: *Wyoming, *Federal Water Pollution Control Act, *Federal government, *Jurisdiction, Regulation, Federal jurisdiction, Navigable waters, State governments, Permits, Non-navigable waters, Governmental interrelationships, Water pollution, Water pollution control, Dredging, Legislation, Administration, Legal aspects.

Plaintiff state sought a writ of mandamus challenging regulations promulgated by the United States Army Corps of Engineers and the Environmental Protection Agency regarding procedures for applications for dredge and fill permits within interstate Wyoming waters. The challenge was based on the premise that regulatory jurisdiction under the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) extends only as far as waters which meet the traditional federal test for navigability. The court held that the statutory term 'waters of the United States' refers to all of the nation's waters, not just those meeting the traditional tests of navigability. The court looked to legislative history indicating that the Act was to be given the broadest possible constitutional interpretation, and also to several cases holding that FWPCA's jurisdiction extended to non-navigable streams. The court noted that pollution control of navigable streams would be impossible without also controlling pollution on the non-navigable tributaries, and held that the regulations which extended federal jurisdiction beyond traditionally navigable waters were lawful. (Molloy-Florida)
W78-09901

COUNTY OF TRINITY V. ANDRUS (CHALLENGE TO DAM PROJECT FOR FAILURE TO COMPLY WITH FEDERAL AND STATE STATUTORY REQUIREMENTS).
438 F. Supp. 1368-1391 (E.D. Cal., 1977).

Descriptors: *California, *Rivers, *Droughts, *Environmental effects, Dams, Local governments, Fish, Drawdown, Federal government, Fish barriers, Administrative agencies, Judicial decisions, Reservoirs, Hydroelectric plants, River regulation, Fish populations, Legislation, Projects, Water levels.

Plaintiff political subdivision requested injunctive relief against the administration of a series of dams, reservoirs, canals and hydroelectric generating plants which decreased the water flow through the county's Trinity River. The claim was based upon state and federal statutory duties set forth in the Trinity Act to release sufficient amounts of water to sustain fish populations in the Trinity River. In addition, the plaintiff sought to require maintenance of the water level in Clair Engle Lake pending the filling of an environmental impact statement according to the provisions of the National Environmental Policy Act of 1969 (NEPA). The court held that there was no absolute duty to maintain fish population at pre-project levels, but that the fish preservation was a matter within the administrative discretion of the Secretary of the Interior. Judicial review was thus restricted to abuse of discretion under the Administrative Procedures Act. Additionally, the court found that an environmental impact statement was not required because the project was a response to the 1977 federal statute entitled 'Emergency Action 1976-77 Drought.' The court also held that the applicability of NEPA is an agency determination subject only to limited judicial review. The court found no violation of state or federal law in the project. (Molloy-Florida)
W78-09902

BRUSCO TOWBOAT COMPANY V. STATE (THE APPLICABILITY OF ESTOPPEL TO STATE PORT DISTRICTS AS TO LICENSE REVOCATION BY THE STATE).
570 P. 2d 996-98 (Or. App., 1977).

Descriptors: *Oregon, *Riparian rights, *Leases, *Eminent domain, *Navigable water, Legislation, State governments, Land use, Riparian land, Structures, Land management, Water law, Regulation, Administration, Legal aspects, Judicial decisions, Beds under water.

Riparian land owners whose actions were consolidated for trial sought to challenge the validity of a state program which required users of submerged lands to enter into leases for that use. One group of plaintiffs consisted of port districts owned and operated by the state. Plaintiffs had erected structures on state-owned submerged lands prior to the enactment of the lease program. Plaintiffs contended that estoppel should limit the state's power to revoke the license issued to erect the structures. Defendant state insisted that public policy dictates that estoppel principles should not operate as to the port districts since they are public

bodies. The Oregon Court of Appeals held that estoppel should apply to the port district also, since they are entities, distinct from the state. The court noted that port districts serve a distinct constituency and are supported by a distinct tax base. Furthermore, it is equitable to treat the port districts in the same manner as private parties since the lease program treats them as such. The court also held that a previous similar lease program under which some of the plaintiffs were lessees may affect the cutoff period from which recoupment must run as to such plaintiffs. (Quarles-Florida)
W78-09903

CENTRAL COLORADO WATER CONSERVANCY DISTRICT V. ENVIRONMENTAL PROTECTION AGENCY (WATER POLLUTION ELIMINATION REGULATIONS CHALLENGED).
559 F. 2d 1179-1182 (10th Cir., 1977).

Descriptors: *Water pollution, *Pollutants, *Water pollution sources, *Federal Water Pollution Control Act, Water pollution control, Agriculture, Chemical wastes, Administrative agencies, Permits, Regulation, Judicial decisions, Colorado, Legal review, Water law, Legal aspects, Navigable waters.

Petitioners sought review of respondent Environmental Protection Agency's (EPA) water pollution elimination regulations. Petitioners argued that the regulations were promulgated unlawfully and sought a final injunction directing respondent to withdraw and rescind the regulations from the Code of Federal Regulations and issue new regulations. The new regulations desired were to be in compliance with the requirements of the Federal Water Pollution Control Act Amendments of 1972. In addition, petitioners sought an injunction prohibiting respondent from extending the National Pollutant Discharge Elimination System permit program to certain agricultural sources of pollutants. Respondent filed a motion to dismiss on jurisdictional grounds. The court found the record insufficient to rule on the jurisdictional issue. Accordingly, the motion to dismiss was denied without prejudice to respondent's right to renew the motion on review. The court found the briefs and oral arguments to be incomplete as well. Opposing counsel were directed to assess the impact of E.I. duPont de Nemours and Co. v. Train, 430 U.S. 112 (1977), on their dispute and also to brief the merits of the review fully. (Thomas-Florida)
W78-09904

STATE WATER RESOURCES MANAGEMENT.
S.D. Comp. Laws Ann. secs 46-17A-1 through 46-17A-3, 46-17A-4.1 through 46-17A-19 (1967), as amended (Supp., 1977).

Descriptors: *South Dakota, *Legislation, *Water policy, *Comprehensive planning, *Water management, Water utilization, Administration, Water conservation, Water supply development, Competing uses, Cost allocation, Cost sharing, Multipurpose projects, Water law, Coordination, Estimated cost, Estimated benefits, State governments, Long-term planning, Project planning.

The South Dakota legislature found that in order to achieve the conservation, development management and optimum use of all water within the state and to protect the waters of the state from diversion, it was necessary that a coordinated, integrated multiple use water resource plan be formulated and implemented. To accomplish this goal, the legislature passed the State Water Management Act. As amended, the Act authorizes the Board of Natural Resource Development to establish a statewide policy on multipurpose water facilities, to resolve conflicting interest among federal, state and local interests, and to review the development and progress of the comprehensive statewide water plan. This Act also provides procedures for interdepartmental planning, for submission of the final statewide water plan to the governor and legislature, for submission of preliminary cost estimates of proposed construction, for allocation of benefits and costs among governmental and private interests and for presentation of final cost data to the legislature for financial authorization. (Curran-Florida)
W78-09905

CONSERVANCY DISTRICTS.
Mont. Rev. Code secs 89-3401 thru 89-3449 (Supp. 1975).

Descriptors: *Feasibility studies, *Bond issue, *Investment, *Montana *Water districts, Water conservation, Legislation, Beneficial use, Water management(Applied), Wildlife conservation, Fish conservation, Recreation, Economics, Erosion control, Land reclamation, Natural resources, Public use, Project purposes, Water resources development, Project feasibility.

The legislative purpose of Montana's Conservancy Districts Act is to enable the formation of conservancy districts in order to prevent and control floods, erosion, and sedimentation; regulate stream flows and lake levels; improve drainage and reclaim wet or overflowed lands; promote recreation; and provide for better utilization of water in all areas of public concern. The department of natural resources and conservation shall receive and scrutinize all petitions for proposed conservancy districts. Upon receipt of a preliminary survey report, the applicants may request the department to hold a hearing. Upon determination that the planned district is feasible and desirable, a feasibility report must be prepared by the department. Specific provisions as to organization of the district are detailed herein. In general, these provisions are concerned with election of officials for the district, issuance of bonds, merger of districts, financial reports of districts, real estate transaction rights of districts, and dissolution of districts. Inaction of a district for over one year is cause for dissolution. No district has the authority to generate, distribute, or sell electric energy. Regulations regarding the use of district revenues are also set forth. (Thomas-Florida)
W78-09906

INLAND LAKES AND STREAMS ACT OF 1972.
Mich. Laws sec 281.951 thru 281.965 (Supp. 1977).

Descriptors: *Michigan, *Inland waterways, *Permits, *Legislation, *Administrative agencies, Riparian rights, Lakes, Marines, Streamflow, Natural flow, Alteration of flow, Regulation, State governments, High water mark, Watercourses(Legal aspects), Penalties(Legal), Remedies, Dredging, Streams.

The purpose of the Michigan Inland Lakes and Streams Act of 1972 is regulate inland lakes and streams; protect riparian rights and the public trust in inland lakes and streams; and to prescribe duties, powers, remedies, and penalties. Unless otherwise provided, a permit is required before a person may dredge or fill bottomland, construct on bottomland, operate a marina, or structurally interfere with natural flows of inland lakes or streams. Permits are also required before an artificial waterway can be constructed, extended, or enlarged to connect to an existing inland lake or stream or where such waterway will be located within 500 feet of the ordinary high water mark of an existing lake or stream. Connection of waterways for navigational purposes are also regulated by permit. Specific operations which do not require permits are listed. Applications for permits are to be filed with the department of natural resources. Public hearings are optional and require a request in writing by the applicant. Permits will be issued only if the proposed operation will not adversely affect the public trust or riparian rights. Permits shall have specified terms and are subject to revocation for cause. (Thomas-Florida)
W78-09907

SHORELANDS PROTECTION AND MANAGEMENT ACT OF 1972.
Mich. Laws secs 281.631 through 281.645, as amended (Supp., 1977).

Descriptors: *Shore protection, *Shores, *Michigan, *Interagency cooperation, Erosion, Marsh management, Aquatic environment, Long-term planning, Legislation, Administration, Habitats, Fish management, Environmental engineering, Management, Costs, Research and development, Planning, Zoning, Governmental interrelations.

The Michigan state water resources commission has been granted authority to make an engineering study of the shoreland to determine high risk areas needing erosion protection, the type of protection best suited for the area, and the expected cost of construction and maintenance for each type of protection. The commission is also authorized to make an engineering study of the shoreland to determine flood risk areas and flood frequency. In addition to the engineering studies, an environmental study of the shoreland is to be initiated. The primary purpose of the environmental study is to determine which marshes, fish, and wildlife habitat areas are to be protected by zoning or regulation. The Act grants authority in the water resources commission to promulgate rules of shoreland zoning and regulations consistent with the study findings. Townships, cities, villages, and counties may zone any shoreland within its jurisdiction until July 1, 1975. The commission must approve all such local zoning. Within 18 months after the effective date of this Act the commission must submit a shoreland use and management plan for public scrutiny and approval. (Thomas-Florida)
W78-09908

SLOW PROGRESS IN DEVELOPING AND IMPLEMENTING A NATIONAL DAM SAFETY PROGRAM: DEPARTMENT OF THE ARMY. CORPS OF ENGINEERS (CIVIL FUNCTIONS).
General Accounting Office, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 876, Price codes: A03 in paper copy, A01 in microfiche. Report to Congress by the Comptroller General of the United States. Report No. CED-77-94, June 29, 1977. 31 p, 1 append.

Descriptors: *Dams, *Safety, *Programs, *United States, Census, Inspection, Federal government, Structures, Hydraulic structures, Institutions, National Dam Inspection Act.

The National Dam Inspection Act of 1972 provided, among other things, for the Corps of Engineers to inventory and inspect dam structures throughout the United States. The purposes of the act was to protect life and property and provide information for designing of a comprehensive national dam safety program. The Corps' dam inventory was not adequately developed, and the Army never requested enough money from the Congress to inspect dams or to design a comprehensive national dam safety program. To obtain the information needed to design a national dam safety program, the Congress should direct the Corps of Engineers to: Obtain and verify inventory data on all dams that the law covers. Make at least a sampling of dam inspections. Determine whether Federal participation is needed for a program to be effective and, if so, the nature of involvement. Present possible alternatives to the Congress. (Humphreys-ISWS)
W78-10005

REGIONAL OIL AND HAZARDOUS MATERIALS POLLUTION CONTINGENCY PLAN, REGION V (INLAND).
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5G.
W78-10029

OREGON WATER SUPPLY PROGRAM EVALUATION.
Environmental Protection Agency, Seattle, WA.
For primary bibliographic entry see Field 6B.
W78-10032

FINAL ENVIRONMENTAL IMPACT STATEMENT: WATER QUALITY MANAGEMENT PLAN FOR EL PASO AND TELLER COUNTIES, COLORADO.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5F.
W78-10033

THE WINTERS DOCTRINE: HISTORICAL PERSPECTIVE AND FUTURE APPLICATIONS OF RESERVED WATER RIGHTS IN ARIZONA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
Ground Water, Vol. 16, No. 3, p 186-191, May-June, 1978. 5 tab, 15 ref.

Descriptors: *Winters doctrine, *Water rights, *Indian reservations, *Arizona, Water utilization, Irrigation.

All discussions of the legal basis for Indian water rights must begin with the Supreme Court's Winters decision. In that decision the Court ruled that the U.S. government impliedly reserved water rights for the Indiana of the Fort Bethold Reservation in Montana when it withdrew the lands from public domain. Subsequent court decisions upheld the Winters doctrine in other conflicts between reservations and mining, agricultural and municipal entities and extended it to include groundwater rights. Five central Arizona reservations propose to exercise the Winters doctrine to obtain 3 million AFY of water supplies for irrigation. These withdrawals may affect pre-existing non-Indian uses developed legally under state law and which represent large investments. It is apparent that ground water cannot sustain increasing Indian agricultural development and the non-Indian status quo. The present and future water situation in central Arizona is discussed and alternative water depletion-supply futures are presented in tabular form. If the federal government is to fulfill its role in Arizona as defined by the Winters doctrine it must either develop substitute water sources or augment water supplies for the tribes. Five recommendations are suggested in considering the possibilities of these two alternatives. (Purdin-NWWA)
W78-10074

CAUTION: RURAL WATER DISTRICTS,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol. 32, No. 6, p 36-37, June, 1978.

Descriptors: *Water districts, *Water resources development, Water wells, Rural areas, Individual water systems.

Centralized rural water districts pose a threat to the livelihood of private water well drillers. Such systems must be supported by government grants and loans which are virtually impossible to obtain for financing an individual water system. Promoters of centralized water districts who stand to profit by them use scare tactics and half-truths to convince people of their necessity. Alternatives such as individual domestic wells, cluster wells, and centralized water delivery are seldom considered by federal agencies. An objective comparison between the individual domestic water well supply and the rural water district shows that in some areas the rural water district costs more in the long run and is less reliable in terms of service, quality, and drought prevention. (Purdin-NWWA)
W78-10086

AMENDMENTS TO MINES AND WORKS ACT TAKE SHAPE.
South African Tunneling, Vol. 2, No. 1, p 26-27, 29-30, 1977.

Descriptors: *Legislation, Civil engineering, *Tunnelling, Projects, *Water supply, *Hydroelectric power, *Pumped storage, *South Africa.

Sancot's report for the year ending 31 March 1977, details the work carried out during the year by the organisation's various sub-committees. The report particularly notes the gratifying progress made on reframing portions of the Mines and Works Act to make it more suitable for civil engineering tunnelling. An appendix to the report lists many of the tunnelling projects currently underway in South Africa. Apart from mining and railway tunnels attention is also paid to the Ruacana Hydro-Electric scheme, Johannesburg service tunnels, Vanderkloof Hydro-electric Power station, Steenbras Pumped storage scheme, Drakensburg pumped storage scheme and Elandsberg pumped storage scheme. (So Afr Water Info Center)
W78-10223

THE NPES RESEARCH ACTIVITIES OF ENVIRONMENTAL SCIENCES,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W78-10239

PROCEEDNGS OF RECONVENED SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE STATES OF CALIFORNIA, COLORADO, UTAH, ARIZONA, NEVADA, NEW MEXICO, AND WYOMING (7TH) HELD AT DENVER, COLORADO, APRIL 26-27, 1972.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10368

DIGEST OF EPA'S MONITORING-RELATED STATUTORY AUTHORITY.
Environmental Protection Agency, Washington, DC. Office of Monitoring Systems.
For primary bibliographic entry see Field 5G.
W78-10371

LEGISLATIVE REGULATION OF THE ENVIRONMENTAL IMPACT OF STRIP MINING,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5G.
W78-10377

NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5G.
W78-10378

AN ANALYSIS OF CURRENT AND PROPOSED FEDERAL LEGISLATION SEEKING TO CONTROL THE USE OF TOXIC MATERIALS,
Environmental Protection Agency, Washington, DC. Effluent Standards and Water Quality Information Advisory Committee.
For primary bibliographic entry see Field 5G.
W78-10379

STATE ENVIRONMENTAL PROGRAMS: A COMPENDIUM OF FEDERAL AND STATE PROGRAMS PREPARED FOR THE CONGRESSIONAL DELEGATIONS.
Environmental Protection Agency, Kansas City, MO. Region VII.
For primary bibliographic entry see Field 5G.
W78-10380

ACCOMPLISHMENT PLAN-REGION VIII, CHEYENNE RIVER BASIN.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W78-10381

SELF-REGULATION OF ENVIRONMENTAL QUALITY: IMPACT ANALYSIS IN CALIFORNIA LOCAL GOVERNMENT,
Center for California Public Affairs, Claremont.
For primary bibliographic entry see Field 6G.
W78-10382

FLORIDA COASTAL ZONE MANAGEMENT PROGRAM (SECTION 305) STATUS REPORT TO THE GOVERNOR AND CABINET.
Florida Dept. of Natural Resources, Tallahassee. Div. of Resource Management.
Report of Bureau of Coastal Zone Planning, January, 1977, 125 p.

Descriptors: *Governmental interrelations, *Interagency cooperation, *Coasts, *Optimum development plans, *Comprehensive planning, Coastal engineering, Shore protection, Coastal structures, Management, Administration, Social aspects, Boundaries(Property), Boundaries(Surfaces), Priorities, Preferences(Water rights), Water law, Environmental effects, Wildlife, Legislation.

This draft report culminates six years of assessment of Florida's coastal management needs. It delineates the current scope of goals, policies, and institutional arrangements proposed under Florida's coastal zone management program. Introductory material provides background on legislation, coastal zone issues and problems, federal funding, and the general need for a comprehensive coastal management program. The balance of the status report presents executive summaries of the work thus far completed in the effort to meet the requirements of state legislation and the Federal Coastal Zone Management Act. Summaries include discussions on: (1) Florida's Coastal Zone Planning Program; (2) proposed management policies and criteria; (3) boundaries of the coastal zone; (4) permissible and priority uses in the coastal zone; (5) geographic areas of particular concern; (6) public involvement; and (7) federal, state, regional, and local government interaction. Additionally discussed are projected an on-going tasks within the Coastal Zone Management Program as well as the necessary organizational structure needed for program implementation. A final chapter contains an extensive bibliography of documents published by or under the auspices of the Florida Coastal Zone Management program. Appendices providing detailed information on summarized material are also included. (Baumbach-Florida)
W78-10383

TO AMEND AND EXTEND AUTHORIZATIONS FOR THE FEDERAL WATER POLLUTION CONTROL ACT.
Hearings--Subcommittee on Water Resources--Committee on Public Works, U.S. House of Representatives, March 1-4, 1977. Serial Number 95-5, p. 545.

Descriptors: *Water pollution control, *Legislation, *Waste water(Pollution), *Federal Water Pollution Control Act, Government finance, Federal government, Water pollution, Waste treatment, Waste water treatment, Water quality control, Administrative agencies, Environmental control.

To better implement the water pollution control program, an amendment to the Federal Water Pollution Control Act was proposed by the House of Representatives. H.R. 3199 provides authorization for manpower training and waste treatment programs, construction of municipal treatment works, operating and maintenance costs through ad valorem taxes, state certification programs for grant approvals, an Environmental Protection Agency emergency fund, and court review of EPA effluent guidelines. The subcommittee on Water Resources heard testimony by sixty witnesses over a four day period concerning various provisions of H.R. 3199. Those testifying included representatives from environmental groups, utilities, agriculture, engineering, state and local government, industry, and Congress. The testimony given and materials submitted generally supported H.R. 3199, considering it to be a god and necessary law. Most representatives who testified addressed specific minor parts of the Bill with which they took issue. All testimony and materials were made a part of the record. (Spector-Florida)
W78-10384

COAST GUARD EFFORTS TO PREVENT OIL POLLUTION CAUSED BY TANKER ACCIDENTS.
Hearings Before a Subcommittee of the Committee on Government Operations, House of Representatives, March 21, 23, 1977. 551 p.

Descriptors: *Coast Guard regulation, *Law enforcement, *Oil pollution, *Oil spills, Abatement, Oil industry, Permits, Regulations, Safety, Ships, Water pollution control, Federal Water Pollution Control Act.

A Subcommittee of the House Committee on Government Operations met to take testimony on the Coast Guard's efforts to prevent oil pollution caused by accidental tanker spills. In the 1972 Federal Water Pollution control Act, Congress declared the policy of the United States to be that there should be no discharges of oil or hazardous substances into or onto the navigable waters of the United States, adjoining shorelands, or the into or onto the navigable waters of the United States, adjoining shorelands, or the waters of the contiguous zone. The subcommittee considered proposed regulations for all waters of the contiguous zone. The subcommittee considered proposed regulations for all oil tankers entering U.S. ports, including: (1) double bottoms on all new tankers; (2) segregated ballast on all tankers; (3) inert gas systems on all crude tankers; (4) backup radar systems with collision avoidance equipment; and (5) emproved emergency steering standards. The subcommittee also heard testimony concerning: (1) pilot and dockmaster licensing; (2) port safety and security; (3) vessels involved in major casualities; (4) penalties assessed; (5) ratification of the International Convention for the Prevention of Pollution from Ships; and (6) accidents caused by pilot errors. Oil polution caused by oil tankers must be dealt with domestically as well as internationally. (Jordan-Florida)
W78-10385

DIRECTORY OF FEDERAL AND STATE WATER POLLUTION STANDARDS,
Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5G.
W78-10386

COMPILATION OF FEDERAL, STATE AND LOCAL LAWS CONTROLLING NONPOINT POLLUTANTS. AN ANALYSIS OF THE LAW AFFECTING AGRICULTURE, CONSTRUCTION, MINING AND SILVICULTURE ACTIVITY.
Aspens Systems Corp., Germantown, MD.
For primary bibliographic entry see Field 5G.
W78-10387

STATE ENVIRONMENTAL PROGRAMS: A COMPENDIUM OF FEDERAL AND STATE PROGRAMS PREPARED FOR THE CONGRESSIONAL DELEGATIONS.
Environmental Protection Agency, Kansas City, MO. Region VII.
For primary bibliographic entry see Field 5G.
W78-10388

A SYNOPSIS OF STATE LEGISLATION ON WATER POLLUTION CONTROL LAWS ENACTED DURING 1971.
Environmental Protection Agency, Washington, DC. Office of Intergovernmental Programs.
For primary bibliographic entry see Field 5G.
W78-10389

PUBLIC USE OF COASTAL BEACHES,
North Carolina State Univ. at Raleigh.
D. Owens, and D. Brower.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 073, Price codes: A16 in paper copy, A01 in microfiche. Report UNC-SG-76-08, September, 1976. 356 p.

Descriptors: *North Carolina, *Beaches, *Constitutional law, *Land use, *Public access, Coasts, Judicial decisions, Land tenure, Legal aspects, Legislation, Military reservations, Recreation, Public rights, Seashores, Trespass, Water law, Prescriptive rights, Boundaries(Property), Zoning.

The question of beach access has developed into an important social, political and legal issue in America recently. Private ownership of the beach is not the only cause of the beach access problem. A good deal of the beach area that is in public hands is not available for public recreation. Some of the land is put to use for governmental purposes that are incompatible with recreational use, such as military installations. An equally serious problem is the exclusionary nature of many locally owned beaches. Methods for firmly established public rights that already exist in the beach resource are explored and means of acquiring new rights which permit the public to make use of the beach are examined. The public has property rights in most of the coastal tidelands, either because the state owns them or because private owners must allow public exercise of certain uses of them. Tidelands, however, are only a mall portion of the beach. Private littoral owners not only can restrict the use of the dry-sand area, but also can isolate many beaches by denying public access across private uplands. (Jordan-Florida)
W78-10390

WATER QUALITY MANAGEMENT OF SUMMIT COUNTY, COLORADO.
Environmental Protection Agency, Denver, CO. Div. of Air and Water Programs.
For primary bibliographic entry see Field 5G.
W78-10391

SECOND ANNUAL REPORT--EFFLUENT STANDARDS AND WATER QUALITY INFORMATION ADVISORY COMMITTEE, (PART II).
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10392

FEDERAL AND STATE EFFORTS TO CONTROL WATER POLLUTION CAUSED BY ACID DRAINAGE FROM MINES.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10393

A SYNOPSIS OF STATE LEGISLATION ON WATER POLLUTION CONTROL LAWS ENACTED DURING 1970.
Environmental Protection Agency, Washington, DC. Water Quality Office.
For primary bibliographic entry see Field 5G.
W78-10394

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME III: DATA ELEMENT DICTIONARY. DEFINITION OF SYSTEM REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-10398

ECONOMIC LAW ENFORCEMENT. VOLUME I. OVERVIEW.
Connecticut Dept. of Environmental Protection, Hartford.
For primary bibliographic entry see Field 5G.
W78-10399

ECONOMIC LAW ENFORCEMENT. VOLUME III. STRENGTHENING ENVIRONMENTAL LAW ENFORCEMENT: WATER POLLUTION.
Connecticut Dept. of Environmental Protection, Hartford.
For primary bibliographic entry see Field 5G.
W78-10400

ECONOMIC LAW ENFORCEMENT VOLUME VI. LEGAL ISSUES.
Connecticut Dept. of Environmental Protection, Hartford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 746, Price codes: A14 in paper copy, A01 in microfiche. Report EPA-901/9-76-003f September, 1975. 301 p.

Descriptors: *Connecticut, *Economic feasibility, *Institutional constraints, *Water pollution control, Abatement, Cost-benefit analysis, Costs, Pollution abatement, Regulation, Standards, Waste water disposal, Law enforcement.

The primary objective of Connecticut Enforcement Project (CEP) is to design an administrative program which will discourage delay in compliance with environmental standards by effectively taxing away the benefits derived from the delay. The major legal issues fall into four categories: (1) constitutional problems attending the Environmental Enforcement Act which may be solved by administrative interpretations that will lead the courts in a positive direction; (2) clarification of statutory and administrative law constraints to avoid unknown risktaking; (3) the legal viability of assessing violation for the entire period of noncompliance, including the period prior to detection and during litigation; and (4) the legal consequences attending a number a specific procedural devices. Unless the assessment period can be made commensurate with the period of noncompliance, the effectiveness and equity of the en-

forcement program will be seriously compromised. The legality of including pre-detection noncompliance in the assessment period depends upon the sufficiency of notice of proof. The CEP is less interested in establishing a violation of emissions standards by any source on a given day than it is in ensuring that proper control equipment is installed to reduce the risk of excess emissions during plant operation. (See also W78-10399) (Jordan-Florida)
W78-10401

ECONOMIC LAW ENFORCEMENT. VOLUME IV. STRENGTHENING ENVIRONMENTAL LAW ENFORCEMENT: ILLEGAL FILLING.
Connecticut Dept. of Environmental Protection, Hartford.
For primary bibliographic entry see Field 4C.
W78-10402

A MANUAL OF LAWS, REGULATIONS AND INSTITUTIONS FOR THE CONTROL OF GROUND WATER POLLUTION.
National Water Well Association, Worthington, OH. Model Law Task Force Committee.
For primary bibliographic entry see Field 2A.
W78-10404

POWERS AND RESPONSIBILITIES OF LOCAL GOVERNMENTS, REGIONAL PLANNING COUNCILS AND THE DIVISION OF STATE PLANNING RELATIVE TO COASTAL ZONE MANAGEMENT.
Florida Div. of State Planning, Tallahassee.
October, 1977. 75 p, 6 fig.

Descriptors: *Florida, *Comprehensive planning, *Management, *Regional development, Legislation, Local governments, Planning, Coasts, Methodology, Administration, State governments, Water law, Governmental interrelations, Interagency cooperation, Land use, Zoning, Regulation, Coordination.

Four Florida land and water use management programs are analyzed in terms of value for use by local governments and regional agencies for implementing the Federal Coastal Zone Management Act of 1972 (FCZMA). The Development of Regional Impact Section of the Florida Environmental Land and Water Management Act of 1972 provides for management of land and water use activities of greater than local significance and meets some of the requirements of the FCZMA. Areas of Critical State Concern (ACSC), impacting natural or other resources, or affecting other defined interests, are subject to special land use regulations. Although paralleling sections of the FCZMA, the constitutionality of ACSC procedures is in doubt. The Local Government Comprehensive Planning Act requires both a Coastal Zone Protection Element and consistency of development decisions with adopted plans. This act also parallels the requirements of the FCZMA except for state overview. In addition, state and regional procedures concerning federal OMB circular No. A-95 review of applications for federal assistance parallel FCZMA consistency requirements. Survey results are presented summarizing suggestions for modification of the programs for consistency with the FCZMA and for use by local governments in coastal zone management. (Hoofman-Florida)
W78-10407

MISSOURI STATE LAWS PERTAINING TO WATER AND RELATED LAND RESOURCES,
Missouri Dept. of Natural Resources Jefferson City. Clean Water Commission.
For primary bibliographic entry see Field 4A.
W78-10408

WATER LAWS OF ALABAMA.
Geological Survey of Alabama, Montgomery.
Available from State Planning Division, Alabama Development Office, State Office Building, Montgomery, Alabama, 36104. October, 1974. 242 p.

Descriptors: *Alabama, *Legislation, *Water resources development, *Water rights, Water law, Legal aspects, Judicial decisions, Law enforcement, Public rights, Riparian rights, Water policy, Regulation.

The Alabama State Planning Information Program provides herein information and assistance to state and local governments concerning Alabama water law. Pertinent statutory law and leading court decisions, intended to serve as primary reference materials, are set out. Supplements will be added, including important judicial decisions and newly enacted legislation covering all aspects of water law. The authors include relevant constitutional provisions and analyze in detail the Alabama Water Management Act and the Gulf States Marine Fisheries Compact. Also discussed is the statutory authority pertaining to water, soil and water conservation districts, watersheds and water resources research. The authority and functions of water conservation and irrigation agencies, water improvement commissions, the Board of Certification and the Water Well Standards Board, as well as specific Development Authorities are reviewed. Regulations concerning the erection of dams, the development of coastal areas, navigation and riparian and littoral rights are examined also. The report concludes with attorney general opinions written in response to specific problems. (Stump-Florida)
W78-10409

LEGAL-POLITICAL HISTORY OF WATER RESOURCE DEVELOPMENT IN THE UPPER COLORADO RIVER BASIN (PARTS I AND II),
California Univ., Los Angeles. Dept. of Political Science.
D. Mann, G. Weatherford, and P. Nichols.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 674, Price codes: A04 in paper copy, A01 in microfiche. Lake Powell Research Project Bulletin No. 4, September, 1974, 56 p.

Descriptors: *Colorado River Basin, *Colorado River Compact, *Legislation, *Water conservation, Decision making, History, Land use, Political aspects, Water consumption, Water law, Water management, Colorado River, Water policy, Water resources, Water rights, Water shortages, Water supply, Water storage, Interstate rivers, Legal aspects, Interstate compacts.

This study is in two parts. Part I chronicles the dominant events of the legislative history of the Colorado River Storage Project Act of 1956. Five general themes are evident in this history: (1) the developmental needs of the Upper Colorado River Basin; (2) the legal constraints of the 1922 Colorado River Compact; (3) the economic wisdom of the Colorado River Storage Project; (4) the conservation value of Dinosaur National Monument; and (5) the engineering feasibility and geological effects of the project. Part II analyzes these historical events from the perspective of political science. Lowe's 'distributive' model is used to account for the way in which a political coalition was formed and operated in the upper Colorado River Basin to foster legislation. The dynamics of the political bargaining, including the nature of some of the major tradeoffs, are described. The persistence of distributive politics is discussed in the context of some of the current problems such as water quality of the river. Finally, several unresolved issues of public policy concerning Colorado River management are posed. (Jordan-Florida)
W78-10410

ROLE OF INTERSTATE WATER POLLUTION CONTROL COMMISSIONS.
Blaser, Zeni and Co., Chicago, IL.
For primary bibliographic entry see Field 5G.
W78-10411

FLORIDA'S COASTAL MANAGEMENT PROGRAM: THE NO NEW NOTHING ACT EXAMINED,
Florida Univ., Gainesville. School of Law.
C. McCann.
Available from Eastern Water Law Center, Florida University, Gainesville, 32611, for $1.75. Spring 1978, 36 p.

Descriptors: *Coasts, *Management, *Planning, *Florida, Land development, Zoning, Legislation, Federal government, Federal Water Pollution Control Act, California, Resources, Environmental control.

The proposed Florida Coastal Management Plan (FCMP) is evaluated. The FCMP enumerates guidelines for future development in the coastal zone rather than authorizing any new development restrictions. The author discusses whether the intent of the federal Coastal Zone Management Act (CZMA) is environmentally protectionist or land development oriented; and whether this intent will be effected in actual or contemplated administration of states' plans. The author discusses the CZMA incentive plan of providing grants to coastal states to develop and administer programs to preserve, protect, develop, restore or enhance the resources of the nation's coastal zone. The incentive method is contrasted with national pollution control legislation which imposes direct federal and state controls. California's Coastal Plan is detailed and contrasted with the proposed FCMP. The author discusses the way the FCMP adds no new regulations of authority, but seeks to employ existing state regulatory programs. The proposed FCMP classifies the coastal a zone into vital, conservation, and development areas and sets the policies and standards for planning and conducting activities in the coastal zone. The author concludes by noting the likely ineffectiveness of the proposed FCMP. (Hoofman-Florida)
W78-10412

STATE LIABILITY TO PRIVATE PROPERTY OWNERS AS A RESULT OF THE REDIVERSION OF THE KISSIMMEE RIVER,
Florida Univ., Gainesville. School of Law.
P. Helm, and V. B. Cook.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611, for $1.75. March 1978, 52 p.

Descriptors: *Flood control, *Channeling, *Flow, *Navigable rivers, *Eutrophication, Environmental effects, Florida, Lakes, Drainage, Agricultural watersheds, Recreation, Water quality, Eminent domain, Comprehensive planning, Reclamation, Structures, Condemnation, Property values, Water resources development.

In 1976, the Florida legislature enacted legislation specifically aimed at planning for and implementing measures designed to reverse the environmental damage caused by the channelization of the Kissimmee River. The flood control project which was completed in 1970 has increased water flow into Lake Okeechobee and has resulted in the lake becoming eutrophic because of excessive nutrient concentrations. As a result of the priority given restoration goals, each alternative under consideration involves the seasonal reflooding of areas presently protected by the channelization project and raises legal questions as to eminent domain, condemnation, and whether specific actions may constitute a taking. After exploring the legal ramifications of the property reflooding alternatives and examining the relationship between private property rights and state comprehensive planning which includes restoration policies to further environmental goals, the paper concludes that there are no clear answers with respect to state liability issues. While the taking issue

emerges as the primary consideration for state liability, the particular facts surrounding each affected property owner will ultimately require a case by case approach before the state liability issue can be resolved and the total cost of the restoration program can be determined. (Easterbrook-Florida)
W78-10413

FOURTH SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN IN THE STATES OF WISCONSIN, ILLINOIS, INDIANA, AND MICHIGAN, VOLUME 2.
Environmental Protection Agency, Chicago, IL.
For primary bibliographic entry see Field 5G.
W78-10414

DEVELOPMENT OF WATER QUALITY MANAGEMENT PLANNING IN THE UNITED STATES,
Weston (Roy F.), Inc., Wilmette, IL.
For primary bibliographic entry see Field 5G.
W78-10417

ENVIRONMENTAL ANALYSIS FOR DEVELOPMENT PLANNING IN CHAMBERS COUNTY, TEXAS. VOL 3: COASTAL ZONE MANAGEMENT: A PROPOSED INCREMENTAL CHANGE SYSTEM FOR TEXAS,
Houston Univ., TX. Bates Coll. of Law.
J. Mixon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 747, Price codes: A07 in paper copy, A01 in microfiche. Southwest Center for Urban Research, Houston, Texas. Technical Report to National Science Foundation, Research Applied to National Needs, June 1974. 130 p, 3 append. NSF-RANN-GI-39211.

Descriptors: *Resources development, *Coasts, *Land use, *Baseline studies, *Environmental effects, Shore protection, Water resources, Water utilization, Legislation, Texas, *Outer Continental Shelf, Coastal zone management.

Emerging federal environmental and land use legislation of private land uses and coordinate state-level allocation of resources. This paper tries to blend Texas's present land use system, Chambers County preferences for local control, and federal requirements into a coherent response to the Coastal Zone Management Act. It is advanced as a point of beginning, and as a theory of approach instead of a 'must' system for the state. The proposal emphasizes an 'incremental change' process to balance development and conservation values along the Texas Gulf Coast. One portion of the Chambers County graphic representation of the capability of the county land and water areas to accommodate land development of various types. This study should be valuable to a coastal zone management agency in carrying out the major tasks required by the federal act. (Sinha - OEIS)
W78-10438

THE WATER ELEMENT OF THE FLORIDA STATE COMPREHENSIVE PLAN.
For primary bibliographic entry see Field 6B.
W78-10449

WILL WE SAVE OUR COASTS,
Senate, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-10450

SHIPOWNERS' LIABILITY FOR POLLUTION REMOVAL EXPENSES UNDER A STATE STATUTE LIMITED BY FEDERAL LIMITATION OF LIABILITY ACT, BUT NOT LIMITED BY FEDERAL WATER POLLUTION CONTROL ACT,
For primary bibliographic entry see Field 5G.
W78-10451

STATE COURT ADJUDICATION OF FEDERAL RESERVED WATER RIGHTS,
M. L. Koch.
Urban Law Annual, School of Law, Washington University, Vol 13, p. 239-249 (1977).

Descriptors: *Governmental interrelations, *Water rights, Adjudication procedure, Beneficial use, Priorities, Judicial decisions, Federal jurisdiction, Prior appropriation, State jurisdiction, Water control.

Water is essential to the survival and development of the arid western United States. Without specifying the exact quantity, the federal government has asserted claims to vast amounts of water in the West through the doctrine of federal reserved water rights, thus hindering effective planning by the states and increasing current users' fears of losing their water to the federal government. The Supreme Court, nearly 100 years after the creation of the western states, created the doctrine of federal reserved water rights; and determined that the rights reserved were for any amount necessary to cover future as well as present needs. The McCarran Amendment was enacted before the development of the reserved rights, but it has become a method for alleviating problems arising from government claims. The Amendment, which waives the federal government's immunity to joinder in suits to adjudicate water rights, has been applied to reserved waters and may be the means of forcing the federal government to quantify its claims. This objective was furthered when the Supreme Court held in a 1976 case that the Amendment favored litigation of federal reserved water rights in state courts. (Jordan-Florida)
W78-10452

FEDERAL RESERVED RIGHTS IN WATER: THE PROBLEM OF QUANTIFICATION,
C. S. Leach.
Texas Tech Law Review, Vol 9, No 1, p 89-111 (Fall, 1977).

Descriptors: *Federal government, *Water allocation(Policy), *Reservation doctrine, *Water rights, Adjudication procedure, Legal aspects, State governments, Water policy, Water control, Water resources, Prior appropriation, Governmental interrelations.

A water crisis in the arid West may result from the interaction of the federal government's reserved rights in water and the states' systems for acquisition of water rights. The doctrine of implied reservation of water gives the federal government the ability to claim much of the water that many state water users believe they now own. The greatest conflict between the state systems and the federal reserved rights results from the indefinite quantity of particular federal rights. Overall, a scheme of reporting the federal government's claims to water, combined with court adjudicated quantification to resolve disputes, seems to be a workable solution for the problems created by the doctrine of implied reservation. Such a scheme would require each federal department or agency with a claim, present of potential, to determine its own water needs and then report that quantity to state water officials. The plans for the federal government to make its claims known should prevent future inequities from arising as a result of investments made in reliance on water that is subject to a federal reserve right. (Jordan-Florida)
W78-10453

RESTORATION AS A FEDERAL REMEDY FOR ILLEGAL DREDGING AND FILLING OPERATIONS,
For primary bibliographic entry see Field 5G.
W78-10454

THE COSTS OF FAILURE AT THE THIRD LAW OF THE SEA CONFERENCE,
Rhode Island Univ., Kingston.
L. Alexander, F. Cameron, and D. Nixon.
Journal of Maritime Law and Commerce, Vol 9, No 1, p. 1-32, (October, 1977).

Descriptors: *Law of the sea, *Negotiations, *United Nations, *Conferences, Economic impact, Foreign trade, International law, International waters, Mining, Navigation, Oceans, Beds under water.

After several years of effort, the Third United Nations, Law of the Sea Conference was, by the summer of 1977, in a state of disarray. There remained serious difficulties concerning such topics as the legal status of the waters of the economic zone beyond the territorial limits, and the outer extent of national jurisdiction on the continental margin. The basic difference between the major industrialized powers and the developing states was over the conditions of exploitation of seabed minerals. There will be many 'costs' if the Conference fails, such as: (1) economic costs. It is also anticipated that four additional major categories of costs might be incurred as a result of conference failure. These are: (1) unilateral extension of offshore claims; (2) impairment of the North/South dialogue; (3) ineffective use of the marine environment; and on the benefits and costs of a treaty has less to do with the oceans or specific rules of law than with their perception of the kind of world they want to live in. (Jordan-Florida)
W78-10455

LAW OF THE SEA AT THE BRINK,
J. T. Swing.
Oceans, Vol. 10, No. 5, p 4-5 (September-October, 1977).

Descriptors: *Law of the sea, *Negotiations, *Conferences, *United Nations, International waters, Mining, Natural resources, Oceans, Resources, Water policy, International law, Treaties.

To a large extent, there have been two separate negotiation sessions conducted at the Third United Nations Conference on the Law of the Sea. One session has been organic in nature--its purpose to create an entirely new institution to manage deep seabed resources beyond the area of national jurisdictions. The other negotiation session has been jurisdictional in nature--defining the rights and duties of the coastal state and of all other states in the international system within a succession of bands leading away from the shoreline. The first session--the effort to build a new institution acceptable to both the developed world and the Group of 77--has proved exceptionally difficult, perhaps in part due to the political overtones of the North/South debate with which the world is becoming increasingly familiar. Congress is hardly likely to be enchanted by the results and the forces pushing for the adoption of unilateral United States legislation that would permit United States nationals to exploit finite areas of the ocean floor beyond 200 miles in the 'common heritage' area of the ocean. (Jordan-Florida)
W78-10456

THE ORDINARY HIGH WATER MARK: ATTEMPTS AT SETTLING AN UNSETTLED BOUNDARY LINE,
Florida Univ., Gainesville. School of Law.
F. E. Maloney.
Land and Water Law Review, Vol. 13, No. 2, p 465-499 (1978).

Descriptors: *Earth-water interfaces, *Riparian waters, *High Water Mark, *Water level fluctua-

tions, Boundaries(Surfaces), Accretion, Navigable waters, Riparian rights, Judicial decisions, Water levels, Measurement, Water measurement, Mathematics, Physical properties, Freshwater, Constitutional law, Submergence, Statistical methods.

The definition of the Ordinary High Water Line (OHWL), developed by Justice Curtis in Howard v. Ingersoll, is often used in both state and federal courts. The OHWL is found by examining physical factors that indicate the ordinary water level. However, uncertainties exist as to whether federal or state rules apply in determining boundaries in tidally-affected areas. It seems clear, though, that state rules apply for non-tidal inland navigable waterbodies. However, states are not free to adopt any rules they please. States may still adopt the concept that rapid boundary changes may be treated as accretions where navigation-related interests are not involved and riparian rights to navigable waterbodies are in need of protection. Because of the ambulatory nature of an actual water boundary, use of the surveyed meander line as an alternative to the OHWL is impractical and perhaps unconstitutional. In addition, the use of mathematical averaging may also lack constitutionality. Despite much controversy, the OHWL is still recognized as the true water-land boundary. However, application of the legal rules to accurately locate the boundary on the ground will continue to pose difficulties. (Spiegel-Florida)
W78-10457

FEDERAL WATER POLLUTION ACT AMENDMENTS OF 1972,
For primary bibliographic entry see Field 5G.
W78-10459

PROMISED LANDS: AN ANALYSIS OF WETLAND SUBDIVISIONS IN FLORIDA,
INFORM Inc., New York.
For primary bibliographic entry see Field 6G.
W78-10460

PL 92-500: PROSPECTS FOR CHANGE,
For primary bibliographic entry see Field 5G.
W78-10462

PASSAGE THROUGH INTERNATIONAL STRAITS: FREE OR INNOCENT. THE INTERESTS AT STAKE,
F. Nolta.
San Diego Law Review, Vol. 11, No. 3, p 815-833 (May, 1974).

Descriptors: *International law, *Law of the sea, *Military aspects, *Straits, *International waters, Boundary disputes, Channels, Foreign countries, Foreign waters, Governments, Legal aspects, Navigable waters, Navigation, Treaties, United Nations, Water law, Water policy, Water rights, United States, Coasts.

One of the subjects scheduled for discussion at the United Nations Convention on the Law of the Sea is passage through straits used for international navigation. The law that will cover international straits is important because of the expected extension of a nation's territorial sea to twelve miles. If this extension is agreed upon, it will have the effect of enclosing as territorial water straits of a width of twenty-four miles or less. The United States favors a right of free transit through international straits. Many other nations contend that uncontrolled transit is not acceptable, arguing that the concept of innocent passage is sufficient to protect both the interests of the international community and the coastal states. Innocent passage refers to transits which are not prejudicial to the peace, good order, or security of the coastal states. Some nations do not recognize the right of innocent passage for warships through their territorial sea. The United States publicly stresses its national security and other opposing nations resist on much the same grounds. The author concludes that the world's dependence on the free flow of trade makes the concept of free transit vital. (Jordan-Florida)
W78-10463

THE STATUS OF GROUNDWATER IN SOUTH DAKOTA,
W. Hubbard.
South Dakota Law Review, Vol. 22, No. 3, p 591-618 (Summer, 1977).

Descriptors: *South Dakota, *Groundwater, *Hydrologic budget, *Prior appropriation, Aquifers, Beneficial use, Groundwater basins, Groundwater potential, Groundwater recharge, Groundwater resources, Hydrologic cycle, Legal aspects, Permits, Preferences, Reasonable use, Subsurface waters, Water law, Water policy, Water sources, Water wells.

As water becomes increasingly important in our lives, it becomes more important to control its movement and use. The regulation and use of underground water poses a special, obvious problem, that being the extreme difficulty in determining the quantity and movement of groundwater. South Dakota, like other water-scarce western states, has a system of water laws separate and distinct from its land laws. Private ownership forms the basis of land law while water lies within the public domain and cannot be privately owned. In South Dakota, the tradition of the older English system of riparian rights became entrenched slightly before the acceptance of the new prior appropriation system. Consequently, the water laws of the state remain snarled in a dual system of forces that do not mesh well, or at all in some cases. An individual whose title to subsurface water rights has been violated has nothing unless he or she can prove that injury. In South Dakota, the courts tend to favor a common sense approach in determining water rights. Relevant surface indications that can be reasonably analyzed by reasonable men are a favorite means of proof. (Jordan-Florida)
W78-10464

THE LAW OF THE SEA CONFERENCE: WHAT HAPPENED IN NEW YORK.,
W. A. Eklund.
Ocean Law Memo, Vol. 4, No. 2, p 1-7, (January 6, 1978). Available from Ocean Resources Law Program, University of Oregon Law School, Eugene, Oregon, 97403.

Descriptors: *Law of the Sea, *International law, *Mining, *Treaties, *United Nations, Continental margin, Continental shelf, Foreign waters, Geology, International waters, Legal aspects, Legislation, Minerals, Navigation, Oceans, Water law, Water policy, United States, Conferences.

During its four years of continuous existence, the Third Conference on the Law of the Sea has undertaken to hammer out a single, comprehensive treaty that will serve as a foundation for a permanent international legal regime to govern the oceans. Although many participants were pleased with the progress made at the sixth session, there is still major disagreement over the substantive issues. Seabed mining is still the most intractable issue before the convention. The United States insists on reasonably unfettered access for its seabed miners; while underdeveloped nations are just as insistent that private miners will be granted access only when the treaty is fully operational. The U.S. also finds unacceptable certain provisions that make technology transfer by seabed miners a condition of access to the deep seabed. In addition, the U.S. objects to: (1) limits placed on production; (2) the composition of the council; (3) the financing of the treaty's operational arm, the Enterprise; (4) the definition of the continental shelf; and (5) the precise nature of the exclusive economic zone. Despite the production of a text 'fundamentally unacceptable' to the U.S., participants of the Conference are more optimistic than outside observers. (Jordan-Florida)
W78-10465

MUNICIPAL PROBLEMS WITH PL 92-500 M: CONFORMANCE VERSUS PERFORMANCE,
For primary bibliographic entry see Field 5G.
W78-10466

THE PENALTY FOR VIOLATION OF SECTION 1161(B)(5) OF THE WATER QUALITY IMPROVEMENT ACT IS CIVIL IN NATURE,
For primary bibliographic entry see Field 5G.
W78-10467

RECOGNITION OF AESTHETIC VALUES IN WATER LAW,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Virginia Water Resources Research Center.
W. E. Cox, and W. R. Walker.
Journal of the American Water Works Association, Vol. 69, No. 1, p 31-34 (January, 1977).

Descriptors: *Aesthetics, *Prior appropriation, *Riparian rights, *Water resources development, *Water allocation(Policy), Beneficial use, Legislation, Natural resources, Psychological aspects, Riparian land, Scenery, Water demand, Water distribution(Applied), Water law, Water policy, Water quality control, Water resources, Water supply development, Water utilization.

One of the major conflicts in water resources management arises from the fact that aesthetically-oriented water uses are basically incompatible with many utilitarian uses. The degree of recognition of aesthetic values is always constrained by the demand for water for strictly utilitarian purposes. A movement towards greater recognition of aesthetic values has taken place in essentially all areas of the law, including water quality protection, allocation, and planning, and authorization of water resource development projects. Although aesthetic values have been recognized by the western appropriative states, certain basic characteristics of the appropriative doctrine itself are incompatible with protection of instream values. Aspects of riparian doctrine, such as the vesting in each landowner of the right to a continuance of a certain portion of the natural streamflow, are contrasted with appropriation theory. Prior appropriation's legal separation of water rights from the adjacent land de-emphasizes the natural aesthetic attributes and results in treatment of water resources more akin to economic commodities. The author notes that real challenge that must be met, if aesthetic values are to be recognized as a water management objective, exists at the operational level where actual water use decisions are made. (Jordan-Florida)
W78-10468

HIGH COURT CONCLUDES WATER ACT WAS NOT INTENDED TO AFFECT NUCLEAR REGULATORY COMMISSION'S JURISDICTION.
For primary bibliographic entry see Field 5G.
W78-10469

OCEAN DUMPING, THE REVISED EPA CRITERIA, AND THE NATIONAL SOIL FERTILITY PROGRAM.
For primary bibliographic entry see Field 5G.
W78-10470

WATER ACT AMENDMENTS: DEJA VU IN THE HALLS OF CONGRESS,
P. S. Ward.
Journal, Water Pollution Control Federation, Vol 49, No 10, p 2055-2061 (October, 1977).

Descriptors: *Federal government, *Federal Water Pollution Control Act, *Political aspects, *Water pollution control, Benefits, Costs, Economic impact, Governments, Industries, Law enforcement, Legal aspects, Legislation, Planning, Political constraints, Regulation, Water law, Water pollution sources, Water Quality Act, Economics, Water pollution.

The Hose Public Works and Transportation Subcommittee on Water Resources completed another round of hearings on the Water Act amendments during September, 1977. The object of the hearings was to compile a record of comments on the collection of proposed amendments passed by the Senate just before it adjourned for the summer. The hastily prepared Senate proposals covered a wide-ranging package. A number of the differences between the proposals are considered by the author to be especially significant. The (1) The Senate bill contains measures designed to promote the use of unconventional treatment systems and the recyling of wastewater nutrients. (2) The Senate bill also retains the 1983 best available technology requirement for industry, while the House recommends a postponement. (3) In addition, the Senate bill eliminates federal funding for storm sewers, for rehabilitation and for collectors. The House bill also limits the dredge and fill permit requirement to commercially navigable waters and adjacent wetlands. Finally, the Senate bill would subject an industrial discharger to a fee commensurate with the economic competitive advantage of noncompliance. (Jordan-Florida)
W78-10471

SOME UNRESOLVED ISSUES ON THE LAW OF THE SEA,
Department of External Affairs, Ottawa (Ontario).
J. A. Beesley.
Natural Resources Lawyer, Vol 4, No 3, p. 629-638 (1971).

Descriptors: *Law of the sea, *United Nations, *International law, *Oceans, Continental shelf, Foreign countries, International waters, Navigable waters, Canada, Water rights, Pollution abatement, Resources.

There is one central issue facing the international community today, namely, the continued viability of the concept of the freedom of the high seas as an absolute doctrine. Establishing an equitable international regime for the seabed and ocean floor beyond the limits of national jurisdiction raises problems concerning: boundary questions; arms control matters; the need for new concepts of resource administration; economic problems relating to possible market disruptions; and basic questions concerning problems relating to possible market disruptions; and basic questions concerning the developmental needs of the Third World. The prospects for an international regime are uncertain because, while progress is being made in some areas, there is little or none in others. Canada has suggested that States be called upon to define their continental shelf claims by a specified date. The effect would be the immediate definition of the noncontentious area of the seabed--the area that no one claims. The subsequent negotiations could have the effect of expanding the noncontentious area, but could not have the effect of diminishing it. (Jordan-Florida)
W78-10472

SOUTH DAKOTA'S ARTESIAN PRESSURE--SHOULD IT BE A PROTECTED MEANS OF DIVERSION,
A. L. Rusch.
South Dakota Law Review, Vol 16, No 2, p 481-492 (Spring, 1971).

Descriptors: *South Dakota, *Artesian wells, *Artesian aquifers, *Prior appropriation, *Water allocation(Policy), Agriculture, Beneficial use, Groundwater, Hydrologic cycle, Judicial decisions, Land tenure, Legislation, Public rights, Reasonable use, Utah, Water rights, Irrigation, Regulation, Water utilization, Water law.

Greater demand for water has caused problems for those wells which rely upon artesian pressure as means of delivery. The use of irrigation wells and large capacity pumps affects pressure in neighboring artesian wells, often with the result that they will no longer bring water to the surface. There are no statutes in South Dakota which protect artesian wells, but it is the policy of the Water Resources Commission to protect the means of delivery of those prior appropriators who utilize artesian pressure. No consideration of reasonableness is made since any well which produces water is considered reasonable. However, none of the South Dakota court cases really support the current policy of absolute protection of artesian pressure as a means of diversion. A means of delivery should be reasonable if the state has adopted the doctrine of beneficial use of water in order to promote full development of water resources. Most courts accept the rule of reasonableness in light of the surrounding circumstances. The author concludes that the rule of reasonableness is much more tenable than the present South Dakota policy of absolutely protecting artesian pressure as a means of delivery. (Jordan-Florida)
W78-10473

THE LAW OF THE SEA: ALLIANCES AND DIVISIVE ISSUES IN INTERNATIONAL OCEAN NEGOTIATIONS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
J. T. Kildow.
San Diego Law Review Vol 11, No 3, p 558-574 (May, 1974).

Descriptors: *International law, *International waters, *Foreign countries, *Law of the sea, *Negotiations, Foreign waters, Governmental interrelations, Governments, Legal aspects, Jurisdiction, Natural resources, Political aspects, Oceans, Solid aspects, United Nations, Water law, Water policy, Water rights, Beds under water, Continental shelf.

Throughout history, the oceans have played a major role in geopolitics. Freedom of the seas and resource management for the oceans have become the two major issue areas, bringing some nations into conflict while creating new alliances between others. Patterns of alliances and bloc formations in the Law of the Sea negotiations are discussed. The major split at the inception of the meetings between the 'have' and 'have not' nations does not seem to have changed markedly. However, as the issues have become better defined, sub-blocs have changed partners to a limited extent. The original bloc formations, particularly the large bloc the Third World Asian, African and Latin American countries, have been effective as a voting force against the industrialized maritime states on numerous issues, particularly the 'economic zone.' With much of the framework for international arragements pounded out, and with the time for final negotiations fast approaching, some of the unity of the large blocs of nations may be breaking down due to separate national interests and changing economic positions. (Jordan-Florida)
W78-10474

FLOODPLAIN ZONING: IMPLICATIONS OF HYDROLOGIC AND LEGAL UNCERTAINTY,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 6F.
W78-10475

FREEDOM OF THE SEAS: INTERNATIONSAL LAW APPLICABLE TO DEEP SEABED MINING CLAIMS,
University of Southern California, Los Angeles. School of Law.
S. J. Burton.
Stanford Law Review, Vol. 29, No. 6, p1135-80, July, 1977.

Descriptors: *International law, *Law of the sea, *Conference, *Explitation, *International waters, Jurisdiction, Regime, United Nations, Governments, Boundary disputes, Legal aspects, Mining, Oceans, Beds, Water law, Water rights, Treaties, Resources, Comprehensive planning.

Recent developments of advanced technologies for deep ocean mining have enabled states to focus their attention on vast deposits of minerals lying on and beneath the ocean floor. Delegates to the Third United Nations Conference on the Law of the Sea are currently striving to conclude a comprehensive treaty to govern the use of the deep seabed through international law. Many states, however, are acting unilaterally preempting the Conference's efforts to establish a regime for the development of mineral resources on the deep seabed. The author suggest that even without a new treaty, international law contains sufficient traditional principles of freedom of the seas to establish a minimum order regarding mining activities on the deep seabed. Thus, mining of the deep seabed with reasonable regard for others is lawful, but exclusive mining claims are not. The authors concludes that even though deep sea mining, while negotiations continue, may cause legal problems in the future, there are enough mining sites whereby states can continue to mine without interfering with the interests of other states. (Curtis-Florida)
W78-10478

HISTORY OF FLORIDA OIL SPILL LEGISLATION,
Barrett, Boyd and Holder, Tallahassee, FL.
For primary bibliographic entry see Field 5G.
W78-10479

THE PATRIMONIAL SEA OR ECONOMIC ZONE CONCEPT,
A. M. Aguilar.
San Diego Law Review, Vol. 11, No. 3, p 579-602 (May, 1974).

Descriptors: *Continental margin, *International law, *Law of the sea, *Resource allocation, *Conferences, Coasts, Commercial fishing, Economic justification, Foreign countries, Economics, International waters, Legal aspects, Mining, Navigation, Treaties, United Nations, Water law, Water policy, Boundary disputes, Beds under water.

The Third United Nations Conference on the Law of the Sea scheduled its second session in 1974 at Caracas, Venezuela. The purpose of the Conference was to consider progressive development of the law of the sea. One of the keystones of a possible general agreement is the new juridical concept of the patrimonial sea or economic zone. The economic zone would include the waters, bed and subsoil of a belt or strip of sea beyond the territorial sea, in which the coastal state would have exclusive rights over all the renewable and nonrenewable resources existing there. The freedom of navigation, overflight and the laying of submarine cables and pipelines would be maintained. The only restrictions would be those incident to the exercise by the coastal state of its rights in the economic zone. The maximum breadth of this zone would be 200 nautical miles, calculated from the baselines from which the territorial sea is measured. The author noted that while the details would be resolved at the Conference, there seems to have been a consenus among the delegates favoring the acceptability of the economic zone. (Jordan-Florida)
W78-10480

DEVELOPING LAND-LOCKED STATES AND THE RESOURCES OF THE SEABED,
Southern Connecticut State Coll., New Haven. Dept. of Geography.
M. I. Glassner.
San Diego Law Review, Vol. 11, No. 3, p 633-655 (May, 1974).

Descriptors: *Continental margin, *International law, *Law of the sea, *Natural resources, *Resource allocation, Foreign countries, Boundary disputes, Coasts, Foreign trade, Governments, International waters, Legal aspects, Navigation, Treaties, United Nations, Fish, Water law, Water policy, Jurisdiction, Negotiations, Oceans.

There are in the world today some 26 land-locked nations, in addition to a number of land-locked microstates, dependecies and other political entities. Of these nations, all but the five in Europe are poor and may be considered developing. These countries suffer from the double handicap of lacking a seacoast and being poor and weak. While efforts to improve their access to the sea continue, they have not been entirely forgotten in the preparatory discussions for the Third Law of the Sea Conference. The first and perhaps most difficult problem to solve is the size of the area to come under the authority of an international seabed regime, from which the land-locked states may be expected to derive the most long-term benefits. The author discusses the ideal international regime which should have title to and jurisdiction over the 'indivisible ecological whole' of the sea, the airspace above it and the earth beneath it. But the author concludes that such an ideal solution is simply impossible to attain in this age of fervent nationalism. (Jordan-Florida)
W78-10481

BOOM, DOOM, AND GLOOM OVER THE OCEANS: THE ECONOMIC ZONE THE DEVELOPING NATIONS, AND THE CONFERENCE ON THE LAW OF THE SEA,
Center for the Study of Democratic Institutions, Santa Barabara, CA.
E. M. Borgese.
San Diego Law Review, Vol. 11, No. 3, p 541-556 (May, 1974).

Descriptors: *Law of the sea, *Mining, *Navigation, *Treaties, *United Nations, Foreign coutnries, Governments, Continental Shelf, International law, International waters, Legal aspects, Oceans, Water law, Water policy, Water rights, Beds under water, Jurisdiction, United States.

The quest for an international ocean regime came with the discovery of seabed resources declared to be the common heritage of mankind. But the wealth of the oceans was beyond the limits of national sovereignty and classical concepts of ownership. There was no law, national or international, because technical advances had made the old law of the sea obsolete. The United Nations Conference on the Law of the Sea is attempting to build new international law to control the new technology. Freedom of navigation and of transit through straits is of more interest to great sea powers than to developing nations. However, poor nations should gain more than the rich by an extensive of sovereignty into the seas. The development of the economic zone concept is not entirely to the advantage of developing countries. The developed nations, with their greater resources and talent, can more effectively exploit whatever portion of the oceans' resources they may claim. The author concludes that the hope of the poor majority of mankind is in an international enterprise that will manage the resources of the sea for all nations. (Jordan-Florida)
W78-10482

AUTHORITY OF COASTAL SUBSIDENCE DISTRICT CHALLENGED,
Harris-Galveston Coastal Subsidence District, Houston, TX.
J. DeBerry.
Water and Sewage Works, Vol. 124, No. 8, p 55-56, (August, 1977).

Descriptors: *Texas, *Groundwater, *Gulf Coastal Plain, *Land subsidence, Flood control, Regulation, Subsidence, Tidal effects, Water districts, Water levels, Flood damage, Hurricane.

Subsidence, the loss of land surface elevation, has accelerated along the Texas Gulf Coast since 1900 to a point where some areas have lost as much as six inches per year. Subsidence has caused considerable damage to private and public facilities, and has escalated the vulnerability of the Houston-Galveston area to tidal inundation and hurricane damage. The Harris-Galveston Coastal Subsidence District (HGCSD) has caused a decrease in groundwater pumping in critical subsidence areas by encouraging increased use of the area's surface water system. The use of groundwater led to substantial losses of land elevation. By regulating groundwater use on a geographical basis, the HGCSD can manage withdrawal so that groundwater pumping can be maximized without subsidence. However, several cities have filed lawsuits challenging the constitutionality of the HGCSD regulations. The cities question the authority of the HGCSD to regulate the internal affairs of home rule cities under Texas law and claim traditional immunity from taxation by other governmental bodies. The author concludes that regardless of the outcome of the HGCSD's legislative and judicial problems, an agency should exist to regulate groundwater pumping to end subsidence. (Jordan-Florida)
W78-10483

ENVIRONMENTAL PROTECTION AGENCY V. CENTRAL ILLINOIS LIGHT COMPANY (POWER COMPANY'S RIGHT TO MAINTAIN WASTEWATER SOURCE WITHOUT PERMIT).
369 N.E. 2d 389-392 (111. Ct. App. 1977).

Descriptors: *Illinois, *Thermal pollution, *Powerplants, *Artificial lakes, *Waste water(Pollution), Water pollution, Water cooling, Water pollution sources, Pumping plants, Impoundments, Surface waters, Water sources, Regulation, Watershed, Perched water, Administrative agencies, Permits.

An order of the State Pollution Control Board found that a wastewater source had been constructed without a permit in violation of the Pollution Control Board's rules and regulations. The power company which had constructed the souce appealed from the Board's order. The power company alleged that the Board had incorrectly construed and applied its own rules and regulations when it found the reservoir in question to be an 'artificial cooling lake' rather than a 'perched lake.' A 'perched lake' or sidechanneled lake is exempt from the Board's water quality standards. The appellate court held that, in view of the entire record, the reservoir in question fitted the Board's own definition of 'treatment works' or 'perched lake' for cooling thermal effluent as a result of power plant operations. The court further held that the Board's showing that the watershed of a creek area drained into the reservoir did not fulfill its burden of proving that the reservoir was an 'artificial cooling lake' rather than a 'perched lake.' (Beamer-Florida)
W78-10485

TUCKER V. BADOIAN (LIABILITY FOR DAMAGE TO PROPERTY BY SUBSURFACE WATERS).
Mass. App., 370 N.E. 2d 717-719 (1977).

Descriptors: *Massachusetts, *Subsurface waters, *Land tenure, *Flow, Groundwater, Land use, Legal apsects, Landfills, Discharge(Water), Soil water movement, Subsurface flow, Legislation, Water law, Groundwater movement, Surface waters, Damages.

The plaintiff landowners brought an action to recover for damage to their property caused by subsurface waters. The Superior Court entered judgment for the plaintiffs and three of the defendants appealed. Two defendants who owned land adjoining the plaintiff's property moved for a directed verdict asserting that the law was clear that a property owner could not be held liable for damaged to adjoining property resulting from activities undertaken on his own property which affected the flow of surface waters. The appellate court granted these two defendants a directed verdict, finding that the adjoining landowners were not liable for damage to the plaintiff's property even if the placing of fill on the land did cause subsurface waters to back up onto the plaintiff's property. The appellate court held, in this instance, that there was ample evidence from which the jury could have concluded that this defendant, a trustee for a realty trust, had misrepresented the water problem and that all of the other elements necessary for an action for deceit were present. (Beamer-Florida)
W78-10486

STATE EX. REL. COMMISSIONERS OF LAND OFFICE V. SEELKE (DOCTRINE OF AVULSION CONTROLS EJECTMENT ACTION).
568 P.2d 650-54 (Okla. App. 1977).

Descriptors: *Oklahoma, *Accretion(Legal aspects), *Boundaries(Property), *Avulsion, Floods, Rain, Channel erosion, Erosion, Bank erosion, Channel flow, Rivers, Water flow, Flow, River flow, Channels, Riverbeds, Volume.

Plaintiffs, Commissioners of the Land Office, brought an ejectment action against defendant landowners. The plaintiffs alleged that by virtue of accretion the channel of the Cimarron River had gradually moved west with the result that over 400 acres of land, including defendants' property, had accreted and attached to the plaintiff's land. Although the defendants admitted that the channel of the river had changed, they denied any land accreted to the plaintiff's land. On the contrary, defendants alleged that since the change in the channel occurred as a result of sudden high waters and floods, the doctrine of avulsion would control. Witnesses for the plaintiffs testified that the channel of the river changed drastically in 1957. After this evidence had been presented, the defendants demurred. The trial court in granting the demurrer held that the plaintiffs' evidence was insufficient to grant relief. The plaintiffs appealed but the appellate court affirmed, holding that the evidence showed an avulsive charge. Accordingly, the riparian owners' boundary lines remained at the place where the middle of the main channel of the stream was before the flood. (Beamer-Florida)
W78-10487

OPEN DITCHES.
Mont. Rev. Code. secs 11-4001 thru 11-4002 (1947), as amended, (Supp. 1975).

Descriptors: *Montana, *Ditches, *Open channels, *Drowning, *Safety, Water conveyance, Hazards, Water rights, Legal aspects, Legislation, Regulation, State governments, Local governments, Public health, Water law.

The legislative assembly of Montana has declared that the contol of ditch water in inhabited areas is in the public interest. The purpose of this act is to prevent the drowning of children in ditches which are filled or partially filled with water. Only ditches which are within the confines of an incorporated town or city are subject to this regulation. The act, which is solely regulatory in function, is not intended to affect any valid water rights. It merely insures that the diversion, transportation, and use of water in such ditches shall be in a safe manner. At the option of the governing body of the city or town, water which flows through the limits of an incorporated city or town in an open ditch

may be declared a public nuisance. (Beamer-Florida)
W78-10488

MONTANA WATER USE ACT.
Mont. Rev. Code secs 89-865 through 89-8-111 (Supp. 1975).

Descriptors: *Montana, *Appropriation, *Public rights, *Water allocation(Policy), Water rights, Beneficial use, Consumptive use, Equitable apportionment, Land tenure, Legal aspects, Legislation, Permits, Prior appropriation, Public access, Regulation, Water, Water law, Water policy, Water supply, Water utilization.

The legislature declares that any use of water is a public use, and that the waters within the state are the property of the state for the use of its people and are subject to appropriation for beneficial uses. The department of natural resources and conservation shall establish a centralized record system of all existing rights, and shall begin proceedings to determine those rights. The department of fish and game may represent the public for purposes of establishing any prior and existing public recreational use in existing right determinations. The district court shall issue a preliminary decree based on data submitted by the department of natural resources and conservation. The department and any other person who objects to the preliminary decree is entitled to a hearing. The district court shall, on the basis of any hearing and the preliminary decree, enter a final decree which is conclusive as to all existing rights in the source or area under consideration. An appropriator may not sever any part of an appropriation right from the land to which it is appurtenant without obtaining prior approval from the department. (Jordan-Florida)
W78-10489

YELLOWSTONE RIVER COMPACT.
Mont. Rev. Code sec 89-901 thru 89-916 (1947), as amended, (Supp. 1975).

Descriptors: *Yellowstone River Compact, *Montana, *Legislation, *Interstate compacts, *National parks, *Water allocation(Policy), Beneficial use, Domestic wate, Irrigation programs, Irrigation water, Irrigation, North Dakota, Prior appropriation, River basins, State jurisdiction, State governments, Water distribution(Applied), Wyoming, Regulation, Governmental interrelations, Water rights.

The legislative assembly of Montana hereby ratifies the Yellowstone River Compact (YRC). The YRC divides the waters of the Yellowstone River and it's tributaries between Montana, Wyoming and North Dakota for the purpose of irrigation. No commission is necessary to administer the YRC between Montana and North Dakota, but a commission consisting of one representative each from Wyoming, Montana and the United States Geological Survey shall administer the YRC between Montana and Wyoming. The YRC shall not be construed so as to adversely affect any water rights of Indian tribes. Any signatory state may require such lands, easements and rights of way in another signatory state as may be required for the enjoyment of privileges granted under the YRC. No water shall be diverted from the Yellowstone River basin without the unanimous consent of the signatory states. Any person claiming an appropriative right to the use of interstate water shall file a written statement with the Montana department of natural resources and conservation and shall install in his irrigation ditch a weir or other measuring device approved by the department. The department shall enforce reasonable rules consistent with the YRC. (Jordan-Florida)
W78-10491

COUNTY PLANS FOR PUBLIC WATER SUPPLY, SEWERAGE AND SOLID WASTE DISPOSAL SYSTEMS.
For primary bibliographic entry see Field 5G.
W78-10492

THERMAL DISCHARGES (E.P.A. REGULATIONS).
Title 40, Code of Federal Regulations, Part 122, Sections 122.1-122.16. (1977).

Descriptors: *Federal Water Pollution Control Act, *Regulation, *Thermal pollution, *Water pollution control, Administrative agencies, Administrative decisions, Discharge(Water), Effluents, Industrial wastes, Permits, Pollution abatement, Thermal water.

The Environmental Protection Agency (EPA) recently promulgated regulations for the control of thermal pollution under the authority of the Federal Water Pollution Control Act (FWPCA). The regulations prescribe the procedures to be followed in connection with the establishment of alternative effluent limitations. The regulations also prescribe procedures for the use of such alternative effluent limitations in conjunction with applications for National Pollutant Discharge Elimination System (NPDES) permits. The terms alternate effluent limitations means all limitations or standards of performance for the control of the thermal component of any discharge, which are established pursuant to section 316(a) of the FWPCA. The procedures for determination of the alternative effluent limitations include: (1) application for determination by the owner of the point source; (2) public notice of the proposed issuance, denial of or modification of an NPDES permit for a discharge; (3) plan of study and determination; (4) state certification; (5) determination of the alternative effluent limitation; and (6) public hearings within 30 days of the issuance of the public notice at the request of any person. (Jordan-Florida)
W78-10493

TUG OCEAN PRINCE, INC. V. UNITED STATES (MITIGATION OF PENALTY IMPOSED BY FEDERAL WATER POLLUTION CONTROL ACT FOR OIL SPILLS).
436 F. Supp. 907-27 (S.D.N.Y. 1977).

Descriptors: *New York, *Federal Water Pollution Control Act, *Oil spills, *Hudson River, Penalties(Legal), Oil pollution, Water pollution, Navigation, Buoys, Charts, Negligence, Coast Guard regulations, Oily water, Pollutants, Water law, Federal governments, Legislation.

In a combined action, plaintiffs (owners and charterers of a tug) sought exoneration from liability on the grounds that an accident causing an oil spill into Hudson River was caused by the government's failure to maintain adequate navigation aids. The owner of the oil-carrying barge sought to recover the value of al oil lost from either the plaintiffs or the government. The government sought to recover the costs of the pollution cleanup from the other parties, and also a civil penalty from the owner of the barge under the Federal Water Pollution Control Act (FWPCA). The barge owner sought indemnity from plaintiffs for any liability he may have to the government. In an extended opinion, the Federal Court for the Southern District of New York held that the penalty provided by the FWPCA against the owner of any vessel from which oil is discharged may be mitigated by the owner's lack of culpability. The court also held that the Coast Guard was not negligent in maintaining navigation aids and that the tug owners were liale for cleanup costs. However, this liability was limited to $100.00 per gross ton of the tug. (Stump-Florida)
W78-10494

WARM SPRINGS DAM TASK FORCE V. GRIBBLE (EARTHQUAKE CONSIDERATIONS IN DAM DESIGN).
565 F. 2d 549-554 (9th Cir. 1977).

Descriptors: *Dam construction, *Dam failure, *Seismic design, *Social aspects, Administrative agencies, California, Dam design, Dams, Earthquake engineering, Earthquakes, Federal government, Geology, Judicial decisions, Legal aspects, Structures, Water law, Seismic waves, Envionmental effects.

The plaintiff environmental group sought an injunction barring further work on a proposed dam on the ground that the Environmental Impact Statement (EIS) prepared for the project by the Army Corps of Engineers failed to comply with the requirements of the National Environmental Policy Act (NEPA). The district court rejected the plaintiff's motion and the plaintiff appealed. The plaintiff's primary contention was that the dam was not designed to resist a potential maximum credible event; i.e., an earthquake registering 7.5 to 8.1 on the Richter scale. The dam was designed to resist a quake measuring 7.0 on the same scale. The dispute about the maximum credible event is based upon differences of opinion among geological experts. The Ninth Circuit Court of Appeals affirmed the district court's decision, finding that the purpose of an EIS is to disclose such issues, but the responsible agency is not under a duty to resolve them. The court also held that the environmental concern of the plaintiff must be weighed against the societal interests which would be adversely affected by the injunction. (Jordan-Florida)
W78-10495

DYER AND MOODY, INCORPORATED V. DYNAMIC CONSTRUCTORS, INCORPORATED (DAMAGES APPROPRIATE FOR OBSTRUCTION OF NATURAL SERVITUDE OF DRAINAGE).
357 So. 2d 615-619 (La. Ct. App. 1978).

Descriptors: *Drainage, *Easements, *Louisiana, *Natural flow, Damages, Drainage effects, Ditches, Land development, Judicial decisions, Remedies, Surface waters, Insurance.

Defendants constructed an apartment complex which filled in a natural drainage ditch and obstructed the natural flow of the surface water. The surface water thereafter drained across plaintiff's property. Plaintiff filed a petition for an injunction and damages, complaining of the obstruction of a natural servitude of drainage. The defendant denied the complaint and filed a third party claim against a title insurance company which had insured a pervious owner of defendant's property against such damages and loss. The lower court awarded damages to the plaintiff and granted summary judgment in favor of the insurance company. The defendant appealed. The appellate court affirmed and held: (1) the proprietor below is not at liberty to prevent the drainage of water; (2) the trial court was correct in awarding damages instead of an injunction because relocating the apartments would be impractical; and (3) the title insurance company was not liable since the fact that an owner of the subject property obstructed a natural servitude of drainage did not create a defect in the title of the property. (Jordan-Florida)
W78-10496

AKERS V. RESOR (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENTS).
443 F. Supp. 1355-1361 (W.D. Tenn., 1978).

Descriptors: *Administrative agencies, *Economic justification, *Engineering structures, *Flood control, *Environmental effects, Channels, Conservation, Drainage systems, Engineers' estimates, Environmental control, Floodproofing, Legislation, Legal aspects, River basin develop-

ment, Rivers, Water control, Water law, Alternative planning, Judicial decisions, Channel improvement.

This action was brought in federal district court to challenge the sufficiency of the Army Corps of Engineers' (Corps) attempts to comply with the requirements of the National Environmental Policy Act (NEPA), concerning a flood control and drainage project which would realign two rivers to reduce flooding. Plaintiff landowners contended that the environmental impact statement (EIS) required by NEPA and prepared by the Corps was inadequate. The court agreed with the plaintiff, and held that the Corps' EIS did not contain the information that would enable the reader to form any meaningful conclusions about the impact on downstream flooding in the area. The court noted that the lack of meaningful information was particularly critical in light of the fact that the primary justification for the project was flood control. In addition, the court held that the EIS was inadequate to the proposed project, and the cumulative impacts of this project in conjunction with other projects. The court also suggested that the Corps should consult the Soil Conservation Service and other federal agencies before preparing a new EIS. The court retained jurisdiction over the case and continued the injunction which had halted the project. (Jordan-Florida)
W78-10497

HOUSTON V. UNITED STATES GYPSUM COMPANY (OWNERSHIP OF ISLAND ACCRETIONS).
569 F.2d 880-887 (5th Cir. 1978).

Descriptors: *Mississippi, *Accretion(Legal aspects), *Boundary disputes, *Riparian rights, *Islands, Adjacent land owners, Avulsion, Boundaries(Property), Interstate rivers, Land tenure, Legal aspects, Mississippi River, Navigable waters, Ownership of beds, Remedies, Riparian land, Rivers, Water law, Water rights, Adverse possession.

Plaintiff owned an island on the west side of the Mississippi River which was growing to the south by accretion. Defendant owned land on the east bank of the river. All the land was in the state of Mississippi and the common law of Mississippi governed the dispute. Defendant contended that when the accretions crossed its northern boundary, as extended westerly from the east bank, the dry land so created passed out of the ownership of the plaintiffs and became its property. The plaintiffs argued that they own the island accretions, regardless of how far south they may run, so long as they do not cross into the territory of another sovereign. The plaintiffs also claimed the land by adverse possession. The United States Fifth Circuit Court of Appeals ruled in favor of defendant because by Mississippi common law the title to an accretion originally formed on the property of one owner does not cover the accretion after it has extended to and over the property of another. The court remanded the case to the trial court on the issue of adverse possession because the trial court had not considered the correct standard in reaching its decision. (Jordan-Florida)
W78-10498

STATE DEPARTMENT OF HIGHWAYS V. SMITH (COMPENSATION FOR RIVER DIVERSION).
353 So. 2d 322-325 (La. Ct. App. 1977) (Rehearing denied December 28, 1977).

Descriptors: *Louisiana, *Damages, *Highways, *Eminent domain, *Riparian rights, Administrative agencies, Condemnation, Easements, Legal aspects, Right-of-way, River flow, Road construction, Roads, State governments, Stream improvement, Rivers, Real property, Transportation, Water law, Judicial decisions, Diversion.

Plaintiff, the Louisiana Department of Highways, brought an expropriation action and took 17.518 acres in full ownership and 1.214 acres as drainage servitudes from an 85.682 tract. The parcel was taken for an interstate highway right-of-way. In addition, a river on the property of other landowners was diverted so that its main channel no longer flowed past defendant landowner's property. The trial court awarded the landowner monetary damages for: (1) the 17.518 acres taken; (2) the 1.79 acre tract located south of the proposed highway; and (3) the reduced value of the north remainder because of the diversion of the river. Plaintiff appealed. The appellate court then: (1) reduced the compensation for the 17.518 acres tract; (2) increased the compensation for the 1.79 acre tract; and (3) held that no compensation was required for the north remainder of the property. The court also held that in view of the shape and size of the isolated 1.79 acre tract, the landowner should be compensated for its full value, but that since the loss in value from the river diversion did not result from the expropriation, it could not be compensated. (Jordan-Florida)
W78-10499

OAK LEAF COUNTRY CLUB, INC. V. WILSON (DOMINANT OWNER'S STREAM CHANNELIZATION MAY RESULT IN LIABILITY IF FOUND UNREASONABLE).
257 N.W. 2d 739-48 (Iowa, 1977).

Descriptors: *Iowa, *Channeling, *Streamflow, *Damages, *Reasonable use, Bank erosion, Erosion, Silting, Deposition, Flooding, Surface waters, Flow characteristics, Streams, Downstream, Abrasion, Water law, Judicial decisions, Sedimentation.

Defendant farmer channelized a meandering stream which ran through his farm. The plaintiffs, private owners of adjacent land, brought suit claiming that the channelization resulted in increased scouring and abrasion to creek banks and increased flooding, thereby damaging their land through deposits of sand, silt, and extensive erosion. Although the trial court ruled for the defendant without letting the case go to the jury, the appellate court ruled that a jury should have decided the case. While a dominant owner is entitled to drain surface water in a natural watercourse from his land over a servient owner's land, the court noted that unless he observes the overriding requirement to exercise ordinary care in so doing, the dominant owner may be liable to downstream owners for resulting damages if he acts unreasonably. To prevail, the court said that plaintiff landowners must show that the channelization was a substantial factor in causing the harm they suffered and that it was the probable cause of the harm. The court further held that the damage caused by channelization and damage caused by normal flooding would not be fatal to the plaintiff's case. (Easterbrook-Florida)
W78-10500

6F. Nonstructural Alternatives

AREAS SUBJECT TO INUNDATION BY THE 100-YEAR FLOOD IN AVRA VALLEY, PIMA COUNTY, ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10038

A SYSTEMATIC APPROACH TO FLOOD RISK MAPPING,
Acres Consulting Services Ltd., Niagara Falls, (Ontario).
I. P. G. Hutchison, and W. E. Watt.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 180-195, 1978. 2 tab, 15 ref.

Descriptors: *Floods, *Risks, *Mapping, *Canada, *Uncertainties, Hydraulics, Hydrology, Design flood, Land use, Projects, Flood damage, Damage reduction, Programs, Mathematical models, Systems analysis, Hydrotechnical studies.

Flood risk mapping is the cornerstone of the new, comprehensive approach to the reduction of flood damage both in Canada and the United States. The ultimate use of such maps requires resolution of four interdependent aspects of the problem: (1) determination of acceptable risk; (2) calculation of corresponding flood levels; (3) preparation and distribution of maps; and (4) implementation of land use restrictions. Items (1), (3), and (4) are discussed briefly, but the paper is primarily concerned with item (2)--the calculation of corresponding flood levels. A systematic approach is described beginning with the identification of the sites requiring mapping. Then, types of hydraulic systems involved are identified and an appropriate hydrologic/hydraulic technique is selected. The available approaches, including regionalization, are discussed as well as the type and magitude of uncertainty associated with the various hydrologic and hydraulic and mapping techniques. Canada's FDR program represents a more comprehensive approach to flood damage reduction and a more rational adjustment to flood risk than hitherto has been the case. However, the success of this program could be impaired unless certain aspects are treated more rigorously and consistently. (See also W78-10094) (Bell-Cornell)
W78-10105

OPTIMAL RISK-BASED DESIGN OF WATER RESOURCE PROJECTS,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-10113

UNCERTAINTIES IN DETERMINATION OF FLOOD PROFILES,
Dames and Moore, Washington, DC.
D. R. Dawdy, and A. K. Motayed.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 6 tab, 6 ref.

Descriptors: *Probability, *Methodology, Estimating, *Flood profiles, *Uncertainties, *Computer models, Hydrology, Hydraulics, Flood magnitude, Risks, Systems analysis, Flood frequency.

Commonly used methodologies for the determination of flood profiles are based on estimation of flood magnitude by hydrologic computations and the estimation of the flood elevation by hydraulic computations. Statistical analyses of flood frequency give some assessment of the risk and uncertainty in estimates of magnitude of the flood under consideration. Elevations attained by that flood contain uncertainties in flood magnitude (hydrology) and flood routing (hydraulics). Such uncertainties in various phases of computations, including those in the measurements and estimates of physical parameters, in the assumptions behind the analyses, and in the computations, are investigated herein, sources of uncertainties are assessed, and their relative importance is evaluated. It is concluded that consideration of alternative methodologies for flood plain delineation should account for the uncertainties inherent in present methods and should compare the relative uncertainties if a cost-effective decision is to be obtained. Depending on the step-backwater computation model used, the computed profiles may vary significantly due to the use of different computational schemes and parameter values. (See also W78-10094) (Bell-Cornell)
W78-10119

FLOODPLAIN ZONING: IMPLICATIONS OF HYDROLOGIC AND LEGAL UNCERTAINTY,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
S. L. Dingman, and R. H. Platt.
Water Resources Research, Vol. 13, No. 3, p 519-522 (June, 1977).

Descriptors: *Flood plain zoning, *Hydrologic data, *Judicial decisions, *Land use, *Mapping, Drainage, Flood control, Flood damage, Flood plains, Flood plain insurance, Flood protection, Hydrography, Hydrologic aspects, Hydrologic properties, Hydrologic systems, Land development, Regulation, Water law, Water zoning, Zoning.

The authors assert that the adoption of floodplain regulations is being unnecessarily delayed because of a widespread misunderstanding on the part of planners and, in some cases, the courts as to the degree of precision hydrologically possible and legally necessary in delineating flood hazard areas. Hydrologists and engineers cannot precisely delineate areas that are flooded with a given probability. The authors question whether the law permits the imposition of regulations based on less than prefectly accurate information. The imprecision of mapping techniques makes it extremely likely that some property will be erronesouly included or excluded from the regulatory floodplain district. Where the zone is conscientiously drawn according to the best maps available to the community, courts may be expected to apply the presumption of validity. Regulations are primarily effective as preventive measures. Once development occurs, regulations can do little to reduce damages. The authors conclude by noting recent judicial trends which indicate that if a community proceeds in good faith and to the best of its ability to try to protect the lives and investments of its citizens, the law will not stand in the way. (Jordan-Florida)
W78-10475

6G. Ecologic Impact Of Water Development

ESTIMATE OF MAXIMUM LEVEL OF OIL INNOCUOUS TO MARINE BIOTA AS INFERRED FROM LITERATURE REVIEW,
Mississippi State Univ., Mississippi State.
For primary bibliographic entry see Field 5C.
W78-09803

REPORT OF THE SYMPOSIUM ON PREVENTION OF MARINE POLLUTION FROM SHIPS, HELD IN ACAPULCO, MEXICO, 22-31 MARCH 1976.
Coast Guard, Washington, DC. Office of Marine Environment and Systems; and Inter-Governmental Maritime Consultative Organization, London (England).
For primary bibliographic entry see Field 5G.
W78-09805

COASTAL ENERGY IMPACT PROGRAM ASSESSMENTS AND ENVIRONMENTAL IMPACT STATEMENTS.
National Oceanic and Atmospheric Administration, Washington, DC.
Federal Register, Vol. 42, No. 171, p 44400-04, September 2, 1977.

Descriptors: *Management, *Coastal engineering, *Project planning, *Coasts, Coastal structures, Administrative decisions, Beaches, Dunes, Environmental control, Projects, Research and development, Land use.

The Department of Commerce and the National Oceanic and Atmospheric Administration issued guidelines designed to provide coastal states and local communities with a detailed description of the environmental information required in applications for financial assistance under the Coastal Energy Impact Program (CEIP) of the National Environmental Policy Act (NEPA) of 1969. The purpose of an environmental impact assessment (EIA) is to document the environmental impacts of the alternative courses of action studied by the applicant during the development of the project proposal. The Office of Coastal Zone Management analyzes the EIA in making its determination as to whether an environmental impact statement must be prepared in accordance with NEPA. The applicant must include a description of the project and its design, any alternatives considered, an environmental summary, and any Federal and State Agency involvement. In addition, the proposed project must consider, in detail, potential effects it will have on Federally regulated environmental concerns. These concerns include: present land use planning; noise impact; air quality; water quality; waste water treatment plants; solid waste management; human population in the area; transportation; wild and scenic rivers; and protection of historic and cultural properties. (Kastner-Florida)
W78-09858

THE PROMISE OF FEDERAL CONSISTENCY UNDER SECTION 307 OF THE COASTAL ZONE MANAGEMENT ACT,
For primary bibliographic entry see Field 6E.
W78-09861

ENVIRONMENTAL IMPACTS OF DREDGING IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W78-09868

NATIONAL WATER QUALITY INVENTORY 1975 REPORT TO CONGRESS.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W78-09874

WETLANDS: WHERE DEVELOPERS AND REGULATORY PROGRAMS MEET,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5G.
W78-09879

THE DETERMINATION, ASSESSMENT, AND DESIGN OF 'IN-STREAM VALUE' STUDIES FOR THE NORTHERN GREAT PLAINS REGION,
Montana Univ. Missoula, Dept. of Geology.
K. D. Bovee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 269, Price codes: A10 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Region VIII, Denver, September 1, 1974, 215 p, 183 ref, 3 append. EPA-68-01-2413.

Descriptors: *Discharge(Water), *Methodology, *Fisheries, *Habitats, *Streamflow, Water quality, Sediment yield, Biological properties, Biological communities, Measurement, Hydrology, Nutrients, Biotic, Warm-water fish, *Rearing flows, *Great Plains Region, Stream productivity, Anchor ice formation, Stream community, Macroinvertebrate habitat, Polyodon spathula, Stizostedion canadense, Notorus flavus, Indicator species.

The study proposes a methodology for the recommendation of minimum discharges for a warm water fishery. The method utilizes field measurements of critical stream areas and biological criteria determined from the use of indicator species. For large rivers, the indicator species was the paddle fish (Polyodon Spathula); for smaller rivers it was the sauger (Stizostedion Canadense); and for determining adequate fish habitat, the stonecat (Notorus Flavus) was used. Rearing flows are determined on the basis of stream productivity by analyzing macroinvertebrate habitats, and on the basis of fish habitat typing. A number of variables might require a greater amount of instream flows than the fishery. These variables include streamflow needs for riparian and other sub-irrigated vegetation, water quality parameters, anchor ice formation, and the relationship between discharge and sediment yield. Information concerning these variables is presently insufficient to determine whether a variable will override the requirement for the fishery. Further research is needed in these areas, and several investigative methods for conducting such research are proposed. An extensive literature review was conducted to determine the discharge requirements of a warm water fishery. Where exact hydrologic parameters were not measured directly, they were estimated. From this information it was determined which components of the stream community would be most seriously affected by reduced discharges. A method for recommending minimum discharges should not sacrifice reliability for expediency. (Nessa-NC)
W78-10028

FINAL ENVIRONMENTAL IMPACT STATEMENT: WATER QUALITY MANAGEMENT PLAN FOR EL PASO AND TELLER COUNTIES, COLORADO.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5F.
W78-10033

HOW MAN HAS AFFECTED THE BALANCE OF NATURE IN THE HAPPY VALLEY NATURE RESERVE,
durban Girl's High School (South Africa).
J. Hall.
Environment Republic of South Africa, Vol. 4, No. 4, p 4-5, 1977.

Descriptors: *Ecosystem ecology, Water birds, Aquatic plants, Mosquitoes, Durban, *Happy Valley Nature Reserve(South Africa), Tilapia Melanopleura, Nymphaea.

An essay by a high school student in which she describes the destruction of the ecological balance in a swamp by the introduction of Tilapia Melanopleura for the eradication of mosquito larvae. (So Afr Water Infor Center)
W78-10246

SOLAR ENERGY, WATER, AND INDUSTRIAL SYSTEMS IN ARID LANDS, TECHNOECOLOGICAL OVERVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6B.
W78-10288

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR SLUDGE DISPOSAL AND LAND RECLAMATION IN FULTON COUNTY, ILLINOIS.
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5E.
W78-10372

DRAFT ENVIRONMENTAL IMPACT STATEMENT, GRAND STRAND REGION, SOUTH CAROLINA.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5D.
W78-10376

LEGISLATIVE REGULATION OF THE ENVIRONMENTAL IMPACT OF STRIP MINING,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology
For primary bibliographic entry see Field 5G.
W78-10377

SELF-REGULATION OF ENVIRONMENTAL QUALITY: IMPACT ANALYSIS IN CALIFORNIA LOCAL GOVERNMENT,
Center for California Public Affairs, Claremont.
A. W. Jokela.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 450, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-600/3-76-040, April, 1976, 132 p.

Descriptors: *Administrative agencies, *Comprehensive planning, *Environmental control, *California, Federal Water Pollution Control Act, Federal government, Coordination, Local governments, Federal project policy, Decision making, Project planning, Environmental effects.

The National Environmental Policy Act initiated the widespread use of environmental impact analysis in federal decisionmaking. This process has subsequently been adopted on the state level. Implementation of California's environmental impact reporting program at the local level is described here. Also discussed are the implications of this program with respect to other federal and state programs, particularly concerning the federal Clean Water Grants Program. California's Environmental Quality Act requires an environmental impact report on any project significantly effecting the environment, including permit-granting activities of local government agencies. Similarly, Section 201 of the 1972 Federal Water Pollution Control Acr Amendments requires a facilities plan report before sewage treatment plant construction grants may be disbursed to local agencies. But while the federal program's management structure is centralized and hierarchical, California's process stays at the local level. It also requires few specifics when compared to the detailed report outline required by the federal program. The report concludes that where possible, California's decentralized procedures should be adopted by the federal program so that a variety of local interests are balanced. Also, the stimulation of an active local dialogue should be encouraged. (Malefatto-Florida)
W78-10382

ECONOMIC LAW ENFORCEMENT. VOLUME IV. STRENGTHENING ENVIRONMENTAL LAW ENFORCEMENT: ILLEGAL FILLING.
Connecticut Dept. of Environmental Protection, Hartford.
For primary bibliographic entry see Field 4C.
W78-10402

ENVIRONMENT ASSESSMENTS IN WATER QUALITY MANAGEMENT PLANNING,
Louisville Univ., KY. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-10423

ENVIRONMENTAL ANALYSIS FOR DEVELOPMENT PLANNING IN CHAMBERS COUNTY, TEXAS. VOL 3: COASTAL ZONE MANAGEMENT: A PROPOSED INCREMENTAL CHANGE SYSTEM FOR TEXAS,
Houston Univ., TX. Bates Coll. of Law.
For primary bibliographic entry see Field 6E.
W78-10438

SKYLAB/EREP APPLICATION TO ECOLOGICAL, GEOLOGICAL, AND OCEANOGRAPHIC INVESTIGATIONS OF DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5A.
W78-10441

STRATEGIC PETROLEUM RESERVE. SULPHUR MINES SALT DOME, CALCASIEU PARISH, LOUISIANA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of Energy Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10443

THE MARINE RESOURCES OF ANAHEIM BAY,
Department of the Environment, Edmonton (Alberta).; and California State Univ., Long Beach. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W78-10446

PHYSICAL AND BIOLOGICAL MEASUREMENTS, JULY 29 - AUGUST 5, 1973, (CRUISE Y7307D),
Inter-American Tropical Tuna Commission, La Jolla, CA., and Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2L.
W78-10447

WILL WE SAVE OUR COASTS,
Senate, Washington, DC.
E. F. Hollings.
Sierra Club Bulletin, Vol 59, p. 5-7, 38 (June 1974).

Descriptors: *Coasts, *Long-term planning, *Environmental effects, *Land development, Wetlands, Coastal plains, Legislation, Federal government, Law enforcenment, Regulation, Environmental control, Water quality control.

The 1972 Coastal Zone Management Act (CZMA) is intended to form a basis for long-term planning and management for the nation's coastal resources. In passing the law, Congress recognized the need of creating a balance between the natural biological and physical resources of the coastal zone as it was increasingly developed. While the National Environmental Policy Act requires federal agencies to include an 'environmental awareness' in their decision making process, the CZMA goes further by requiring state agencies to include this 'awareness' in their everyday decisions. Planning and mangement responsibilities are placed with the state, although the statute also provides for federal and local government participation. The Act has provided three grant programs: (1) assistance to states in creating coastal zone management programs; (2) assistance for program implementation; and (3) a program to establish an estuarine sanctuary system. An Office of Coastal Zone Management has been created within the Natonal Oceanic and Atmospheric Administration to implement the Act. While the Nixon-Ford Administration originally withheld funds for CZMA implementation, and initial $12 million grant was authorized in late 1973. (Malefatto-Florida)
W78-10450

PROMISED LANDS: AN ANALYSIS OF WETLAND SUBDIVISIONS IN FLORIDA,
INFORM Inc., New York.
L. Allen, B. Kuder, S. L. Oakes, and J. M. Halloran.
Florida Environmental and Urban Issues, Vol. 5, No. 2, p. 9-13, (December, 1977).

Descriptors: *Florida, *Environmental effects, *Land development, *Wetlands, Conservation, Environment, Land resources, Mangrove swamps, Natural resources, Swamps, Water injury, Ecology.

When Florida joined the Union in 1845, almost every region in the state possessed extraordinary natural beauty. A century and a half later Florida is suffering what the state's Department of Natural Resources has bluntly termed 'ecological disaster.' The uncontrolled development of environmentally fragile wetlands has offered residents ambiguous rewards. The land-sales industry has been one of the prime exploiters and promoters of Florida's growth. Many of the land sales companies profess to be developing 'new communities.' All are marketing the lots in their subdivisions via some form of installment-contract sales, in which the purchaser makes a small downpayment and pays for a lot over a period of years. Unfortunately, the subdividers are falling far short of their promise in terms of actually creating well-planned new communities. The problems involve deficiencies in water supplies and provisions for utilities; poor environmental planning; and lack of resale value for the land. Regulatory pressure, and in some cases coercion, seems to be required if the general population is not to suffer at the expense of the profit-seeking few. (Jordan-Flordia)
W78-10460

RECOGNITION OF AESTHETIC VALUES IN WATER LAW,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Virginia Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W78-10468

7. RESOURCES DATA

7A. Network Design

WATER-RESOURCES INVESTIGATIONS IN UTAH, 1977.
Geological Survey, Salt Lake City, UT. Water Resources Div.
Water-Resources Investigations in Utah Folder, 1978. 1 sheet.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, *Utah, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Flood plains, Precipitation(Atmospheric), Groundwater, Water quality, On-site investigations, Dissolved solids, Bibliographies, Networks, Maps, *Cooperative water-studies program.

Water-resources investigations in Utah in which the U.S. Geological Survey participates are summarized. A bibliography of pertinent reports is included. The investigations include collections of basic information through a hydrologic-data network, areal hydrologic or interpretative studies, and research projects. The hydrologic-data network consists of primary, secondary, and water-management streamflow stations; ground-water observation wells; and water-quality observation sites. Small State maps show principal sources and quality of ground water, flood prone areas, mean annual precipitation, discharge of the principal rivers, and dissolved solids in principal rivers. A map, scale 50 mi to the in., shows by symbols and colored outline the hydrologic-data network and investigations in Utah as of May 1977. (Woodard-USGS)
W78-10044

APPLICABILITY AND RELIABILITY OF TELEMETRIC NETWORKS FOR REAL-TIME WATER QUALITY CONTROL,
Association of Bay Area Governments, Berkeley, CA.
For primary bibliographic entry see Field 5G.
W78-10110

STREAM GAUGING INFORMATION, AUSTRALIA-DECEMBER 1974.
Australian Water Resources Council, Canberra. Dept. of National Resources.
For primary bibliographic entry see Field 7C.
W78-10280

7B. Data Acquisition

A NEW APPROACH TO DETERMINATION OF CATION EXCHANGE CAPACITY,
California Univ., Davis.
M. J. Fernando, R. G. Burau, and K. Arulanandan.
Soil Science Society of America Journal, Vol. 41, No. 4, p 818-820, July-August 1977. 3 fig, 2 tab, 8 ref.

Descriptors: *Sampling, Laboratory tests, *Cation exchange, Soil texture, Soil properties, Soil tests.

The dielectric dispersion defined as the difference in the dielectric constant of a sample measured at 3,000,000 Hz and at 75,000,000 Hz, was linearly related to CEC of the sample. One linear relationship between dielectric dispersion and CEC was obtained for clay-silica flour mixtures where CEC was varied by changing the proportion of clay in the sample as well as by using clays with different CEC (kaolinite, illite, montmorillonite). A second linear relationship, with somewhat different slope, was obtained between the dielectric dispersion and the CEC of natural soil samples. (Skogerboe-Colorado State)
W78-09910

GAS CHROMATOGRAPHIC ANALYSIS OF SOIL ATMOSPHERES,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W78-09922

CORRECTING TURBIDITY INTERFERENCE IN THE DETERMINATION OF PHOSPHORUS,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 2K.
W78-09924

A MECHANICALLY CONTROLLED VARIABLE RATE LEACHING DEVICE,
National Soil Survey, Lab., Lincoln, NE.
G. G. S. Holmgren, R. L. Juve, and R. C. Geschwender.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1207-1208, November-December, 1977. 1 fig, 1 tab.

Descriptors: *Leaching, *Sampling, Laboratory studies, Cation exchange.

Twenty-four leaching tubes attached to 60-ml plastic syringes are mounted on the periphery of three vertically aligned slotted discs 45 cm in diameter. The plungers are withdrawn at a controlled rate by a variable speed screw jack that separates the two lower discs holding the plungers and syringe barrels, respectively. Leaching time can be varied from 15 min. to 12 hours or more. The final volume of extract is determined by weighing the syringes. Precision of ammonium acetate CEC and extractable cations by this procedure with 2.5 grams of soil and 50-ml extract matches that of a comparable manual method using vacuum extraction with 5 grams of soil and 100 ml of extract. This apparatus has also cut required operator time in half. (Skogerboe-Colorado State)
W78-09936

CORRECTION FOR DISSOLVED NITROUS OXIDE IN NITROGEN STUDIES,
North Dakota State Univ., Fargo. Dept. of Soils.
J. T. Moraghan, and R. Buresh.
Soil Science Socity of America Journal, Vol. 41, No. 6, p 1201-1202, November-December, 1977. 1 fig, 2 tab, 6 ref.

Descriptors: Nitrification, Denitrification, *Nitrogen, Temperature, *Sampling, Soil chemistry.

Rapid methods for the accurate determination of N20 in atmospheres of closed incubation flasks are now available. However, serious errors in measuring total N20 within a closed system may arise if dissolved N20 is not considered. Temperature and the ratio of solution volume to atmosphere volume are important factors determining the magnitude of errors resulting from this cause. A simple formula for calculating dissolved N20 based on solution and atmosphere volumes, the mass of N20 in the gaseous phase, and published solubility data for N20 in water is presented. If the chemical composition of the solution phase is likely to influence solubility coefficients, these values can be experimentally determined using a described technique. (Skogerboe-Colorado State)
W78-09937

DESIGN AND TEST OF A FIELD SAMPLER FOR AMMONIA VOLATILIZATION,
Texas Agricultural Experiment Station, Temple.
D. E. Kissel, H. L. Brewer, and G. F. Arkin.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1133-1138, November-December, 1977. 9 fig, 1 tab, 12 ref.

Descriptors: *Ammonia, Fertilizers, Data collection, *Sampling, Nitrogen.

A system is needed to measure ammonia volatilization from N fertilizer applied under field conditions. This study was undertaken to develop a device for making these measurements and still maintain a field environment. The basic system developed consists of a vacuum pump, a chemical trap to capture ammonia, and the volatilization chamber. (Skogerboe-Colorado State)
W78-09939

LINEAMENTS ON SKYLAB PHOTOGRAPHS-DETECTION, MAPPING, AND HYDROLOGIC SIGNIFICANCE IN CENTRAL TENNESSEE,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 4B.
W78-10000

HYDROLOGICAL APPLICATION OF LANDSAT IMAGERY USED IN THE STUDY OF THE 1973 INDUS RIVER FLOOD, PAKISTAN,
Geological Survey, Reston, VA. Geography Program; and Geological Survey, Reston, VA. Water Resources Div.
M. Deutsch, and F. H. Ruggles, Jr.
Water Resources Bulletin, Vol 14, No 2, p 261-274, April 1978. 7 fig, 1 tab, 6 ref.

Descriptors: *Flood data, *Remote sensing, *Satellite(Artificial), *Photogrammetry, Flood damage, *Indus River, *Pakistan, LANDSAT.

During August and September 1973, the Indus River Valley of Pakistan experienced one of the largest floods on record, resulting in damages to homes, businesses, public works, and crops amounting to millions of rupees. Tremendous areas of lowlands were inundated along the Indus River and major tributaries. Landsat data made it possible to easily measure the extent of flooding, totaling about 20,000 sq km within an area of about 400,000 sq km south from the Punjab to the Arabian Sea. The Indus River data were used to continue experimentation in the development of rapid, accurate, and inexpensive optical techniques of flood mapping by satellite begun in 1973 for the Mississippi River floods. The research work on the Indus River not only resulted in the development of more effective procedures for optical processing of flood data and synoptically depicting flooding, but also provided potentially valuable ancillary information concerning the hydrology of much of the Indus River basin. (Woodard-USGS)
W78-10051

NEWER TECHNIQUES AID SEARCH FOR GROUND WATER,
W. L. Anderson, and R. L. Traylor.
Johnson Driller's Journal, Vol. 50, No. 3, p 4-8, May-June, 1978. 6 fig.

Descriptors: *Resistivity, *Groundwater, *Exploration, Subsurface mapping, Subsurface investigations, Geophysics.

Electrical resistivity prospecting for ground water has many advantages such as the ability to obtain subsurface data without extensive test hole drilling or manpower. Proper interpretation of this data aids in the selection of the most productive aquifers. Resistivity values are obtained from vertical electrical soundings or horizontal electrical profiling. Resistivity prospecting is limited by rough terrain, subsurface composition, depth of formations, and narrowness of buried channels. Two case histories of successful use of resistivity data to locate ground-water supplies are presented. They clearly demonstrate that while earth resistivity prospecting is not an exact process, and is not without definite limitations, it can, with proper interpretation, save both time and money in the search for ground water. (Purdin-NWWA)
W78-10090

RISK ASSESSMENT IN WATER QUALITY SAMPLING FOR CALIBRATION/VERIFICATION ANALYSES,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-10108

ACCURACY OF HYDROLOGIC MODEL PARAMETERS ESTIMATED USING REMOTELY SENSED DATA,
Agricultural Research Service, Beltsville, MD. Hydrograph Lab.
T. J. Jackson, and R. H. McCuen.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 292-305, 1978. 5 fig, 6 ref.

Descriptors: *Parametric hydrology, *Remote sensing, *LANDSAT data, Estimating, Data collections, Equations, Mathematical models, Systems analysis, *Data acquisition.

Remote sensing offers an attractive alternative to conventional data collection employed in the estimation of certain hydrologic model parameters. In this investigation, the standard error of parameters estimated from Landsat data are examined. Relationships between the standard error and the size of the spatial modeling units are developed which allow extension of the resuls to larger areas. (See also W78-10094) (Bell-Cornell)
W78-10111

TECHNIQUE FOR COLLECTING AND INCUBATING EGGS OF THE FATHEAD MINNOW,
Texas Parks and Wildlife Dept. Heart of the Hills Research Station, Ingram.
W. C. Guest.
The Progressive Fish Culturist, Vol 39, No 4, p 188, October 1977.

Descriptors: *Aquiculture, *Minnows, *Fish eggs, *Fish reproduction, *Hatching, *Fungi, *Incubation, *Fish food organisms, Methodology, Equipment, Laboratory tests, Fry, Fish management, Fish diseases, Mortality, Pesticides, Malachite green.

Fathead minnow (Pimephales promelas) were raised in the laboratory to be used as forage for laboratory-reared northern pike. Eggs deposited on screens by fathead minnow brooders were

placed in McDonald jars. Each day for 6 days the screens were dipped in malachite green or formalin solutions. Mean percentage hatch was 58 and 23, respectively, and 27% for untreated controls. Mean percentage of fungal infestation was 2, 53, and 70% for malachite green treated, control and formalin treated eggs, respectively. This fathead minnow egg collection and incubation method has been used successfully on several occasions to provide small fry to feed on various piscivorous species reared at the station. (EIS-katz)
W78-10171

TECHNIQUE FOR INCUBATING AND HATCHING EGGS OF SURF SMELT FOR BIOASSAY,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
D. A. Misitano.
The Progressive Fish Culturist, Vol 39, No 4, p 187, October 1977. 1 fig, 3 ref.

Descriptors: *Bioassay, *Fish eggs, Hatching, Equipment, *Smelts, *Aquiculture, *Commercial fish, *Fish reproduction, *Larvae, *Marine fish, *Incubation, Laboratory tests, Sport fish, Methodology, Tidal effects, Aquatic habitats, Reproduction, Spawning, Research equipment, *Surf smelt, Hypomesus.

A technique is described by which surf smelt (Hypomesus pretiosus) are incubated and hatched in the laboratory for use in bioassays. The eggs are collected from the intertidal spawning areas after fertilization and maintained in the laboratory in a plywood box which contains the egg-laden gravel. Seawater runs through the box continuously to maintain the required temperature and humidity and covers the eggs to simulate high tide once each day. Hatching of the eggs is induced by submerging them in water and agitating them gently for 30 seconds by stirring. Full-term eggs will begin to hatch within 2-10 minutes. This makes it possible to have newly hatched larvae available daily for use as test animals. (EIS-Katz)
W78-10172

MODIFICATION OF THE WATER FLOTATION METHOD FOR SEPARATING ORGANISMS FROM DETRITUS IN BENTHIC SAMPLES,
Minnesota Dept. of Natural Resources, St. Paul.
V. W. Koosman, and H. J. Newburg.
The Progressive Fish Culturist, Vol 39, No 4, p 189-190, October 1977. 1 tab, 1 fig, 3 ref.

Descriptors: *Bottom sampling, *Benthic fauna, *Benthos, *Separation techniques, *Detritus, Equipment, *Screens, *Fish eggs, *Aquatic insects, *Invertebrates, Flotation, Residual soils, Sediment, Flow rates, Research equipment, Design, *Water flotation method.

The equipment required to separate and collect macroinvertebrates from sediments by using flowing water at different rates is described. It consists of a source of controlled water flow through a standpipe in a hatchery jar which contains the benthic sample. The benthic material flows through the jar outlet onto a collection screen which is loosely fitted over the rim of a drainage funnel. A flow-rate gauge allows calibration and control of the water flow. Water-flow can be increased as the rate of recovery of target organisms declines. Organisms and detrits of low density were removed at a flow of 110 ml/s. (EIS-Katz)
W78-10173

FLOW METERING FLUMES MONITOR WATER IN COASTAL FOREST WATERSHED,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 4D.
W78-10260

USE OF REMOTE SENSING TO QUANTIFY CONSTRUCTION MATERIAL AND TO DEFINE GEOLOGIC LINEATIONS; DICKEY-LINCOLN SCHOOL LAKES PROJECT, MAINE,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 8D.
W78-10263

RETRANSMISSION OF HYDROMETRIC DATA IN CANADA,
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
R. A. Halliday.
Available from the National Technical Information Service, Springfield, VA 22161 as E7710041, Price codes: A02 in paper copy, A01 in microfiche. NASA Contract Report 149153, Quarterly Report SR28190, October 1976. 10 p, 1 fig, 3 tab.

Descriptors: *Hydrologic data, *Data transmission, *Satellites(Artificial), *Data collections, *Canada, Water levels, Flood forecasting, Water resources, Meteorological data, Precipitation(Atmospheric), Runoff, Remote sensing, *Data collection platforms, *LANDSAT, Hydrometric data, Retransmission.

Data collection platforms have been installed at 23 sites in remote areas of Canada for transmittal of water level and other water resources data. The near real-time data are used for water management purposes. The system has met all requirements, and the suitability of satellite retransmission continues to be demonstrated. A contract for installation of a Landsat/GOES DCS downlink at the Prince Albert (Saskatchewan) satellite station has been awarded to SED Systems, Saskatoon, Saskatchewan. (See also W77-02506 and W77-03111) (Sims-ISWS)
W78-10277

ASSESSMENT OF THE TRACE ORGANIC MOLECULAR COMPOSITION OF INDUSTRIAL AND MUNICIPAL WASTEWATER EFFLUENTS BY CAPILLARY GAS CHROMATOGRAPHY/REAL-TIME HIGH-RESOLUTION MASS SPECTROMETRY: A PRELIMINARY REPORT,
California Univ., Berkeley, Space Sciences Lab.
For primary bibliographic entry see Field 5A.
W78-10332

MEASURING WASTEWATER FLOW WITH DYE,
For primary bibliographic entry see Field 5B.
W78-10425

SKYLAB/EREP APPLICATION TO ECOLOGICAL, GEOLOGICAL, AND OCEANOGRAPHIC INVESTIGATIONS OF DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5A.
W78-10441

APPLICATION OF REMOTE SENSING TO THE CHESAPEAKE BAY REGION. VOLUME 2-PROCEEDINGS,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 5A.
W78-10448

7C. Evaluation, Processing and Publication

CHEMICAL ANALYSES OF SURFACE WATER IN ILLINOIS, 1958-74, VOLUME I, DES PLAINES RIVER BASIN AND LAKE MICHIGAN,
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-10034

CHEMICAL ANALYSES OF SURFACE WATER IN ILLINOIS, 1958-74, VOLUME II, ILLINOIS RIVER BASIN AND MISSISSIPPI RIVER TRIBUTARIES NORTH OF ILLINOIS RIVER BASIN,
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-10035

CHEMICAL ANALYSES OF SURFACE WATER IN ILLINOIS, 1958-74, VOLUME III, OHIO RIVER TRIBUTARIES AND MISSISSIPPI RIVER TRIBUTARIES SOUTH OF ILLINOIS RIVER BASIN,
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-10036

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, AND WELL HYDROGRAPHS,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
C. E. Lamb, and M. J. McIntrye.
Available from OFSS Branch of Distributin USGS Box 25425 Fed Ctr Denver CO 80225 paper copy $3.50 mf $0.50. Open-file map 78-435, 1978. 1 sheet.

Descriptors: *Geologic mapping, *Groundwater, *Water wells, *Hydrographs, *Water levels, Maps, California, *Antelope Valley, Groundwater subunits.

The U.S. Geological Survey has released to the open file a map, scale 1:125,000, showing groundwater subunits and areas, and well hydrographs in the Antelope Valley-East Kern Water Agency area, California. (Woodard-USGS)
W78-10037

AREAS SUBJECT TO INUNDATION BY THE 100-YEAR FLOOD IN AVRA VALLEY, PIMA COUNTY, ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.
R. H. Roeske.
Water-Resources Investigations 78-33 (open-file report), March 1978. 1 sheet, 9 fig, 1 tab, 6 ref.

Descriptors: *Floods, *Flood plains, *Flood data, *Maps, Arizona, Flood discharge, Flood frequency, Land development, Planning, *Avra Valley, *Pima County(Ariz), *100-year flood, Step-backwater computations.

Avra Valley in Pima County, Arizona, is sparsely populated and is used mainly for agriculture and cattle grazing; however, its proximity to Tucson makes it desirable for urban development. Administrators and planners concerned with future land development may use the map report to determine the approximate areas that are subject to inundation by the 100-year flood. Avra Valley is drained mainly by Brawley Wash; Blanco Wash drains the west side of the valley. Most of the natural drainage system consists of small braided channels bordered by narrow bands of dense vegetation, which cause floodwater to spread over wide areas of shallow depths. During the 100-year flood, the areas inundated by Brawley and Blanco Washes may join in several places. (Woodard-USGS)
W78-10038

HYDROLOGIC DATA FOR THE COPPER BASIN AREA, A POTENTIAL MINING AREA IN YAVAPAI COUNTY, ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.
B. W. Thomsen, and R. S. Stulik.
Open-file report 78-413, April 1978. 51 p, 4 fig, 1 plate, 1 ref.

Descriptors: *Hydrologic data, *Baseline studies, *Copper, *Mining, *Water quality, Perennial streams, Groundwater, Hydrogeology, Aquifer characteristics, Water wells, Water levels, Test wells, Pumping, Water analysis, Evaluation, Arizona, *Copper Basin area, *Potential copper mining, Yavapai County.

Large low-grade ore bodies have been discovered in Copper Basin, Ariz., and a large copper-mining operation is anticipated in the near future. Hydrologic data are being collected to provide the data base necessary to determine the effects of a potential mining operation on the water resources of the area. The area of potential depletion or contamination of water supplies is the 50-square-mile alluvial slope downgradient from Copper Basin. In the Copper Basin area the streams generally are dry, except for the perennial flow in a 3-mile-long reach of Kirkland Creek, where the base flow ranges from about 1 to 3 cubic feet per second. The water in the alluvium, which is more than 1,000 feet thick in places, generally is under confined conditions. The depth to water in wells ranges from less than 10 to 675 feet below the land surface. Near the center of the area, test wells penetrate a clay confining bed at the base of the alluvium and an underlying sequence of volcanic rocks, which is more than 1,000 feet thick and contains water under confined conditions. Pump tests indicate that the confining bed forms a barrier between the water in tha alluvium and the water in the volcanic rocks and that, initially, pumping from the volcanic rocks would not affect the water level in the alluvium. (Woodard-USGS)
W78-10040

WATER-RESOURCES INVESTIGATIONS IN UTAH, 1977.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7A.
W78-10044

DEFINITIONS OF COMPONENTS OF THE MASTER WATER DATA INDEX MAINTAINED BY THE NATIONAL WATER DATA EXCHANGE,
Geological Survey, Reston, VA. Water Resources Div.; and CACI, Inc. Reston, VA.
R. A. Perry, and C. J. Lewis.
Open-file report 78-183, 1978. 179 p, 2 fig, 34 ref, 2 append.

Descriptors: *Information retrieval, *Data storage and retrieval, *Water resources, *Hydrologic data, *Indexing, Stations, Data collections, Surface waters, Groundwater, Water quality, Sites, Computer programs, *National Water Data Exchange(NAWDEX), *Master Water Data Index(MWDI), *Information systems, Data base management systems, Definitions of components.

The Master Water Data Index (MWDI) is a computerized data base developed and maintained by the National Water Data Exchange (NAWDEX). The MWDI contains information about water-data collection sites. This information includes: the identification of sites for which water data are available, the location of these sites, the type of site, the data-collection organization, the types of data available, the major water-data parameters for which data are available, the frequency at which these parameters are measured, and the media in which the data are stored. This document contains a definition and description of each component of the MWDI data base. (Woodard-USGS)
W78-10045

SELECTED DATA FROM THERMAL-SPRING AREAS, SOUTHWESTERN MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
R. B. Leonard, T. M. Brosten, and N. A. Midtlyng.
Open-file report 78-438, May 1978. 71 p, 1 fig, 31 tab, 11 ref.

Descriptors: *Geothermal studies, *Thermal springs, *Water quality, *Chemical analysis, *Flow rates, Montana, Water temperature, Thermal water, Radiochemical analysis, Trace elements, Stable isotopes, Gases, *Southwest Montana.

Data collected during 1975-77 are combined with published and unpublished data from several sources to provide a data base that can be useful for assessing the geothermal potential of 27 hot-spring areas in southwestern Montana. Parameters determined in the field were site location, flow rate, specific conductance, pH, and temperature. Laboratory determinations were concentrations of major and trace chemical constituents. The stable isotopic composition and gross alpha and gross beta activity of the waters were determined for several sites, as well as the composition of gases associated with the water. Temperatures of the thermal waters exceeded 100 F at each of the locations. Temperature profiles in water wells near several hot-spring areas are tabulated. Sources of data included in the report, and sources of related data not in the report, are identified in the Selected References. (Woodard-USGS)
W78-10046

ANNUAL WATER-RESOURCES REVIEW WHITE SANDS MISSILE RANGE, NEW MEXICO, 1977,
Geological Survey, Albuquerque, NM. Water Resources Div.
R. R. Cruz.
Open-file report 78-553, May 1978. 31 p, 13 fig, 5 tab, 3 ref.

Descriptors: *Water wells, *Groundwater, *Water levels, *Water quality, Water level fluctuations, Pumping, Aquifers, Water yield, Test wells, Observation wells, Water supply, Military reservations, New Mexico, *White Sands Missile Range.

Ground-water data were collected in 1977 at White Sands Missile Range in south-central New Mexico. Near the Post Headquarters water-level declines for the period 1968-77 declined about 20 feet. Total ground-water pumpage at White Sands Missile Range for 1977 was 2,146 acre-feet, 93 acre-feet more than in 1976. Wells at the Post Headquarters produced 2,112 acre-feet of the total volume. Specific conductance of ground water ranged from 277 to 2,410 micromhos per centimeter at 25 degrees Celsius for wells T-4 and T-14 respectively at Post Headquarters. (Woodard-USGS)
W78-10049

WATER-QUALITY DATA FOR THE VILLAGE CREEK WATERSHED, NORTHEAST ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
T. E. Lamb.
Open-file report 78-497, 1978. 46 p, 4 fig, 10 tab, 11 ref.

Descriptors: *Baseline studies, *Soil conservation, *Streamflow, *Flow characteristics, *Water quality, Drainage area, Topography, Geology, Aquifers, Water analysis, Chemical analysis, Bottom sampling, Pesticides, Arkansas, *Village Creek Watershed(Ark).

The results of a 1-year study of surface-water quality in the Village Creek Watershed document conditions in the northeast Arkansas study area before implementation of Soil Conservation Service programs. Included are descriptions of topography, geology, and aquifers; the results of monthly measurements of discharge at five sites; and several physical and chemical parameters, plus quarterly analyses for several ions and semi-annual analyses of bottom material for pesticides. (Woodard-USGS)
W78-10050

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1977.
Geological Survey, Iowa City, IA. Water Resources Div.
Water-Data Report IA-77-1, May 1978. 259 p, 6 fig.

Descriptors: *Iowa, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Iowa consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 111 gaging stations, stage and contents for 5 lakes and reservoirs, water quality for 21 gaging stations, and water levels for 34 observation wells. Also included are 125 crest-stage partial-record stations, 202 low-flow partial-record stations, and 130 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. The data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Iowa. (Woodard-USGS)
W78-10055

GROUND-WATER RECORDS FOR EASTERN OKLAHOMA, PART 2 - WATER-QUALITY RECORDS FOR WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, OK. Water Resources Div.
J. S. Havens.
Open-file report 78-357, May 1978. 139 p.

Descriptors: *Oklahoma, *Groundwater, *Water quality, *Chemical analysis, *Water wells, Springs, Tests wells, Data collections, *Eastern Oklahoma.

The U.S. Geological Survey has collected data on Oklahoma's ground-water resources since 1934. This report makes available both published and unpublished water-quality records for approximately 1,740 wells, test holes, and springs in 39 counties in eastern Oklahoma. (Woodard-USGS)
W78-10056

THE UNRELIABILITY OF RELIABILITY ESTIMATES OF STORAGE RESERVOIR PERFORMANCE BASED ON SHORT STREAMFLOW RECORDS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 4A.
W78-10102

A SYSTEMATIC APPROACH TO FLOOD RISK MAPPING,
Acres Consulting Services Ltd., Niagara Falls, (Ontario).
For primary bibliographic entry see Field 6F.
W78-10105

THE VARIABILITY OF WATER QUALITY DATA AND ITS SIGNIFICANCE IN WATER QUALITY SIMULATION,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5A.
W78-10107

ACCURACY OF HYDROLOGIC MODEL PARAMETERS ESTIMATED USING REMOTELY SENSED DATA,
Agricultural Research Service, Beltsville, MD. Hydrograph Lab.
For primary bibliographic entry see Field 7B.
W78-10111

THE RELIABILITY OF PUMPED STORAGE YIELD INVESTIGATED BY SYNTHETIC DATA GENERATION FOR SIX BRITISH RIVERS,
Water Research Centre, Marlow (Bucks). Medmenham Lab.
For primary bibliographic entry see Field 4A.
W78-10117

USER'S GUIDE FOR U.S. GEOLOGICAL SURVEY RAINFALL-RUNOFF-MODELS--REVISION OF OPEN-FILE REPORT 74-33,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2A.
W78-10187

REVIEW OF AUSTRALIA'S WATER RESOURCES 1975.
Australian Water Resources Council, Canberra. Dept. of National Resources.
Australian Government Publishing Service, Canberra, 1976. 8 fig, 20 tab, 21 plate, 6 map, 67 ref, 1 append. $12.95.

Descriptors: *Australia, *Water resources, *Reviews, Foreign countries, Foreign research, Groundwater, Groundwater resources, Surface waters, Water quality, Floods, Droughts, Hydrologic cycle, Drainage, Data collections, Maps, Rainfall, Runoff, Aquifers, Aquifer characteristics, Watersheds(Basins), Discharge(Water).

This review was designed to provide a concise and balanced assessment of Australia's water resources. The review was confined to giving broad indications of the occurrence, yield, and quality of surface water, and groundwater within Australia. Descriptions were brief, and where possible, quantitative information was summarized in tabular or graphical form and supported by maps. Treatment and presentation were uniform throughout, although completeness was not possible due to insufficient data from some areas, particularly arid and sparsely populated regions of the continent. (Froehlich-ISWS)
W78-10262

METEOROLOGICAL ASPECTS OF THE BIG THOMPSON FLASH FLOOD OF 31 JULY 1976,
National Oceanic and Atmospheric Administration, Boulder, CO. Applied Physics and Chemistry Lab.
For primary bibliographic entry see Field 2B.
W78-10271

HISTORICAL WATER QUALITY DATA, CHICAGO RIVER, SAITARY AND SHIP CANAL, AND CALUMET RIVER SYSTEMS,
Northeastern Illinois Planning Commission, Chicago.
For primary bibliographic entry see Field 5A.
W78-10273

CALCULATING USEFUL PRODUCTS FROM AN OCEANOGRAPHIC DATA BASE,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2L.
W78-10274

STREAM GAUGING INFORMATION, AUSTRALIA-DECEMBER 1974.
Australian Water Resources Council, Canberra. Dept. of National Resources.
1976. 141 p, 10 tab, 1 map, 1 append.

Descriptors: *Gaging stations, *River basins, *Australia, Networks, Stations, Surface waters, Data collections, Gaging, Stream gages, Instrumentation, Streams.

This catalog provided information of 4,610 stations in Australia where hydrographic data are being or have been collected. Each station was identified by its national gauging station number, and details were provided on its location, catchment area, type of data collected including water quality, period of record, and the authority collecting data. Where available, statistics on the annual discharges of streamflow at a station also were provided. The catalog follows on from earlier publications which provided details of stream gauging stations within Australia. The most recent of these was entitled Stream Gauging Information Australia December 1969, which was followed by annual supplements in 1970, 1971, 1972 and 1973. This issue is a complete re-compilation of the information and is based on data as at 31 December 1974. The format and content of the publication have been revised to facilitate storage of the information on computer media and to include a water quality index. It is intended that subsequent issues of this catalog be published every two years, and the practice of issuing annual supplements will be discontinued. (See also W75-01311, W75-07480, W74-00350, W73-08738) (Froehlich-ISWS)
W78-10280

MISSOURI RIVER-GAVINS POINT TO OMAHA NEBRASKA HISTORICAL RECORDS RESEARCH.
Water and Environment Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 4A.
W78-10285

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME III: DATA ELEMENT DICTIONARY. DEFINITION OF SYSTEM REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-10398

8. ENGINEERING WORKS

8A. Structures

DESIGN AND CONSTRUCTION OF RETAINING DIKES FOR CONTAINMENT OF DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 8D.
W78-10001

RESERVOIRS AND INDUCED SEISMICITY AT CORPS OF ENGINEERS PROJECTS,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 2H.
W78-10004

WATER-SUPPLY DAM FOR ABHA TOWN,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia). Project Execution Dept.
For primary bibliographic entry see Field 4A.
W78-10010

INVESTIGATION OF STRUCTURAL RISKS BASED ON EXTREME-VALUE STATISTICS,
Technische Univ., Munich (West Germany). Inst. fuer Bauinzenieurwesen III.
For primary bibliographic entry see Field 8B.
W78-10109

DAMS OF SOUTHERN AFRICA.
Department of Water Affairs, Pretoria (South Africa).
Buildng and Construction (Johannesburg), Vol. June 1976, p 27-32, 1 map.

Descriptors: *Dams, Dam construction, *Dam projects, Nzhelele dam, Albastini dam, Blyderivierspoort dam, Vaal dam, Strydom dam, Chelmsford dam, Welbedacht dam, Leroux dam, Paul Saur dam, Olifantsrivier dam, Roode Elsberg dam, *South Africa, Stompdrift dam, Naute dam, Swakop dam.

The article consist of submitted brief progress reports of each of the bigger dam projects in the Republic and S.W.A. which have either been completed or are in the process of construction. Recent droughts have emphasised the importance of adequate stored water schemes and good progress is being made in equipping the country with sufficient water for its agricultural, industrial and domestic needs. Dams described are Nzhelele dam Albasini dam, Blyderivierspoortdam, Vaal dam, J.G. Strijodom dam, Chelmsford dam, Welbedacht dam, P.K. le Roux dam, Paul Sauer dam, Olifantsrivier dam and Roode Elsberg dam. (So Afr Water Info Center)
W78-10211

THERMAL REGIME OF THE DOWNSTREAM SHOULDER OF ROCKFILL DAMS,
For primary bibliographic entry see Field 8D.
W78-10264

WATER-HEAT REGIME OF EARTH CATCHWORK DAMS,
Akademiya Nauk SSSR, Yakutsk. Inst. Merzlotovedeniya.
For primary bibliographic entry see Field 8D.
W78-10266

CONDITIONS OF MODELING HEAT AND MASS EXCHANGE PROCESSES IN LOWER PRISM OF ROCK-FILL DAM IN CASE OF FORCED CONVECTION,
Gorkovskii Inzhenerno-Stroitelnyi Inst. (USSR).
For primary bibliographic entry see Field 8D.
W78-10268

TUNNEL COST MODEL: A STOCHASTIC SIMULATION MODEL OF HARD ROCK TUNNELING, VOLUME 1, SUMMARY REPORT,
Massachusetts Inst. of Tech., Cambridge. School of Engineering.
For primary bibliographic entry see Field 8E.
W78-10276

TUNNELING: THE STATE OF THE INDUSTRY,
Cresheim Co., Inc., Philadelphia, PA.
For primary bibliographic entry see Field 8E.
W78-10286

8B. Hydraulics

DRAINAGE MANUAL, A GUIDE TO INTEGRATING PLANT, SOIL, AND WATER RELATIONSHIPS FOR DRAINAGE OF IRRIGATED LANDS.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
Available from Superintendent ofDocuments, U. S. Government Printing Office, Washington, D. C. 20402, and the Bureau of Reclamation, Engineering and Research Center, P. O. Box 25007, Denver Colo. 80225. Stock No. 024-003-00117-1. A Water Resources Technical Publication, First edition, 1978. 286 p, 112 fig, 20 tab, 63 ref, append.

Descriptors: *Drainage, Publications, *Drainage engineering, *Drainage systems, Drainage wells, *Irrigation systems, Irrigation engineering, Irrigated land, Testing procedures, Drains, Operations and maintenance, Drainage water, Hydraulic conductivity, Tile drains, Design, Construction, Conveyance structures, Controlled drainage, Tile drainage.

This manual contains the engineering tools and concepts that have proven useful in planning, constructing, and maintaining drainage systems for successful long-term irrigation projects. The manual is not a textbook. Mathematical and experimental development of the engineering tools has generally not been included. Indeed, not even all the innovative ways to use the tools are included. The manual provides drainage engineers a ready reference and guide for making accurate estimates of drainage requirements. Design and construction criteria, if followed with reason, will result in reliable drainage systems for irrigated areas. All the methods and techniques covered in the manual have proven to be very satisfactory through observed field conditions on irrigated lands throughout the world. Some methods have a more elegant development and basis in science than others, but all have been designed to solve practical problems in the field. (Bur Reclam)
W78-09828

WELL CONSTRUCTION,
Aufschlager (Ferdinand) KG., Munich (West Germany), (Assignee).
K. Ingerle, and K. Meister.
U.S. Patent No. 4,071,087, 7 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 966, No 5, p 1757, January 31, 1978.

Descriptors: *Patents, *Water wells, *Aquifers, *Water sources, Water supply, Water storage, Boreholes, Drilling.

The object of the invention is to create a water well of greater yield which combines the advantages of the vertical filter well in regard to its depth, which those of the shaft well in regard to its large capacity, but which is at the same time simpler and considerably less expensive to construct. The method consists of drilling an initial series of boreholes with the smallest spacing of their walls. The bore diameter of a second series of boreholes is larger and bridge over each spacing. The boreholes of the first series, where appropriate during withdrawal of the used piping, are then filled with filter gravel, and the second series is then sunk and filled with filter gravel. The storage space of such wells can vary in cross-section within wide limits. The boreholes can be filled with filter gravel of various coarseness, or with so-called single-grain concrete. It is an advantage of the method that a vertical filter well can be subsequently enlarged, since further boreholes can be sunk, which are connected with one another and with the existing well storage space. (Sinha-OEIS)
W78-09842

DISSIPATION AND FINE-SCALE STRUCTURE IN TURBULENT OPEN CHANNEL FLOW,
Department of Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
A. R. M. Nowell.
Water Resources Research, Vol 14, No 3, p 519-526, June 1978. 6 fig, 4 tab, 48 ref.

Descriptors: *Open channel flow, *Turbulent boundary layers, *Laboratory tests, Turbulence, Energy dissipation, Roughness(Hydraulic), Flumes, Beds, Flow, Channels, Open channels, Reynolds number, Data processing, Analytical techniques.

Turbulent open channel flows were studied in a laboratory by using 'Lego' blocks at various spacings on the bed to examine the effect of different shear Reynolds numbers on the fine-scale structure. Measurements of dissipation rates, computed by various methods, were compared, and the high values were shown to be reasonable when viewed against local mean shear values. The fine-scale structure and the intermittent nature of the small-scale motions were examined spectrally and by studying the moments. The 'rescaled range,' a technique developed in communications work and in geophysical time series analysis, was utilized to investigate the possible scale interactions among the various processes of production and dissipation in a turbulent boundary layer. (Sims-ISWS)
W78-09977

TURBULENT MASS TRANSFER RATES TO A WALL FOR LARGE SCHMIDT NUMBERS,
Illinois Univ. at Urbana-Champaign. Dept. of Chemical Engineering.
D. A. Shaw, and T. J. Hanratty.
AIChE Journal, Vol. 23, No. 1, p 28-37, January 1977. 9 fig, 1 tab, 27 ref. NSF ENG 71-02362.

Descriptors: *Mass transfer, *Boundary processes, *Turbulent flow, *Laboratory tests, Analytical techniques, Mathematical studies, Analysis, Momentum transfer, Convection, Diffusivity, Diffusion, Electrochemistry, Instrumentation, Physical properties, Measurement, Chemical engineering, Schmidt number, Eddy viscosity, Eddy diffusivity.

New measurements were presented on the influence of Schmidt number on the rate of mass transfer between a turbulent fluid and a pipe wall. It was found that for large Schmidt numbers the fully developed mass transfer coefficient, K, is related to the friction velocity, v*, and the Schmidt number, Sc, by the equation K = 0.0889v* (Sc to the -0.704 power). The experiments were accurate engough to rule out the Sc to the -2/3 power or the Sc to the -3/4 power relations commonly used, deduced from plausible limiting expressions for the eddy diffusivity close to a wall. It was argued that these expressions are valid only over a vanishingly small portion of the concentration field as Sc approaches infinity. One of the consequences of these results is that for large Schmidt numbers the analogy between momentum and mass transfer does not hold in that the eddy diffusivity is not proportional to the eddy viscosity. The experiments described in this paper were carried out in a 2.54 cm pipe. Two different electrolysis systems were used. One of these consisted of potassium ferrocyanide, potassium ferricyanide, and a large excess of sodium hydroxide dissolved in water. The other consisted of iodine and a large excess of potassium iodide dissolved in a water-sucrose solution. The Schmidt number was varied by either changing the sodium hydroxide concentration or the sucrose concentration. (Humphreys-ISWS)
W78-09991

CASING DEPTHS AND SOLUTE TRAVEL TIMES TO WELLS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-10076

REGIONAL GEOLOGY SERIES: PART VI,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-10077

HOW TO MEET WELL PROJECT GOALS, PART 2,
F. H. Klaer, Jr.
Water and Sewage Works, Vol. 125, No. 6, p 114-118, June, 1978. 2 fig.

Descriptors: *Groundwater, *Water wells, *Water resources development, *Planning, Well projects, Ranney collectors, Well field design, Hydrologic data.

The success of any well project will depend largely on obtaining sufficient information on the geologic and groundwater conditions to permit proper design and construction of the required facilities. Each development must be designed to take advantage of the actual conditions as they are known. In spite of all the information obtained prior to construction, it is still necessary to make assumptions of continuity of known conditions, applicability of estimating techniques, and future natural climatic and pumping conditions. Four case histories of well projects that met with varying degrees of success are presented and analyzed. Most well projects are neither 100 percent successful or unsuccessful, as defined by the well owner's specifications. However, with proper preliminary study and testing, the chance of providing the well owner with a suitable water supply are greatly increased. (Purdin-NWWA)
W78-10079

NEW WEAPON IN THE WAR ON SAND.
For primary bibliographic entry see Field 8G.
W78-10085

DRILLING FOR HEAT: THE COMING OF THE GEOTHERMAL AGE,
J. A. May.
Water Well Journal, Vol. 32, No. 6, p 60-62, June, 1978.

Descriptors: *Thermal power, *Geothermal drilling, Steam turbines, Drilling equipment.

Increasing energy demands have created a worldwide enegy crisis which forces us to drastically reduce our energy growth rates and develop alternate sources of energy. Some scientists and engineers feel that geothermal energy offers our best hope. It already supplies more electricity than solar and wind power combined. ERDA has allocated $101 million for geothermal research and development in 1978. The heat of geothermal energy comes from radioactive decay of crustal rocks and from molten rock which intrudes upward. This power can be converted to electricity with steam or water of at least 300 degrees F which is used to drive turbines. Below 300 degrees F, geothermal water can be used for space heating, domestic water supplies, farming and other industries. All forms of geothermal energy are tapped drilling. The hard rocks, extreme heat and brine in geothermal zones lead to metal fatigue, corrosion, erosion, and reduced performance life of drilling parts. Geothermal wells may take up to 50 days to drill and cost from $300,000 to $600,000. Improved equipment and techniques are needed to increase geothermal drilling capabilities. Severa new developments are outlined which should enhance the potential of geothermal energy. (Purdin-NWWA)
W78-10087

SHALY-SAND ANALYSIS IS SIMPLIFIED,
Dresser Atlas Co., Houston, TX.

For primary bibliographic entry see Field 8G.
W78-10092

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-10094

INVESTIGATION OF STRUCTURAL RISKS BASED ON EXTREME-VALUE STATISTICS,
Technische Univ., Munich (West Germany). Inst. fuer Bauinzenieurwesen III.
H. S. Choi, and O. W. Knappe.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 245-274, 1978. 6 fig, 4 tab, 14 ref.

Descriptors: Water resources, *Risks, *Structures, *Probability, *Simulation analysis, *Theoretical analysis, *Extreme-value statistics, Reliability, Management, Evaluation, Waves(Water), Failures, Wind data, Rayleigh distribution, Gamma distribution, Equations, Mathematical models, Systems analysis.

Presented is an introduction to the development and application of extreme-value statistics for risk analysis of structures in water resources and other engineering fields. Since primary structural risk is caused by unusual natural hazards such as floods, storms, and tsunamis, the reliability of the risk analysis depends strongly on accurate probabilistic models of extreme events and on the precise estimation of proability distributions of load and resistance during such severe disturbances. In most situations, however, the recorded data of extreme events are insufficient for a long-term prediction stretching over the whole project life. Therefore, it is necessary to extrapolate the scope of the available short-term data to the range of the large and/or smaller values; this leads to an extreme-value consideration. Herein, four probabilistic models commonly adopted in water resources, considered as initial distribution and extreme values (largest or smallest) are analyzed by the simulation method and by theoretical derivation. This results in determining the probability parameters (mode and dispersion) of the resulting extreme-value distribution. These are expressed as a function of the number of observation N, the mean value, and the standard deviation of the initial distribution. Under assumptions of independence and stationariness for the observation process, the results from the simulation and theoretical approaches show good agreement. Finally, the structural risk based on extreme-value distributions is formulated in well known mathematical functions and compared to that based on the initial distributions. Examples illustrate the concept. (See also W78-10094) (Bell-Cornell)
W78-10109

OPTIMAL RISK-BASED DESIGN OF WATER RESOURCE PROJECTS,
Texas Univ. at Austin. Dept. of Civil Engineering.
L. W. May.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources, 'E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 314-329, 1978. 6 fig, 3 tab, 18 ref.

Descriptors: Water resources, *Projects, *Design, *Risks, *Optimization, *Drainage, *Culverts, *Expected flood damage, *Cost minimization, Highways, Methodology, Size, Construction costs, Operating costs, Search techniques, Equations, Mathematical models, Systems analysis.

In designing water resources projects, there are many uncertainties involved in addition to the normally-considered hydrologic uncertainties due to the randomness in flood and rainfall frequencies. Uncertainties also arise from the mathematical model, reliability, data errors, insufficient data, construction, material variability, operational aspects, costs, and damages. This paper describes an effort to establish a scientific basis for systematically analyzing and incorporating the uncertainties into the optimal design of water resources engineering projects. Optimization models can be used to select the magnitudes of design variables in order to minimize total expected project costs. Using such optimal risk-based design procedures, a proper trade-off analysis among the potential flood damages, the design uncertainties, and the project cost is performed in determining the design. An illustrative procedure is applied to the optimal risk-based design of highway drainage culverts using the concepts of hydrologic risk, first order analysis of uncertainties, and evaluation of expected damages; the optimization is obtained using the Hooke and Jeeves search technique. The methodology is developed in a general format so as to be applicable to different water engineering projecrs, e.g., the design of storm sewers, spillways, stilling basins, and more. (See also W78-10094) (Bell-Cornell)
W78-10113

SAFETY FACTOR IN HYDROLOGIC AND HYDRAULIC ENGINEERING DESIGN,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
B. C. Yen.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 331-344, 1978. 3 fig, 14 ref.

Descriptors: *Hydraulic design, *Hydrologic aspects, Engineering, *Safety factors, *Reliability analysis, Probability, Failures, Projects, Storm drains, Risks, Equations.

The safety factor is used in engineering design as a protection against uncertainties. Conventionally, a given design value is chosen arbitarily, or sometimes through judgement based on the designer's experience. With recent developments in probability theory, particularly in risk and reliability analysis, the safety factor for many hydrologic and hydraulic engineering designs can be more precisely defined and evaluated; herein, the theoretical background is presented. Six different definitions of safety factor are discussed. A first-order second-moment reliability analysis is shown to be relatively simple, capable of accounting for the practical applications. The determination of safety factor on the basis of risk and reliability analysis allows the design to be pursued in a more rational manner than through the use of the conventional technique; it often results in a more balanced and satisfacotry design. It reduces the overall human judgement and guesswork, and it also provides a framework to assess the relative safety of existing structures. A typical example of determination and application of the characteristic safety factor for storm sewer design is illustrated. (See also W78-10094) (Bell-Cornell)
W78-10114

RISK AND RELIABILITY ANALYSIS IN HYDROLOGIC DESIGN,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulics and Water Power.
Z. Sen.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 364-374, 1978. 1 fig, 3 tab, 10 ref.

Descriptors: *Risks, *Reliability, Hydrology, *Design, *Markov processes, Methodology, Probability, Stochastic processes, Safety, Return period, Run theory, Equations, Systems analysis, Natural phenomena.

Due to random evolution of natural phenomena both in space and time, even properly designed engineering structures which interact with these phenomena cannot be expected to perform successfully at all times over their projected lives. Thus any particular design value is associated with a risk factor, which is an overall measure of the designer's ignorance and the uncertainties involved in the problem. With the conventional probability theories, risk and/or reliability (safety) of a system can evaluated on the basis of the assumption that successive occurrences of the events are independent and hence only the univariate probability distributions of random variables are sufficient for any calculations. However, in practice, there are cases in which the occurrences are dependent, where the aforementioned approach, is not suitable and can yield approximate results only. Primarily, this paper extends the existing conventional risk and reliability analysis so as to cover dependent occurrences of successive events. A first order Markov process is chosen to characterize dependence, and the theory of runs is employed to arrive at necessary formulations of simple risk. One of the major conclusions drawn is that reliability increases with increasing dependence. Thus, a water structure subject to persistent natural phenomena performs better than when subjected to independent events. (See also W78-10094) (Bell-Cornell)
W78-10116

RELIABILITY CONCEPTS IN PLANNING STORM-DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
S. A. Dendrou, and J. W. Delleur.
In: Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 390-410, 1978. 5 fig, 1 tab, 14 ref, 1 append.

Descriptors: *Reliability, *Planning, *Storm drains, *Simulation analysis, *Flood control, Networks, Overflow, Time series, Computer models, Decision making, Input-output analysis, Probability, Pollutants, Water quality, Stochastic processes, Analytical techniques, Costs, Economic losses, Street flooding.

The concept of urban storm-drainage systems has been extended in recent years to include--aside from the network of storm-runoff collectors--the appropriate treatment facilities, detention storage facilities, and points of potential overflow into receiving waters. The sporadic nature of rainfalls constitutes the most important argument in favor of introducing the notion of risk at the planning stage of the study. While traditionally a drainage network would be designed to protect an urban agglomeration from the street flooding resulting from storms not exceeding the so-called 'design-storm', today's broader environmental concern requires equal attention to be given to the effects on the downstream portion of a watershed such as stream-floods and pollution. In the 'design-storm' approach the variability of rainfall sequences is measured by the expected value of the return period of critical storms and the margin of safety against the risk involved in the design introduced through the notion of safety factor. But it is the frequency of the resulting street-floods and the probability of exceedance of a certain flood depth that are of interest, as well as the corresponding frequencies and probabilities of exceedance for the overflows. Thus a complete set of reliability measures is proposed associated with the three basic functions of protection against local street-floods, contribution to downhill river floods, and

pollution from the runoff. A computational scheme for these reliability measures is also proposed, making use of the performance time series generated by a simulation model. Finally, an example of application is given of the reliability concepts in the framework of decision making for storm drainage systems. (See also W78-10094) (Bell-Cornell)
W78-10118

QUO VADIS HYDRAULICS ENGINEERING, (IN AFRIKAANS),
Department of Water Affairs, Pretoria (South Africa).
J. P. Kriel.
University of Pretoria Publication 105, 1976. 22 p, 12 ref.

Descriptors: *Hydraulic engineering, *Water supply, *Water utilization, *Water requirements, Water shortage, Pollution producer principle, Irrigation schemes, Hydraulics, Hydrology, *Management, *South Africa.

The author commences by discussing the nature of hydraulics engineering and points out the various disciplines that may be involved in securing advantageous utilization of water and adequate water supplies for the essential requirements of society. He reviews the history of hydraulics engineering in citing examples from as early as 4000 BC (the Nile Valley and Mesopotamia) and traces the development of hydraulics to the twentieth century when its two main schools of thought, i.e. empiricism and rational analysis, were united in modern fluid mechanics. In discussing the current situation in hydraulics engineering the author briefly compares some of the finding of the South African Commission of Enquiry into Water Matters and the U.S. National Water Commission with regard to water shortages, the 'polluter pays' principle, subsides for irrigation schemes and water supply for municipal and industrial use. He then replies to the question 'Quo Vadis, Hydraulics Engineering.' by dealing briefly with a comprehensive number of its important aspects such as hydraulics, hydrology, mathematical models, evaporation control, groundwater utilization, water quality, desalination, reclamation, irrigation, pollution control and many more. The author concludes that hydraulics engineering will, to an increasing extent require a multi-disciplinary approach in future and that public support for its task will also be essential. (So Afr Water Info Center)
W78-10231

TRANSIENT FLOW IN UNSATURATED POROUS MEDIA,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2G.
W78-10255

AIR-WATER FLOW IN COARSE GRANULAR MEDIA,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
A. A. Hannoura, and J. A. McCorquodale.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings Paper 13888, p 1001-1010, July 1978. 5 fig, 1 tab, 15 ref.

Descriptors: *Breakwaters, *Darcys law, *Granules, *Porous media, *Coastal engineering, Entrainment, Hydraulic conductivity, Waves(Water), Hydraulics, Air-water interfaces, Laboratory tests, Model studies, Homogeneity, Two-phase flow, Bubbly drift-flux, Slug drift-flux, Counter-current flow.

Air may be entrained in the flow in porous shore structure under wave action. Three conceptual models for two-phase flow in ducts were adapted to describe flow in coarse granular media. These are the homogeneous bubbly drift-flux, and slug drift-flux models. An experimental study was undertaken to check the three models against air-water flow in three coarse granular porous media. The best model was chosen based on its agreement with the experimental head drop results. On this basis, the slug flow drift-flux model was recommended to calculate the effect of entrained air on the hydraulic conductivity for co-current and counter current flows. (Visocky-ISWS)
W78-10256

POLYMER INJECTION INTO A DEVELOPING BOUNDARY LAYER,
Colorado State Univ., Fort Collins. Engineering Research Center.
J. P. Tullis, M. Poreh, and J. A. Hooper.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 901, Price codes: A02 in paper copy, A01 in microfiche. Hydro Machinery Laboratory Report No. 71, March 1976. 26 p, 31 fig, 1 tab, 14 ref. ONR N00014-75-C-0274.

Descriptors: *Polymers, *Drag, *Pipe flow, *Laboratory tests, Cavitation, Roughness(Hydraulic), Pipes, Chemicals, Organic compounds, Boundary layers, Velocity, Flow, Discharge(Water), Hydraulics, *Drag reduction.

This report described the last phase of a study on the drag reduction at the entrance region of a 12-inch pipe by injection of polymer solutions. In the phase of the study, the effect of injecting concentrated solutions of WSR 301, up to 3600 ppmw, was examined. This study indicated that the local friction downstream from the injector can be reduced considerably by increasing the discharge of the polymer injected into the pipe. However, the injection disturbs the flow and increases the pressure losses across the injector. When the total drag reduction of a given pipe length (Z/D), which includes the losses due to the injection, was considered, it was found that different optimal conditions exist for reducing the drag of short pipe sections and for reducing the drag of long pipe sections. This report also summarized a study of drag reduction in a pipe flow of calgon TRO-375 solutions. For certain tests, this polymer caused an apparent increase in the effective roughness of the pipe walls. In addition, the report summarized a study of the effect of a polymer (WSR 301) on the cavitation characteristics of a orifice. (Sims-ISWS)
W78-10270

INTERIM REPORT ON MASONBORO INLET, NORTH CAOLINA, MOVABLE-BED MODEL TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
N. W. Hollyfield.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 399, Price codes: A13 in paper copy, A01 in microfiche. Miscellaneous Paper H-76-14, June 1976. 297 p, 246 fig, 3 tab, 3 ref, 1 append.

Descriptors: *Inlets(Waterways), *Tidal effects, *Model studies, Hydraulic models, Littoral drift, Sands, Beaches, Jetties, Scour, Beds, Beds under water, Movement, Erosion, Beach erosion, Deposition(Sediments) Estuaries, *Masonboro Inlet(NC), Bed movement, Movable-bed models.

The movable-bed model study of Masonboro Inlet was undertaken to evaluate model predictions of inlet response to a major improvement project when verification is based on preconstruction conditions. Masonboro Inlet was chosen for the study because prototype survey data were available for the preconstruction condition of the inlet area and hydrographic surveys had been performed at approximately six-month intervals subsequent to construction of the north jetty. Model results were to be compared to the prototype data to ascertain how well the model predicted the bed changes that occurred in nature. Only two of the four prototype prejetty hydrographic surveys was nine-months (from the end of October 1964 to the first of August 1965). This nine-month interval was not adequate for model verification since there was insufficient change in the inlet hydrography to provide a satisfacotry verification data base. Thirty-nine model tests were made in an attempt to reproduce the prototype scour and fill patterns for the nine month period. An acceptable verification was not obtained for the nine month period being used as the data base; however, due to time and cost limitations, an arbitrary decision was made to use the best model results as a verification and to continue the testing program on this basis. (Sims-ISWS)
W78-10272

SHORELINE EROSION CONTROL ON VIRGINIA'S RIVERS AND BAYS,
Soil Conservation Service, Warsaw, VA.
F. B. Givens, Jr.
Shore and Beach, Vol. 44, No. 1, p 25-30 (April, 1976).

Descriptors: *Virginia, *Engineering structures, *Beach erosion, *Shore protection, Administrative agencies, Bulkheads, Bank protection, Groins(Structures), Retaining walls, Littoral drift, Erosion control.

The United States Department of Agriculture's Soil Conservation Service activities in Virginia tidal waters have consisted of practical application of engineering principles. The structures and protective measures used in Virginia are to be located in shallow waters and are designed to provide protection in storms of less than hurricane intensity. The records indicate that the rate of Virginia Shore erosion is fairly constant, approximately 2 feet per year throughout the state. The protective measures employed in Virginia have thus far consisted of groin systems, bulkheads and revetments, and vegetative systems. The three systems are often used in combination. Groins often interfere with the littoral process and starve the adjacent area, thus creating or accelerating erosion in that area. However, groins may be used where there is a sufficient supply of sand to support them. The bulkhead is the most often used structure where the littoral drift supply is not sufficient to support groins. If some vegetation exists on the beach, there is a chance that the problem can be solved with more vegetation. However, vegetation has been of the most benefit when used in conjunction with structures. (Jordan-Florida)
W78-10461

8C. Hydraulic Machinery

OXON SYSTEM USES IN AND OUT PUMPS,
Surveyor, Vol. 151, No. 4479, p 22, April, 1978.

Descriptors: *Storm drains, *Pumps, *Storm runoff, *Overflow, *Sumps, Pumping plants, Sewers, Storage tanks, Storm water, Urban runoff, Sewerage, Drainage, Pumps, Electricity, Electric generators, Waste water treatment, Municipal wastes.

Four electrically-powered pumps are activated automatically when combined sewer overflow conditions occur in Garterton, Oxfordshire, England's storm drainage system. The storm drainage system consists of 2.5 miles of sewers servicing a town with a population of 10,000. The storm water flows to a pumping station which tansports the waste water to a balancing pond for controlled discharge to a stream. Main pipes with diameters of 1.2 m drain into a 47,000 gal sump located at the pumping station. Three of the four 9,000 gpm pumps rechannel storm water overflows when the water level in the sump reaches a predetermined level. The fourth reserve pump is activated automati-

cally in an emergency situation. The 950,000 pounds sterling storm water drainage project includes a generator to power the pumps in the event of power failure. (Lisk-FIRL)
W78-09835

NEW SEWER CLEANING SERVICE.
Water Services, Vol. 82, No. 985, p 184, March, 1978.

Descriptors: *Sewers, *Centrifugal pumps, *Separation techniques, *Sewerage, *Cleaning, Descaling, Equipment, Sewage sludge, Design data, Centrifugation, Waste water treatment, Municipal wastes.

The Vactor 810 jet rodder for cleaning sewers is manufactured by a subsidiary of Vactor Industrial Pollution Ltd. of Winkleigh, Devon, England. The Vactor vacuum cleaning unit is mounted on a 16-ton two-axle truck and employs a centrifugal pump which can handle both solids and liquids for filling its 6 cu m tank. The jet rodding system provides pressures up to 140 kg/sq cm for cleaning sewers from 100-1,000 mm in diameter at a rate of 150 m/hr. Liquids are drained from the full tank and solids remain so that the system can continue to operate. The number of trips required for the disposal of solids is reduced because the solids are allowed to accumulate during the cleaning process until the tank is full. (Lisk-FIRL)
W78-09845

POLYMER HELPS 'OVERFLOWS' GO DOWN THE DRAIN,
Clinton Bogert Associates, Fort Lee, NJ.
D. H. Hull.
Water and Wastes Engineering, Vol. 15, No. 5, p 55-56, May, 1978. 1 fig.

Descriptors: *Polymers, *Storm runoff, *Overflow, *Pumping plants, *Laminar flow, Urban runoff, Flow rate, Flood control, Sewerage, Infiltration, Inflow, Hydrologic studies, Conveyance structures, Centrifugal pumps, Waste water treatment, Municipal wastes.

Anionic polyacrylamide polymer injection into the sewage stream at the Tenafly, New Jersey, pumping station increased the plant's pumping capacity by 20% during overflow conditions. The 5.9 mgd maximum capacity of the pumping station had been exceeded by 1.2 mgd due to infiltration during periods of wet weather; by-passing of overflows was attributed to the empirical peak-to-average ratios employed in designing the pumping station. Infiltration/inflow analysis of the gravity sewer system indentified inaccurate ratios of domestic and extraneous flows during peak conditions. The injection of an anionic polymer into the sewer system during overflow conditions included laminar flow conditions and increased flow velocity. Parallel operation of the pumping plant's centrifugal variable speed pump with a 4.8 mgd capacity and the gas-powered 75 hp pump increased the plant's capacity by 29% with the addition of 100 ppm of dry polymer powder, supplied by Hercules Powder Co. of Wilmington, Delaware. During overflow conditions, about $150-400 polymer/hr are required; the polymer treatment is not yet amenable to automation. The Tenafly plant has employed polymer injection about once a year during severe storm conditions. (Lisk-FIRL)
W78-09920

INTERNATIONAL CONTRACTOR AND SUPPLIER FEATURES SLUDGE TECHNOLOGY.
Water Services, Vol. 81, No. 975, p 293-294, May, 1977.

Descriptors: *Pumps, *Screens, *Dewatering, *Incineration, *Activated sludge, Bubbles, Storm water, Aeration, Tertiary treatment, Sludge disposal, Waste water treatment, Aluminum alloys, Construction materials, Equipment, Municipal wastes.

Waste water treatment equipment manufactured by Hawker Siddeley Water Engineering Ltd., Workingham, Berkshire, England, and its subsidiary, F.W. Brackett, is reviewed. Trummer tube screw pumps lift influent at the treatment plant inlet; raked inlet screens, dewatering presses, Temact screenings presses, automatic baggers, and a TC incinerator remove and dispose of screenings. Spiral flow aerated grit channels with sedimentation and storm tank scrapers are available in an aluminum alloy or steel. Hawker manufactures diffused activated sludge systems that provide optimum oxygen transfer with low operating costs in sizes accommodating populations of 250-3,000,000. Brackett supplies Geiger vertical shaft surface aerators, Trummer tube screw pumps for sludge return, and final clarification tanks. Sludge and screenings disposal systems include thermal or chemical sludge conditioning in conjunction with a single rotating hearth, multipal hearth units, and Ahlstorm fluidized bed incinerators. AKA dissolved air flotation units thicken sludges in activated sludge processes. Tertiary treatment systems include the Brackett Microscreen and the Hawker Contraflow filter systems. These companies also manufacture industrial waste and potable water treatment equipment. (Lisk-FIRL)
W78-09928

ENERGY-SAVING HEAT PUMPS.
Ground Water Age, Vol. 12, No. 10, p 20-23, June, 1978. 3 fig.

Descriptors: *Heat pumps, Heating, Cooling, Swimming pools, Solar energy, Dehumidification, Energy conservation.

A heat pump can abstract heat from air or water and transfer it to a conditioned space (when heating is desired) or remove heat from the space when cooling and dehumidification are desired. In many installations, the use of a heat pump will reduce the energy consumption as much as thirty percent to sixty percent. Three examples of water to air heat pumps are presented. In one a swimming pool was used as a heat source and heat sink. The ratio of heat output to electric input was almost four to one. During the warm months the heat pumps were used for cooling and dehumidifying the living area. A similar installation used a surface spring with a constant flow of 52 degrees F water as the heat source and sink. A third example used a heat pump in conjunction with a solar energy system. An auxiliary electric heating element was installed to assure sufficient heat during successive cold, cloudy days when little solar energy is available. The initial cost of heat pumps is more than conventional heating and cooling systems but they soon pay for themselves because of their ability to furnish more heat energy than they consume in electricity. (Purdin-NWWA)
W78-10084

ON THE RELIABILITY STUDIES FOR OPERATION OF WATER RESOURCES SYSTEMS,
Universidade Federal do Rio de Janeiro, (Brazil). Dept. of Civil Engineering.
P. G. Salazar.
Supplement to Proceedings, Volume 1, 'International Symposium on Risk and Reliability in Water Resources,' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, 6 p, 7 ref.

Descriptors: *Reliability, *Water resources systems, *Operation, *Design, *Hydroelectric power, Estimating, Water utilization, Water supply, Simulation analysis, Probability.

Reliability in relation to operation of water resources systems is discussed. The definition of reliability and its place in the design and operation are analyzed. The studies commonly made to estimate reliability figures are mentioned. The different approaches developed in the electrical engineering field for power systems are presented and the extension of these concepts to water resources systems is indicated. (See also W78-10094) (Bell-Cornell)
W78-10123

SEWAGE PUMPING THE PREFAB WAY.
Surveyor, Vol 151, No 4478, p 20, 1978. 1 fig.

Descriptors: *Pumping plants, *Construction materials, *Pumps, *Design data, *Pumping, Plastics, Intakes, Outlets, Pipes, Valves, Waste water treatment, Waste water disposal, Conveyance structures, Municipal wastes, Equipment.

Skyes Pumps Ltd., of London, England, has begun manufacturing prefabricated Pumpex sewage pumping stations in three size ranges. The pumping stations are constructed of a leak-proof, fiberglass-coated polyester tank equipped with pumps, pipework, valves, ladder, and control systems. Manufactured in diameters of 1.1 m, 2m, and 2.5 m, the Pumpex stations have rated capacities up to 1,000 gal/min. The prefabricated stations are available in heights of 2.2-5.2 m to accommodate design depths of the pumping mains; each Pumpex unit is equipped with a steel plate cast at its base for attaching pump volutes with instructions for removing the motor units. The station is bolted to a concrete base and connected to the inlet and discharge lines of the pumping main. The excavated area is backfilled and the system is connected to a power source. Stations may be supplied with platforms, allowing the addition of a wash basin, water heater, lighting, flush water hose, and electric radiator. (Lisk-FIRL)
W78-10139

AMENDMENTS TO MINES AND WORKS ACT TAKE SHAPE.
For primary bibliographic entry see Field 6E.
W78-10223

APPRAISAL REPORT, WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING, KERN RIVER BASIN, CALIFORNIA.
Federal Power Commission, Washington, DC. Bureau of Power.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 750, Price codes: A05 in paper copy, A01 in microfiche. 1977. 94 p, 25 fig, 22 tab.

Descriptors: *California, *River basin development, *Watersheds(Basins), *Hydroelectric power, Hydroelectric plants, Permits, Water resources development, Hydrologic aspects, Water resources, Land use, Economics, Data collections, Reservoirs, Surveys, Water quality, Water supply, Water utilization, *Kern River(Calif).

The Kern River Basin is considered as the 2,407 sq mi above the U.S. Geological Survey gaging station for the Kern River near Bakersfield, California. This report included descriptions of the Kern River Basin, prior reports and current investigations, the economy of the basin, existing water and related land development, Kern Canyon and Borel Projects, economic and human needs for further development of water and related land resources, and possible future development and utilization of water resources. Although the licensed project areas offer very little potential for recreationall use, much of the watershed of the Kern River has become very popular for outdoor recreational activity. The area around Lake Isabella is a major attraction. Joint studies are being made by the licensees and appropriate Federal and State agencies to determine the extent of measures needed to protect and develop the recreational, fish, and wildlife

alues of the streams affected by project diversions. This report was intended primarily to provide information which the Federal Power Commission and its staff may use or build upon, as appropriate, when considering matters related to hydroelectric licensing, relicensing, or recommendation for Federal takeover. (Humphreys-ISWS)
W78-10278

HYDRAULIC SHEET PILE DRIVER HAMMERS DOWN SEWER TRENCH COSTS,
N. Hancock.
Engineering and Contract Record, Vol. 91, No. 6, p 74-75, June, 1978.

Descriptors: *Hydraulic equipment, *Sheet piling, *Retaining walls, *Trenches, *Sewers, Excavation, Engineering structures, Sewerage, Saturated soils, Waste water treatment, Municipal wastes.

The Hydraulic Trench Master, manufactured in West Germany, drives sheet piles for sewer construction in unstable ground conditions or in narrwo trenches from 2-18 ft wide. The hyraulic unit, which can simultaneously drive piles on both sides of the trench to be excavated, reduces shoring costs by 50% and eliminates the need for dewatering of narrow trenches in saturated soils. The 700 mm wide, 3.5 m long interlocking sheet sections can be driven to depths up to 40 ft by the continuous pressure, medium weidht impact of the hydraulic hammer unit; the driving technique allows reuse of sheet piles which are removed by an air-operated extractor mounted on a crane. The hydraulic unit is equipped with a 125 hp diesel motor and usable within one foot of a trench wall. (Lisk-FIRL)
W78-10297

DIESEL GENERATING SETS PROVIDE BACK-UP POWER.
Water Services, Vol 82, No 987, p 295-296, May, 1978.

Descriptors: *Motor generators, *Electric power, *Pumps, *Hydraulic equipment, *Electric power failure, Manual control, Automatic control, Protection, Standby power, Waste water treatment, Equipment, Municipal wastes.

Auto Diesels Braby Ltd. manufactures a variety of generators for use as standby power units in England's water and sewage treatment plants. The diesel generator units have power outputs ranging over 20-1500 kilovolt-amperes. The generators are available as mobile units or stationary models; weatherproof enclosures and optional soundproofing make the units suitable for a variety of residential or treatment plant conditions. The power units are equipped with either manual or automatic start-up control and may be used as power backups or primary power sources. Power frequencies range over 40-60 hertz to operate variable speed pumps; the diesel generators are usually installed as sets which operate separately or in parallel. (Lisk-FIRL)
W78-10360

EVALUATION OF FLUIDIC COMBINED SEWER REGULATORS UNDER MUNICIPAL SERVICE CONDITIONS,
Freeman (Peter A.) Associates, Inc., Berlin, MD.
P. A. Freeman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 273, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-77-071, August 1977. 104 p, 34 fig, 4 ref, 3 append.

Descriptors: *Combined sewers, *Regulated flow, *Equipment, *Sewerage, *Overflow, Diversion structures, Measurement, Hydralic structures, Flow rates, Waste water disposal, Municipal wastes.

The performance of two fluidic regulators, installed under a grant by the USEPA Demonstration Program in a section of combined sewers in Philadelphia, Pennsylvania, is compared to the performance of static regulators. The fluidic regulators are evaluated as a means of overcoming the hydraulic problems of static regulators that are controlled by only the flows in combined sewers. Dynamic regulators can respond to both combined and interceptor sewer flows, but are more expensive and less reliable than fluidic regulators. The fluidic unit is controlled by tube sensors located in combined and/or interceptor sewers. The design and construction details of the project are described; a detailed comparison is made of the hydraulic performance, maintenance, and costs associated with static and fluidic regulators. One regulator has been operating adequately for 36 mos under combined flows of 2 cu ft/sec; the second fluidic regulator has accommodated flows of 25 cu ft/sec for 30 mos with few problems. Specific design modifications to the fluidic regulators, including corrosion-resistant construction materials, rerouting of connecting air lines, and inlet nozzle expansion, were formulated to improve the operation of the fluidic regulators. Routine surveillance practices and maintenance operations were simpler and faster than with static regulators. (Lisk-FIRL)
W78-10366

AERATION EQUIPMENT COSTS REDUCED BY NEW SYSTEM.
For primary bibliographic entry see Field 5D.
W78-10436

CANADIAN-MADE BEARINGS PROLONG LIFESPAN OF PASVEER SEWAGE TREATMENT SYSTEM.
Water and Pollution Control, Vol. 116, No. 4, p 50, April, 1978.

Descriptors: *Bearings, *Aerations, *Abrasion, *Friction, *Corrosion, Design data, Equipment, Biological treatment, Lubricants, Oil, Sealants, Waste water treatment, Construction materials, Municipal wastes.

Modifications to the aeration unit of the Pasveer sewage treatment system have increased the projected lifespan of the treatment facility in New South Wales, Australia. The Pasveer extended aeration system utilized a Mark I floating aeration unit containing two 6-ft rotors, supported by segmental bearings and driven at 75 rpm. Corrosive and abrasive material caused excessive wear on labrinth seals; materials invaded bearing casings. Case-hardened shaft sleeves reduced some of the wear. The Mark II unit incorporated 9-ft rotors supported by bearings, designed by Thomas-Gordon Ltd. of Hamilton, Ontario, Canada, consisting of a cast pillow block with a central thrust ring and two flanged, 270 degree segmented inserts. Oil is circulated through the bearings; the rubber thrust ring is covered with felt to prevent infiltration of abrasive material. The modular Pasveer unit also utilizes a gravity decanting system with a bell-mouth. (Lisk-FIRL)
W78-10458

8D. Soil Mechanics

DESIGN AND CONSTRUCTION OF RETAINING DIKES FOR CONTAINMENT OF DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
D. P. Hammer, and E. D. Blackburn.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 311, Price codes: A10 in paper copy, A01 in microfiche. Technical Report D-77-9, August 1977. 200 p, 77 fig, 14 tab, 50 ref, 2 append.

Descriptors: *Dikes, *Dredging, *Design, *Construction, Embankments, Sites, Waste disposal, Planning, Disposal, *Containment areas, *Dredged material disposal, Waste disposal sites, Dike construction, Site conditions, Construction practices, Retaining dikes, Earth embankments.

A major problem exists in the area of dike construction for dredged material containment areas. Frequent dike failures have been reported, along with problems associated with high maintenance requirements. The failures and problems have been traced to inadequate design and construction practices compounded by very poor site conditions. Recommendations were made for proper investigation, design, and construction of retaining dikes to aid in ensuring that the dikes would be constructed with a minimum of problems. Raising of existing dikes was covered, as well as construction of new dikes. Recommendations were based on a survey of past Corps of Engineers design and construction practices for retaining dikes and on current state-of-the-art design procedures for construction on earth embankments. (Roberts-ISWS)
W78-10001

EXPLORATORY INVESTIGATION FOR SEWER AND PIPELINE CONSTRUCTION,
H. Weber.
Municipal Engineer, Vol. 8, No. 2, p 39-41, 1977. 3 ref.

Descriptors: Exploration, Engineering, Soil investigations, Subsurface investigations, Contracts, *Sewers, *Pipelines, Equipment description, South Africa.

The proper design and efficient execution of civil engineering projects require adequate knowledge of site subsurface conditions. It is necessary, therefore that exploration programmes must provide the information required for safe and economical design and construction in 'unearthing' field conditions which are likely to affect safety and cost. The large diameter augered investigation procedure proves a very rapid, accurate and economical method of providing sub-surface information useful both for design as well as construction purposes. (So Afr Water Info Center)
W78-10243

VANDERKLOOF COMES ON STREAM.
Construction in Southern Africa (Johannesburg), Vol. 21, No. 9, p 17-20, 1976. 3 Illustr.

Descriptors: Hydroelectric plants, Civil engineering works, *Rock excavation, Shafts, *Tunneling, Geologic investigations, Geologic formation, Weathering, Design criteria, Shales, Dolorite, Orange River Scheme, Le Roux Dam, South Africa.

Describes the civil engineering that went into the excavation of the underground facilities for the Vanderkloof Hydro-electrid power station situated on the left bank of the Orange River immediately downstream of the P.K. le Roux dam. The excavations include shafts and tunnels and a machine hall of some 48m in height and probably ranks as one of the least publicised of South Africa's major civil engineering projects. (So Afr Water Info Center)
W78-10248

USE OF REMOTE SENSING TO QUANTIFY CONSTRUCTION MATERIAL AND TO DEFINE GEOLOGIC LINEATIONS; DICKEY-LINCOLN SCHOOL LAKES PROJECT, MAINE,
Army Terrestrial Sciences Center, Hanover, NH.
H. L. McKim, and C. J. Merry.
Special Report 242, Part II, December 1975. 8 p, 8 fig, 2 append.

Descriptors: *Remote sensing, *Construction materials, *Dam construction, *Maine, Damsites,

Aerial photography, Satellites(Artificial), Aircraft, Geological surveys, Fractures(Geologic), Faults(Geologic), Drainage, Drainage patterns(Geologic), Projects, Reservoirs, *Geologic lineations, *Dickey-Lincoln School Lake Project(ME).

A potential site for construction of a series of earth dams and dikes with a maximum height of 335 ft, the Dickey-Lincoln School Lakes Project, is being evaluated. The site is located on the St. John River in Aroostook County, Maine, approximately 30 mi west of the town of Ft. Kent. The project is primarily designed to generate hydroelectric power, but it is also intended to provide flood control. During November 1974, a study was initiated to apply state-of-the-art remote sensing techniques to the delineation and quantification of surficial geology units to locate construction of surficial geology units to locate construction material within the headwaters of the St. John River Basin. This report contains Appendixes A and B of Special Report 242, Part I. Large-scale aerial photographs depicting the geologic lineations, surficial geology, drainage patterns, and boring data locations in the Dickey-Lincoln area were included. (See also W77-06888) (Sims-ISWS)
W78-10263

THERMAL REGIME OF THE DOWNSTREAM SHOULDER OF ROCKFILL DAMS,
N. A. Mukhetdinov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 988, Price codes: A03 in paper copy, A01 in microfiche. CRREL Draft Translation 586, February 1977. 27 p, 12 fig, 21 ref. Translated from Bulletin of the All-Union Scientific Research Institute of Hydraulic Engineering, Vol 90, p 275-294, 1969.

Descriptors: *Rockfill dams, *Temperature, *Model studies, Mathematical models, Dams, Heat transfer, Convection, Air, Rock fill, On-site investigations, Porous media, Structures, Hydraulic structures, Civil engineering, *USSR, Thermal regime.

A system of equations describing the thermal regime of rockfill dams, one taking natural air convection into account, was presented. A numerical solution of the equations was given for the profile of the downstream shoulder of the rockfill dam of the Vilyuy Hydroelectric Power Plant, the solution being obtained with the aid of a computer. The results of calculation and of field observations were found to be in close agreement. This paper was devoted to study of the thermal regime of the downstream shoulder of rockfill dams. Calculation of the thermal regime of the downstream shoulder was necessary in order to establish the thermal state of the apron (core), the base of the dam, and the location of drainage installations. The thermal regime of the downstream shoulder of a rockfill dam was formed as a result of conductive heat transfer and convective heat transfer by the air moving in the pores. (Sims-ISWS)
W78-10264

WATER-HEAT REGIME OF EARTH CATCHWORK DAMS,
Akademiya Nauk SSSR, Yakutsk. Inst. Merzlotovedeniya.
R. V. Chzhan.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 989, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 583, January 1977. 10 p, 4 fig. Translated from Trudy Yakutskogo Nanchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva, No. 12, p 93-101, 1972.

Descriptors: *Earth dams, *Cold weather construction, *Permafrost, Dams, Cold regions, On-site investigations, Temperature, Moisture content, Soils, Thawing, Freezing, Heat transfer, Structures, Hydraulic structures, *USSR, Thermal regime.

The planning of earth dams in Far North regions involves heat engineering calculations which make it possible to draw up the necessary geocryological prognosis of the heat regime of the grounds of the dam and its foundation during the period of use. In view of the large-scale deterioration of catchwork dams in Yakutia, the Institute of Permafrost Studies carried out a special investigation to identify the causes of dam deformation and to propose some ways of preventing them. Some results of this research were set forth in this article. The geocryological investigation included a cycle of regime observations at operating sites and a calculation of the change in the temperature fields of dams during the period of operation. Two land improvement systems were chosen for on-site observation: the Khorobutskaya system, whose structures have an established (steady) temperature regime, and a new system on the Khos-Yurekh River in Gornyy Rayon. (Sims-ISWS)
W78-10266

CONDITIONS OF MODELING HEAT AND MASS EXCHANGE PROCESSES IN LOWER PRISM OF ROCK-FILL DAM IN CASE OF FORCED CONVECTION,
Gorkovskii Inzhenerno-Stroitelnyi Inst. (USSR).
V. A. Zhdanov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 990, Price codes: A02 in paper copy, A01 in microfiche. Draft Translation, 584, January 1977. 6 p, 6 ref. Translated from Collection of the Works of the Gor'kiy Construction Research Institute, p 37-42.

Descriptors: *Rockfill dams, *Temperature, *Moisture content, *Model studies, Dams, Rock fill, Mathematical models, Heat transfer, Mass transfer, Winds, Air temperature, Equations, Cold weather construction, Hydraulic structures, Civil engineering.

The temperature-moisture regime in the lower prism of the dam is an important factor determining normal operation of rockfill dams in regions with severe climatic conditions. In view of the difficulty of solving a system of differential equations which describes the processes of heat and mass exchange in the lower prism of the dam, the physical processes can be investigated experimentally on a model of the dam and then, using the modeling conditions, the results of the experiment can be transferred to the actual dam. (Sims-ISWS)
W78-10268

TEMPERATURE REGIME IN LOW-HEAD EARTH DAMS IN CENTRAL YAKUTIA,
R. V. Chzhan.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 117, Price codes: A02 in paper copy, A01 in microfiche. Cold Regions Research and Engineering Laboratory Draft Translation 581, January 1977. 13 p, 5 fig, 5 tab. Translated from the book 'Geokriologicheskiye Issledovania', USSR Academy of Sciences, Yakutsk, 1974. p 167-175.

Descriptors: *Earth dams, *Cold regions, *Permafrost, *Temperature, Dams, Dam foundations, Thawing, Freezing, Soil temperature, Soils, Stability, Soil stability, On-site investigations, Model studies, Mathematical models, Structures, Hydraulic structures, *Yakutia(USSR).

The Institute of Permafrost Studies of the Siberian Department of the USSR Academy of Sciences carried out studies of the processes of formation of the heat regime of catchwork and storage earth dams applicable to the climatic and engineering-geocryological conditions of the Tatta River valley where, to solve the water supply problem in Alekseyevskiy and Churapchinskiy rayons of the Yakut USSR using water from the Amga River, a series of earth dams was planned for construction. The basic results of the thermal engineering forecasts made were given. (Sims-ISWS)
W78-10283

THE PORTOBELLO OUTFALL AT BRIGHTON.
For primary bibliographic entry see Field 5E.
W78-10294

8E. Rock Mechanics and Geology

TUNNEL COST MODEL: A STOCHASTIC SIMULATION MODEL OF HARD ROCK TUNNELING, VOLUME 1, SUMMARY REPORT,
Massachusetts Inst. of Tech., Cambridge. School of Engineering.
F. Moavenzadeh, H. H. Einstein, M. J. Markow, E. N. Lindner, and C. H. Minott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 252, Price codes: A06 in paper copy, A01 in microfiche. Research Report No. R74-22, May 1974. 113 p, 23 fig, 12 tab. GI 34029.

Descriptors: *Tunneling, *Tunnel construction, *Model studies, *Construction costs, *Estimated costs, Cost analysis, Markov processes, Stochastic processes, Geology, Rocks, Tunnels, Computer models, Probability, Tunneling machines, Direct costs, Indirect costs, Engineering geology, Excavation, Tunnel geology, Flow charts, Hard rocks.

This report described the completed first phase in a project to develop a Tunnel Cost Model: the organization and scope of the model; its technical content, assumptions, and capabilities; and the relation of the model to various exploratory and tunneling practices. The report consisted of three volumes, a Summary Report, a Technical Report, and the Appendices. The Tunnel Cost Model was developed in an attempt to improve the assessment of uncertainty in tunnel cost estimates, with enough detail and accuracy to aid in preparing estimates or bids. The scope of the model is limited to hard rock tunneling. A working version of the model has been obtained, and trial runs of selected example problems have been run and were discussed in this report. This report is the first in a series relating to the Tunnel Cost Model to document the work continuing under the research project mentioned. (Humphreys-ISWS)
W78-10276

TUNNELING: THE STATE OF THE INDUSTRY,
Cresheim Co., Inc., Philadelphia, PA.
R. S. Mayo, J. E. Barrett, and R. J. Jenny.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 817, Price codes: A13 in paper copy, A01 in microfiche. Report No. DOT-TSC-OST-76-29 June 1976. 275 p, 84 exhibit, 12 append. DOT-TSC-1091.

Descriptors: *Tunneling, *Reviews, *Management, *Tunnel construction, Planning, Tunnels, Risks, Underground structures, Transportation, Aqueducts, Sewers, Financing, Engineering, Construction costs, Estimating, Railroads, Highways, Bonding, Estimated costs, Decision making, Rapid transit.

The report covered transport, water, and sewer tunnels, with emphasis on rapid transit. This report assessed the structure and capacity of the US tunneling industry, with an emphasis on transportation tunnels. Historical and future demand was charted for the period 1955 through 1985. Owners, engineering consultants, and construction contractors were described. Corporate decision making in these firms was examined. Because the report looked at tunneling as a commercial as well as a technological enterprise and because it treated the

people as rational decision makers, it showed clearly that the main problems in the industry are not technological. It was the primary conclusion of this report that in transportation tunneling, an institutional system has evolved which strongly discourages innovation in design or practice. Little improvement in productivity will occur until two facets of this system are addressed: accountability and risk sharing. (Humphreys-ISWS)
W78-10286

SWISS TUNNEL CONFIRMS MINI'S URBAN ROLE.
Water Services, Vol. 82, No. 988, p 361-362, June, 1978.

Descriptors: *Tunnel construction, *Sewerage, *Limestones, *Tunneling, *Equipment, Tunneling machines, Excavation, Engineering structures, Compressive strength, Railroads, Sewers, Municipal wastes.

Atlas Copco's Mini Fullfacer tunnel driving system was selected over conventional blasting, drilling, and boring techniques to construct a 250-m long sewage tunnel that ran under railroad tracks, a church, and several houses in Laufen, Switzerland. Rock cover below the railroad bed ranged from 1.5-2.0 m. The Fullfacer, equipped with a conveyor belt and 2.5 cu m diesel dumper for muck removal, power connections, ventilation system, and laser directional control, completed the tunnel within 1 mo. The unit undercut rock and broke the mass toward the free face, a process requiring less power than drilling or blasting. The Fullfacer unit initially cut a right hand curve with a radius of 80 m and proceeded to excavate at a rate of almost 15 m/day. The 1.5 m vault of the tunnel beneath the railroad bed did not require reinforcement because of the 1,000-1,300 bar compressive strength of the area's limestone. (Lisk-FIRL)
W78-10317

8F. Concrete

BARGES CUT OUTFALL IN HALF.
For primary bibliographic entry see Field 5E.
W78-09823

DESIGN PROLONGS SERVICE LIFE OF CORRUGATED STEEL PIPES.
For primary bibliographic entry see Field 8G.
W78-10292

8G. Materials

DRAINAGE MANUAL, A GUIDE TO INTEGRATING PLANT, SOIL, AND WATER RELATIONSHIPS FOR DRAINAGE OF IRRIGATED LANDS.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W78-09828

PLASTIC PIPE FOR DEEP SEWER.
Civil Engineering-ASCE, Vol. 48, No. 5, p 22, May, 1978.

Descriptors: *Sewerage, *Gravity, *Pipes, *Plastics, *Rocky mountain region, Corrosion control, Trenches, Excavation, Construction materials, Deflection, Strength of materials, Structural stability, Municipal wastes.

Johns-Manville 14 inch polyvinyl chloride pipe was used for a gravity main sewer laid 42 feet beneath two Rocky Mountain foothills. Installing the gravity sewers over the hills would have required a pumping station. Constructing the gravity sewer through the hills required maintenance free and corrosion resistant pipe that could withstand heavy loads without deflection. The plastic pipe was laid in a 42-ft deep trench constructed with the proper bedding and width to control deflection. After the pipe was installed, it had a deflection of less than 4%. The sewerage project was designed by the engineering firm of Serafini and Meurer, Inc. of Denver, Colorado. (Lisk-FIRL)
W78-09844

REPAIRING DAMAGE SEWERS AND WATER MAINS.
Surveyor, Vol. 151, No. 4471, p 22, 24, February, 1978. 1 fig.

Descriptors: *Linings, *Plastics, *Sewers, *Pipelines, *Resins, Curing, Chemical degradation, Corrosion control, Sewerage, Pressure head, Pipes, Waste water treatment, Waste water disposal.

A terylene fiber-reinforced polyester resin lining for repairing damaged sewers and water mains has been developed by Edmund Nuttall Ltd. and Insituform Ltd. and distributed by Drainalay Ltd., a subsidiary of Power Rod Ltd., London, England. The lining procedure is accomplished via an access manhole and is suitable for pipes with diameters of 4-48 inches; pipes with diameters of 4-6 inches have been repaired with linings up to 100 m in length. Linings, in thicknesses ranging over 3-19 mm, are sheathed in polyurethane and vacuum-impregnated with Isophthalic resin for added structural strength and chemical resistance. The lining is fed into the opening of the pipe through a vertical steel inversion pipe with a perpendicular end. The lining is clamped to the end of the inversion pipe; water pumped through the inversion pipe builds up a pressure head, forcing the liner to turn inside out into the damaged pipe. As flexible hose is drawn through the pipe; the water pumping through the pipe is heated to 75C; and the lining resin is cured. The resin curing requires about 2 hrs, after which the ends of the liner are trimmed and sealed onto the channel. The lined pipes can be used within 2-3 hrs; the flow characteristics of the liner reportedly compensate for the pipe's smaller diameter of the liner. (Lisk-FIRL)
W78-09876

SEWER PIPE SYSTEM PROTECTS SUBURB'S WATER SUPPLY.
Water and Sewage Works, Vol. 125, No. 5, p 59, May, 1978.

Descriptors: *Sewerage, *Plastic pipes, *Concrete pipes, *Gravity, *Pressure conduits, Corrosion control, Clays, Conveyance structures, Joints(Connections), Sewers, Treatment facilities, Tertiary treatment, Infiltration, Equipment, Waste water treatment, Municipal wastes.

Johns-Manville polyvinyl chloride gravity sewer pipe, 'Transite' asbestos cement force mains, and polyvinyl chloride water pressure pipe were used in the sewerage project at Little Elm, Texas. The sewers transport municipal wastes to a sewage treatment plant utilizing contact stabilization and tertiary filtration. The Johns-Manville pipes were selected because of their corrosion resistance, ease of handling, and rapid installation. The clay soils of the 10 sq mile area necessitated the selection of non-metallic pipes with lightweight handling properties. The polyvinyl chloride gravity sewer pipes in 20 ft lengths were installed in about half the expected time because of less jointing and ease of handling. The asbestos cement force mains connecting the gravity sewers were installed at elevations of 12-27 ft and required less and lighter equipment during construction. The force mans were equipped with factory-belled couplings with rubber rings built into the pipe during manufacture; the rings were lubricated and joined with a bush-motion to connect pipe sections. The joint had an exfiltration rate of less than 250 gal/inch diameter/mi/day. Polyvinyl chloride water pressure pipes provided zero exfiltration when installed within 75 ft of a reservoir's high eater elevation. The sewerage and treatment plant project alleviated pollution of the area's water supply via seepage from septic tanks in the area. (Lisk-FIRL)
W78-09914

COST-MINDED COMMUNITY CHOOSES SMALL DIAMETER GRAVITY SYSTEM,
For primary bibliographic entry see Field 5D.
W78-09921

DYNAMIC BEHAVIOR OF ICE UNDER CYCLIC AXIAL LOADING,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W78-09992

ICE ENGINEERING: A NATIONAL NEED.
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-09999

COMBINED SEWER CLEANER.
Water and Waste Treatment, Vol. 21, No. 7, p 27, July, 1978.

Descriptors: *Cleaning, *Manholes, *Jets, *Water pressure, *Pumps, Sludge disposal, Corrosion control, Storage tanks, Instrumentation, Hoses, Siphons, Sewerage, Hydraulic equipment, Construction materials, Municipal wastes.

General Descaling Co. has designed a sewer cleaning vehicle for simultaneous high-pressure water jetting and suction removal of manhole deposits. The unit, designed for single crew operation, contains a 700 gal sludge tank and a 1000 gal water tank, both constructed of 0.25 inch mild steel and internally coated for corrosion resistance. The two tanks are mounted on a two-axle 16 ton chassis. A valve between the two tanks may be opened to allow a larger sludge or water capacity. The triple-ram positive displacement pumps for water jetting are available with capacities of 22 gal/min at 1,500 lbs/sq inch or 45 gal/min at 1,250 lbs/sq inch. The water jet is supplied through 300 ft of braided-rubber hose; controls and monitoring equipment are mounted on a panel adjacent to the hose reel. A rotary vane air exhauster with an output of 26,500 cu ft/hr and 4-inch diameter hoses comprise the suction equipment. The vehicle and its operations are powered by a Perkins turbo-charged diesel engine with a five-speed gearbox. (Lisk-FIRL)
W78-10018

NEW WEAPON IN THE WAR ON SAND.
Water Well Journal, Vol. 32, No. 6, p 68-69, June, 1978. 4 fig, 1 ref.

Descriptors: *Well filters, *Gravels, *Sands, *Gravel packing, Water wells, Drilling equipment.

A new technique for gravel packing, 'Vibra-Pak', is described. It utilizes a rotary-activated vibration tool that compacts the gravel and blocks sand production for the life of the well. This method preserves, as much as possible, the pre-drilled physical structure of the formation and forms a strong, porous interface to support the surrounding formation. (Purdin-NWWA)
W78-10085

NEWER TECHNIQUES AID SEARCH FOR GROUND WATER,
For primary bibliographic entry see Field 7B.
W78-10090

SCALE DOWN ON HARD WATER PROBLEMS.
For primary bibliographic entry see Field 5F.
W78-10091

SHALY-SAND ANALYSIS IS SIMPLIFIED,
Dresser Atlas Co., Houston, TX.
W. H. Fertl.
Oil and Gas Journal, Vol. 76, No. 27, p 77-79, July 3, 1978. 2 fig, 1 tab, 4 ref.

Descriptors: *Shales, *Oil reservoirs, *Logging(Recording), Permeability, Water saturation, *Shaly-sand analysis.

A simplified shaly sand analysis using a resistivity-one porosity log combination is described. It involves estimation of shaliness by conventional techniques and porosity corrections for gas effects. The fraction (q) of the total porosity occupied by disseminated clay is expressed as: $q=aVsh/ODL + aVsh$) where: a = an empirical constant derived from density and acoustic data; Vsh = the smallest shale volume estimated; ODL = density leg porosity. Similar mathematical manipulations can be carried out when an acoustic - induction or neutron induction combination is available. The q-factor can be expressed as follows: $q=(Otot - Oe)/Otot = aVsh/Otot$ where Otot = total reservoir porosity from acoustic or neutron logs. The q-factor can be used to calculate formation water saturation. Computed water saturations in high, medium, and low-porosity reservoir rocks compare favorably with subsequent well tests. The q-factor also provides a basis for determination of cutoff permeability in pay sands. One expects this permeability cutoff to be dependent on both shaliness and effective porosity of the reservoir rock. Past attempts suggested a tentative permeability cutoff when value for the q-factor exceeded twice the value of effective porosity or $q > 0.4$. A chart of q-factors vs. reservoir porosities shows whether the formation is producible. (Purdin-NWWA)
W78-10092

SYSTEM USES INTERNAL COPPER TUBING,
Down-hole Communications Co., Richardson, TX.
J. J. Godbey.
Oil and Gas Journal, Vol. 76, No. 27, p 72-76, July 3, 1978. 5 fig, 2 tab.

Descriptors: *Electric well logging, *Conductors, *Down-hole devices, Borehole geophysics, Drilling equipment, Communication.

A new coaxial conductor system (Power-COM) for telemetering data from down-hole instruments while drilling is described. An interconnect plug in the box portions of the drill string provides inner conductor continuity, forms a fluid seal and electrically isolates the drill pipe outer conductor from the inner conductor. This action takes place even though the plug may be submerged in drilling fluid during coupling. The plug design also assures that the conductor isolation is maintained as fluid pressure in the drill string increases. The installation does not obstruct the bore of the drill pipe and requires no special handling in the field. Besides two-way transmission of power and signals, the conductor system allows for a number of downhole instruments operating simultaneously in a multiplex mode while being powered from the surface. Tests proved the system capable of operating at 850 volts RMS at 60 hz using an internal saturated salt (NaCl) solution pressured to 3,000 psi. The inner conductor is conservatively rated to carry 800 amp. (Purdin-NWWA)
W78-10093

A NEW PACKING MEDIUM FOR BIOLOGICAL PERCOLATING FILTERS.
For primary bibliographic entry see Field 5D.
W78-10135

POLYMER INJECTION INTO A DEVELOPING BOUNDARY LAYER,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W78-10270

DESIGN PROLONGS SERVICE LIFE OF CORRUGATED STEEL PIPES.
Water and Sewage Works, Vol. 125, No. 4, p 60-61, April, 1978.

Descriptors: *Steel pipes, *Corrosion control, *Coastings, *Linings, *Construction materials, Asphaltic concrete, Hydraulic properties, Iron, Zinc, Polymers, Paving, Construction, Sewerage, Equipment, Waste water disposal, Municipal wastes.

Coatings and linings increase the performance and durability of corrugated steel pipes. The steel pipes are manufactured with a 2 oz/sq ft zinc coating and often an 0.05 inch hot-dip compound asphalt internal and external coating which can extend the pipes durability by 25 yrs. Asphalt pavement poured in the critical flow or invert section areas can further increase pipe durability. Coating the pipe interior with centrifugally spun asphalt during pipe rotation improves the hydraulic performance. Polymer coatings applied to steel coil stock in thicknesses of 0.010 inches to 10 mils provides resistance to corrosive acids, alkalis, brackish water, and industrail solvents. Asbestos-bonded fibers applied to molten zinc during galvanizing, followed by asphalt-based saturant coating, also protect pipe materials against corrosives. Coastings of anodic iron-zinc and aluminum-zinc alloys and cement mortar protect underlying metal. Installation recommendations include: gradients step enough to prevent solids accumulations, sand and gravel as backfill to reduce external corrosion, and proper coupling materials for bituminous-coated corrugated pipes. (Lisk-FIRL)
W78-10292

SEWER RESTORED BY THERMOSET RESIN CURED IN PLACE,
Illinois State Univ., Normal, Coll. of Applied Science and Technology.
A. R. Jacobson.
Public Works, Vol. 109, No. 7, p 94, July, 1978.

Descriptors: *Liners, *Resins, *Sewers, *Pipes, *Heat treatment, Plastic, Sewerage, Pipes, Conduits, Physical properties, Waste water treatment, Construction materials, Municipal wastes.

A brick sewer in Kidderminster, England, was repaired by the Insituform process which utilizes a resin-saturated polyester tubing liner. A polyester needle felt tube of the same dimensions as the sewer was saturated with a thermosetting resin and inserted into the sewer line. The tube was filled with cold water to maintain pliability and to push it through the pipe; the water in the tube was then heated to cure and set the resin-saturated liner. The Kidderminster pipe, located beneath a factory, was 1,800 ft long and had a 30-inch diameter. Underground Surveys Corporation of Fresno, Caifornia, are North American suppliers of the Insituform process. (Lisk-FIRL)
W78-10293

MONTREAL SEWER CONTRACTOR IS FORCED TO USE HIGH AIR PRESSURE IN TREACHEROUS CLAY,
J. Brown.
Engineering and Contract Record, Vol. 91, No. 6, p 40-41, June, 1978.

Descriptors: *Tunneling, *High pressure, *Tunnel pressure, *Clays, *Flooding, Pumps, Deep-well pumping, Flood control, Tunnel failure, Rock bolts, Tunneling machines, Tunnel linings, Sewerage, Waste water treatment, Equipment, Municipal wastes.

Compressed air at pressures up to 124 kiloPascals was used where unstable ground conditions existed in the tunneling areas of Montreal Urban Community's sewerage project. The compressed air stabilization was required after a cave-in trapped the tunneling machine in one of the sewerage construction sections and also because of unstable clay and silt in three other sections 42, 43, and 78 m in length. Manual excavation within the compressed air lock areas was completed prior to tunneling with the mole. Air was supplied through 152 mm diameter lines at a rate of 276 cu m/min and pressures of 96-124 kiloPascals. Deep wells with 22 kilowatt submersible pumps were required in one section to reduce water inflow from 5,455 to 2,273 liters/min. Heading and bench methods of excavation were employed in areas which had been drilled and blasted; 1.2 m-long, 19 mm-diameter rock bolts prevented rock spalling. Strict scheduls were required for employees working under the compressed air; at 96 kiloPascals, continuous working time was limited to 3.75 hrs. A medical lock similar to a decompression chamber was required for treating employees with the bends; medical personnel were maintained on-site. The use of compressed air also limited the equipment to air or electric power and influenced the selection of explosives. The 8,473 m sewer tunnel will be lined with concrete when completed. (Lisk-FIRL)
W78-10295

SWANSEA'S SEA OUTFALL IN TAILOR-MADE.
For primary bibliographic entry see Field 5E.
W78-10296

8H. Rapid Excavation

OXYGENATION OF DREDGED MATERIAL BY DIRECT INJECTION OF OXYGEN AND AIR DURING OPEN-WATER PIPELINE DISPOSAL,
JFB Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 2J.
W78-10002

8I. Fisheries Engineering

DISPERSA OF FISHES VIA THE ORANGE-FISH TUNNEL, SOUTH AFRICA,
South African Div. of Nature and Environmental Conservation, Grahamstown.
J. A. Cambray, and R. A. Jubb.
Journal of the Limnological Society of South Africa, Vol. 3, No. 1, p 33-35, 1977. 11 ref.

Descriptors: Distribution patterns, Watersheds(Basins), Freshwater fish, Fishkills, Fish passages, Fish handling facilities, Cyprinus, Clarias, Labeo, Barbus, *South Africa(Orange-Fish tunnel), Great Fish River, Sundays River.

In spite of fatal hazards likely to be encountered by fishes being carried by the 82,45 km Orange-Fish-Tunnel from the Orange River to the headwaters of the Great Fish River, Eastern Cape, observations show that some are surviving this journey. Fish species passing through the Orange-Fish Tunnel are recorded and the possibility of their becoming established in the Great Fish River system and later the Sundays River system is discussed. (So Afr Water Info Center)
W78-10212

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

ESTIMATE OF MAXIMUM LEVEL OF OIL INNOCUOUS TO MARINE BIOTA AS INFERRED FROM LITERATURE REVIEW,
Mississippi State Univ., Mississippi State.
For primary bibliographic entry see Field 5C.
W78-09803

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION.
Geological Survey, Menlo Park, CA. Water Resources Div.
California District report, May 1978. 145 p.

Descriptors: *Bibliographies, *California, *Water resources, *Publications, Information retrieval, Indexing, *US Geological Survey reports.

The U.S. Geological Survey has been involved in measuring and studying the water resources of California since 1898. Most of the work has been carried out in financial cooperation with other governmental agencies at the local, State, and national levels. This bibliography presents a listing, by author, of reports prepared and released by the Water Resources Division through December 1977. The listing includes certain reports that, although not prepared specifically for California, contain information applicable to this State or adjacent areas. It also includes research and general hydrologic reports prepared by personnel in the California District Office and Western Region Headquarters even though they may contain no specific reference to California. Indexing is according to hyrologic area, county, and subject. The subject index is divided into three general categories--ground water, surface water, and water resources. A report may be indexed under more than one area, county, or subject. (Woodard-USGS)
W78-10054

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DEFINITIONS OF COMPONENTS OF THE MASTER WATER DATA INDEX MAINTAINED BY THE NATIONAL WATER DATA EXCHANGE,
Geological Survey, Reston, VA. Water Resources Div.; and CACI, Inc. Reston, VA.
For primary bibliographic entry see Field 7C.
W78-10045

10F. Preparation Of Reviews

RISK IN RESERVOIR DESIGN AND OPERATION: A STATE-OF-THE-ART REVIEW,
Iowa Univ., Iowa City. Iowa Inst. of Hydraulic Research.
For primary bibliographic entry see Field 04A.
W78-10104

CATCHMENT GEOMORPHOLOGY AND ITS HYDROLOGIC SIGNIFICANCE: A REVIEW,
New South Wales Univ., Kensington (Australia). School of Geography.
For primary bibliographic entry see Field 04D.
W78-10261

TUNNELING: THE STATE OF THE INDUSTRY,
Cresheim Co., Inc., Philadelphia, PA.
For primary bibliographic entry see Field 08E.

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 22
NOVEMBER 15, 1978

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 22
NOVEMBER 15, 1978

W78-10501 -- W78-11300

e Secretary of the U.S. Department of the Interior has de-
rmined that the publication of the periodical is necessary in the
nsaction of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

OPTIMAL IDENTIFICATION OF NONLINEAR SURFACE RUNOFF SYSTEMS WITH COPOSITIVITY THRESHOLD CONSTRAINTS,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Industrial and Management Engineering.
For primary bibliographic entry see Field 2E.
W78-10515

EFFECTS OF URBAN DEVELOPMENT ON THE FLOOD-FLOW CHARACTERISTICS OF THE WALNUT CREEK BASIN, DES MOINES METROPOLITAN AREA, IOWA,
Geological Survey, Iowa City, IA. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-10633

A PROGRESS REPORT ON ESTUARY MODELING BY THE FINITE-ELEMENT METHOD,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2L.
W78-10648

CALIBRATION AND SENSITIVITY ANALYSIS OF THE CONTINUOUS RUNOFF SIMULATION MODEL 'STORM',
Purdue Univ., Lafayette, IN. Water Resources Research Center.
J. Luc Sautier, and J. W. Delleur.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 818, Price codes: A05 in paper copy, A01 in microfiche. Report No. 103, May 1978. 67 p, 33 fig, 5 tab, 4 ref, 2 append. OWRT B-083-IND(5) and C-6106(No. 5213)(3).

Descriptors: *Rainfall-runoff relationships, *Urban hydrology, *Storm runoff, Urban drainage, Hydrologic models, Computer models, *Model studies, *STORM, Urban runoff model.

The hourly continuous runoff simulation model 'STORM' provides a substantial improvement over the elementary rainfall-runoff transformations without being so sophisticated as to become cumbersome. Using the composite runoff coefficient method in an urban watershed and the Soil Conservation Service method for the pervious areas in a semi-urban watershed, a methodology is developed to calibrate the parameters characterizing the equations relating to each of these methods. A sensitivity analysis of the model is done around the calibration values of the parameters. In an urban area, the runoff coefficient for impervious surfaces is a decisive parameter. The relative error in the runoff is of the same magnitude as the relative error in the parameter. In semi-urban areas the decisive parameter is the maximum soil moisture retention capacity. The two methods of analysis show that the yearly total amount of runoff, the total amounts by storm events and the peaks by event are all good and stable estimates. The choice of the method depends on the percent of imperviousness. (Wiersma-Purdue)
W78-11060

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME IV, TURBULENT ENERGY COMPUTATION,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 2L.
W78-11209

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME V, TURBULENT ENERGY PROGRAM,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 2L.
W78-11210

2B. Precipitation

CHARACTERISTICS OF PRECIPITATION DURING MONSOON SEASON IN KHUMBU HIMAL,
Nagoya Univ. (Japan). Water Research Inst.
Y. Ageta.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 84-88, 1976. 7 fig, 6 ref.

Descriptors: *Precipitation(Atmospheric), *Mountains, *Asia, On-site investigations, Monsoons, Spatial distribution, Temporal distribution, Rainfall, Snowfall, Glaciers, Watersheds(Basins), Orography, Seasonal, Meteorology, Climatology, Foreign countries, Foreign research, *Himalaya Mountains, *Nepal, *Kkumbu Region(Nepal).

During the monsoon season, when most of the annual precipitation concentrates in the Nepal Himalayas, precipitation was measured at 50 points in the Imja river catchment. Meteorological observations were made at a small glacier near a ridge and at Lhajung near the bottom of the valley for the comparison of the orographic effect between the two points. It was found from these obserservations that while monsoon activity from the southern foot of the Himalayas decreased approaching the interior of the main range of the Himalayas, precipitation increased at some of the higher places in the interior of the range. Precipitation occurred mainly in the daytime around the ridge but in the nighttime around the bottom of the valley. These characteristics are explained by the simplified pattern of diurnal variation of clouds caused by the local circulation associated with orographic convection. It also was found that precipitation was more in the drainage on the left side of the upper wind than in the neighboring windward drainage. Observational results of the phase (solid or liquid) of summer precipitation on the glacier were presented. (Sims-ISWS)
W78-10510

SNOW CRYSTALS OBSERVED AT LHAJUNG STATION IN KHUMBU REGION,
Nagoya Univ. (Japan). Water Research Inst.
For primary bibliographic entry see Field 2C.
W78-10511

CLIMATE OF HIDDEN VALLEY MUKUT HIMAL DURING THE MONSOON IN 1974,
Meteorological Service, Kathmandu (Nepal). Dept. of Irrigation, Hydrology and Meteorology.
M. L. Shrestha, Y. Fujii, and M. Nakawo.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol. 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 105-108, 1976. 5 fig.

Descriptors: *Monsoons, *Climatic data, *Mountains, *Asia, Temperature, Air temperature, Precipitation(Atmospheric), Snowfall, Rainfall, Evaporation, Winds, Pressure, Atmospheric pressure, Climatology, Meteorology, Foreign countries, Foreign research, *Himalaya Mountains, *Nepal, *Mukut Himal(Nepal), *Hidden Valley(Nepal).

For the purpose of understanding climate of the glacier area of the northern side of the Himalayan range, a temporary station was set up at a height of 5,055 m in Hidden Valley, Mukut Himal, during the monsoon season of 1974. The temperature pattern, especially the trend of minimum temperature and the diurnal temperature range, seems to reflect the monsoonal character and to represent the temperature pattern effect better than the precipitation pattern. At the beginning and the end of the observation period, a rapid change of minimum temperature and a large temperature range were recorded, as opposed to the stationary trend of mean temperature from the middle of July to the middle of August, which seems to be the monsoon season in Hidden Valley. At the station, most of the precipitation was in the form of rain and rain-snow mixed. Nocturnal precipitation was more than daytime precipitation, which was less than 5 mm. The daily mean of evaporation slightly exceeded the daily mean of precipitation even in the monsoon period. The diurnal variation of atmosphere pressure shows two maxima and two minima. (Sims-ISWS)
W78-10512

AN INEXPENSIVE PRECIPITATION GAUGE,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 7B.
W78-10523

THE POTENTIAL PRIMARY PRODUCTIVITY OF PENINSULAR MALAYSIA,
Guelph Univ. (Ontario), Dept of Geography.
For primary bibliographic entry see Field 2D.
W78-10650

PROBABLE MAXIMUM PRECIPITATION ESTIMATES, COLORADO RIVER AND GREAT BASIN DRAINAGES,
National Weather Service, Silver Spring, MD. Office of Hydrology.
E. M. Hansen, F. K. Schwarz, and J. T. Riedel.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Hydrometeorological Report No. 49, Sept. 1977. 173 p, 84 fig, 31 tab, 66 ref.

Descriptors: *Precipitation(Atmospheric), *Storms, *Colorado River, *California, *Great Basin, *Arizona, Hydrology, Estimating, Meteorology, Isohyets, Orography, Meteorological data, *Precipitation estimates, *Maximum probable precipitation, Orographic effects, Isohyetal patterns, Duration, Local storms, Rainfall observations, General storms, Convergence.

General storm probable maximum precipitation (PMP) estimates for durations from 6 to 72 hours and for area sizes between 10 and 5000 sq mi (26 and 12,950 sq km), were given for locations in the Colorado River and Great Basin drainages. Total PMP was determined as the sum of convergence and orographic PMP components. Estimates were given for each month. Estimates for local storm PMP also were provided, and the estimates were good for all of California. The estimates covered durations between 15 min and 6 h, and drainage areas between 1 and 500 sq mi (2.6 and 1,295 sq km). Local storm PMP was applicable to the warm season between May and October. Comparisons were given between PMP estimates and the greatest observed rainfalls of record, 100-year frequency rainfall, and statistically derived PMP. A step-by-step outline of the procedure for computing PMP estimates was presented with examples for both the general and local storm. (Roberts-ISWS)
W78-10925

COMPRESSED AIR SEEDING OF SUPERCOOLED FOG,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 3B.
W78-10931

RELATIONSHIP BETWEEN LAKE-INDUCED DISTURBANCES AND SYNOPTIC CIRCULATION,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2H.
W78-10938

LOCALLY HEAVY SNOW DOWNWIND FROM COOLING TOWERS,
National Weather Service Forecasting Office, Charleston, WV.
For primary bibliographic entry see Field 4C.
W78-10942

CLIMATIC VARIATIONS IN THE SAHEL AND OTHER AFRICAN REGIONS DURING THE PAST FIVE CENTURIES,
National Center for Atmospheric Research, Boulder, CO. Advanced Study Program.
S. E. Nicholson.
Journal of Arid Environments, Vol. 1, No. 1, 1978, p. 3-24. 17 fig, 29 ref.

Descriptors: *Climatology, *Droughts, Geologic history, Palynology, Dendrochronology, Weather patterns, *History, *Sahel, *Africa, Fluctuations, Variability, *Arid lands.

The 1968-1973 drought in the African Sahel has generated much speculation concerning climatic fluctuations and trends on the African continent. This study reviews African climatic chronology for the past 5 centuries in an effort to analyze current ideas. Proxy data is used in reconstructing past environments which were determined by climatic elements, especially precipitation. Some of the techniques used were geologic and palynologic studies of lake-level variations, changes in stream regimes and deposits, tree rings and historical and geographical sources such as archives, chronicles, travel journals and colonial weather observations. Results of this extensive and interdisciplinary investigation indicated that the Sahel was significantly wetter from the 16th through the 18th centuries. Several severe droughts are evident begining at 1680, although general trends indicate a humid condition unitl late in the 18th century. After this date, however, the Sahel began to develop its present arid climate, interrupted only in the late 19th century by a period of increased rainfall. This survey illustrates the complex historical development of the Sahelian climate and its bearing upon present fluctuations. (Tickes-Arizona).
W78-10967

RAINFALL, DROUGHT AND THE SOLAR CYCLE,
Haile Sellassie I Univ., Addis Ababa (Ethiopia). Geophysical Observatory.
C. A. Wood, and R. R. Lovett.
Nature, Oct. 18, 1974, Vol. 25, No 5476, p 594-596. 3 fig.

Descriptors: *Droughts, *Hydrologic cycle, *Warning systems, Climatology, Meteorology, Precipitation(Atmospheric), India, Sahelian zone, Ethiopia, Climatic zones, Forecasting, Tropic regions.

The mid-1970s drought that devastated the Sahel, India, and Ethiopia has been explained elsewhere by Winstanly and Lamb who suggest that a slowly changing atmosphere is resulting in a equator-ward shift of the principal climatic belts. These shifts, thought to be part of a 200-year cycle, could make severe droughts more commonplace during the next 60 years. In Addis Ababa, however, the 11-year solar cycle seems to have more effect upon rainfall variation than these long term cycles. When applying this rainfall/sunspot cycle relationship to the Sahel, India, and other drought-afflicted areas of Africa, there are locations where the relationship is positive and locations where it is negative. If data from other areas substantiate this relationship, they could provide an important warning during drouht danger periods. (Tickes-Arizona).
W78-10972

CATTLE, RAINFALL AND TSETSE IN AFRICA,
Oxford Univ. (England). Animal Ecology Research Group.
For primary bibliographic entry see Field 5G.
W78-10975

CENTENNIAL VARIATIONS OF GENERAL CIRCULATION AND THEIR RELATION TO DROUGHT IN NORTHERN MEXICO (VARIACIONES SECULARES DE LA CIRCULACION GENERAL Y SU RELACION CON LA SEQUIA DEL NORTE DE MEXICO),
D. Klaus, and O. E. Jauregui.
Recursos Hidraulicos, Vol. 4, No. 4, 1975, p 580-593. 12 fig, 20 ref.

Descriptors: *Atmosphere, *Air circulation, *Droughts, Climatology, Precipitation(Atmospheric), Mexico, Intertropical convergence zone, Tropic, *Climatic zones.

Alterations of general atmospheric circulation may be responsible for decreased summer rains in areas of northern Mexico. Zonal circulation predominated until the 1930's, characterized by western currents at 500mb upon which planetary waves of reduced amplitude travelled. A meridional circulation has prevailed since the thrities, displacing climatic zones toward the south. Displacement of the Intertropical Convergence Zone (ITC) toward the equator has resulted in a 50-60% reduction of precipitation in the exterior limits of the tropics. The recent droughts in the Sahel, in northern India, and in northern Mexico are a consequence of narrowed seasonal migrations of the Intertropical Convergence Zone. Precipitation will continue to be reduced during the next 50 years, in accordance with the existence of 200 year cycles in which zonal circulation alternates with meridional circulation. (Russell-Arizona).
W78-10977

DROUGHT AND THE NIGERIAN FARMER,
Ibadan Univ. (Nigeria). Dept. of Geography.
J. Oguntoyinbo, and P. Richards.
Journal of Arid Environments, Vol. 1, No. 2, June, 1978, p 165-194, 19 tab, 8 fig, 31 ref.

Descriptors: *Droughts, *Agroclimatology, Meteorology, Weather, Planning, Water resources development, Projections, Forecasting, Census, Social impact, Estimated benefits, *Nigeria.

The importance of agro-meteorological research and advisory services to the farmers in the arid and semi-arid regions of Africa is presented here. Lack of data, personnel and proper communication channels are documented as major barriers to effective planning and prediction. Data for this study were obtained from interviews with approximately 30 farmers each in a number of selected localities from the Sahel savanna zone to the northern, drier part of the forest zone. The objective of this study was to compile a general picture of how Nigerian farmers saw and responded to the 1973 drought. Results indicated that drought in Nigeria has a longer history and more extensive geographical, social, and economic impact than before realized. Additionally it was found that while farmers are limited in their understanding of climatic origins of drought they are competent observers of climatic phenomena and possess an extensive and rational cultural apparatus of weather lore to help them adjust to it. These authors recommend the active involvement of the Nigerian farmers in agro-meteorological work, especially in the process of determining research and planning priorities. (Tickes-Arizona).
W78-10979

PROBABLE MAXIMUM RAINFALL FOR CONDITIONS OF IRAQ,
Ministry of Irrigation, Bagdad (Iraq).
F. Y. El Yussif.
Irrigation and Power, Vol 33, No 4, Oct 1976, p 529-39. 7 tab, 16 fig, 15 ref.

Descriptors: *Iraq, *Probable maximum precipitation, *Time series analysis, Depth-area-duration analysis, Water management(Applied), Forecasting, Planning, On-site data collections, Hydrologic data, Measurement, Rainfall intensity.

Increased demands upon a limited water supply have caused a vital problem in the largely arid country of Iraq. Designers and planners have been greatly hindered by a lack of adequate data in their attempts to manage the country's water resources. This paper presents an analysis of the limited data collected at 6 sites for 20 years (1955-1975) in an attempt to illustrate the vital role of data collection in making intelligent decisions about water management. Accumulated and average yearly rainfall measurements for the 20-year period, collected at Bakraju, Mosul, Baghdad, Basrah, Hit, and Rutba, are given. Yearly ranges were found to be greatly irregular with maximum ranges from 1.68 to 2.17 and minimum ranges from .15 to .57. Statistical methods were applied to determine coefficients of variation of .54 in the arid regions and .28 in the more humid regions. Probable maximum rainfall for 100 years and 1000 years are presented. These authors recommend the establishment of more data collection points throughout the country, as well as an increase in the scope of data collected, i.e. frequency and intensity duration characteristics. (Tickes-Arizona)
W78-10980

SEDIMENT YIELD AS A FUNCTION OF CLIMATE IN UNITED STATES RIVERS,
For primary bibliographic entry see Field 2J.
W78-11122

ATMOSPHERIC BULK PRECIPITATION IN THE LAKE ERIE BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-11195

CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART A. EARTH SCIENCE IN CLIMATE RESEARCH.
Geological Survey, Menlo Park, CA. Geologic Div.
Available from the Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA, 22202. Circular 776-A, 1978. 15 p. Smith, G. I., Editor.

Descriptors: *Climates, *Effects, *Water resources, *Land use, *United States, Coordination, Organizations, Planning, Conferences, Projects, Climatology, Precipitation(Atmospheric), Storms, Floods, Droughts, Winds, Temperature, Topography, Humidity, Erosion, Mudflows, Landslides, Avalanches, Hurricanes, U.S. Geological Survey, Geologic division, Water resources division, Office of Land Information and Analysis.

To better coordinate information being generated by the U.S. Geological Survey, a workshop was convened near Denver, Colo., on December 7-9, 1976, to exchange ideas about research that is oriented toward climate, climate variation, and the effects of climate on the Nation's land and water resources. This is the first circular of a three-part report resulting from that workshop. Hydrologic records provide information to the earth scientist about the responses of ground water, surface water, and glaciers to climatic change; geologic sequences provide evidence of earth-surface water, and glaciers to climatic change; geologic sequences provide evidence of earth-surface

responses to climatic change; biological records yield information about the effects of climatic change on the Earth's biota; archeological records tell us where and how man was able to live under changing climatic conditions; and historical records allow the specific effects of short-term changes in climate to be accurately documented. The interrelation between present and past geologic environments, various methods of study, and the span of time over which the results can be applied are shown in a table. (Woodard-USGS)
W78-11263

CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART B. CURRENT RESEARCH BY THE GEOLOGICAL SURVEY.
Geological Survey, Menlo Park, CA. Geologic Div.
Available from the Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202. Circular 776-B, 1978. 52 p. Smith, G. I., Editor.

Descriptors: *Climates, *Effects, *Water resources, *Land use, *United States, Coordination, Organizations, Planning, Conferences, Projects, Climatology, Precipitation(Atmospheric), Storms, Floods, Droughts, Winds, Temperature, Topography, Humidity, Erosion, Mudflows, Landslides, Avalanches, Hurricanes, U.S. Geological Survey, Geologic Division, Water Resources Division, Office of Land Information Analysis.

To better coordinate information being generated by the U.S. Geological Survey, a workshop was convened near Denver, Colo., on December 7-9, 1976, to exchange ideas about research that is oriented toward climate, climate variation, and the effects of climate on the Nation's land and water resources. This is the second circular of a three-part report resulting from that workshop. This circular presents a summary of the types of work in progress in the Geological Survey and gives brief examples of the rationale and results of about 50 selected efforts. Many of these efforts are described in detail by one or more of the several hundred technical publications by Survey authors listed at the end of this report. The studies that are related to climate are divided into five categories: I. present climate-related processes and indices that provide baseline data for climatic interpretation; II. geologically short-term changes in climate; III. geologically longer term climate changes; IV. the areal distributions of past climates, and V. dating and correlation methods. (Woodard-USGS)
W78-11264

CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART C. GEOLOGICAL SURVEY CLIMATE PLAN.
Geological Survey, Menlo Park, CA. Geologic Div.
Available from the Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202, Circular 776-C, 1978. 15 p. Howard, K. A., and Smith, G. I., Editors.

Descriptors: *Climates, *Effects, *Water resources, *Land use, *United States, Coordination, Organizations, Planning, Conferences, Projects, Climatology, Precipitation(Atmospheric), Storms, Floods, Droughts, Winds, Temperature, Topography, Humidity, Erosion, Mudflows, Landslides, Avalanches, Hurricanes, U.S. Geological Survey, Geologic Division, Water Resources Division, Office of Land Information and Analysis.

To better coordinate information being generated by the U.S. Geological Survey, a workshop was convened near Denver, Colo., on December 7-9, 1976, to exchange ideas about research that is oriented toward climate, climate variation, and the effects of climate on the Nation's land and water resources. This is the third circular of a three-part report resulting from that workshop. This circular presents a summary of the workshop including an organization chart of the U.S. Geological Survey highlighting the three active participating units of the Survey: the Geological Division, Water Resources Division, and Office of Land Information and Analysis. An interdivision committee under the lead of the Geologic Division's Office of Environmental Geology is established to ensure coordination of current and future climate-related research within the agency. (Woodard-USGS)
W78-11265

2C. Snow, Ice, and Frost

FLIGHT OBSERVATIONS FOR THE INVENTORY OF GLACIERS IN THE NEPAL HIMALAYAS,
Nagoya Univ. (Japan). Water Research Inst.
K. Higuchi, T. Iozawa, and H. Higuchi.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 6-9, 1976. 3 fig, 1 tab, 2 ref.

Descriptors: *Glaciers, *Remote sensing, *Aerial photography, Aircraft, Surveys, Photography, Mountains, Ice, Foreign countries, Foreign research, Snow, Glaciology, *Himalaya Mountains, *Nepal, *Khumbu Region.

Air flights for photographing glaciers in Nepal Himalayas were carried out 8 times during the period from 1970 to 1975. The oblique aerial photographs of glaciers in the Khumbu region taken by these flights will be of aid when the glacier inventory by Muler and the maps hitherto published are compared, as a first step in the inventory study of glaciers in this region. (Sims-ISWS)
W78-10502

ON THE TYPES OF GLACIERS IN THE NEPAL HIMALAYAS AND THEIR CHARACTERISTICS,
Nagoya Univ. (Japan). Water Research Inst.
O. Watanabe.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 10-16, 1976. 5 fig, 2 tab, 3 ref.

Descriptors: *Glaciers, *Classification, *Mountains, Ice, Snow, Foreign countries, Foreign research, Surveys, Data processing, Analytical techniques, Glaciology, *Glacier types, *Himalaya Mountains, *Nepal.

The glaciers in the Nepal Himalayas were classified into two types, 'Nepal type glaciers' and 'Tibet type glaciers'. The lowest elevation of the glaciers of the first type is lower than that of the second type. The length of the glaciers of the first type is longer than that of the second type. For both types, it was found that the length of glaciers in the Nepal Himalayas is longer in eastern Nepal than in western Nepal. (Sims-ISWS)
W78-10503

MASS BALANCE STUDIES OF THE GLACIERS IN HIDDEN VALLEY, MUKUT HIMAL,
Nagoya Univ. (Japan). Water Research Inst.
Y. Fujii, M. Nakawo, and M. L. Shrestha.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 17-21, 1976. 4 fig, 5 ref.

Descriptors: *Glaciers, *Ablation, *Surveys, On-site investigations, Mountains, Ice, Snow, Precipitation(Atmospheric), Melting, Foreign research, Freezing, Melt water, Glaciology, *Himalaya Mountains, Mass balance, Accumulation.

Accumulation and ablation measurements and stratigraphic studies were carried out on the Rikha Samba Glacier and Glacier G 3 in Hidden Valley, Mukut Himal, during the monsoon season of 1974. The summer balance over the whole area of the Rikha Samba Glacier was slightly positive. The winter snow layer observed as a dirt layer in a pit was so thin that the summer blance approximated the net balance. The total amount of precipitation over the area above the firn line in the glacier basin was very close to the summer balance over the accumulation area. The change from snow to ice occurred due to the formation of columnar ice with parallel projections to the surface in firn by the daily melting-refreezing cycle. (Sims-ISWS)
W78-10504

WATER DISCHARGE OF IMJA KHOLA IN KHUMBU HIMAL,
Nagoya Univ. (Japan). Water Research, Inst.
K. Higuchi, Y. Ageta, and H. Kodama.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University, Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 22-26, 1976. 5 fig, 4 ref.

Descriptors: *Glaciers, *Discharge(Water), *Runoff, Mountains, Gaging stations, Watersheds(Basins), Rivers, Water levels, Melt water, Temperature, Air temperature, Monsoons, Precipitation(Atmospheric), Variability, Seasonal, Diurnal, Snow, Ice, Glaciology, *Imja Khola(Nepal), *Nepal, *Himalaya Mountains.

Observations of water discharge from a drainage area of 142.5 sq km including glacier zones were made at Dingboche (4330 m) in east Nepal. The annual discharge of this drainage was estimated as 1.7 x 10 to the 8th power cu m. The annual variation of the discharge showed a tendency to increase in summer and decrease in winter. It was assumed that precipitation during the monsoon season strongly contributes to high discharge in summer. On the basis of the data of ablation of glaciers and precipitation in this region, preliminary estimates of water balance in the drainage during a year were made. Since the variation of daily mean air temperature at Lhajung near Dingboche had a good correlation with the variation of daily discharge in summer but not in winter, the contribution of melt water from glaciers to the variation of the discharge also was discussed on the basis of the air temperature over glaciers estimated from the monthly mean temperature at Lhahung. Diurnal variations of the discharge in different months showed periodic tendencies which might be due to the diurnal variations at discharge of melt water from glaciers. The seasonal change of this tendency can be explained by the change of air temperature. Monthly discharge in depth of runoff from this drainage was compared with that at a point 460 m in altitude in the lower part of this drainage. The latter was nearly twice as much as the former during the monsoon season since precipitation in the upper drainage during the monsoon season is less than below. (Sims-ISWS)
W78-10505

WATER DISCHARGE OF RIKHA SAMBA KHOLA IN HIDDEN VALLEY, MUKUT HIMAL,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
M. Nakawo, Y. Fujii, and M. L. Shreshtha.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 27-30, 1976. 7 fig, 1 ref.

Descriptors: *Glaciers, *Discharge(Water), *Runoff, Mountains, Gaging stations, Rivers, Watersheds(Basins), Monsoons, Precipitation(Atmospheric), Temperature, Water temperature, Melt water, Suspended solids, Variability, Diurnal, Seasonal, Solar radiation, Snow, Ice, Glaciology, *Himalaya Mountains, *Nepal, *Rikha Samba Khola(Nepal).

The water level of Rikha Samba Khola in Hidden Valley, Mukut Himal, was measured from July 16 to September 7, 1974. The discharge was estimated on the basis of a stage-discharge curve, giving a gradual decrease during the observational period. The amount of the suspended materials in the river was measured after sampling the river water at the sample place during the monsoon season of 1974. The amount also decreased gradually during this period. The daily variation of discharge and the amount of suspended materials shows a maximum around 1400 NST (Nepal Standard Time). (Sims-ISWS)
W78-10506

THE FLOW OF GLACIERS IN THE KHUMBA REGION,
Nagoya Univ. (Japan). Water Research Inst.
H. Kodama, and S. Mae.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 31-36, 1976. 3 fig, 3 tab, 9 ref.

Descriptors: *Glaciers, *Flow, *Movement, On-site investigations, Ablation, Melt water, Discharge(Water), Measurement, Variability, Seasonal, Glaciology, Foreign countries, Foreign research, *Glacier flow, *Himalaya Mountains, *Nepal, *Khumbu Region(Nepal).

The results of measurements of the surface velocity of the glaciers in the Khumbu region showed that the surface velocity underwent a seasonal variation in the upper parts of the ablation area of the Khumbu and the Nuptse glaciers, that is, the velocity from May to August was higher than that of the rest of the year. It was found that the surface of the Kongma Glacier moved upward, and this strange motion of the ice was discussed. The thickness of the Khumbu and the Nuptse glaciers was estimated using the theory of glacier flow to be 110 m and 70 m, respectively. The discharge of the Khumbu Glacier also was estimated to be 7.5, 3.4, 1.6 and approximately 0 million tons/year at the elevations of 5340 m, 5280 m, 5140 m, and 4960 m, respectively. Using these values and measured ablation rate, the increasing rate of the thickness of the Khumbu Glacier was obtained as follows, 1 m/year between 5340 m and 5280 m, 0.3 m/year between 5280 m and 5140 m, and -1.5 m/year between 5140 m and 4960 m. These results indicated that the Khumbu Glacier was not in equilibrium. (Sims-ISWS)
W78-10507

ICE TEMPERATURE OF KHUMBU GLACIER,
Nagoya Univ. (Japan). Water Research Inst.
S. Mae.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 37-38, 1976. 3 ref.

Descriptors: *Glaciers, *Temperature, *Boreholes, Borehole geophysics, Ice, Measurement, Ablation, Spatial distribution, Drill holes, Drilling, Foreign countries, Foreign research, Glaciology, *Glacier temperatures, *Khumbu Glacier(Nepal), *Nepal, *Himalaya Mountains.

Thermal drilling was carried out in August 1974 on the Khumbu glacier. The drilling site was set at 5,360 m above sea level in the upper part of the ablation area of the glacier. The drilling was stopped due to the freezing of the drilled hole at a depth of 20.3 m. The analysis of the relationship between the depth and the time of drilling indicated that there 7 layers down to the maximum depth reached and there was a possibility that the deepest layer was at the melting point. A simple calculation of the freezing rate of the drilled hole showed that the ice temperature at a depth of 2 m was below -2C at the driling time. The measurement of the resistance of a thermistor put into the hole showed that the ice temperature at a depth of 2.7 m was -5.3C at the end of November. Therefore, it was concluded that the ice temperature above the deepest layer (its depth was 16 m) was below the melting point, but it was at the melting point below the layer. This conclusion was supported by the analysis of the flow velocity of the glacier. (Sims-ISWS)
W78-10508

FLOW OF GLACIERS IN HIDDEN VALLEY, MUKUT HIMAL,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
M. Nakawa, Y. Fujii, and M. L. Shrestha.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 39-43, 1976. 6 fig, 1 tab, 5 ref.

Descriptors: *Glaciers, *Movement, *Flow, On-site investigations, Measurement, Ablation, Snow, Ice, Glaciology, Foreign countries, Foreign research, *Glacier flow, *Himalaya Mountains, *Nepal, *Hidden Valley(Nepal).

Surface flow velocities of three glaciers in Hidden Valley, Nepal, were measured from the end of July to the end of August 1974. The Rikha Samba glacier, the largest one, moved 1-2 m/month, and an unnamed glacier near Tukche Peak, the only debris-covered type glacier, showed movements of 0-0.5 m/month. But no movement was observed at all on a glacier-like ice mass close to the Rikha Samba glacier. (Sims-ISWS)
W78-10509

CHARACTERISTICS OF PRECIPITATION DURING MONSOON SEASON IN KHUMBU HIMAL,
Nagoya Univ. (Japan). Water Research Inst.
For primary bibliographic entry see Field 2B.
W78-10510

SNOW CRYSTALS OBSERVED AT LHAJUNG STATION IN KHUMBU REGION,
Nagoya Univ. (Japan). Water Research Inst.
K. Higuchi.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol. 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 93-101, 1976. 9 fig, 18 ref.

Descriptors: *Snow, *Crystals, *Precipitation(Atmospheric), *Asia, Snowfall, Particle shape, Particle size, Sampling, Graupel, Rime, Cloud physics, Meteorology, Foreign countries, Foreign research, *Himalaya Mountains, *Nepal, *Khumbu Region(Nepal).

The shape and size of snow crystals were recorded by making plastic replicas of them during the snowfall on 1, and 2 January, 1975, at Lhajung (4,420 m) in Khumbu region. It was found by observation of the photomicrographs of the replicas that the shapes of snow crystals during the period from 1900 to 2100 NST (Nepal Standard Time) 1 January were hexagonal plates, thick plates of skelton form, plates with simple extension, plates with dendritic extension, crystals with sector-like branches, crystals with broad branches, dendritic crystals with plates at ends, hollow columns with plates, side planes, and graupel. The meteorological conditions in the precipitating clouds were estimated on the basis of the observations of snow crystals. During the period from 0750 to 0935 NST, 2 January, graupel, graupel-like snow of hexagonal type, and rimed crystals were observed. (Sims-ISWS)
W78-10511

PERIGLACIAL PHENOMENA IN HIDDEN VALLEY, MUKUT HIMAL,
Nagoya Univ. (Japan). Water Research Inst.
Y. Fujii.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol. 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 120-124, 1976. 7 fig, 1 tab, 6 ref.

Descriptors: *Glaciers, *Permafrost, *Geormorphology, Mountains, Ice, Solifluction, Frost, Soils, Rocks, Geology, Foreign countries, Foreign research, *Periglacial landforms, *Hidden Valley(Nepal), *Mukut Himal(Nepal), *Nepal, *Himalaya Mountains.

Periglacial landforms occur in the altitudinal range between the forest line and snow line in Hidden Valley and its southern outer slope. Since most of Hidden Valley is situated above the vegetation limit, sorted patterned ground and solifluction slopes cover vast areas, but vegetated patterned ground, such as earth hummocks and turf-banked terraces, is found only along the streams drained from glaciers. The occurrences of large sorted polygons and solifluction lobes are likely to be associated with the existence of permafrost. The occurrences of large sorted stripes on the supraglacial moraine seem to indicate that the glacier ice is stagnant in this part. The stripe pattern of small sorted stripes observed at 5,630 m starts to become clear on gradients of more than 5 deg and is still clear on gradients of 40 deg. The rate of mass movement was proportional to the square root of the gradient of the slope and ranged from 0.4 cm/day (150 cm/year) to 0.8 cm/day, greater with one or two digits than those previously reported. Such a high rate seems to be induced by both solifluction and frost creep and is intensified by soaked and loose states above permafrost table and by a steep slope angle. (Sims-ISWS)
W78-10513

GROUND TEMPERATURE AND ITS RELATION TO PERMAFROST OCCURRENCES IN THE KHUMBU REGION AND HIDDEN VALLEY,
Nagoya Univ. (Japan). Water Research Inst.
Y. Fujii, and K. Higuchi.
In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol. 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 125-128, 1976. 5 fig, 12 ref.

Descriptors: *Permafrost, *Temperature, *Frozen ground, *Asia, Mountains, Frozen soils, Soils, Frost, Glaciers, On-site investigations, Foreign countries, Foreign research, *Himalaya Mountains, *Hidden Valley(Nepal), *Khumbu Region(Nepal), *Mukut Himal(Nepal), *Nepal.

In order to detect the existence of permafrost and to study its relation to ground temperature distribution in high altitude of the Himalayas, ground temperature measurements were carried out in the Khumbu region and Hidden Valley, Mukut Himal. The results indicated that permafrost occurs above 4,900-5,000 m in the Khumbu region and above 5,000 m in Hidden Valley. The lapse rates of the ground temperature at a depth of 50 cm below the surface are about 0.9-1.0 deg C/100 m and about 0.4 deg C/100 m above and below the lower altitudinal limit of permafrost distribution in both regions. (Sims-ISWS)

W78-10514

INTERACTION BETWEEN BEDROCK AND PRECIPITATION AT TEMPERATURES CLOSE TO 0C,
Oslo Univ. (Norway). Dept. of Geology.
For primary bibliographic entry see Field 2K.
W78-10527

CENTRAL AVALANCHE HAZARD FORECASTING. PHASE 1 - FEASIBILITY STUDY.
Washington State Highway Commission, Olympia. Dept. of Highways.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 365, Price codes: A05 in paper copy, A01 in microfiche. Final Report, August 1975. 76 p, 1 fig, 2 tab, 11 ref, 1 append.

Descriptors: *Avalanches, *Hazards, *Highways, *Washington, Mountains, Snow, Snowfall, Snowpacks, Weather, Networks, Communication, Forecasting.

This report described the results of a feasibility study comprising Phase I of a Central Avalanche hazard Forecasting Program for mountain passes in the State of Washington. The report described existing weather and avalanche data sources, and it suggested improvements and additions for improved input to and feedback from a centralized avalanche forecaster's office which will improve avalanche predictions for all passes within the State. Washington State Department of Highways and consultant efforts and results during FY 75 were described, and specific recommendations for Phase II, implementation of avalanche hazard forecasting, were provided. An appendix contained a consultants' report that described a weather observation and reporting network for prediction of avalanche hazard conditions in the Cascade Mountains of Washington State. (Sims-ISWS)
W78-10536

WATER REDISTRIBUTION IN PARTIALLY FROZEN, SATURATED SILT UNDER SEVERAL TEMPERATURE GRADIENTS AND OVERBURDEN LOADS,
Guelph Univ. (Ontario). Dept. of Land Resources Science.
J. P. G. Loch, and B. D. Kay.
Soil Science Society of America Journal, Vol. 42, No. 3, p 400-406, May-June 1978. 7 fig, 2 tab, 17 ref.

Descriptors: *New Hampshire, *Freezing, *Soil water, *Crystal growth, *Frost heaving, *Cryogenics, Silts, Thermocline, Overburden, Ice, Saturated flow, Laboratory tests, Model studies, Theoretical analysis, Instrumentation, Gamma scanning system.

The flux of water and the resultant formation of discrete ice lenses were studied in samples of New Hampshire silt which were saturated and then frozen under different temperature gradients and overburden pressures. A dual energy gamma scanning system was employed to locate the position of the growing ice lens relative to the freezing front. Parameters controlling water flow and the location of the ice lenses were employed to evaluate theories that have been proposed to describe the mechanisms of ice lens formation. The capillary theory was employed to locate the freezing front. However, the ice lenses were found to be located 0.2-0.4 cm behind the freezing front, which is inconsistent with the location of the ice lenses predicted by the capillary theory. Neither the hydrodynamic theory nor the secondary frost heaving theory account for the redistribution of overburden pressure between soil particles, ice, and water. These theories cannot be employed to predict the location of the ice lens relative to the freezing front until overburden pressure effects are incorporated into the theory. (Visocky-ISWS)

W78-10919

AN INVESTIGATION OF CREEP INSTABILITY AS A MECHANISM FOR GLACIER SURGES,
Department of Energy, Mines and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
W. S. B. Paterson, U. Nitsan, and G. K. C. Clarke.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-UR-77-550, Price codes: A03 in paper copy, A01 in microfiche. Report LA-UR-77-550, Los Alamos Scientific Laboratory, New Mexico. 37 p, 5 fig, 5 tab, 28 ref. (1977).

Descriptors: *Glaciers, *Movement, *Model studies, Stability, Ablation, Ice, Mathematical models, Heat transfer, Strain, Temperature, Mechanics, Glaciology, Creep instability, Glacier surges.

Creep instability, the runaway increase of internal temperature and deformation rate, has been suggested as a possible cause of surges of cold glaciers. This was investigated by considering a simple slab model which includes the effect of ice advection normal to the surface. Whether a steady-state solution of the heat transfer equation exists depends on the value of a 'stability parameter' proportional to the ratio of the rate of deformational heat production to the rate at which this heat is conducted away. If the parameter exceeds a certain critical value, instability occurs; and basal ice eventually reaches melting point. The ice mass can then start to slide over its bed. If the stability parameter exceeds a second higher critical value, a layer of basal ice at melting point will form. The critical values depend on geothermal heat flux and strongly on advection. Upward advection, as in the ablation area, decreases stability, whereas downward advection (accumulation) increases it. On the other hand, if unstable conditions exist, as accumulation increases the growth rate of the instability while ablation decreases it. Calculations suggest that certain natural ice masses may be unstable. The time for the instability to develop, however, is of the order of 100 to 10,000 yr, whereas the residence time of the ice in many glaciers is less than 10,000 yr. Moreover, observed periodicities of glacier surges are between 10 and 100 yr. Thus it appears that creep instability cannot explain glacier surges. (Sims-ISWS)
W78-10941

LOW TEMPERATURE ADAPTED SUBMERSIBLE SPECTROPHOTOMETERS FOR USE IN FLOATING ICE RESEARCH,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2K.
W78-11190

2D. Evaporation and Transpiration

THE POTENTIAL PRIMARY PRODUCTIVITY OF PENINSULAR MALAYSIA,
Guelph Univ. (Ontario), Dept of Geography.
M. R. Moss.
Journal of Environmental Management, Vol 6, No 2, p 171-183, March 1978. 3 fig, 2 tab, 28 ref.

Descriptors: *Evapotranspiration, *Meteorological data, *Primary productivity, *Malaysian Peninsula, Environmental control, Climate, Hydrology, Planning, Ecology, Measurement, Moisture deficit, Agriculture, Land use, Equations, Mathematical models, Systems analysis.

The measurement of ecological primary productivity is an important indication of the potential agricultural productivity of a site. It is therefore particularly significant as a planning consideration in any developing area. For an evaluation of methods usable at a national scale, only 'indirect' methods using non-vegetational data can be used to bring out spatial variations. Here, evapotranspiration data are used in the calculation of primary productivity data for the Malay Peninsula. Three available models are tested and the results compared with known 'direct' measures of primary producivity. One of these models is seen to produce results compatible with known values. Correlation with other environmental factors is then sought and a relationship between decreasing primary productivity values and increasing elevation is found to be significant. The significance of these findings in the context of existing development schemes and practices is discussed. (Bell-Cornell)
W78-10650

EXTREME EVAPOTRANSPIRATION BY IRRIGATED ALFALFA: A CONSEQUENCE OF THE 1976 MIDWESTERN DROUGHT,
Nebraska Univ., Lincoln. Agricultural Meteorology Section.
N. J. Rosenberg, and S. B. Verma.
Journal of Applied Meteorology, Volume 17, No. 7, p 934-941, July 1978. 5 fig, 3 tab, 22 ref. NSF ATM-10000 A01.

Descriptors: *Evapotranspiration, *Alfalfa, *Central U.S., *Irrrigation, Irrigation wells, Irrigation water, Irrigation systems, Droughts, Lysimetes, Growth rates, Heat flow, Soils, *Irrigated alfalfa, *Midwestern drought, Precision weighing, Growing season, Latent heat flux, Soil heat flux density, Sensible heat advection, Net radiation.

The rate of evapotranspiration by irrigated alfalfa at Meade, Nebraska, reached record levels in 1976. Evapotranspiration was measured with precision weighing lysimeters in a field 1.9 ha in size. Evapotranspiration ranged during the growing season from 4.75 to 14.22 mm/day and exceeded 10 mm/day on 1/3 of the days studied. On each day of study, the ratio of latent heat flux density (LE) to the sum of the net radiation and soil flux densities (Rn+S) was such that LE/(Rn+S) was greater than 1, indicating the occurrence of significant sensible heat advection. On clear days during midsummer, the net radiation provided energy sufficient for evaporation of no more than 7 mm/day. Sensible heat advection provided the remaining energy consumed in evapotranspiration. The unusually strong sensible heat advection was due to the generally dry condition of surrounding regions during the drought of 1976. (Roberts-ISWS)
W78-10923

A PORTABLE CHAMBER FOR RAPID EVAPOTRANSPIRATION MEASUREMENTS ON FIELD PLOTS,
South Carolina Agricultural Experiment Station, Florence.
D. C. Reicosky, and D. B. Peters.
Agronomy Journal, Vol 69, No 4, p 729-732, July-August 1977. 4 fig, 6 ref.

Descriptors: Sampling, *Evapotranspiration, *Crop production, Scheduling, *Irrigation efficiency, Soil water, Soil moisture, Temperature, Measurement.

The increased importance of water-use efficiency in agricultural production has prompted the need for new techniques to measure evapotranspiration (ET) on field plots to evaluate the effects of new soil and water management practices on plant-water use and stress. This note describes the design and performance of an inexpensive, portable chamber for rapid field measurement of ET. This chamber was constructed from aluminum conduit covered with Mylar film and mounted on a farm tractor for portability. The air within the chamber was mixed constantly with four strategically located fans. The ET rate was calculated from the air and wet-bulb temperatures of a

thermistor psychrometer before the chamber was lowered on the plot and 1 minute later. The psychrometer's accuracy was checked by measuring the transpiration from a solution-absorbtion system that accurately measured the change in solution level using an LVDT-float system. When microlimatological conditions were changing slowly, transpiration was assumed to be equal to the absorption. The high correlation between measured absorption and transpiration rates indicated reasonable accuracy. The chamber's accuracy and rapidity of the measurement, portability, and relatively low cost makes it a useful tool in measuring ET under field conditions. (Skogerboe-Colorado State)
W78-11028

2E. Streamflow and Runoff

WATER DISCHARGE OF IMJA KHOLA IN KHUMBU HIMAL,
Nagoya Univ. (Japan). Water Research, Inst.
For primary bibliographic entry see Field 2C.
W78-10505

OPTIMAL IDENTIFICATION OF NONLINEAR SURFACE RUNOFF SYSTEMS WITH COPOSITIVITY THRESHOLD CONSTRAINTS,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Industrial and Management Engineering.
A. Boneh, and A. Golan.
Advances in Water Resources, Vol. 1, No. 3, p 121-129, March 1978. 4 fig, 2 tab, 11 ref.

Descriptors: *Runoff, *Illinois, *Watersheds(Basins), *Model studies, *Mathematical models, Precipitation(Atmospheric), Rainfall, Mathematics, Analytical techniques, Numerical analysis, Hydrology, Optimal identification, Copositivity threshold constraints.

The surface runoff system is often represented by a single-input, single-output model in which the rainfall excess x(t) is defined as the input function and the direct surface runoff y(t) is the output. The problem considered was the optimal identification of the system from given records of several independent storm events, each consisting of an input and the corresponding output function. The system was represented by a discrete-time, second-order Volterra series. The method was a point-by-point identification which can be extended to Volterra systems of order higher than a second order. The identified system was required to be conservative as in a previous work. In this study, the identified system further was required to be copositive. Therefore, the notion of copositivity was introduced, and an example of a watershed system in Southern Illinois was identified with variable copositivity threshold constraints. (Sims-ISWS)
W78-10515

ON THE SPREADING OF POWER PLANT COOLING WATER IN A TIDAL RIVER APPLIED TO THE RIVER ELBE,
Swedish Meteorological and Hydrological Inst., Norrkoping.
For primary bibliographic entry see Field 5B.
W78-10518

THE PHYSIOGRAPHIC INFLUENCE ON RECESSION RUNOFF IN SMALL NORWEGIAN RIVERS,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 4A.
W78-10528

LOW-FLOW FREQUENCY OF GEORGIA STREAMS,
Geological Survey, Doraville, GA. Water Resources Div.
R. F. Carter, and S. A. Putnam.
Water-Resources Investigations 77-127 (open-file report), January 1978. 104 p, 7 fig, 17 ref.

Descriptors: *Low flow, *Low flow frequency, *Streamflow, *Georgia, Streams, Base flow, Average flow, Droughts, Runoff, Data collections, Hydrologic data, Gaging stations.

Analyses of low-flow data and tabulation of computed low-flow frequency are presented for all stream sites in Georgia where suitable flow records have been collected. These include 147 continuous-record gaging stations and 102 partial-record gaging stations. Frequency records for gaging stations with short records have been adjusted where possible so as to more nearly represent results that would have been obtained from longer records. Areal variations in low-flow characteristics are indicated and the relationship of these characteristics to geology are discussed. Streamflow (per square mile of drainage area) during dry weather periods is generally greatest in the Blue Ridge province in the northern part of the State and in the upper zone of the Coastal Plain below the Fall Line. It is generally smallest in the lower zone of the Coastal Plain. Low streamflow in the Valley and Ridge and the Piedmont provinces is generally in an intermediate range. (Woodard-USGS)
W78-10623

FLOOD PROFILES FOR LOWER BROOKER CREEK, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. R. Murphy, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 955, Price codes: A03 in paper copy, A01 in microfiche.
Water-Resources Investigations 77-115, March 1978. 21 p, 5 fig, 4 tab, 17 ref.

Descriptors: *Flood profiles, *Peak discharge, *Flood recurrence interval, *Flood plains, *Flood plain zoning, Streamflow, Flow rates, *Florida, *Brooker Creek(Fla), Hillsborough County, Pinellas County, Step-backwater analysis.

Flood heights are computed for a range of recurrence intervals for a 12.6 mile reach of Brooker Creek, in west-central Florida, beginning at the mouth of Lake Tarpon. A U.S. Geological Survey step-backwater computer program, E431, was used in these analyses using (1) stream and valley cross-section geometry and roughness data, (2) recurrence interval flood-peak discharges, (3) recurrence interval starting elevations, and (4) gaging station stage-discharge relations. Flood heights may be plotted versus distance above stream mouth and connected to construct flood profiles. They also may be used to indicate areas of inundation on detailed topographic maps. (Woodard-USGS)
W78-10624

RAINFALL-RUNOFF DATA FOR SELECTED BASINS, PORTLAND, OREGON, AND VANCOUVER, WASHINGTON, 1973-77,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10631

FLOOD FREQUENCY ANALYSIS WITH A GENERALIZED SKEW COEFFICIENT,
Geological Survey, Reston, VA. Water Resources Div.
G. D. Tasker.
Water Resources Research, Vol 14, No 2, p 373-380, April 1978. 2 fig, 1 tab, 5 ref.

Descriptors: *Floods, *Peak discharge, *Flood frequency, *Frequency analysis, *Monte Carlo method, Analytical techniques, *Regional skew coefficient.

The Hydrology Committee of the Water Resources Council (1976) has recently issued guidelines for flood frequency analyses. One aspect of these guidelines concerns the estimate of skewness. Monte Carlo experiments are used to gain some insights into sensitivity of estimates of peak flows to errors in mapped skew coefficients. The optimum factor by which to weigh a sample skew coefficient and a generalized skew coefficient is a function of sample size, population skew coefficient, and map error. (Woodard-USGS)
W78-10639

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE LOWER WISCONSIN RIVER BASIN,
Geological Survey, Madison, WI. Water Resources Div.
W. A. Gebert.
Water-Resources Investigations 77-118 (open-file report), March 1978. 80 p, 6 fig, 2 plates, 3 tab, 14 ref.

Descriptors: *Low flow, *Streamflow, *Flow characteristics, *Low-flow frequency, *Wisconsin, Streamflow forecasting, Base flow, Analytical techniques, Regression analysis, Reliability, *Lower Wisconsin River basin(Wisc), 7-day 10-year low flow, Flow duration.

Low-flow characteristics of streams in the lower Wisconsin River basin are presented in a series of tables. Included are estimates of low-flow frequency and flow duration at a series of tables. Included are estimates of low-flow frequency and flow duration at 11 gaging stations; low-flow frequency characteristics at 26 low-flow partial-record stations and 70 miscellaneous sites; and a list of low-flow discharge measurements at 155 miscellaneous sites. Relations are provided to estimate low-flow characteristics at ungaged sites and at sites where one base-flow discharge measurement is available. The relationships were determined from multiple regression analyses that related the low-flow characteristics at gaging stations and low-flow partial-record stations to basin characteristics. The standard error of estimate is provided for each method of estimating the annual minimum 7-day mean flow below which the flow will fall on the average of once in 2 years and once in 10 years. Standard error provides the user with the expected degree of accuracy for each method. (Woodard-USGS)
W78-10643

CONVERGENCE OF FOUR-POINT IMPLICIT WATER WAVE MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. M. Ponce, H. Indlekofer, and D. B. Simons.
American Society of Civil Engineers, Journal of the Hydraulics Division, Vol. 104, No. HY7, Proceedings Paper 13890, p 947-958, July 1978. 3 fig, 11 ref, 3 append.

Descriptors: *Waves(Water), *Theoretical analysis, *Numerical analysis, Hydraulics, *Model studies, Unsteady flow, Continuity equation, Froude number, Stability, Methodology, Shallow water waves, Courant number, Convergence, Finite differences.

A comprehensive theoretical treatment of the convergence of the four-point implicit numerical model of shallow water waves was presented. The propagation celerity and attenuation factor of the numerical analog were derived, and convergence was tested by establishing the ratios of attenuation and translation given by the numerical and analytical solutions. Convergence was shown to be a function of the Froude number, the dimensionless

wave number, the Courant number, the spatial resolution, and the weighting factor of the scheme. (Singh-ISWS)
W78-10912

VARIED FLOW FUNCTIONS FOR CIRCULAR CHANNELS,
Newcastle-upon-Tyne. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-10913

MATHEMATICAL SIMULATION OF DAM-BREAK FLOW,
Ljubljana Univ. (Yugoslavia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-10914

CALIBRATION TECHNIQUE FOR 1-D UNSTEADY FLOW MODELS,
National Weather Service, Silver Spring, MD. Hydrologic Research Lab.
For primary bibliographic entry see Field 8B.
W78-10915

FLUID ROUTING BY CHARACTERISTIC METHODS,
Lanchester Polytechnic, Coventry (England). Dept. of Civil Engineering.
K. Sivaloganathan.
American Society of Civil Engineers Journal of the Hydraulics Division, Vol. 104, No. HY7, Proceedings Paper 13886, p 1075-1091, July 1978. 7 fig, 4 tab, 18 ref, 2 append.

Descriptors: *Flood routing, *Hydraulics, *Numerical analysis, *Storm drains, Computers, Methodology, Channel flow, Unsteady flow, Analytical techniques, Boundary processes, Hydrographs, *Method of characteristics, St. Venant equations.

A modified form of the rectangular grid characteristic method and the characteristic method of specified distances were detailed. Computed solutions by the two methods were compared for different types of boundary conditions. The two methods were found to yield solutions that agree closely in all situations. The characteristic method of specified distances was found to take less computing time than the rectangular grid characteristic method, while the latter method requires less storage and is easier to program. (Singh-ISWS)
W78-10918

LONGITUDINAL GRAIN SORTING BY CURRENT IN ALLUVIAL STREAMS,
Technical Univ. of Denmark, Lyngby.
For primary bibliographic entry see Field 2J.
W78-10924

LONG-TERM SURFACE-WATER SUPPLY AND STREAMFLOW TRENDS IN THE UPPER COLORADO RIVER BASIN,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
C. W. Stockton, and G. C. Jacoby, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 533, Price codes: A05 in paper copy, A01 in microfiche. Lake Powell Research Project Bulletin No. 18, Report NSF/RA-760410, March 1976. 79 p, 19 fig, 5 tab, 37 ref, 1 append.

Descriptors: *Streamflow, *Water supply, *Surface waters, *Colorado River Basin, Colorado River, *Dendrochronology, Rivers, Runoff, Watersheds(Basins), Drainage, River basins, River flow, Water resources, Trees, Growth rates, Climatology.

The long-term annual runoff was reconstructed for 12 selected streamgage stations within the Upper Colorado River Basin. These gaged records were analyzed to determine homogeneity, streamflow trends, and periodicities, and were compared to other records within the Basin. Three long-term reconstructed hydrographs for the total annual flow at the Colorado River Compact Point were calculated and compared. Records showed that the early part of the 20th century was one of anomalously persistent high runoff from the Colorado River Basin, and that it apparently was the greatest and longest high-flow period within the last 450 years. When the results of the analysis are viewed in the context of future demand for water usage in the Upper Colorado River Basin, it is apparent that projected demand could soon outstrip the natural annual supply of surface water. This situation probably would necessitate shifts in water use priorities, with current agricultural and recreational allotments being diverted to those needed to meet energy, municipal, and industrial demands. (Sims-ISWS)
W78-10940

DROUGHT AND THE NIGERIAN FARMER,
Ibadan Univ. (Nigeria). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W78-10979

STUDY TO DETERMINE DISCHARGE AT 50-PERCENT FLOW DURATION AND ORDINARY HIGH WATER FOR STREAMS IN LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
B. L. Neely, Jr.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225; Paper copy, $3.50; Microfiche, $.50 Open-file report 78-218, April 1978. 21 p, 2 fig, 1 tab.

Descriptors: *Flow duration, *Streamflow, *Estimating, *Methodology, *Louisiana, Gaging station, High water mark, Rainfall-runoff relationships, Drainage area, Channel morphology, Mannings equation, Roughness(Hydraulic).

Techniques are presented for estimating the discharge at 50-percent duration and 'ordinary high water' on ungaged streams in Louisiana that have drainage areas of less than 3,000 square miles. Discharge data from 91 gaging stations were used in developing the techniques. The discharge at 50-percent duration can be estimated if the drainage area size and mean annual precipitation are known. The 'ordinary high water' can be estimated if the drainage-area size, mean annual precipitation, channel cross section, channel slope, and Manning's roughness value are known. (Woodard-USGS)
W78-11260

FLOODS OF JUNE 4 AND 12, 1976, AT CULBERTSON, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
M. V. Johnson.
Open-file report 78-429, May 1978. 6 p, 1 plate, 1 tab, 6 ref.

Descriptors: *Floods, *Flood damage, *Flood data, *Peak discharge, *Rainfall-runoff relationships, Flood recurrence interval, Streamflow, Culverts, Dam failure, Montana, *Culbertson.

Runoff from rainfall caused flooding in the town of Culbertson, Montana, on June 4 and 12, 1976. Flood damage was mostly to business and residential structures within Culberston. Two small drainage contributed the peak flows, which at one site exceeded 1,200 cubic feet per second per square mile of contributing area. Flow from the Missouri River tributary No 5 at Culbertson consisted of flow through a pipe-arch at the State Highway 16 crossing and flow that overtopped the right bank of the main channel. Maximum combined pipe-arch and bypass flow for the June 12 flood was 1,30030 cubic feet per second. Flow from Diamond Creek consisted of flow through a culvert at the U.S. Highway 2 crossing west of Culbertson and flow that overtopped a road. Maximum combined culvert and bypass flow for the June 4 flood was 1,320 cubic feet per second. Failure of small dam increased the flow volume of the flood. (Woodard-USGS)
W78-11262

FLOOD INVESTIGATIONS IN NEVADA THROUGH 1977 WATER YEAR, PROGRESS REPORT 17,
Geological Survey, Carson City, NY. Water Resources Div.
O. Moosburner.
Open-file report 78-610, June 1978. 90 p, 2 fig, 5 ref, append.

Descriptors: *Streamflow, *Peak discharge, *Nevada, *Gaging stations, *Crest-stage gages, Floods, Annual peak discharge, Planning, Highways, Data collections, Hydrologic data.

This is the seventheenth progress report on streamflow prepared by the U.S. Geological Survey in cooperation with the Nevada Highway Department. The report consists primarily of the tabulation of the annual peak stage and discharge by water year for each crest-stage gage included in the program. Also included are crest-stage gage records obtained in cooperation with other agencies, a brief resume of program activities and plans for the future, selected flood data collected since the last progress report, and a compilation of peak discharge data obtained at ungaged sites and at gaged sites operated under other programs. (Woodard-USGS)
W78-11269

DISCHARGE, GAGE HEIGHT, AND ELEVATION OF 100-YEAR FLOODS IN THE HUDSON RIVER BASIN,
Geological Survey, Albany, NY. Water Resources Div.
R. J. Archer.
Open-file report 78-332, April 1978. 5 p, 1 plate, 1 tab, 2 ref.

Descriptors: *Flood discharge, *Flood frequency, *Hudson River, *New York, Gaging stations, Streamflow, Flood stages, Frequency analysis, Statistical methods, *Hudson River Basin.

The flood discharge that may be expected to be equaled or exceeded on the average of once in 100 years (100-year flood) was computed by the log-Pearson Type-III frequency relation for 72 stations in the Hudson River basin. These discharges and, where available, their corresponding gage height and elevation above mean sea level are presented in tabular form. A short explanation of computation methods is included. The data are to be used as part of a federally funded study of the water resources and related land resources of the Hudson River basin. (Woodard-USGS)
W78-11271

A SIMPLE-HARMONIC MODEL FOR DEPICTING THE ANNUAL CYCLE OF SEASONAL TEMPERATURES OF STREAMS,
Geological Survey, Lakewood, CO. Water Resources Div.
T. D. Steele.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Printed copy, $2.25; Microfiche, $3.50. Open-file report 78-155, March 1978. 16 p, 4 fig, 4 tab, 21 ref.

Descriptors: *Water temperature, *Streams, *Data collections, Networks, *Simulation analysis, Statistical methods, Computer models, Analytical technique, Computer programs, *Harmonic analysis.

Due to economic or operational constraints, stream-temperature records cannot always be collected at all sites where information is desired or at frequencies dictated by continuous or near-continuous surveillance requirements. For streams where only periodic measurements are made during the year, and that are not appreciably affected by regulation or by thermal loading, a simple harmonic function may adequately depict the annual seasonal cycle of stream temperature at any given site. Resultant harmonic coefficients obtained from available stream-temperature records may be used in the following ways: (1) To interpolate between discrete measurements by solving the harmonic function at specified times, thereby filling in estimates of stream-temperature values; (2) to characterize areal or regional patterns of natural stream-temperature values; (2) to characterize areal or regional patterns of natural stream-temperature conditions; and (3) to detect and to assess any significant at a site brought about by streamflow regulation or basin development. Moreover, less-than-daily or sampling frequencies at a given site may give estimates of annual variation of stream temperatures that are statistically comparable to estimates obtained from a daily or continuous sampling scheme. The latter procedure may result in potential savings of resources in network operations, with negligible loss in information on annual stream-temperature variations. (Woodard -USGS)
W78-11274

2F. Groundwater

A PERSPECTIVE ON NUMERICAL ANALYSIS OF THE DIFFUSION EQUATION,
California Univ., Berkeley. Lawrence Berkeley Lab., and California Univ., Berkeley. Dept. of Materials Science and Mineral Engineering.
T. N. Narasimhan.
Advances in Water Resources, Vol. 1, No. 3, p 147-155, March 1978. 6 fig, 14 ref.

Descriptors: *Groundwater movement, *Diffusion, *Model studies, *Mathematical models, Flow, Groundwater, Porous media, Mass transfer, Energy transfer, Finite element analysis, Equations, Mathematics, Hydrology, Galerkin functions.

The equation of transient groundwater motion is founded on the principle of mass conservation and can be described mathematically by the diffusion equation. Recently, powerful integral formulations have been developed for numerically solving the diffusion equation under complex conditions. In the literature, it is customary to formulate the integral equations by integrating point differential equations. Instead, employed in this paper was a direct method of formulation, starting from the concepts of set and measure, the notion of partitions and the definition of set-averages. When the direct approach was applied to formulate the well-known finite element (FEM) equations, it was seen that the 'Galerkin' weighting function, which is treated mathematically as an artifice for weighting residuals, is but an appropriate spatial partition function. The logical framework of the direct approach was applied then to study the properties of 'lumped' and 'consistent' matrices arising in the use of the FEM. The lumped matrix, stemming naturally from the direct approach, seeks to conserve mass locally as well as globally, while the consistent matrix, which results only when the differential equation is integrated in a specific fashion, attempts only to preserve global mass balance. It was concluded that the direct approach is simple and complete, and, in so far as the integral formulation is concerned, there is little to be gained in starting with the differential equation. Further, in formulating integral equations, it is common practice to evaluate only the time-dependent changes in the mass content of the system and to ignore the evaluation of the mass content of the system at any given instant of time. In order to be complete in itself, a true integral approach should evaluate both the time-dependent changes in the mass content of the system as well as the instantaneous mass content at any given time. (Sims-ISWS)
W78-10517

INTEGRODIFFERENTIAL EQUATIONS FOR SYSTEMS OF LEAKY AQUIFERS AND APPLICATIONS 3. A NUMERICAL METHOD OF UNLIMITED APPLICABILITY,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Investigacion en matematicas Aplicadas Sistemas.
I. Herrera, and R. Yates.
Water Resources Research, Vol. 13, No. 4, p 725-732, August 1977. 6 fig, 15 ref.

Descriptors: Aquifers, Aquifer management, *Aquifer systems, *Aquifer testing, Mathematics, Mathematical studies, Groundwater, *Leaky aquifers, *Equations.

The integrodifferential equation formulation of leaky aquifer mechanics is used to develop a numerical method of unlimited applicability based on the finite element technique. This approach reduces the dimensionality of the problem and effectively uncouples the equations corresponding to each of the aquifers. Thus the number of nodes required and the bandwidth of the matrices involved are significantly reduced. Consequently, storage and computer time are decreased by a factor greater than 30 in axially symmetric problems and by a considerably greater factor in the absence of such symmetry. (See also W74-12333 and W73-13378) (Skogerboe-Colorado State)
W78-10587

NONLINEAR DIFFUSION APPLIED TO GROUNDWATER CONTAMINATION PROBLEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-10606

GROUND-WATER RESOURCES OF TANGIPAHOA AND ST. TAMMANY PARISHES, SOUTHEASTERN LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10620

A GROUND-WATER INVENTORY OF THE WAIALUA BASAL-WATER BODY, ISLAND OF OAHU, HAWAII,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10622

GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1971-75,
Geological Survey, Lawrence, KA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10630

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--HAWAII REGION,
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10635

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--SOURIS-RED-RAINY REGION,
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10636

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--TENNESSEE REGION,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10637

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--GREAT LAKES REGION,
Geological Survey, Indianapolis, MO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10638

NUMERICAL SIMULATION OF STEADY STATE THREE-DIMENSIONAL GROUND-WATER FLOW NEAR LAKES,
Geological Survey, Denver, CO. Water Resources Div.
T. C. Winter.
Water Resources Research, Vol 14, No 2, p 245-254, April 1978. 14 fig, 8 ref.

Descriptors: *Groundwater movement, *Lakes, Effects, *Seepage, *Surface-groundwater relationships, Model studies, Numerical analysis, Simulation analysis, Hydrogeology, Lake beds, Groundwater basins, Hydraulic models, Lake morphology, *Three-dimensional simulation analysis, *Lake-water budget.

Numerical simulation of three-dimensional groundwater flow near lakes shows that the continuity of the boundary encompassing the local groundwater flow system associated with a lake is the key to understanding the interaction of a lake with the groundwater system. The continuity of the boundary can be determined by the presence of a stagnation zone coinciding with the size of the lake nearest the downgradient side of the groundwater system. For most settings modeled in this study the stagnation zone underlies the lakeshore, and it generally follows its curvature. The length of the stagnation zone is controlled by the geometry of the lake's drainage basin divide on the side of the lake nearest the downgradient side of the groundwater system. In the case of lakes that lose water to the groundwater system, three-dimensional modeling also allows for estimating the area of lake bed through which outseepage takes place. Analysis of the effects of size and lateral and vertical distribution of aquifers within the groundwater system on the outseepage from lakes shows that the position of the center point of the aquifer relative to the littoral zone on the side of the lake nearest the downgradient side of the groundwater system is a critical factor. If the center point is downslope from this part of the littoral zone, the local flow system boundary tends to be weak or outseepage occurs. If the center point is upslope from this littoral zone, the stagnation zone tends to be stronger (to have a higher head in relation to lake level), and outseepage is unlikely to occur. (Woodard-USGS)
W78-10642

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1978,
Geological Survey, Salt Lake City, UT. Water Resources Div.
J. S. Gates.
Utah Division of Water Resources, Salt Lake City, Div of Water Resources, Cooperative Investigations Report No 17, 1978. 63 p, 37 fig, 3 tab, 16 ref.

Descriptors: *Groundwater resources, *Utah, *Water level fluctuations, *Aquifer characteristics, *Water utilization, Water quality, Withdrawal, Irrigation, Water supply, Water demand, Water wells, Water yield, Hydrogeology, Groundwater recharge, Annual, Data collections.

This report is the fifteenth in a series of annual reports that describe ground-water conditions in Utah. The estimated total withdrawal of water from wells in Utah in 1977 was about 947,000 acre-feet, which was about 86,000 acre-feet more than in 1976 and 210,000 acre-feet greater than the average annual withdrawal for the period 1967-76. Both the increases over 1976 and the increase over the 10-year average were due primarily to increases in withdrawals for irrigation and public supply. Precipitation in 1977 was below average in most of Utah, especially during the early part of the year. The decreased availability of surface water for irrigation and below-average precipitation resulted in an increase in ground-water withdrawals for irrigation. Water levels generally declined in the major areas of ground-water development. Included is a list of ground-water reports for Utah that were released by the U.S. Geological Survey during 1977. (Woodard-USGS)
W78-10645

PROBABLE YIELDS OF WELLS IN THE SAND-AND-GRAVEL AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10646

PROBABLE YIELDS OF WELLS IN THE SANDSTONE AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10647

A STUDY OF NEAR WELL GROUNDWATER FLOW AND THE IMPLICATIONS IN WELL DESIGN,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 8B.
W78-10668

STEADY-STATE DRAWDOWNS IN COUPLED AQUIFERS,
Geraghty and Miller, Inc., Tampa, FL.
L. H. Motz.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings Paper 13886, p 1061-1074, July 1978. 8 fig, 1 tab, 14 ref.

Descriptors: *Aquifers, *Leakage, *Drawdown, *Mathematical models, Equations, Groundwater movement, Pumping, Steady flow, Evapotranspiration, Water resources, Water supply, Wells, Water table aquifers, Coupled aquifers.

The analytical linear solution that predicts the steady-state drawdowns for a coupled two-aquifer system in which pumping from an underlying artesian aquifer is balanced by a reduction in evapotranspiration from an overlying water-table aquifer was developed. An example illustrating how the drawdown equations can be used to determine whether significant drawdowns will occur in the water-table aquifer was presented. These drawdown equations can be used for preliminary analysis and planning studies and to test the convergence of digital model solutions when these more sophisticated techniques are warranted. A major limitation to using these equations is that the predicted water table drawdowns cannot be so great that evapotranspiration would cease altogether and, thus, could not be reduced any further to balance the pumping. (Visocky-ISWS)
W78-10917

SUBSURFACE DRAINAGE IN SOILS WITH HIGH HYDRAULIC CONDUCTIVITY LAYERS,
North Carolina State Univ., at Raleigh. Dept. of Biological and Agricultural Engineering.
Y. K. Tang, and R. W. Skaggs.
Transactions of the American Society of Agricultural Engineers, Vol.21, No. 3, p 515-521, May-June 1978. 16 fig, 20 ref.

Descriptors: *Subsurface drains, *Hydralic conductivity, *Soils, Groundwater movement, Water table aquifers, Drains, Mathematical models, Equations, Head loss, Depth, Saturated flow, Unsaturated flow, Soil water, Computer models, Drawdown.

The Richards equation for two-dimensional, saturated-unsaturated flow during drainage was solved for layered soils using finite difference methods. Solutions were obtained for soils in which the deeper layer has a higher hydraulic conductivity than the surface layer. Solutions were presented to show the distribution of equipotential lines and position of the water table during drainage processes. When the drain depth is increased so that it is closer to the high conductivity layer, head loss due to convergence near the drain is reduced. Thus, deeper drains may significantly increase drainage rates, even if the hydraulic head at the outlet remains unchanged. This effect is larger for deep profiles and narrow drain spacings than for shallow profiles and wide spacings. The effect of increasing the drain depth also increases with the hydraulic conductivity of the bottom layer. When outlet conditions are limiting, the most efficient drain depth is that of the layer interface. Solutions for various cases showed that further increasing the depth had only a slight effect on water table drawdown. (Visocky-ISWS)
W78-10922

A COMPARISON OF HYDROTHERMAL RESERVOIRS OF THE WESTERN UNITED STATES.
Geonomics, Inc., Berkeley, CA.
For primary bibliographic entry see Field 4B.
W78-10928

THE RELIEF AND LAND FORM MAP OF AUSTRALIA: DOES IT SHOW ROCK TYPES AND LAND FORMS OF HYDROLOGIC SIGNIFICANCE,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W78-10963

A NUMERICAL, FIELD AND LABORATORY STUDY OF FLOW IN ROCKS WITH DEFORMABLE FRACTURES,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
J. E. Gale.
Scientific Series No. 72, 1977, 145 p, 78 fig, 86 ref, 18 tab, append.

Descriptors: *Rocks, *Rock mechanics, *Rock properties, *Model studies, *On-site tests, *Laboratory tests, *Numerical analysis, Flow, Pressure, Deformation, Stress analysis, Aquifer systems, Permeability, *Galerkin method, *Steady-state interaction, *Nonuniform apertures, *Uniform apertures, In situ measures, Axisymmetric model.

The main objectives of this study were to determine whether fractures open or close because of changes in fluid pressure and what effect such changes in fracture aperture might have on fluid pressure distributions and flow rates within the fracture system. The research program consisted of (1) numerical, (2) field and (3) laboratory studies. A numerical model is presented that simulates the steady-state interaction of fluid pressures and stresses in fractured rock masses. This simulation requires the combination of two nonlinear equations and the use of two finite-element techniques, one for fluid flow in fractures and the other for stress analysis of the joined rock mass. The finite-element formulations are developed directly from the appropriate governing equations using the Galerkin method. The numerical model can simulate general two-dimensional plane strain problems in either vertical or horizontal sections as well as the axisymmetric case of flow to a well intersecting a system of horizontal fractures. Model studies with idealized fracture systems showed that fractures open during injection and close during withdrawal and that injection rates are much greter than the withdrawal rates for corresponding pressure gradients. Also, the model studies showed that because of the difference in fluid pressure distribution, fractures with nonuniform apertures cannot be replaced with a system of fractures having equivalent uniform apertures. (WATDOC)
W78-11197

AQUIFER TESTS - THE STATE OF THE ART IN HYDROLOGY,
Geological Survey, Lubbock TX. Water Resources Div.
E. P. Weeks.
In: Proceedings of the Invitational Well-Testing Symposium held in Berkeley, California, October 19-21, 1977, p 14-26, 1977. 1 fig, 1 tab, 93 ref.

Descriptors: *Aquifer testing, *Aquifer characteristics, *Analytical techniques, *Reviews, Evaluation, Aquifers, Transmissivity, Storage coefficient, Specific yield, Aquitards.

Careful planning and design, based on site investigation and pretest prediction, are essential in performing successful aquifer tests. The importance of identifying the geohydrologic situation during the site investigation cannot be overemphasized, because the theoretical response curves for different geohydrologic conditions tend to be similar to shape. Thus, use of the shape of the data response curve to identify the geohydrologic model applicable to the test site could be very misleading and result in erroneous conclusions. Pretest prediction, based on best estimates of the hydraulic properties of the aquifer and the adjacent confining beds, is also important for successful aquifer-test design. Such predictions can indicate the need for additional observation wells, their location, and the duration necessary for a successful test. (Woodard-USGS)
W78-11257

STRATIGRAPHIC TEST WELL, NANTUCKET ISLAND, MASSACHUSETTS,
Geological Survey, Reston, VA. Geologic Div.
For primary bibliographic entry see Field 4B.
W78-11266

GEOHYDROLOGY OF THE GREAT BEND PRAIRIE, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, KA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11268

WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, SEPTEMBER 1977.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11270

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1974-78,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11273

JANUARY 1978 WATER LEVELS, AND DATA RELATED TO WATER-LEVEL CHANGES SINCE 1940 OR 1950, WESTERN KANSAS,
Geological Survey, Garden City, KS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11275

GROUNDWATER DATA FOR THE SALT BASIN, EAGLE FLAT, RED LIGHT DRAW, GREEN RIVER VALLEY, AND PRESIDIO BOLSON IN WESTERNMOST TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11276

2G. Water In Soils

INFLUENCE OF VEGETATION ON WATER REPELLENCY IN SELECTED WESTERN WISCONSIN SOILS,
North Dakota State Univ., Fargo.
J. L. Richardson, and F. D. Hole.
Soil Science Society of America Journal, Vol 42, No 3, p 465-467, May-June 1978. 2 tab, 17 ref.

Descriptors: *Infiltration, *Vegetation effects, *Soil property, *Wisconsin, Laboratory tests, Soils, Forest soils, Coniferous forests, Deciduous forests, Prairie soils, Humus, Organic matter, Organic soils, Fungi, Soil fungi, Vegetation, Effects, Wetting, Surface tension, Soil science, Water repellency, Wetting angle.

Water repellency in several western Wisconsin soils was characterized by three tests: wetting angle (theta), wetting drop penetration-time (WDPT), and 90 deg surface tension (gamma sub eta). It appears that the high contents of organic matter in the A horizon of Mollisols and Alfisols are associated with slight repellency as measured by theta and WDPT. Frequent burning of a prairie on a Mollisol increased persistence (WDPT) and gamma sub eta, as compared with soil at a nearby control site, but had no influence on theta, indicating that repellency is present at initial water contact but is unstable and disappears with prolonged water contact. More litter layers having observable fungal mycclia had repellent surfaces as measured by three of the above tests. These repellent materials were observed in Spodosols under red pine, hemlock, and under a mixed hard and soft wood stand with dense ericaceous shrub understory. The repellency of mor horizons of Spodosols may relate in some significant way to process of genesis of Spodic horizon. (Sims-ISWS)
W78-10520

A PHYSICALLY-BASED MODEL TO PREDICT RUNOFF UNDER VARIABLE RAIN INTENSITY,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
A. Y. Hachum, and J. F. Alfaro.
Transactions of the American Society of Agricultural Engineering, Vol 21, No 3, p 500-509, May-June 1978. 2 fig, 2 tab, 14 ref.

Descriptors: *Infiltration, *Rainfall, *Model studies, Mathematical models, Irrigation, Hydraulic conductivity, Soils, Soil water, Ponding, Rainfall intensity, Precipitation(Atmospheric), Precipitation intensity, Soil properties, Soil science.

Physically-based rain infiltration models are useful in predicting time and amount of potential runoff. A simple physical model for describing infiltration in uniform soils under variable rainfall was presented. The model was tested against others, and a close agreement was found. Model applications also were included. (Sims-ISWS)
W78-10525

PREDICTED AND MEASURED DRAINABLE POROSITIES FOR FIELD SOILS,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs, L. G. Wells, and S. R. Ghate.
Transactions of the American Society of Agricultural Engineering, Vol 21, No 3, p 522-528, May-June 1978. 8 fig, 3 tab, 12 ref.

Descriptors: *Porosity, *Soil properties, *Drainage, *Model studies, Mathematical models, Laboratory tests, Soil water movement, Soil water, Soils, Water table, Hydraulic conductivity, Soil science, *Drainable porosities.

Experiments were conducted on large field cores to determine the relationship between drainage volume and water table depth for five soils. The measured drainage volumes were less than predicted from the soil water characteristics for three soils, but were in good agreement for the other two. Drainable porosities were calculated from both theoretical and experimental drainage volume-water table depth relationships by assuming that the unsaturated zone is essentially 'drained to equilibrium' with the water table. The experimental drainable porosities thus obtained were less than predicted. Drainable porosities for drainage in two-dimensions were calculated from experimental results for one dimension by assuming an elliptical water table profile. These results gave nearly constant drainable porosities for the layered soils and a variable drainable porosity for Wagram, a homogeneous, sandy soil. (Sims-ISWS)
W78-10526

SOIL NITRATE-NITROGEN DETERMINED BY CORING AND SOLUTION EXTRACTION TECHNIQUES,
Agricultural Research Service, Lafayette, IN.
E. E. Alberts, R. E. Burwell, and G. E. Schuman.
Soil Science Society of America Journal, Vol 41, No 1, p 90-92, January-February 1977. 1 fig, 1 tab, 13 ref.

Descriptors: *Nitrates, *Nitrogen, Sampling, Soil profiles, *Soil tests, Iowa, *Leaching, Soil chemistry.

Soil-coring and solution-extraction sampling techniques were compared for determining the content of N03(-)N in the soil profile of a Monona silt loam in southwestern Iowa. The N03(-)N content of the 3.05-m profile, determined by solution extraction, was 28% lower in 1972, 8% higher in 1973, and 13% lower in 1974 than that determined by soil coring. The profile difference in N03(-)N content between the two sampling techniques was insignificant in 1973 and 1974 but was highly significant (1%) in 1972. (Skogerboe-Colorado State)
W78-10592

OBSERVED AND PREDICTED RATES OF PHOSPHORUS DIFFUSION IN SOILS OF VARYING BULK DENSITY AND WATER CONTENT,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
G. S. Hira, and N. T. Singh.
Soil Science Society of America Journal, Vol 41, No 3, p 537-540, May-June 1977. 5 fig, 2 tab, 14 ref.

Descriptors: *Phophorus, Soils, Soil chemistry, Soil investigations, Soil water, Soil moisture, *Bulk density, *Adsorption, *Diffusion.

The self-diffusion coefficent of phosphorus (D) was measured at bulk densities of 1.25, 1.45, 1.60 and 1.75 g/cm3 and at three levels of soil water content in Choa sandy loam and Haibowal silty clay loam. The tortuosity factor was calculated from the self-diffusion coefficient of 36C1. Appropriate values of the adsorption isotherm and the tortuosity factor were used to predict P diffusion coefficient in both soils. The tortuosity factor increased with increase in soil bulk density and increase in water content from 7 to 18% in the Choa soil and 14 to 25% in the Haibowal soil. As bulk density increased from 1.25 to 1.60 g/cm3, the observed diffusion coefficient values averaged over all water contents, increased from 0.05 x 10(-10) to 0.31 x 10(-10) and 2.13 x 10(-10) to 5.07 x 10(-10) cm sq/sec in Choa and Haibowal soils, respectively. Further increase in bulk density to 1.75 g/cu cm decreased the diffsion coefficient of P in both soils to a greater extent than at low bulk density. The phosphate ion-soil particle interaction was minimum at a soil bulk density of 1.60 g/cu cm. (Skogerboe-Colorado State)
W78-10593

STABILIZATION OF CALCIUM BY SURFACE CHARGE VARIATION IN AN OXISOL,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
D. N. Munns, and R. L. Fox.
Soil Science Society of America Journal, Vol 41, No 4, p 682-685, July-August 1977. 3 fig, 24 ref.

Descriptors: *Calcium, Soils, Soil investigations, Soil chemistry, Soil water, Soil moisture, *Cation exchange, Salts, *Anion exchange, *Oxisol.

In the surface layer of a Ca-deficient, fine-textured Hawaiian Oxisol, concentrations of Ca in solution were poised against tendencies to increase with liming in the pH-range 5-6, and to decrease with dilution in the range of water content 0.35 to 2.0. Effects of lime and water content on the distribution of Ca between solid phase and solution were quantitatively consistent with effects of pH and ionic strength on exchange capacity. Relationships between soil pH and ionic strength on exchange capacity. Relationships between soil pH, cation exchange capacity, and dissolved Ca were determined in soil samples taken from a field-liming trial. Effects of ionic strength on exchange capacity were determined by summation of adsorbed metal cations after equilibration of soil samples in different salt solutions. Effects of water content on cations in solution were determined by analysis of solutions centrifugally extracted at various water contents. (Skogerboe-Colorado State)
W78-10594

AN ALKALINE OXIDATION METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
W. A. Dick, and M. A. Tabatabai.
Soil Science Society of America Journal, Vol 41, No 3, p 511-514, May-June 1977. 7 tab, 13 ref.

Descriptors: *Phosphorus, Soils, *Soil investigations, Nutrients, Fertilizers, Fertilization, Sediments, *Lake sediments.

A simple and precise method for determination of total phosphorus in soils and lake sediments is described. A mixture of soil and sodium hypobromite solution is boiled to dryness in a sand bath (260-280C), and the total amount of orthophosphate is extracted with 1N H2S04 and determined colorimetrically by the molybdenum blue method. Analysis of a group of diverse soil, lake sediment, and sewage sludge samples indicated that the proposed method and the HC104 digestion method give essentially the same total P values. With 10 soils, the average results by the proposed NaOBr oxidation method were 1% higher than those obtained by the HC104 digestion

method and 4% lower than those obtained by the Na2C03 fusion method. A comparison of methods used for colorimetric determination of the orthophosphate extracted indicated that the results by the recently developed method by Dick and Tabatabai agree closely with those obtained by the method of Murphy and Riley. Digestion of samples with sodium hypobromite solution and colorimetric determination of the extracted P by the method of Murphy and Reley. Digestion of samples with sodium hypobromite solution and colorimetric determination of the extracted P by the method of Murphy and Riley permits rapid analysis of a large number of samples at one time. (Skogerboe-Colorado State)
W78-10596

DECOMPOSITION OF RICE STRAW IN SOILS AS AFFECTED BY SOME MANAGEMENT FACTORS,
California Univ., Davis. Dept. of Land, Air, and Water.
P. Sain, and F. E. Broadbent.
Journal of Environmental Quality, Vol 6, No 1, p 96-100, January-March 1977. 6 fig, 3 tab, 18 ref.

Descriptors: *Rice, *Decomposing organic matter, Soils, *Soil investigations, Laboratory tests, Nitrogen, Phosphorus, Soil properties, Sulfur.

Decomposition of Rice straw contained in nylon bags was measured in field experiments at two different locations during winter and spring months. Incorporated straw decomposed more rapidly than did straw on the soil surface, and least decomposition occurred in straw samples suspended above the soil surface as in a windrow. Decomposition rates were not affected by chopping straw. Laboratory decomposition experiments conducted at 8 and 25C and at 60 and 150% water holding capacity showed more effect of low temperature in retarding straw decomposition than excess water. Additional nitrogen stimulated straw decomposition in Stockton adobe clay during the first few weeks but had little effect in Sacramento clay. After 2 months' initial decomposition the soil samples treated with straw were dried and rewetted to 60% water holding capacity (WHC), then incubated another 2 months. During this period straw decomposition in Sacramento clay samples which had received additional N was significantly depressed. Additional P and S had no effect on rice straw decomposition. (Skogerboe-Colorado State)
W78-10597

ASSESSING TWO DIAGNOSTIC METHODS FOR ENUMERATION OF NITRATE REDUCING AND DENITRIFYING BACTERIA IN SOIL-PLANT ROOT ASSOCIATIONS,
Connecticut Agricultural Experiment Station, New Haven.
M. G. Volz.
Soil Science Society of America Journal, Vol 41, No 2, p 337-340, March-April 1977. 4 tab, 14 ref.

Descriptors: *Nitrates, *Dentrification, Bacteria, Soils, Soil investigations, Soil chemistry, Fertilizers, Fertilization, Tomatoes, Soybeans, Corn(Field), *Denitrifying bacteria.

Most probable number (MPN) determinations were made of NO3(-) reducing- and denitrifying bacteria in soil samples taken at time of crop harvest from fallow sites and from root zones of fertilized field plots of tomato, soybean or corn plants cultivated in pure stand or in association with nutsedge, a competitive weed. Diagnostic methods utilized were inoculated Difco NO3(-) broth and Giltay's medium (citrate-nitrate-asparagine + mineral salts), incubated with and without the exclusion of atmospheric 02, respectively. The NO3(-) broth method usually yielded both numerically larger and significantly different (5% level) MPNs for NO3(-) reducers (5 of 7 cases larger, 3 significant) and denitrifiers (6 of 7 cases larger, 3 significant) from a given soil inoculum when compared with identical enumerations performed with Giltay's medium. (Skogerboe-Colorado State)
W78-10599

RELATIONSHIPS BETWEEN SOIL UREASE ACTIVITY AND OTHER SOIL PROPERTIES,
Iowa State Univ., Ames. Dept. of Agronomy.
M. I. Zantua, L. C. Dumenil, and J. M. Bremner.
Soil Science Society of America Journal, Vol. 41, No. 2, p 350-352, March-April 1977. 3 tab, 14 ref.

Descriptors: Iowa, Soils, *Soil investigations, Soil properties, Cation exchange, Soil texture, *Organic matter, *Urease activity.

Surface samples of 21 diverse Iowa soils representing a wide range in pH, texture, and organic matter content were studied to determine the relationships between soil urease activity and other soil properties. Simple correlation analyses showed that urease activity was correlated very highly significantly with organic C (r=0.72 at the 0.1% level), total N(r=0.71 at the 0.1% level), and cation-exchange capacity (r=0.67 at the 0.1% level). Urease activity also was significantly correlated with clay (0.53 at the 5% level), sand (-0.47 at the 5% level), and surface area (0.45 at the 5% level), but was not significantly correlated with pH, silt, or CaCO3 equivalent. Multiple regression analyses showed that organic matter content accounted for most of the variation in urease activity. (Skogerboe-Colorado State)
W78-10600

IMMOBILIZATION OF FERTILIZER NITRATE APPLIED TO A SWELLING CLAY SOIL IN THE FIELD,
Texas Agricultural Experiment Station, Temple.
D. E. Kissel, S. J. Smith, W. L. Hargrove, and D. W. Dillow.
Soil Science Society of America Journal, Vol. 41, No. 2, p 346-349, March-April 1977. 2 fig, 1 tab, 18 ref.

Descriptors: *Nitrates, *Fertilizers, Fertilization, Nutrients, *Crop production, Soil properties, Soil texture, Crop response, Immobilization, Sorghum, *Clays, *Nitrogen, Soil temperature.

Low recoveries of N fertilizer by crops on Houston Black clay prompted this investigation. Objectives were to determine how much fertilizer nitrate can be biologically immobilized under field conditions when fertilization exceeds crop requirements and to determine when immobilization occurs during the growing season. Calcium nitrate tagged with 9.6 atom % 15N was applied to field microplots at 328 kg N/ha and grain sorghum was planted in rows across each microplot. The various components of the N balance were measured by sampling microplots at different times during the season. Only 2.1 kg N/ha was immobilized during the first 47 days after fertilization and planting. The rate of immobilization increased rapidly during the next 60 days and an additional 60 kg N/ha was immobilized. This increase was apparently in response to an increase in soil temperature above 22C. (Skogerboe-Colorado State)
W78-10607

ON THE CHEMICAL FOUNDATION OF THE SODIUM ADSORPTION RATIO,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
G. Sposito, and S. V. Mattigod.
Soil Science Society of America Journal, Vol. 41, No. 2, p 323-329, March-April 1977. 1 fig, 2 tab, 48 ref.

Descriptors: *Sodium, *Cation exchange, Calcium, Magnesium, Cations, Soil chemistry, Soil investigations, Soil properties, Computer programs, Soil tests, *Adsorption.

The theoretical chemical basis of the sodium adsorption ratio (SAR) was examined in order to clarify two important issues that arise in connection with the problem of estimating potential sodium hazard: (1) the relation between SAR and the theory of cation exchange, and (2) the implications of the universal practice of replacing SAR by what may be termed the practical SAR, which employs total concentrations of Na, Ca, and Mg instead of their free cationic concentrations. In regard to (1), it was confirmed that SAR can be given a chemical basis in terms of the Gapon cation exchange equilibrium constant which is provided in this paper with a rigorous derivation for the first time. The Gapon constant is shown to differ from the Vanselow exchange constant only because of the (arbitrary) convention adopted as to what entity is termed the ligand in the cation exchange reaction. In regard to (2), it was shown through a direct calculation of SAR and the practical SAR for 161 different soil solutions or water extracts, utilizing a comprehensive chemical equilibrium computer program, that an exact functional relationship between the two parameters does not exist. (Skogerboe-Colorado State)
W78-10608

PHOSPHORUS SORPTION CHARACTERISTICS OF FLOODED SOILS,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
R. A. Khalid, W. H. Patrick, Jr., and R. D. Delaune.
Soil Science Society of America Journal, Vol. 41, No. 2, p 305-310, March-April, 1977. 4 fig, 3 tab, 29 ref.

Descriptors: *Phosphorus, Soils, Soil investigations, Soil properties, *Rice, *Crop production, Louisiana, *Sorption, *Flooded soils.

Surface soils representing Alfisols and Inceptisols were collected from various parts of Louisiana under rice cultivation and incubated under oxidized (aerobic) and reduced (anaerobic) conditions for 2 weeks in a soil to 0.01M CaC12 solution ratio of 1:5. The release of native soil P and the sorption of added inorganic P was investigated under these conditions. The soils selected for study were characterized for clay content, total carbon, extractable P, pH, and oxalate-extractable Fe, soil properties associated with P sorption. The results show that generally more soil P was released under reduced than oxidized conditions, and this increase in soluble P under reduced conditions was significantly related to Bray no. 2 extractable P, clay content, and oxalate Fe. (Skogerboe-Colorado State)
W78-10610

ION EXCHANGE REACTIONS IN NONDRIED CHAMBERS MONTMORILLONITE HYDROXY-ALUMINUM COMPLEXES,
Minnesota Univ., St. Paul. Dept. of Soil Science.
R. Keren, R. G. Gast, and R. I. Barnhisel.
Soil Science Society of America Journal, Vol 41, No 1, p 34-39, January-February 1977. 1 fig, 3 tab, 30 ref.

Descriptors: Soils, *Soil chemistry, Soil properties, Soil investigations, *Montmorillonite, Clays, Sodium, *Adsorption, *Cation exchange, *Ion exchange.

The extent and mechanisms by which hydroxy-Al interlays may reduce the CEC of Chambers montmorillonite were studied using 22-Na labeled clay. Clay-hydroxy-Al complexes were formed by added ALC13 and NaOH at pH 7.5-9.5. AlC13 was added at 4, 8, or 16 meq/g clay and either before, after, or simultaneously with NaOH. Addition of 16 meq AlC13/g clay followed by NaOH resulted in CEC reductions of 60, 40, and 10% at pH 7.5, 8.5, and 9.5 as measured by Na adsorption. However, there was no trapped or nonexchangeable 22-Na observed in any of the systems. Since the

charge on the hydroxy-Al is negligible at these pH's, the CEC reduction is apparently due to trapped Al. (Skogerboe-Colorado State)
W78-10611

EVALUATION OF SOIL NITROGEN MINERALIZATION POTENTIALS UNDER MODIFIED FIELD CONDITIONS,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
S. J. Smith, L. B. Young, and G. E. Miller.
Soil Science Society of America Journal, Vol. 41, No. 1, p 74-76, January-February 1977. 1 fig, 3 tab, 11 ref.

Descriptors: *Nitrogen, Soils, Soil investigations, *Mineralization, Oklahoma, Soil temperature, *Soil water, Soil moisture.

Amounts of mineral N obtained by a calculation procedure and measurement in fallow plots were compared during two cropping seasons and annually with eight Oklahoma soils. The calculation procedure involved adjusting the N mineralization potentials for varying soil temperature and water content. The field N measurements involved the use of soil in plastic bags and glass filter tubes. Cropping season and annual field amounts for the eight soils, on the average, ranged from 54 to 78 ppm N. In general, the calculated amounts compared favorably to the field amounts, differences frequently being <10 ppm N. Calculated amounts correlated as well or better with the field amounts than a variety of other N availability indexes. (Skogerboe-Colorado State)
W78-10613

EFFECT OF REDOX POTENTIAL AND PH ON THE UPTAKE OF CADMIUM AND LEAD BY RICE PLANTS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W78-10614

PHYSICAL PROPERTIES OF FLY ASH-AMENDED SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
A. C. Chang, L. J. Lund, A. L. Page, and J. E. Warneke.
Journal of Environmental Quality, Vol. 6, No. 3, p 267-270, July-September 1977. 2 fig, 7 tab, 9 ref.

Descriptors: *Fly ash, Soils, Soil investigations, Soil properties, *Soil physical properties, Soil amendments, Soil water, *Bulk density, *Hydraulic conductivity, Water capacity.

Fly ash from a coal-fired power generating plant was mixed with five California soils at rates of 0, 2.5, 5,0, 10.0, 25.0, and 50.0% by volume. The physical properties related to the agronomic use of fly ash-amended soils were characterized by determining water-holding capacity, bulk density, hydraulic conductivity, and modulus of rupture on laboratory compacted soil cores. The moisture release characteristics of each mixture were also determined. Results indicated that a small amount of fly ash added to soils does appear to affect some measured physical properties of soils. At application rates >25%, there was a consistent increase in water-holding capacity (except a Domino loam soil), and a decrease in bulk density and modulus of rupture in all soils tested. The hydraulic conductivity increased with small amounts of fly ash, but declined rapidly as fly ash volume increased. Although fly ash application increased the water-holding capacity of soils, the amount of water available to the plant did not change significantly. At a low applicant rate, fly ash amendment appeared useful in improving certain agronomic properties of soils. (Skogerboe-Colorado State)
W78-10615

EFFECT OF INORGANIC AND ORGANIC COMPOUNDS ON THE EXTRACTABILITY OF 239PU FROM AN ARTIFICIALLY CONTAMINATED SOIL,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
H. Nishita, R. M. Haug, and T. Rutherford.
Journal of Environmental Quality, Vol. 6, No. 4, p 451-455, October-December, 1977. 1 fig, 4 tab, 32 ref.

Descriptors: Soils, Soil investigations, *Organic matter, Soil tests, Soil properties, Soil chemistry, *Organic compounds, *Inorganic compounds, Hydrogen ion concentrations, Plutonium radioisotopes.

The effect of a number of inorganic and organic compounds on the extractability of 239PU from a contaminated soil has been examined. This has been done on an artificially contaminated kaolinitic soil by using the equilibrium batch method of extraction. Among the 21 inorganic compounds examined, NaHPO4 showed the least 239Pu extractability (0.07% of dose) and Na4P207 showed the greatest extractability (28.59% of dose). The compounds that showed relatively high 239Pu extractability included NaF, Na2B407, Na4P207, Na2CO3, Na202, NaOH, and NH4OH. Among the organic compounds, the order of 239Pu extractability was Na acetate less than Na formate less than Na oxalate less than Na tartrate less than Na citrate. A 0.004M DTPA solution was a more effective extractant than a 0.08M citric acid solution. Aside from the chemical nature of these compounds, the 239Pu extractability was influenced by soil and extractant pH, soil organic matter, equilibrium time, soil weight/extractant volume ratio, and wet-dry pretreatment of the soil (Skogerboe-Colorado State)
W78-10616

THE ASSESSMENT OF PLANT-AVAILABLE CADMIUM IN SOILS,
Wye Coll., Ashford (England). Dept. of Physical Sciences.
C. Symeonides, and S. G. McRae.
Journal of Environmental Quality, Vol. 6, No. 2, p 120-123, April-June 1977. 2 fig, 4 tab, 35 ref.

Descriptors: *Cadmium, Heavy metals, Soils, Soil investigations, Water quality, Pollution, Crop response, *Toxicity, Water pollution sources, Pollutant identification.

A study has been made of the amounts of cadmium recovered by a variety of reagents and extraction procedures from soils to which Cd has been added. Correlation of these results with the Cd content of radish plants grown in these soils has shown that the most sensitive of several possible indices to Cd uptake by plants is the amount extracted by a 1-hour shaking with 1N ammonium nitrate solution at a soil/solution ratio of 1:10 (wt/vol). The greater efficiency of this extractant compared with other proposed extractants is ascribed to the system reflecting the natural pH of the soil which has marked effect on cadmium availability to plants. (Skogerboe-Colorado State)
W78-10617

METHODOLOGY AND EMPIRICAL ESTIMATES OF THE RESPONSE FUNCTION OF SORGHUM TO IRRIGATION AND SOIL MOISTURE,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soil and Water.
For primary bibliographic entry see Field 3F.
W78-10659

WATER REDISTRIBUTION IN PARTIALLY FROZEN, SATURATED SILT UNDER SEVERAL TEMPERATURE GRADIENTS AND OVERBURDEN LOADS,
Guelph Univ. (Ontario). Dept. of Land Resources Science.
For primary bibliographic entry see Field 2C.
W78-10919

APPROXIMATE ANALYTICAL SOLUTION FOR SOLUTE FLOW DURING INFILTRATION AND REDISTRIBUTION,
New Mexico State Univ., University Park. Dept. of Agronomy.
F. De Smedt, and P. J. Wierenga.
Soil Science Society of America Journal, Vol. 42, No. 3, p 407-412, May-June 1978. 5 fig, 25 ref.

Descriptors: *Solutes, *Soils, *Infiltration, *Mathematical models, Dispersion, Theoretical analysis, Equations, Pore water, Velocity, Numerical analysis, Chlorides, Hydraulic conductivity, Depth, Analytical solutions, Miscible displacement, Solute flow, Redistribution.

An approximate analytical solution was developed to describe solute flow in soil during infiltration and redistribution. For the solution it was assumed that hydrodynamic dispersion is linearly related to the pore water velocity. In order to use the solution, it is necessary to estimate the solute penetration depth. Methods of estimating the solute penetration were discussed. Solute concentration distributions computed with the approximate analytical solution were compared with those obtained with a numerical model. It was shown that the solution proposed is most useful during the infiltration phase. During the redistribution phase, the approximate analytical solution provides a first-order estimate of the solute distribution with time and depth. Computed chloride distributions compared favorably with chloride concentrations previously observed. (Visocky-ISWS)
W78-10920

A TWO-ELEMENT CERAMIC SENSOR FOR MATRIC POTENTIAL AND SALINITY MEASUREMENTS,
Forest Service (USDA), Albuquerque, NM. Rocky Mountain Forest and Range Experimental Station.
D. G. Scholl.
Soil Science Society of America Journal, Vol. 42, No. 3, p 429-432, May-June 1978. 4 fig, 6 ref.

Descriptors: *Soil moisture meters, *Saline soils, *Salinity, *Soil moisture, Soil water, moisture content, Moisture meters, Instrumentation, Available water, Coal mine wastes, Strip mine wastes, Water pollution sources, Land reclamation, Water quality, Moisture, Water pollution, *Salinity sensor, *Soil moisture sensor, *Coalmine spoil, *Salinity meter, *Matric potential sensors, Ceramic sensor, Potential measurements, Salinity measurements, Mine spoil reclamation.

A two-element ceramic sensor was developed to produce optimum electrical response to both soil water matric potential and salinity. A spring-loaded housing was developed for the elements for either drill-hole or pit-face placement. The sensors were calibrated under various matric potential, salinity, and temperature conditions. An initial field test with 72 sensors was conducted under irrigated coal mine spoil conditions. Laboratory and field results indicated reasonable instrument precision over a wide range of matric potential and salinity. The correlation between sensor output and water content in the field was best where the mean of several sensors was used. (Henley-ISWS)
W78-10921

SUBSURFACE DRAINAGE IN SOILS WITH HIGH HYDRAULIC CONDUCTIVITY LAYERS,
North Carolina State Univ., at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W78-10922

EXTRACTION AND INJECTION OF SOIL WATER WITH HOLLOW-FIBER SEMIPERMEABLE MEMBRANES,
Oak Ridge National Lab., TN.
C. Guzman, S. R. Bloxom, and G. L. MacWilliam.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/MIT-217, Price codes: A03 in paper copy, A01 in microfiche. Report ORNL/MIT-217, October 21, 1975. 39 p, 8 fig, 1 tab, 6 ref, 1 append.

Descriptors: *Soil water, *Sampling, *Membranes, Cellulose, Model studies, Mathematical models, Computer models, Computer programs, Permeability, Plastics, Semipermeable membranes, Flow, *Hollow-fiber membranes, Soil water extraction, Soil water injection.

A non-destructive technique for periodic soil-water sampling was evaluated. The procedure was described as follows: bundles of hollow cellulose acetate fibers are embedded in the soil, vacuum is applied to the exposed end of the bundle, and water is withdrawn. The flow process through the fiber-soil system consists of three process steps: (1) the flow through the porous soil, (2) the permeation through the membrane, and (3) the flow in the hollow membrane tube. An analysis of the process steps was performed with equations in the form of the general tranport equation; expressions for the resistances to the flow were obtained. A theoretical flow model for single phase flow through the system was developed. Total pressure drops and flow were measured experimentally to test the single-phase model. A two-phase model for the system also was developed. Cellulose acetate fibers were found unsuitable for use in extraction of soil water. In the absence of suitable fibers, it was not possible to evaluate the validity of the models. Alternative fibers and experimental techniques to evaluate the models were recommended. (Sims-ISWS)
W78-10939

NITRIFICATION IN THREE SOILS AMENDED WITH ZINC SULFATE,
Georgia Univ., Experiment. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W78-11029

STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS--I. DISTRIBUTION OF IMMOBILIZED NITROGEN AMONGST SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 2K.
W78-11032

STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS--II. MINERALIZATION OF IMMOBILIZED NITROGEN FROM SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 2K.
W78-11033

EFFECT OF SOIL MOISTURE ON THE RELEASE OF ORGANIC CARBON FROM WHEAT ROOTS,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
J. K. Martin.
Soil Biology and Biochemistry, Vol 9, No 4, p 303-304, 1977. 1 tab, 6 ref.

Descriptors: Soil water, *Soil moisture, *Carbon, *Wheat, *Root systems, Crop response, *Organic compounds.

A strong influence of soil moisture on the release of 14C-labelled organic material into soil from cereal roots was shown by Barber and Martin (1976). There was a four-fold reduction of 14C-labelled water-soluble organic C in soil from pots regularly leached with distilled water compared with soil from pots which had no water addition, other than an initial wetting of the soil to 16% by weight with nutrient solution. Leaching also affected the composition of the water-soluble material. It was not possible to determine from these experiments the relationship between the soil water content and C release from the roots. Results are presented for the release of organic C from wheat roots grown at three different soil water content. (Skogerboe-Colorado State)
W78-11034

SOIL MICROBIAL AND BIOCHEMICAL CHARACTERISTICS IN RELATION TO SOIL MANAGEMENT AND FERTILITY,
Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.
W. Verstraete, and J. P. Voets.
Soils Biology and Biochemistry, Vol 9, No 4, p 253-258, 1977. 5 tab, 18 ref.

Descriptors: Soil investigations, *Fertilization, Nutrients, Fertilizers, Soil properties, *Soil chemistry, *Crop response, Mineralization, Organic matter, Sugar beets, *Soil microbiology.

From 1969 to 1974, two experimental fields were studied in terms of their soil microbial and biochemical characteristics in relation to soil management practice and crop yields. Of the various microbial and biochemical properties measured soil phosphatase, saccharase, Beta-glucosidase and urease activities, N mineralization and soil respiration were found valuable to characterize the soils. These characteristics increased with increasing soil organic matter, clay and CaC03 content. They also revealed a strong effect of organic fertilization. Multiple regression analyses indicated that the alkalinity and the humus content of the soil largely determined the magnitude of these characteristics. The regression analyses also showed that the yields of winter wheat were related positively to phosphatase activity while the sugarbeet yields were related negatively to soil urease activity. (Skogerboe-Colorado State)
W78-11035

SULFUR OXIDATION AND RESPIRATION IN 54-YEAR-OLD SOIL SAMPLES,
Pacific Northwest Forest and Range Experiment Station, Corvallis, OR. Forestry Sciences Lab.
For primary bibliographic entry see Field 2K.
W78-11036

PHOSPHATASES IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W78-11037

EFFECT OF BIURET CONTENT ON TRANSFORMATION OF UREA NITROGEN IN SOIL,
Indian Agricultural Research Inst., New Delhi Div. of Agricultural Chemicals.
For primary bibliographic entry see Field 2K.
W78-11038

ACETYLENE INHIBITION OF NITROUS OXIDE REDUCTION AND MEASUREMENT OF DENITRIFICATION AND NITROGEN FIXATION IN SOIL,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Microbiology.
T. Yoshinari, R. Hynes, and R. Knowles.
Soil Biology and Biochemistry, Vol 9, No 3, p 177-183, 1977. 9 fig, 1 tab, 23 ref.

Descriptors: *Denitrification, *Nitrogen, Nutrients, *Soil moisture, Soil chemistry, Soils, Soil investigations, *Oxides, *Nitrous oxide.

Reduction of N20 in moist soil was inhibited completely by 10(-2) atm C2H2 and partially by 10(-5) atm C2H2. The effect of C2H4 was 10 to the 4th power times less than that of C2H2. Dentrification of N03(-) occurred in anaerobically or aerobically incubated waterlogged soil and in anaerobic but not in aerobic moist soil. (Skogerboe-Colorado State)
W78-11039

FACTORS INFLUENCING THE LOSS OF ORGANIC CARBON FROM WHEAT ROOTS,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
J. K. Martin.
Soil Biology and Biochemistry, Vol. 9, No. 1, p 1-7, 1977. 6 tab, 18 ref.

Descriptors: *Carbon, *Wheat, *Root systems, Soils, Soil investigations, Crop response, Soil microorganisms, *Organic matter.

Wheat plants were grown in an atmosphere containing 14CO2 at temperatures of 10C or 18C for periods from 3-8 weeks. The plant roots were maintained under sterile or non-sterile conditions in soil contained in sealed pots which were flushed to displace respired 14CO2. The 14C content of the shoots, roots and soil was measured at harvest. The loss of 14C from the roots, expressed either in terms of total 14C recovered from the pots or 14C translocated to the roots, ranged from 14.3-22.6%, mean 17.3% or 29.2-44.4%, mean 39.2%, respectively. (Skogerboe-Colorado State)
W78-11042

EFFECT OF NITROGEN DIOXIDE ON NITRITE OXIDATION AND NITRITE-OXIDIZING POPULATIONS IN SOIL,
Cornell Univ., Ithaca, NY. Lab. of Soil Microbiology.
W. C. Ghiorse, and M. Alexander.
Soil Biology and Biochemistry, Vol. 9, No. 5, p 353-355, 1977. 2 fig, 9 ref.

Descriptors: *Nitrogen, *Nitrites, *Oxidation, Soils, Soil investigations, *Soil chemistry.

When nitrogen dioxide was added to soil at a rate equivalent to 51 micro-g N g-l soil, the nitrite formed was oxidized logarithmically. The numbers of nitrite-oxidizing microorganisms also increased logarithmically, but the final count was too low to account for the amount of nitrite metabolized. In soil treated with NO2 at a rate equivalent to 106 micro-g N g-l, the nitrite formed was oxidized, but the counts of autotrophic nitrite oxidizers did not rise. Discrepancies between predicted bacterial numbers and nitrifying activity were also noted in soils amended with nitrite. (Skogerboe-Colorado State)
W78-11043

SOIL LOSS EQUATION: DERIVATION FOR STEEP SLOPES,
Missouri Univ.-Columbia. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-11045

NITROGEN ISOTOPE DISCRIMINATION IN DENITRIFICATION OF NITRATE IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W78-11052

STERILITY IN RICE CULTIVARS AS INFLUENCED BY MSMA RATE AND WATER MANAGEMENT,
Arkansas Agricultural Experiment Station, Stuttgart. Rice Branch Experiment Station.
For primary bibliographic entry see Field 5B.
W78-11053

AMMONIA VOLATILIZATION FROM SURFACE APPLICATIONS OF AMMONIUM COMPOUNDS TO CALCAREOUS SOILS: VI. EFFECTS OF INITIAL SOIL WATER CONTENT AND QUANTITY OF APPLIED WATER,
Texas A and M Univ., El Paso. Agricultural Research Station.
L. B. Fenn, and R. Escarzaga.
Soil Science Society of America Journal, Vol. 41, No. 2, p 358-363, March-April, 1977. 5 fig, 1 tab, 12 ref.

Descriptors: *Ammonia, Soils, Soil investigations, Irrigation, Irrigation effects, Soil water, *Soil moisture, *Soil water movement, *Application rates, *Calcareous soils.

Ammonia losses from (NH4)2SO4(AS) and NH4NO3(AN) applied to the surface of initially wet and initially dry soils, when followed by irrigation, were generally greater from the initially wet soils, especially when water application rates were <2.5 cm. The greatest NH3 loss occurred at the lowest water addition and the least loss at the highest water addition. The addition of 20.3 cm of water to a Harkey silty clay load did not reduce NH3 loss below that found with the addition of 5.1 cm of water. Ammonium was moved deeper into the soil by water in the initially wet soil than into the initially dry soil. (See also W77-09960 and W77-01515) (Skogerboe-Colorado State)
W78-11054

SEARCH FOR NITRIFYING AGENTS IN WATER AND SOILS AS SOURCES OF NITRATES IN SURFACE WATER,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5B.
W78-11063

LARGE CROP YIELD IS A MAJOR GOAL OF IRRIGATION,
Universal Oil Products, Inc., Saint Paul, MN. Johnson Div.
For primary bibliographic entry see Field 3F.
W78-11068

EROSION AND SOLID MATTER TRANSPORT IN INLAND WATERS SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
For primary bibliographic entry see Field 2J.
W78-11113

ESTIMATING FIELD EROSION LOSSES FROM FALLOUT CESIUM-137 MEASUREMENTS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W78-11116

SOIL EROSIVE POWER OF RAINFALL IN THE DIFFERENT ZONES OF SRI LANKA,
Department of Irrigation, Colombo (Sri Lanka). Land Use Div.
For primary bibliographic entry see Field 2J.
W78-11118

METHODS FOR COMPUTATION OF RUNOFF AND SEDIMENT YIELD FROM SLOPES USED FOR AGRICULTURAL NEEDS,
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).
For primary bibliographic entry see Field 2J.
W78-11119

FACTORS INFLUENCING EROSION IN DISPERSIVE CLAY AND METHODS OF IDENTIFICATION,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-11121

RELATIONSHIP BETWEEN SOIL EROSION AND SEDIMENT DELIVERY,
Agricultural Research Service, Beltsville, MD.
For primary bibliographic entry see Field 2J.
W78-11131

PIPING IN THE MILK RIVER CANYON, SOUTHEASTERN ALBERTA-A CONTEMPORARY DRYLAND GEOMORPHIC PROCESS,
Queens Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-11138

CHARGE CHARACTERISTICS OF SPODIC HORIZONS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
M. R. Laverdiere, and R. M. Weaver.
Soil Science Society of America Journal, Vol. 41, No. 3, p 505-510, May-June 1977. 5 fig, 5 tab, 22 ref.

Descriptors: Soils, Soil investigations, Soil properties, Organic matter, Adsorption, *Spodozols, *Soil physical properties.

Surface charge properties of six Spodosol Bir horizons, enriched in sesquioxides and organic matter, were investigated by acid-base potentiometric titrations and ion adsorption measurements. The results indicate that the horizons have electrochemical properties similar to constant surface potential colloids, as the sign and magnitude of the net charge were dependent upon the pH and electrolyte concentration of the ambient solution. The pH values at which the net surface charge underwent reversal ranged from 4.2 to 4.9, and the values obtained by acid-base potentiometric titrations agreed fairly well with those obtained by ion adsorption measurements. (Skogerboe-Colorado State)
W78-11200

INORGANIC PHOSPHORUS SPECIES AND TRANSFER MECHANISMS IN SOILS TO SEDIMENTS FOR TWO SMALL KANSAS WATERSHEDS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5B.
W78-11206

BENZIMIDAZOLE FUNGITOXICANTS IN VIRGINIA SOILS: MOVEMENT, DISAPPEARANCE, AND EFFECT ON MICROORGANISMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.
For primary bibliographic entry see Field 5B.
W78-11215

REFRACTORY ORGANIC COMPOUNDS IN TREATED EFFLUENT AND THEIR REMOVAL BY SOIL, MILILANI, OAHU, HAWAII,
Hawaii Univ. Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W78-11220

2H. Lakes

PARTITIONING AND TRANSPORT OF LEAD IN LAKE WASHINGTON,
Duke Univ., Beaufort, NC. Marine Lab.
For primary bibliographic entry see Field 5B.
W78-10603

NUMERICAL SIMULATION OF STEADY STATE THREE-DIMENSIONAL GROUNDWATER FLOW NEAR LAKES,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-10642

THE IMPACT OF HUMAN TRAMPLING ON PHOSPHORUS LOADING TO A SMALL LAKE IN GATINEAU PARK, QUEBEC, CANADA,
Brock Univ., St. Catharines (Ontario). Dept of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-10653

MIXING EFFECTS DUE TO BOATING ACTIVITIES IN SHALLOW LAKES,
Florida Technological Univ., Orlando. Dept. of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 5B.
W78-10734

EFFECTS OF ACID PRECIPITATION ON MACROPHYTES IN OLIGOTROPHIC SWEDISH LAKES,
Swedish Water and Air Pollution Research Lab., Gothenburg.
For primary bibliographic entry see Field 5C.
W78-10742

HEAVY METAL TOXICITY AND SYNERGISM TO NATURAL PHYTOPLANKTON IN THE EUTROPHIC ALPNACHERSEE AND THE MESOTROPHIC HORW BAY (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W78-10753

PUBLIC ACCESS TO THE GREAT LAKES. A POLICY STUDY/1976,
Wisconsin Coastal Management Program, Madison.
For primary bibliographic entry see Field 6E.
W78-10756

FEATURES OF FORMATION OF SHORES OF VILYUY RESERVOIR,
For primary bibliographic entry see Field 2J.
W78-10935

RELATIONSHIP BETWEEN LAKE-INDUCED DISTURBANCES AND SYNOPTIC CIRCULATION,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
J. M. Gross.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 406, Price codes: A04 in paper copy, A01 in microfiche. Final Report, December 1976. 67 p, 42 fig, 6 tab, 26 ref. NOAA 04-5-022-23.

Descriptors: *Lakes, Effects, *Weather, *Model studies, *Lake Ontario, Mathematical models, Numerical analysis, Latent heat, Synoptic analysis, Winds, Air circulation, Orography, Storms, Rainfall, Atmosphere, Cloud physics, Meteorology, *Lake effect storms.

A theoretical model was described which is suitable for studying lake-induced disturbances for Lake Ontario. The model is based on the time dependent, nonlinear primitive equations in the sigma coordinate system. The model incorporates parameterizations for vertical and horizontal turbulent eddy fluxes and the release of latent heat. The model also incorporates a method of varying the synoptic conditions with time. A numerical formulation of the theoretical model was discussed. The numerical model was used to conduct a series of sensitivity studies in order to determine the relative importance of various physical processes on development of lake-effect storm. It was found that surface heating alone causes maximum convergence farther from the lake then when the release of latent heat is included in the computation. Including orography in the computation also augments the convergence. Changes in wind direction cause the lake-effect disturbance to move to the lee side of the lake. (Sims-ISWS)
W78-10938

TEMPERATURE ANALYSIS AND SELECTIVE-WITHDRAWAL DESIGN STUDY TALLAHALA CREEK LAKE, MISSISSIPPI; MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5B.
W78-10946

ENHANCEMENT OF RELEASES FROM A STRATIFIED IMPOUNDMENT BY LOCALIZED MIXING, OKATIBBEE LAKE, MISSISSIPPI,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-10950

AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO, APPENDIX B: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF BOTTOM SEDIMENTATION,
Nalco Environmental Sciences, Northbrook, IL.
For primary bibliographic entry see Field 5E.
W78-10961

ZINC, CADMIUM AND LEAD IN WATER, SEDIMENTS AND SUBMERGED PLANTS OF THE DERWENT RESERVOIR, NORTHERN ENGLAND,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W78-11006

PRELIMINARY OBSERVATIONS ON THE PRODUCTIVITY OF PERIPHYTON ATTACHED TO FRESHWATER ARTIFICIAL TIRE REEF,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
For primary bibliographic entry see Field 5C.
W78-11021

SOME EFFECTS OF PAPER AND PULP MILL EFFLUENTS ON SOUTHERN LAKE SAIMAA,
Limnological Inst., Oosterzee (Netherlands).
For primary bibliographic entry see Field 5C.
W78-11023

CHANGES IN FISHES WITH CULTURAL LAKE EUTROPHICATION (FISCHEREILICHE VERANDERUNGEN IN KULTURBEDINGT EUTROPHIERENDEN SEEN),
Staatliches Inst. fuer Seenforschung und Fischereiwesen, Langenargen (West Germany).
For primary bibliographic entry see Field 5C.
W78-11026

THE REGIME OF THE SUSPENDED SEDIMENT YIELD IN THE RIVERS TO LAKE CHAD: SUMMARY OF STUDIES BY ORSTOM IN THE REPUBLIC OF CHAD (REGIME DES APPORTS FLUVIATILES DE MATERIAUX SOLIDES EN SUSPENSION VERS LE LAC TCHAD: SYNTHESE DES ETUDES DE L'ORSTOM EN REPUBLIQUE DE TCHAD),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de n'Djamena.
For primary bibliographic entry see Field 2J.
W78-11127

EFFECT OF A THERMAL GENERATING STATION ON DISSOLVED SOLIDS AND HEAVY METALS IN A PRAIRIE RESERVOIR,
Saskatchewan Dept. of the Environment, Regina. Inland Waters Directorate.
For primary bibliographic entry see Field 5B.
W78-11189

STATISTICAL PROCEDURES FOR CLASSIFICATION OF A LAKE,
Canada Centre for Inland Waters, Burlington (Ontario).
A. H. El-Shaarawi, and K. R. Shah.
Scientific Series No. 86, 1978, 9 p, 5 fig, 2 tab.

Descriptors: *Statistical methods, *Classification, *Variability, *Lake stages, *Limnology, Phytoplankton, Biomass, Lake Superior, Data collections.

Statistical classification procedures for univariate and multivariate limnological data are presented. A regression model in terms of additive temporal and spatial components is fitted to the data after a search for an appropriate transformation. When the spatial component is found to be significant, a hiearchical procedure is suggested to divide the lake into regions. The procedure is illustrated using the data on phytoplankton biomass from Lake Superior collected in 1973. (WATDOC)
W78-11192

TURBULENT DIFFUSION PROCESSES IN THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
C. R. Murthy, and K. C. Miners.
Scientific Series No. 83, 1978, 27 p, 23 fig, 16 ref, 1 tab, append.

Descriptors: *Fluorescence, *Fluorometry, *Turbulent boundary layers, *Great Lakes, Oceans, Diffusion, Instrumentation, Model studies, Analytical techniques, Dye releases, Tracers, Field equipment.

Detailed descriptions of the instrumentation, field equipment, experimental design and procedure widely used for conducting large-scale diffusion experiments in natural bodies of water such as the oceans and the Great Lakes are presented. The data analysis methods of continuous dye plume and instantaneous dye patch diffusion experiments are also given. Experimental data obtained in widely varying environmental conditions are interpreted statistically by constructing diffusion characteristics based on a simple theoretical framework. (WATDOC)
W78-11193

THE RECENT HISTORY OF PRODUCTIVITY IN SELECTED BERKSHIRE LAKES,
Massachusetts Univ., Amherst. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11203

CHEMICAL AND BIOLOGICAL QUALITY OF LAKES FAITH, HOPE, AND CHARITY, AT MAITLAND, FLOIDA, WITH EMPHASIS ON THE EFFECTS OF STORM RUNOFF AND BULK PRECIPITATION, 1971-74,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-11259

NITROGEN REGIME OF SHALLOW EUTROPHIC LAKES ON THE CANADIAN PRAIRIES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W78-11278

ESTIMATED RESPONSES OF LAKE ONTARIO PHYTOPLANKTON BIOMASS TO VARYING NUTRIENT LEVELS,
Manhattan Coll., Bronx, NY. Dept. of Environmental Engineering and Science.
For primary bibliographic entry see Field 5C.
W78-11279

MODEL OF PRIMARY PRODUCTION, INCLUDING CIRCULATION INFLUENCES, IN LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-11280

SEASONAL AND HORIZONTAL DISTRIBUTIONS OF PLANKTONIC CRUSTACEA IN GEORGIAN BAY AND NORTH CHANNEL, 1974,
Waterloo Univ. (Ontario) Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11282

THE VERTICAL AND SEASONAL DISTRIBUTION OF CHLOROPHYLL IN LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO: IMPLICATIONS FOR PRIMARY PRODUCTION ESTIMATES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W78-11289

VERTICAL AND SEASONAL DISTRIBUTION OF CHLOROPHYLL A IN LAKE MICHIGAN,
Wisconsin Univ.-Milwaukee. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11291

2I. Water In Plants

THE FLORA OF DREDGED MATERIALS SITES IN NAVIGATION POOL 8 OF THE UPPER MISSISSIPPI RIVER,
Wisconsin Univ.-La Crosse.
For primary bibliographic entry see Field 5E.
W78-10947

COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME I: PRODUCTIVITY,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 5C.
W78-10952

COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME II: GROWTH DYNAMICS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 5C.
W78-10953

PRIMARY PRODUCTIVITY OF MINOR MARSH PLANTS IN DELAWARE, GEORGIA, AND MAINE,
Georgia Univ., Brunswick. Marine Resources Extension Center.
For primary bibliographic entry see Field 5C.
W78-10956

WATER RELATIONS OF COTTON. II. CONTINUOUS ESTIMATES OF PLANT WATER POTENTIAL FROM STEM DIAMETER MEASUREMENTS,
Agricultural Research Service, Auburn, AL.
For primary bibliographic entry see Field 3F.
W78-11055

2J. Erosion and Sedimentation

EFFECT OF MULCHING ON SEDIMENT IN RUNOFF FROM SIMULATED RAINFALL,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 4D.
W78-10522

SEDIMENT DISCHARGE OF ALLUVIAL STREAMS CALCULATED FROM BED-FORM STATISTICS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
J. C. Willis, and J. F. Kennedy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 634, price codes: A10 in paper copy, A01 in microfiche. Iowa Institute of Hydraulic Research Report No. 202, June 1977. 215 p, 26 fig, 6 tab, 49 ref.

Descriptors: *Sediment transport, *Bed load, *Suspended solids, *Model studies, Hydraulic models, Flumes, Mathematical models, Streams, Streamflow, Sediments, Data processing, Analytical techniques, Beds, Beds under water, Instrumentation, Laboratory tests, Mathematics, Statistics.

The total sand of a stream was treated as the sum of two parts - that contributed by the downstream migration of bed forms as 'dune load' and that carried over the separation zones of dune troughs as 'suspended load'. Development of methods for calculating these loads from concepts closely related to the physical transport processes was the overall objective of this study. Other related objectives were to define the various functions used in the calculation procedure and to relate the parameters of the functions to measureable flow variables. The dune load was derived as the sum of the contributions by Fourier frequency components of bed elevation records. The distribution of the flux rate of suspended sediment over the flow depth was derived from published models for the velocity and concentration distribution for reference concentrations based on the effective bed concentration. This effective bed concentration was defined as the product of the bulk density of the bed material and the fraction of the time or distance during which the bed surface remained above the reference level. New data from a series of laboratory flume tests with equilibrium flows and bed forms were used to supplement existing data and to define the various functions and parameters entering the load calculations. These data included temporal and spatial bed elevation records for different flow rates and water temperatures. Total load measurements provided a check of the load calculations and an aid in developing the empirical aspects of the calculation procedure. (Sims-ISWS)
W78-10535

INFLUENCE OF ENVIRONMENTAL PARAMETERS ON EDTA BIODEGRADATION IN SOILS AND SEDIMENTS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Science.
J. M. Tiedje.
Journal of Environmental Quality, Vol 6, No 1, p 21-26, January-March 1977. 4 fig, 3 tab, 20 ref.

Descriptors: Soils, Soil investigations, *Soil texture, *Sediments, Sedimentation, *Chelation, *EDTA, *Biodegradation, Detroit River, Cometabolism, Metabolism.

14C-EDTA 8ethylenediaminetraacetate) was slowly degraded to 14C02 by all soils tested from the major agricultural EDTA use areas; by soils varying in uses, pH, and texture; and by sediments from the Detroit River. EDTA degradation appears to be a result of cometabolism by established microbial populations. Production of 14C02 from EDTA occurred under aerobic but aerobic but not anaerobic conditions. No detectable quantities of intermediates accumulated under either condition. EDTA degradation followed first-order kinetics for concentrations ranging from 0.4 to 90 ppm. Degradation was observed up to 1,000 ppm EDTA, the highest concentration tested. The date of sample collection had a marked effect on extent of degradation with the winter-collected samples showing greater than twice the degradation of summer-collected samples. The Q10 was two up to 30C. Initially degradation at 50C was limited, but after 9 weeks incubation the rate accelerated indicating the adaptation of thermo-tolerant EDTA-degrading populations. The extent of degradation among soils was variable; common values for 2 to 4 ppm of added 14C-EDTA mineralized were 13 to 45% after 15 weeks and 65 to 70% after 45 weeks. (Skogerboe-Colorado State)
W78-10591

A LABORATORY STUDY ON THE ROLE OF STREAM SEDIMENT IN NITROGEN LOSS FROM WATER,
Guelph Univ. (Ontario). Dept. of Environmental Biology.
For primary bibliographic entry see Field 5B.
W78-10602

TRANSPORT AND DISPERSION OF FLUORESCENT TRACER PARTICLES FOR THE DUNE-BED CONDITION, ATRISCO FEEDER CANAL NEAR BERNALILLO, NEW MEXICO,
Geological Survey, Bay Saint Louis. MS. Water Resources Div.; and Geological Survey, Menlo Park, CA. Water Resources Div.
R. E. Rathburn, and V. C. Kennedy.
Available from Supt. of Documents, GPO, Washington, DC 20402; price, $3.75. Professional Paper 1037, 1978. 95 p, 48 fig, 1 plate, 55 tab, 35 ref.

Descriptors: *Sediment transport, *Tracers, *Fluorescent dye, Particle size, *Alluvial channels, Marking techniques, Sedimentation, Sediment distribution, Dispersion, Evaluation, *New Mexico, *Atrisco Feeder Canal(N Mex), *Dune-bed condition, Dye-coated particles.

A fluorescent tracer technique was used to study the rates of transport and dispersion of sediment particles of various diameters and specific gravities for a dune-bed condition in an alluvial channel, Atrisco Feeder Canal near Bernalillo, N. Mex. The total transport rates of bed material measured by the steady-dilution and spatial-integration procedures were within the range of transport rates computed by the modified Einstein procedure. Lateral dispersion of the tracer particles increased with increase in the size of the tracer particles, whereas longitudinal dispersion decreased. The velocities of the tracer particles decreased with increase in the size of the tracer particles; dependence on particle diameter was large for the small particles, small for the large particles. Tracers were found at larger depths in the bed than would be expected on the basis of the sizes of the dunes in the channel. (Woodard-USGS)
W78-10634

SUSPENDED SEDIMENT IN THE CHESAPEAKE AND DELAWARE CANAL,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W78-10666

BENTHIC MOLLUSCAN ASSEMBLAGES IN RELATION TO SEDIMENT GRADIENTS IN NORTHEASTERN LONG ISLAND SOUND, CONNECTICUT,
City Univ. of New York. Inst. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-10747

CONSERVATION PROBLEMS IN THE NORFOLK BROADS AND RIVERS OF EAST ANGLIA, ENGLAND-PHYTOPLANKTON, BOATS AND THE CAUSES OF TURBIDITY,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-10752

TOTAL LOAD OF BED MATERIALS IN OPEN CHANNELS,
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.
H. Kikkawa, and T. Ishikawa.
Journal of the Hydraulics Division, American Socity of Civil Engineers, Vol. 104, No. HY7, Proceedings Paper 13895, p 1045-1059, July 1978. 10 fig, 12 ref, 2 append.

Descriptors: *Bed load, *Open channels, *Model studies, Channel flow, Sediment transport, Stochastic processes, Suspended load, Hydraulics, Sedimentation, Equations, Mathematical models, *Stochastic models, Bed material load, Sediment sources, Synthetic models.

Bed material load usually is classified into bed load and suspended load. They have been treated individually in the previous theoretical studies, but to obtain the expression of total load, their mutual relation must be formulated. The main objective in this investigation was to study this relation. The basic consideration was that the bed layer is formed under the balance of vertical forces acting on sediment particles near and on the bed surface, and this layer can be regarded as the source of sediments to be diffused to the region of suspended load. According to this consideration: (1) a new stochastic model that interrelates bed load and suspended load was considered to simulate the particle movement; and (2) the equation of dynamic balance in the bed layer was introduced and improved by using the results of basic experiments. A total load equation was derived by combining the results of two processes. The data presented by U.S.G.S. were used to verify it. (Lee-ISWS)
W78-10916

LONGITUDINAL GRAIN SORTING BY CURRENT IN ALLUVIAL STREAMS,
Technical Univ. of Denmark, Lyngby.
R. Deigaard, and J. Fredsoe.
Nordic Hydrology, Vol. 9, No. 1, p 7-16, 1978. 5 fig, 10 ref.

Descriptors: *Alluvial channels, *Particle size, *Currents(Water), Streambeds, Sediment transport, Bed load, Sedimentation, Hydraulics, Equations, Mathematical studies, *Longitudinal grain sorting, Graded sediment, Grain sorting, Stream profiles.

The longitudinal current sorting of graded sediment was analyzed by use of a sediment transport formula developed recently by Engelund and Fredsoe. The analysis yields that for a given longitudinal profile of a river, the longitudinal variation in mean grain diameter and the grain distribution curve is unique determined by the sediment input and water discharge. No requirement concerning an ultimate equilibrium state of the bed elevation is introduced. The analysis yields that the mean grain size will decrease as the slope of the river decreased; and further, that originally logarithmic normally distributed sand will tend to be logarithmic hyperbolic distributed after sorting. (Lee-ISWS)
W78-10924

RADIATIVE TRANSFER MODEL FOR REMOTE SENSING OF SUSPENDED SEDIMENTS IN WATER,
MITRE Corp., McLean, VA. METREK Div.
A. Ghovanlou.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-32567, Price codes: A05 in paper copy, A01 in microfiche. Report MTR-7433, NASA CR-145145, February 1977. 83 p, 18 fig, 7 tab, 20 ref, 5 append. NASA F19628-77-C-0001.

Descriptors: *Remote sensing, *Turbidity, *Suspended solids, Laboratory tests, Model studies, Mathematical models, Monte Carlo method, Simulation analysis, Water quality, Sediments, Clays, Radiation, Reflectance, Computer programs, Computer models.

High concentration of suspended particles in the environmental waters alters the physical and chemical properties of the water systems and leads to a variety of hazardous ecological impacts. In addition, excessive sedimentation leads to significant economic losses because of the reduction of the nation's reservoir and flood storage capacities, and to the necessary performance of operational activities, such as dredging. Considering the importance of this problem, NASA/Langley Research Center has initiated a laboratory study on sediment characteristics as part of its remote sensing program in the area of water quality. The laboratory project was designed to determine whether the spectral characteristics of the radiance upwelling from an illuminated body of turbied water can be related to the amount and properties of the suspended particles. This report described an analytical study in the area of radiative transfer in the turbid water media. The work has been performed in support of the laboratory program in remote sensing of water quality. The modeling methodology described in this report was based on Monte Carlo simulation approach. (Sims-ISWS)
W78-10930

PRELIMINARY STUDY OF SEDIMENT SOURCES IN THE POTOMAC RIVER BASIN, WASHINGTON, D.C., METROPOLITAN AREA.
Environmental Protection Agency, Washington, DC. Surveillance Branch.
For primary bibliographic entry see Field 5B.
W78-10932

FEATURES OF FORMATION OF SHORES OF VILYUY RESERVOIR,
I. P. Konstantinov, and V. L. Sukhodrovskiy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 238, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 633, July 1977. 6 p, 4 tab. Translated from the Proceedings of the 4th AU Union Conference on Study of Shores, Yakutsk, p 11-16, 1975.

Descriptors: *Reservoirs, *Shores, *Erosion, Permafrost, Rocks, Cold regions, Dams, Temperature, Waves(Water), Weathering, Bank erosion, Lakes.

This report briefly discussed the climate and features of formation of the shores of the Vilyuy Reservoir. A table of erodibility coefficients of the rocks that make up the shores of the reservoir was presented. (Sims-ISWS)
W78-10935

SEDIMENT OXYGEN DEMAND STUDIES OF SELECTED NORTH-EASTERN ILLINOIS STREAMS,
Illinois State Water Survey, Urbana.
T. A. Butts, and R. L. Evans.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 788, Price codes: A09 in paper copy, A01 in microfiche. Circular 129, 1978. 179 p, 12 fig, 16 tab, 20 ref, 8 append.

Descriptors: *Sediments, *Oxygen demand, *Benthos, *Streams, *Illinois, Sampling, Cores, On-site data collections, Data processing, Mathematical models, Benthic fauna, Bacteria, Measurement, On-site investigations, Bottom sediments, Oxygen, *Sediment oxygen demand.

Special field sampling equipment was designed and employed for gathering data concerning the oxygen consuming potential of bottom sediments and substrates in small streams in a six-county area in the northeastern corner of Illinois. The sampling program was designed so that results from selected sampling locations could be extrapolated for use throughout most natural streams and rivers in the study area, except for the Kankakee River and its tributaries. The data produced is readily usable for input into most dissolved oxygen oriented water quality models. Sediment oxygen demand (SOD) can be defined broadly as the usage of dissolved oxygen in the overlying water by benthic organisms. In stream waters, it results from the biochemical oxygen demands of micro- and macroorganisms. Sediment oxygen demand measurements were completed successfully at 89 different stations. Ninety-five stations were sampled for benthic macroinvertebrates with from May 2 through October 20, 1976. Sixty-one samples were collected with the Ekman dredge, 33 were collected with the ponar dredge, and 1 was a nonquantitative hand-picked sample. A total of 122 sediment samples were taken with either the ponar or Ekman dredge. Core samples were taken at 83 of the 89 SOD stations. The overall results of the study were very good. The information generated should provide a good base from which to estimate oxygen usage in streams due to a variety of benthic conditions. (Sims-ISWS)
W78-10943

IMPACT OF FLUID MUD DREDGED MATERIAL ON BENTHIC COMMUNITIES OF THE TIDAL JAMES RIVER, VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point. Div. of Biological Oceanography.
For primary bibliographic entry see Field 5C.
W78-10944

A LABORATORY STUDY OF THE TURBIDITY GENERATION POTENTIAL OF SEDIMENTS TO BE DREDGED,
Abcor, Inc., Wilmington, MA. Walden Research Div.
B. A. Wechsler, and D. R. Cogley.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A053 029, Price codes: A03 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-14, November 1977. 177 p, 26 fig, 7 tab, 41 ref, 8 append.

Descriptors: *Turbidity, *Dredging, *Sediments, *Settling velocity, Suspension, Laboratory tests, *Dredged material.

In order to understand the effects of physical and chemical factors which control particle settling rates and thereby develop the means to predict the extent of dredging-related turbidity, a series of laboratory jar tests was performed. The turbidity of suspensions of three pure clay samples and eight natural sediments was monitored as a function of time in waters of various salinity, hardness, and pH. The results were statistically analyzed to relate specific sediment and water compositional factors to observed settling rates and to evaluate their relative importance. Additional experiments were performed to characterize the nature of turbidity. While turbidity was found to be extremely persistent in soft fresh waters, hardness (200 mg/l) and particularly salinity (1-5 ppt) induced flocculation and consequently rapid settling. The organics content was the principal sediment component affecting turbidity, with higher organics levels correlated with more rapid settling in salt water. No significant segregation of sediment components was observed during settling, with the exception of coarser silt particles, which settled independently of clay-organic aggregates. A turbidity plume model was developed which accounts for flocculation in suspensions of dredged material. (WES)
W78-10951

AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO, APPENDIX B: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF BOTTOM SEDIMENTATION,
Nalco Environmental Sciences, Northbrook, IL.
For primary bibliographic entry see Field 5E.
W78-10961

SOIL EROSION AND ITS CONTROL IN EASTERN WOODLANDS,
Northeastern Forest Experiment Station, Broomall, PA.
J. H. Patric.
Northern Logger and Timber Processor 25(11), 1977. p 4, p 5, p 22, p 23, p 31. 17 ref.

Descriptors: Erosion, *Erosion control, Overland flow, Water quality, Logging roads, *Soil erosion, Forests, Forest management, *Appalachian mountain region.

Overland flow rarely occurs in eastern hardwood forests. Tree cutting has only a negligible and temporary effect on soil erosion rates and stream pollution. Logging roads are the source of most water quality problems on logged areas. (Forest Service)
W78-10987

SOIL LOSS EQUATION: DERIVATION FOR STEEP SLOPES,
Missouri Univ.-Columbia. Dept. of Agricultural Engineering.
J. M. Gregory, H. P. Johnson, and D. Kirkham.
Paper No. 77-2525 presented at th 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 29 p, 4 fig, 1 tab, 10 ref.

Descriptors: Model studies, Simulation analysis, *Sediment transport, Erosion, *Soil erosion, *Slopes, *Equations.

An equation has been derived for the prediction of soil loss from areas with steep slopes. The equation compares favorably with the Universal Soil Loss Equation for flat slopes (0-20 percent) and agrees with experimental results in the literature for steep slopes (20-100 percent). (Skogerboe-Colorado State)
W78-11045

DISPOSAL AND UTILIZATION OF HYDRAULICALLY DREDGED LAKE SEDIMENTS IN LIMITED CONTAINMENT AREAS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5E.
W78-11067

EROSION AND SOLID MATTER TRANSPORT IN INLAND WATERS SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
Proceedings of the Paris Symposium, July 1977; International Association of Hydrological Sciences Publication No. 122, July 1977. 352 p. c/o American Geophysical Union, Washington, D.C. $25.00.

Descriptors: *Conferences, *Erosion, *Sediment yield, *Sediment transport, *Model studies, Mathematical models, Soil erosion, Bed load, Suspended load, Watersheds(Basins), Rivers, Runoff, Sediment discharge, Erosion rates, Semiarid climates, Hydraulic structures, Intakes, Humid areas, Foreign countries, Foreign research, Sediment control, Canals, Open channels, Tropical regions, Land use, Impact(Rainfall).

Erosion and sediment transport were discussed at a symposium held at Paris in 1977. The broad subject areas discussed were: estimation of erosion sediment yield parameters in basins with deficient sediment data: the relationship between source-area erosion and sediment yield (delivery ratio); development of mathematical models for erosion and solid matter transport; study of sediment generation, transport, and deposition in semiarid zones; and sediment problems related to intake structures and the influence of intakes on the sediment regime of rivers. (See also W78-11114 thru W78-11150) (Humphreys-ISWS)
W78-11113

RECONNAISSANCE MEASUREMENTS AND SEDIMENT YIELD ESTIMATES IN BASINS WITH INSUFFICIENT DATA,
Technical Univ. of Prague (Czechoslovakia).
V. Kolar.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 3-10, July 1977. 1 fig, 1 tab, 5 ref.

Descriptors: *Surveys, *On-site investigations, *Sediment yield, *Watersheds(Basins), Investigation, Exploration, Rivers, River basins, Suspended solids, Sediments, Discharge(Water), Sampling, Foreign countries, *Czechoslovakia, Sediment concentrations.

Data necessary for decisions as to whether sedimentation basins should be built on tributary streams flowing into 36 reservoirs in Czechoslovakia were furnished by reconnaissance surveys in 210 river basins. The data consisted of checking divides, drainage networks, erosion areas, vegetative cover, reservoirs, flood plains, channels, landslides, human activities, gauges, etc., and included sampling of sediment and bed material. Discharge and wash load were measured in selected cross sections. Methods of measurements were checked in experimental basins. Data therefrom were used to develop evaluation procedures. For shallow streams, a bottle wash-load sampler was developed. For evaluation of the relationship between sediment concentration c and water discharge Q, the equation c = a times Q to the f power was used and was found to be time dependent. In spite of the limited period of observations, the tentative conclusions that sedimentation basins would not be necessary was confirmed subsequently for all reservoirs put into operation. (See also W78-11113) (Humphreys-ISWS)
W78-11114

THE SIGNIFICANCE OF INFREQUENT HIGH SUSPENDED SEDIMENT CONCENTRATIONS IN THE ESTIMATION OF ANNUAL SEDIMENT TRANSPORT,
Research Inst. for Water Resources Development, Budapest (Hungary).
L. Rakoczi.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 19-25, July 1977. 1 fig, 1 tab, 4 ref.

Descriptors: *Suspended solids, *Sediment discharge, *Estimating, *Rivers, Sediment transport, Rating curves, Frequency, Analytical techniques, Annual, Forecasting, Sampling, Sediments, Variability, Discharge(Water), Foreign research, *Hungary, Peak sediment concentration, Sediment concentration.

In order to estimate the long-term suspended sediment transport of streams more reliably, selection of the most suitable time periods and frequencies for sediment sampling were considered. A basis was provided for deciding on the application of traditional or in situ methods of concentration measurement. The main causes of the often poor correlation between discharge and suspended sediment transport were explained, and a method of allowing for most their effects was proposed. Using the example of a Hungarian river, the new procedure takes into consideration the characteristics of the flow regime and, therefore, estimates the average annual suspended sediment transport more realistically than the traditional calculation methods based on flow frequencies or durations which disregard and conceal the process character of sediment movement. (See also W78-11113) (Humphreys-ISWS)
W78-11115

ESTIMATING FIELD EROSION LOSSES FROM FALLOUT CESIUM-137 MEASUREMENTS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
J. R. McHenry, and J. C. Ritchie.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: 2 fig, 3 tab, 23 ref. ERDA E-(49-7)-3029.

Descriptors: *Soil erosion, *Soil profiles, *Wisconsin, *Watersheds(Basins), Erosion, Sediment yield, Tracers, Measurements, On-site tests, On-site investigations, Sampling, Soil investigations, Cesium, Estimating.

Estimates of soil erosion losses from fields or basins can be made using empirically derived soil loss equations, such as the universal soil loss equation, or they can be made from sediment yield data assuming a sediment delivery ratio. Neither method is capable of describing the movement of soil within a field or basin. Actual amounts of soil loss and deposition within a individual cultivated field were determined in this study from measurements of the radioactive cesium-137 content of soil profiles. These values were compared with those obtained for uneroded, undisturbed soil profiles, and the loss of 137Cs from cultivated areas was correlated with soil loss. The fallout 137Cs normally remained concentrated in the surface soil because of its strong adsorption by the colloidal soil particles, and thus, its resistance to desorption and downward movement in the soil profile in percolating waters. In cultivated fields, 137Cs was distributed throughout the plow depth. When 137Cs was found in a soil profile below the normal plow depth, accumulation of soil was apparent. When the 137Cs content of the soil profile was less than in the undisturbed area, the soil loss was assumed proportional to the 137Cs loss. On the Wisconsin field sites described, erosional losses and accumulations of 10 cm or more have occurred in 10 years. (See also W78-11113) (Humphreys-ISWS)
W78-11116

LIMITATIONS OF THE RATING CURVE TECHNIQUE FOR ESTIMATING SUSPENDED SEDIMENT LOADS, WITH PARTICULAR REFERENCE TO BRITISH RIVERS,
Exeter Univ. (England). Dept. of Geography.
D. E. Walling.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 34-48, July 1977. 6 fig, 6 tab, 33 ref.

Descriptors: *Suspended load, *Rating curves, *Analytical techniques, *Duration curves, Suspended solids, On-site investigations, Sampling, Analysis, On-site data collections, Flow duration, Estimating, Rivers, Sediment discharge, Variability, Reliability, Foreign research, *United Kingdom, Sediment concentration.

In the past, the rating curve technique sometimes has been utilized with little regard for its careful application, its limitations, and the possible errors involved. Some of the errors associated with combining the rating curve and the flow record were considered. More attention needs to be directed towards the reliability and accuracy of the resultant values of sediment load. Continuously monitored sediment concentration data from three rivers in Devon, England, also were used to evaluate the inherent inaccuracy of rating curve estimates of sediment load. Results presented suggest that significant errors can be associated with the use of the rating curve technique for estimating sediment loads, particularly in small basins. Errors of + or- 50% or more may be associated with many rating curve estimates of sediment load. Critical evaluatin of sediment load data is necessary if this is to be used in further analysis, and it was suggested that rating curve procedures should be used only if the potential errors are recognized and judged acceptable for the purposes involved. (See also W78-11113) (Humphreys-ISWS)
W78-11117

SOIL EROSIVE POWER OF RAINFALL IN THE DIFFERENT ZONES OF SRI LANKA,
Department of Irrigation, Colombo (Sri Lanka). Land Use Div.
W. D. Joshua.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 51-61, July 1977. 4 fig, 2 tab, 7 ref.

Descriptors: *Soil erosion, *Impact(Rainfall), *Rainfall, Erosion, Climatic zones, Soils, Podzals, Distribution, Seasonal, Soil types, Foreign research, Foreign countries, *Sri Lanka, Erodibility.

Erosivity (R) is a quantitative measure of the erosive power of rainfall. Erosivity as defined by the total kinetic energy of rain falling at intensities greater than 1 in/h (KE greater than 1) was calculated for nine locations which are representative of the different rainfall patterns and soils of Sri Lanka. More than 50% of of the total rainfall in the lowlands was erosive, and this proportion decreased with increasing elevation. In the uplands, less than 25% of the total rainfall was erosive. In the uplands, less than 25% of the total rainfall was erosive. In the wet zone, southwest monsoon rains were more erosive than the northeast monsoon rains. Rainfall intensities up to 4 in/h are experienced throughout the country. Average annual erosivity values range from 78,100 ft-tons/acre in the dry zone. Erodibility (K) of different soils in Sri Lanka was estimated, using the nomograph developed by Wischmeier, et al, to assess the relative susceptibility of the different soils to erosion. Erodibilities thus calculated varied from 0.17 to 0.48. The relative erosion hazard for the nine locations was assessed by comparing the magnitudes of the factor R X K. Experimental evidence suggust that erosivity defined by KE

greater than 1 may not be appropriate for some soils in Sri Lanka, and the basic infiltration rate of soil may have to be taken into consideration when calculating erosivity. (See also W71-13910) and W78-11113) (Humphreys-ISWS)
W78-11118

METHODS FOR COMPUTATION OF RUNOFF AND SEDIMENT YIELD FROM SLOPES USED FOR AGRICULTURAL NEEDS,
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).
N. N. Bobrovitskaya, I. N. Bogolubova, and S. N. Tumanovskaya.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 62-66, July 1977. 2 tab, 6 ref.

Descriptors: *Runoff, *Sediment yield, *Soil erosion, *Agricultural watersheds, Flood discharge, Design flood, Erosion, Soil types, Land use, Mathematical models, Equations, Analytical techniques, Discharge(Water), Snowmelt, Watersheds(Basins), Foreign countries, Foreign research, *USSR.

The paper dealt with methods for the computation of water and sediment discharge for hydrological verification of anti-erosion projects. Maximum snowmelt and rainfall flood runoff were computed in accordance with the instructions for computing hydrological characteristics used in the USSR. Soil erosion from slopes was computed from empirical relationships between specific sediment yield and runoff depth. The soil erosion equation contains parameters that take into account runoff processes, the type of rill network on the slopes, soil type, and the type of land use. (See slso W78-11113) (Humphreys-ISWS)
W78-11119

THE EFFECT OF EXOGENOUS AND ENDOGENOUS FACTORS ON WATER EROSION DEVELOPMENT IN THE USSR,
Gosudarstvennyi Gidrologicheskii Inst., Moscow (USSR).
K. N. Lisytsina.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 67-74, July 1977. 5 fig, 15 ref.

Descriptors: *Sediment discharge, *Erosion, *Land use, Rivers, Erosion rates, Forests, Deserts, Regions, Physiographic provinces, Foreign countries, *USSR, Sediment concentration.

From measurements of suspended sediment discharge on rivers in the European territory of the USSR, Siberia, and Central Asia, an analysis of exogenous and endogenous factors and their effect on erosion was made. The exogenous factors were described according to physiographic zones - 29 erosion areas being studied. Equations for the computation of erosion were obtained for each area. The variation of erosion rates over the study area is governed by the laws of geographical zonality as well as other processes depending on exogenous factors. The effect of endogenous factors on erosion was shown. The ratios of the intensity of endogenous processes to erosion were obtained, and based on these ratios the zones were delimited. (See also W78-11113) (Humphreys-ISWS)
W78-11120

FACTORS INFLUENCING EROSION IN DISPERSIVE CLAY AND METHODS OF IDENTIFICATION,
California Univ., Davis. Dept. of Civil Engineering.
K. Arulanandan, and R. T. Heinzen.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 75-81, July 1977. 3 fig, 19 ref.

Descriptors: *Erosion, *Cohesive soils, *Reviews, *Soil erosion, Clays, Laboratory tests, Methodology, Shear stress, Soil physical properties, Erosion rates, Hydrometry, Expansive clays, Evaluation, Dispersion, Erodibility, Critical shear stress.

Recent laboratory studies of the erosive behavior of saturated cohesive soils using quantitative methods such as the rotating cylinder and flume apparatus showed that the mechanism of saturated cohesive soil erosion is basically a complex phenomenon involving the structure of the soil and the nature of the interaction between the pore and eroding fluids at the surface. In the case of partially saturated soils, erosion is accelerated further by a process called slaking. The slaking rate being influenced by the structure of the soil. Qualitative methods such as the dispersion ratio and the pinhole test are considered to be inadequate to evaluate the erosion potential and shear stresses of all soils. Relationships between critical shear stress, pore fluid composition, and type and amount of clay characterized by the magnitude of dielectric dispersion or cation exchange capacity were presented for the prediction of erosion potential. In the case of dispersive clays, the potential use of free swell tests as a method of evaluation was examined. It was considered that a gross quantitative evaluation of erosive behavior can best be carried out using the rotating cylinder or a flume, using the loss in weight as a measure of erosion. (See also W78-11113) (Humphreys-ISWS)
W78-11121

SEDIMENT YIELD AS A FUNCTION OF CLIMATE IN UNITED STATES RIVERS,
L. Wilson.
In: Erosion And Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 82-92, July 1977. 5 fig, 2 tab, 4 ref.

Descriptors: *Sediment yield, *Rivers, *Climates, *Model studies, *United States, Sediments, Theoretical analysis, Analytical techniques, Sediment discharge, Weather, Watersheds(Basins), Runoff, Graphical methods, Precipitation(Atmospheric), Curves, Hydrographs, Water yield, Sedihydrogram.

The complex climatic controls of sediment yield were evaluated through statistical and graphical analysis of long-term sediment discharge and weather records from 100 drainage basins throughout the United States and additional analysis of 1,400 basins where the data base is less good. The fluvial regimes of the streams studied can be represented on a sedihydrogram (SHG). The SHG is a double-logarithmetic grid on which mean monthly sediment yield is plotted against mean monthly water yield. Although the techniques required have not been developed as yet, it should be possible to construct an SHG for almost any stream, even where data are deficient, especially if the general shape of the SHG can be determined for a gauged stream within the same climatic regime. The SHG will facilitate design of data-gathering programs and subsequent analysis of sediment transport curves and sediment transport curves and sediment yield variations. (See also W78-1113) (Humphreys-ISWS)
W78-11122

SEDIMENT YIELD IN RELATION TO DRAINAGE BASIN CHARACTERISTICS IN SOME INDIAN RIVER VALLEY PROJECTS,
Council of Scientific and Industrial Research, New Delhi (India).
V. B. Lal, S. Banerji, and J. Narayanan.
In: Erosion And Solid Matter Transport In Inland Waters Symposium, Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 93-97, July 1977. 1 fig, 2 tab, 4 ref.

Descriptors: *Sediment yield, *Watersheds(Basins), *Reservoir silting, *Estimating, Analytical techniques, Analysis, Mathematical models, Sedimentation, Reservoirs, Foreign research, Foreign countries, *India, Silt index.

Besides climate, geological factors, soil cover characteristics, and natural and artificial activity leading to abrupt changes in erosion, the most significant factors for sediment yield are geomorphological characteristics of the contributing basin including its area, and the rates of flow of water. With a view to making realistic estimates of sedimentation, particularly for the reservoir projects for which data are not available, the rate of sedimentation was studied for five north Indian reservoirs, lying along the sub-Himalayan belt and in the Indo-Gangetic plain. It was assumed that the characteristics of geology, soil cover, and human activity are comparable for these reservoirs. The rate of sedimentation was defined as a silt index, i.e., the annual rate of sediment yield per unit area. In an earlier paper, the relationship $S = f(C/I, I/A)$ was investigated where C/I is the capacity-inflow ratio, and I/A is the average annual inflow per unit area. Two more relationships investigated introduced separately two geomorphological terms, viz., the area of the basin, A, and the basin relief ratio, R. It was shown that the introduction of these terms does not improve the relationship as obtained earlier so far as the north Indian region is concerned. However, for two dams outside the selected region, viz., the Tungabhadra, and the Nizamsagar, the present equations incorporating the geomorphological parameters A and R give values within + or - 30% of the reported values, whereas the earlier equation was inapplicable for other regions widely differing in geological and hydrological characteristics. This is, however, not to suggest at this stage and with the extent and the nature of the data presently available, that the equations can be legitimately applied to any regions other than north India. (See also W78-1113) (Humphreys-ISWS)
W78-11123

ESTIMATION OF SEDIMENT YIELD IN TEMPERATE ALPINE ENVIRONMENTS,
British Columbia Univ., Vancouver. Dept. of Geography.
O. Slaymaker.
In: Erosion And Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 109-117, July 1977. 2 tab, 47 ref.

Descriptors: *Sediment yield, *Suspended load, *Mathematical models, *Estimating equations, Analytical techniques, Reviews, Rivers, Estimating, Climatic zones, Alpine, Temperate, Erosion, Geomorphology, Watersheds(Basins), Alpine environments.

Sediment yield data, based on dissolved and suspended river loads, and measurements of geomorphic processes at sites in temperate alpine environments were compared critically. Measurements of rates of operation of slope processes, where integrated over a drainage basin, are 1 to 2 orders of magnitude smaller than sediment yield. The relationship between sediment yield and primary denudation was discussed, and ways of estimating sediment yield were seen to suffer from a blurring of this distinction. The estimation of sediment yield in temperate alpine environments was discussed in terms of glacierization, lithology, sediment availability, and mean runoff. (See also W78-11113) (Humphrey-ISWS)
W78-11125

THE EFFECT OF FARMING UPON SOLID TRANSPORT IN THE RIVER ALMOND, SCOTLAND,
Baghdad Univ. (Iraq). Dept. of Geology.
N. A. Al-Ansari, M. Al-Jabbari, and J. McManus.
In: Erosion and Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 118-125, July 1977. 7 fig, 1 tab, 9 ref.

Descriptors: *Sediment discharge, *Land use, *Watersheds(Basins), *Agriculture, Sediment transport, Suspended load, Crops, Discharge(Water), On-site data collections, Analysis, Analytical techniques, Hydrographs, Foreign research, Foreign countries, *Scotland, *River Almond(Scotland), Sediment concentration.

The River Almond, a right bank tributary of the River Tay, Scotland, drains a 176 sq km basin situated mainly on Lower Old Red Sandstones of Devonian age, but straddling the major Highland Boundary Fault, so that the uppermost sectors drain Dalradian metamorphic slates and associated schistose sediments. The area is mainly open moorland (79%) with restricted areas of afforestation (6%) while agriculture is limited to the floors of the main valleys (15%). The mean daily river discharge is 4.1 cu m/s and records dating from 1972 show maximum flows of 82.6 cu m/s and minimum flows of 0.48 cu m/s. Few sand-dominant reaches exist above the confluence with the Tay, and pebbles and cobbles dominate the bed at the Almondbank gauging station. The pebbles and cobbles preclude the use of VUV or similar bed load samplers for direct measurement of bed load. Direct methods of suspended sediment load calculation show that in a wet year (e.g., 1974), 15,817 tons pass seawards, while in a dry year (e.g., 1973), only 4,780 tons pass the gauging station. The annual sediment yield calculated for the 176 sq km basin is 90.4 tons/sq km in a wet year, falling to 27.2 tons/sq km in a dry year. These figures are about half the values obtained for the nearby River Earn for a larger basin on softer rocks and dominated by farmland (126 tons/sq km and 67.3 tons/sq km). Continuous recording of suspended sediment concentrations in transit, obtained using a Partech recording siltmeter giving readings at 0.5-s intervals, has confirmed that suspension concentrations initially increase as discharge rises, but that dilution soon follows. The suspended sediment load transport peak generally precedes peak river discharge, especially during early winter flows. Later in the year the two peaks more closely coincide or reverse their relative positions. Irregularities in the record, such as a steady rise in suspended sediment load while runoff is constant, are related to local agricultural practices. (See also W78-11113) (Humphreys-ISWS)
W78-11126

THE REGIME OF THE SUSPENDED SEDIMENT YIELD IN THE RIVERS TO LAKE CHAD: SUMMARY OF STUDIES BY ORSTOM IN THE REPUBLIC OF CHAD (REGIME DES APPORTS FLUVIATILES DE MATERIAUX SOLIDES EN SUSPENSION VERS LE LAC TCHAD: SYNTHESE DES ETUDES DE L'ORSTOM EN REPUBLIQUE DE TCHAD),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de n'Djamena.
A. Chouret.
In: Erosion And Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 126-133, July 1977. 4 fig, 6 ref.

Descriptors: *Sediment discharge, *Suspended load, *On-site investigations, *Africa, Sediment yield, Rivers, Foreign countries, Foreign research, Erosion, Watersheds(Basins), Measurement, Methodology, Data collections, Sediments, Hydrographs, Discharge(Water), *Chad, *Lake Chad.

Because of the very unusual physical and climatic features in the Lake Chad basin, ORSTOM conducted a study of the suspended load in the main tributaries feeding the lake. The measurements continued for a period of several years and were within the framework of a multidisciplinary study. The suspended sediment yield in the rivers was measured (1) at latitude 8 deg 30 min N, which roughly delineates the zone of erosion for the stations which are hydrologically significant for Lake Chad, and (2) at N'Djamena 12 deg N, to ascertain the separate yields for each river and the total yield for the basin of 600,000 sq km. After establishing the methodology, the sediment discharges at the stations were determined from a statistical analysis of the accuracy of the measurements and their density. The observations period (1969-1974) covered a range of flows from the relatively high flows in 1970, which resulted in floods in the Logone basin, to the exceptionally low flows in 1972 and 1973: on the whole corresponding to a period of low flow. The suspended sediment load to the lake is steady, and the basic data for each basin are found to be uniform, particularly so for sediment concentration. The Logone basin is shown to have an individual character with reference to the Chari basin. A trend of decreasing erosion in the upstream basins from west to east was noticed. The role of the flood plains which are characteristic of the Chad basin appears to be significant. (See also W78-11113) (Humphreys-ISWS)
W78-11127

SUSPENDED LOAD IN CAMEROUN (TRANSPORTS SOLIDES EN SUSPENSION AU CAMEROUN),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de Yaounde.
J. C. Olivry.
In: Erosion and Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 134-141, July 1977. 6 fig, 2 tab.

Descriptors: *Sediment discharge, *Suspended load, *Watersheds(Basins), *Africa, Erosion, Measurement, On-site investigations, Data collections, Foreign research, Foreign countries, Rivers, *Cameroun, Sediment concentration.

Since 1966, ORSTOM hydrologists have been using a simple methodology to measure suspended load in Cameroun. This has enabled a precise study to be made of the transport regime in three large basins: the Sanaga at Nachtigal, the Mbam at Goura and the Tsanga at Bogo. For the Sanaga basin, the specific annual degradation is 28 tons/sq km, and that for the Mbam basin is between these two basins is explained by the importance of agriculture in the Bamileke district. Six million tons of sediment are transported to the ocean each year. For the Tsanaga basin at Bogo in north Cameroun, the specific degradation reaches 210 tons/sq km/yr, and the average annual concentration is between 1,000 and 1,600 g/cu m. The amount of suspended sediment transported from the Tsanaga to the Yaere is about 300,000 tons/year. The erosion in Cameroun occurs mainly in the wet season and is highly dependent on soil and vegetative cover. (See also W78-11113) (Humphreys-ISWS)
W78-11128

TRANSPORT OF BED LOAD AND SUSPENDED LOAD BY RIVERS FROM LOW RAINFALL AREAS IN AFRICA,
British Columbia Univ., Vancouver.
P. R. B. Ward.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 142-148, July 1977. 4 fig, 3 tab, 4 ref.

Descriptors: *Sediment discharge, *Rivers, *Africa, Sediment yield, Suspended load, Bed load, Surveys, Discharge(Water), On-site investigations, Watersheds(Basins), Foreign countries, Foreign research, Analytical techniques, *Rhodesia, Sediment concentration.

Sediment yields from two basins in Rhodesia were compared. Large differences were found in the sediment yields from these basins because of differences in the hydrology and in the geology, although only a small difference exists in the mean annual rainfall. (See also W78-11113) (Humphreys-ISWS)
W78-11129

SEDIMENT TRANSPORT IN THE HOPE RIVER, JAMAICA: A TROPICAL DRAINAGE BASIN CHARACTERIZED BY SEASONAL FLOW,
University of the West Indies Kingston (Jamaica). Dept. of Geology.
P. A. Wood.
In: Erosion And Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 149-156, July 1977. 6 fig, 20 ref.

Descriptors: *Sediment discharge, *Tropical regions, *Watersheds(Basins), *Hydrographs, Suspended solids, Suspended load, Sediment transport, Bed load, Seasonal, Flow, Streamflow, Discharge(Water), Floods, Rating curves, Foreign research, Rivers, *Jamaica, *Hope River(Jamaica), Sediment concentration, Rising stage, Falling stage.

The Hope River, Jamaica, is characterized by periodic high magnitude floods and seasonal flow. A general relationship of suspended sediment concentration to discharge indicates that concentrations of over 60,000 mg/l may be expected, with discharges of 20 cu m/s. Suspended sediment concentrations are higher for the same discharge during the rising stage of the hydrograph than during the falling stage, and data from individual rating loops indicate that over 8,000 tons of suspended sediment have been lost in just over 30 h. Competence determinations for bed material transport suggested that for the Hope River, D and 2D/3 are poor approximations for R, and that very large material (over 400 mm) is capable of being transported during high magnitude events. (See also W78-11113) (Humphreys-ISWS)
W78-11130

RELATIONSHIP BETWEEN SOIL EROSION AND SEDIMENT DELIVERY,
Agricultural Research Service, Beltsville, MD.
A. R. Robinson.
In: Erosion And Solid Matter Transport In Inland Water Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 159-167, July 1977. 3 tab, 18 ref.

Descriptors: *Soil erosion, *Sediment yield, *Reviews, *United States, Erosion, Sheet erosion, Channel erosion, Gully erosion, Stream erosion, Deposition(Sediments), Valleys, Sedimentation, Sediment sources.

In the USA, the amount of erosion occurring at an upstream point generally is estimated using the universal soil loss equation (USLE), although other relationships also have been used. The USLE estimates gross erosion, including rill erosion, on an annual basis. It does not predict deposition or compute gully and channel erosion. The sediment delivery ratio is used as a measure of the amount of sediment delivered by a stream system as a ratio of the erosion that has been occurring upstream. The ratio accounts for the sediment losses and gains that occur below the point where gross erosion is determined. The sediment

delivery ratio has been shown to be somewhat related to the size of basin with the ratio decreasing as the size increases. There is a considerable volume of sediment in transit at any time between the point of origin and final deposition. The amount of sediment delivered at some point in the stream or river system is also a function of the soils, total land use (including construction and surface mining), conservation practices, energy ability of the flow to transport the material, density of stream channels, and streambank stability and/or instability. Recent studies on small basins in the USA have shown that conservation practices have reduced upland erosion but have increased streambank instability so that the sediment delivery has remained essentially the same. In this case, the source of sediment carried in the stream shifted from upland agricultural areas to the channel banks. Consideration of all the above factors should result in better estimating procedures for sediment delivery ratios and stream loadings of sediment. (See also W78-11113) (Humphreys-ISWS)
W78-11131

SEDIMENT DELIVERY RATIOS DETERMINED WITH SEDIMENT AND RUNOFF MODELS,
Agricultural Research Service, Temple, TX. Grassland Forage Research Center.
J. R. Williams.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 168-179, July 1977. 5 tab, 16 ref.

Descriptors: *Sediment yield, *Model studies, *Texas, *Watersheds(Basins), Erosion, Soil erosion, Routing, Analytical techniques, Annual, Mathematical models, Sheet erosion, Sediments, Forecasting, Sediment discharge, Storm runoff, Analysis, Hydrographs, Evaluation, Sediment delivery ratio, Sediment-runoff model, Sediment routing.

The long-term average annual sediment yield from a basin can be predicted by applying a delivery ratio to estimated gross erosion. Average annual sediment yield is the only information required for some problems like sediment pool design for small reservoirs. Applying a delivery ratio to estimated gross erosion is convenient and can be fairly accurate if delivery ratios can be predicted accurately. Traditionally, delivery ratio prediction equations have been developed by relating basin characteristics to measured sediment yield divided by predicted gross erosion. However, prediction equations have been developed for only a few regions of the US because of limited sediment data. By using sediment and runoff models, delivery ratios can be determined for any region for use in developing prediction equations. A sediment-runoff model was used to predict average annual sediment yield from basins with areas up to 65 sq km. A sediment routing technique was used on basins with areas up to 200 sq km to maintain prediction accuracy. The procedure was demonstrated with data from Little Elm Creek basin near Aubrey, Texas. Delivery ratio prediction variables in order of importance were SCS curve number, relief-length ratio, and drainage area. The prediction equation explained about 93% of the variation in delivery ratio. In tests with data from 15 other Texas basins, sheet erosion was computed with the universal soil loss equation and adjusted by the delivery ratio to obtain sediment yield. Sediment yield from gullies was estimated and added to the sheet sediment yield to compare with measured amounts. This procedure explained about 80% of the variation in average annual sediment yield for the 15 basins. Modelling to determine delivery ratios is much faster and less expensive than the traditional method of long-term data collection. (See also W78-11113) (Humphreys-ISWS)
W78-11132

A SEDIMENT YIELD INDEX AS A CRITERION FOR CHOOSING PRIORITY BASINS,
All Indian Soil and Land Use Survey, New Delhi.
Y. P. Bali, and R. L. Karale.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 180-188, July 1977. 1 fig, 4 tab, 2 ref, 1 append.

Descriptors: *Sediment yield, *Forecasting, *Watersheds(Basins), Mapping, Soil erosion, Erosion rates, Analytical techniques, Foreign countries, Foreign research, Analysis, Data collections, Priorities, *India, Sediment yield index, Sediment delivery ratios.

In the absence of measured sediment data, a sediment yield index expressing the relative sediment yield from different basins formed the basis for grading the basins in order of priority for soil and water conservation measures. The methodology involves erosion intensity mapping on a base material on which natural units of sub-basins and basins are delineated and codified. The erosion intensity mapping units, based on significant parameters of sediment detachment, reflect the relative magnitude of sediment yield expressed as a weighting value. A basic factor K = 10 signifies a delicate balance between the different processes of sediment detachment and deposition in a particular unit. Addition of (x) and K is indicative of effect sediment detachment somewhat proportional to the value of x. Subtraction from K suggests deposition. The transport of sediment is estimated using a delivery ratio which is based on the intricate interrelationship of site and soil factors. Following this methodology, demarcation of priority basins has been accomplished for the whole or part of the 12 River Valley Projects covering a total area of about 5.5 million ha. Comparisons with the sediment yield predictive equation showed fairly dependable correlations with the weighting values of erosion intensity units. (See also W78-11113) (Humphreys-ISWS)
W78-11133

BASIN SEDIMENT YIELD MODELLING USING HYDROLOGICAL VARIABLES,
Queens Univ., Kingston (Ontario). Dept. of Geography.
C. A. Onstad, and A. J. Bowie.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: Internatonal Association of Hydrological Sciences Publication No. 122, p 191-202, July 1977. 4 fig, 5 tab, 17 ref.

Descriptors: *Sediment yield, *Forecasting, *Watersheds(Basins), *Model studies, *Iowa, *Mississippi, Mathematical models, Demonstration watersheds, Analysis, Data collections, Gully erosion, Rill erosion, Sheet erosion, Equations. Universal soil loss equation, Sediment sources, Sediment delivery ratios.

Estimates of sediment yields from basins and prediction of sediment sources are needed increasingly throughout the world for use in designing practices to conserve soil and control pollution. Sediment yield models incorporating hydrological and hydraulic flow properties are useful in this respect. Models with these characteristics have been designed to predict sediment yields from single storms to monthly and annual yields. Models of this type also can be used to predict sediment sources within basins. Three models for predicting yields from single storms were compared. One model provides estimates of the magnitude of the sediment sources on the basin which give planners an index of areas where conservation measures are most critically needed. (See also W78-11113) (Humphreys-ISWS)
W78-11134

EROSION PROCESSES IN MOUNTAIN BASINS IN HUMIC REGIONS,
National Research Center for Disaster Prevention, Tokyo (Japan).
T. Mizutani.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 203-208, July 1977. 4 fig, 2 ref.

Descriptors: *Mass wasting, *Watersheds(Basins), *Model studies, *Sediment yield, Mountains, Sediment discharge, Humid areas, Erosion, Mathematical models, Scour, Theoretical analysis, Analytical techniques, Tractive forces, Sediment load, On-site investigations, Running waters, Foreign research, *Japan, Erosion processes.

Theoretical equations which represent the changes in the longitudinal profiles of mountain slopes and valleys were derived from consideration of the simplified erosional mechanisms of the dominant agents in humid regions. The applicability of the equations of actual processes of erosion was confirmed by using the data obtained mainly from morphometric measurements of erosional landforms. Processes of debris transport in mountain basins with high gradients can be represented by the relation Q = c(tau) to the alpha power, where Q is the amount of sediment discharge, tau the tractive force, c a constant, and alpha varies from 3 to 3.5. (See also W78-11113) (Humphreys-ISWS)
W78-11135

THE SEDIMENTS DEPOSITED BY THE OUED MEDJERDAH DURING THE EXCEPTIONAL FLOOD OF MARCH 1973 IN TUNISIA: QUANTATIVE AND QUALITATIVE ASPECTS OF TRANSPORT AND DEPOSITION (LES ALLUVIONS DEPOSEES PAR L'OUED MEDJERDAH LORS DE LA CRUE EXCEPTIONNELLE DE MARS 1973 EN TUNISIE: ASPECTS QUANTITATIF ET QUALITATIF DUE TRANSPORT ET DU DEPOT),
Office de la Recherche. Scientifique et Technique Outre-Mer, Tunis (Tunisia).
J. Claude, and J. Y. Loyer.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 211-218, July 1977. 3 fig, 2 tab, 3 ref.

Descriptors: *Floods, *Sediment yield, *Deposition(Sediments), *On-site investigations, Sediment transport, Storms, Surveys, Sediments, Analysis, Volume, Foreign countries, Measurement, Alluvial channels, Alluvium, *Tunisia.

In March 1973, the Oued Medjerdah experienced an exceptional rise which caused serious flooding. The hydrological measurements made during the flood and the assessments of the thickness of the sediments made after the flood had subsided have allowed the volumes of sediment transported and deposited to be estimated. These volumes are considerable. Analyses of a large number of sections of alluvium and of the materials they overlie have served as the basis for a statistical study of the sediments themselves and for the comparison of the new material with the substratum. (See also W78-11113) (Humphreys-ISWS)
W78-11136

THE EXTENT OF SILTING IN THE BASINS BEHIND SEVEN DAMS IN TUNISIA AND THE ESTIMATION OF SEDIMENT TRANSPORT (MESURE DE L'ENVASEMENT DANS LES RETENUES DE SEPT BARRAGES EN TUNISIE: ESTIMATION DES TRANSPORTS SOLIDS),
Division Ressources en Eau, Tunis (Tunisia).
A. Ghorbel, and J. Claude.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; July 1977. 5 fig, 3 tab, 6 ref.

Descriptors: *Reservoir silting, *Sediment yield, *Demonstration watersheds, *Surveys, Sediment transport, Estimating, On-site investigations, Silting, Volume, Measurements, Methodology, Analytical techniques, Foreign research, Foreign countries, Deposition(Sediments), Reservoirs, Sediments, Erosion.

Inspection of basins behind dams for silting on the one hand, allows, evaluation of the effectiveness of counter measures and, on the other, because of the deposition of sediments over a long period, it leads to estimtes of the total sediment transport and erosion from experimental basins. A systematic program for the measurement of these factors was carried out in Tunisia in 1975 and 1976 using a high resolution echo sounder to measure the depths along previously surveyed profiles. The volume of sediment laid down leads to an estimation of the total solid transport reaching the basins and the specific erosion in the seven experimental basins. The results vary from one basin to another, but they provide ample evidence that erosion and sediment transport reach considerable proportions; and they lead to several comments on the representativity of the measurements. (See also W78-11113) (Humphreys-ISWS)
W78-11137

PIPING IN THE MILK RIVER CANYON, SOUTHEASTERN ALBERTA-A CONTEMPORARY DRYLAND GEOMORPHIC PROCESS,
Queens Univ., Kingston (Ontario). Dept. of Geography.
R. W. Barendregt, and E. D. Ongley.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 233-243, July 1977. 8 fig, 7 ref.

Descriptors: *Gullies, *Geomorphology, *Erosion, *Canada, Surveys, Sediment transport, On-site investigations, Headward erosion, Gully erosion, Canyons, Semiarid climates, Channels, Underground, Sinks, *Alberta, *Milk River Canyon, *Piping phenomena(Soils).

During the spring and summer of 1975 and 1976, the authors observed and recorded piping phenomena as it affects slope development in the Milk river Canyon area of semiarid southeastern Alberta. This little-studied and seldom-described geomorphological process was illustrated amply and occurs on a scale not previously described in Canada or elsewhere. Piping is responsible for a sequence of landscape forms which, together, cause canyon wal retreat. A small dam built at the outlet of a representative pipe network provided a rought estimate of 286 tons of sediment per sq km of canyon wall in the one field season. Factors favorable to piping occur in the Milk river Canyon area. They are: (1) the presence of swelling clays, especially bentonite (a devitrified volcanic ash); (2) the abundance of fine-grained sediments; (3) the presence of soft unconsolidated bedrock as well as alluvium; (4) large zones of porous material alternated with impermeable members; (5) long, hot dry spells with episodic intense precipitation; (6) active badland serosion; (7) incised gullies and a degrading river; (8) sparse vegetation; (9) high local relief producing a steep hydraulic gradient; and (10) the presence of seasonally large hydraulic heads provided by the sloughs on the prairie surface above the canyon walls and by the thick porous sandstones which rest on an impermeable clayey carbonaceous shale and lignite. (See also W78-11113) (Humphryes-ISWS)
W78-11138

STREAM DISCHARGE, SUSPENDED SEDIMENT AND EROSION RATES IN THE RED DEER RIVER BASIN, ALBERTA, CANADA,
Alberta Univ., Edmonton. Dept. of Geography.
I. A. Campbell.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceeding of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 244-259, July 1977. 2 fig, 6 tab, 45 ref.

Descriptors: *Watersheds(Basins), *Canada, *Suspended load, *Rivers, Sediment load, Streamflow, Discharge(Water), On-site investigations, Data collections, Arid climates, Semiarid climates, Erosion, Sediment yield, Rating curves, Foreign research, Foreign countries, *Alberta, *Red Deer River.

The study of the relationship between stream discharge and sediment load and regional erosion rates in arid and semiarid environments is greatly complicated by the fact that fluvial activity within the drainage basins of such areas is econcentrated in perhaps one or two events each year. Such patterns of fluvial activity present a major problem when attempting to estimate suspended sediment rating curves. In most humid drainage basins, much of the sediment load originates with fluvial processes initiated by precipitation, or runoff, over large areas of the basin. High discharges usually are associated with large sediment loads. Under arid and semiarid climates, such situations are rare. Here, intense local convectional rainstorms, often falling on poorly vegetated and highly erodible material close to the channel system, result in large inputs of sediment often accompanied by relatively minor changes in discharge in the main channel. This additional factor further complicates the problem and highlights the general fact that in most drainage systems, in reality, the sediment yield is derived from a relatively small proportion of the total catchment area. In regions of moisture deficiency, such a situation almost always pertains. These patterns were illustrated by data collected from the Red Deer river basin, Alberta, Canada. Suspended sediment and stream discharge data, as related to surface erosion measurements and regional erosion rates, showed that typical rating curves significantly underestimate the occurrence of high sediment concentrations and that in most years the sediment concentrations greatly exceed those computed by rating curves. Such a situation poses potentially severe problems in terms of design criteria for river management projects, especially in the arid world. (See also W78-11113) (Humphreys-ISWS)
W78-11139

EROSION MODALITIES IN THE LOWER BASIN OF THE OUED EL.HADJEL (CENTRAL TUNISIA) (CAUSES ET MODALITIES DE L'EROSION DANS LE BASSIN VERSANT INFERIEUR DE L'OUED EL-HADJEL (TUNISIE CENTRALE),
Office del Recherche Scientifique et Technique Outre-Mer, Tunis (Tunisia).
J. Bonvallot, and A. Hamza.
In: Erosion and Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 260-268, July 1977. 2 fig, 3 tab, 6 ref.

Descriptors: *Reservoir silting, *Watersheds(Basins), *Erosion, *Land use, Dams, Data collections, Rivers, On-site investigations, Foreign countries, Foreign research, Grazing, Sheet erosion, Exploitation, *Tunisia, Sediment sources.

The authors presented some erosion data for the lower sub-basin of the Oued El-Hadjel, in Central Tunisia. The erosion phenomena are due to excessive agricultural exploitation, intense deforestation to provide charcoal, and overgrazing. Modalities of erosion were analyzed. It was concluded that anti-erosion measures are absolutely necessary to avoid rapid silting in the future barrage at Sidi Saad. (See also W78-11113) (Humphreys-ISWS)
W78-11140

SUSPENDED-LOAD DISCHARGE IN THE SEMIARID REGION OF NORTHERN PERU,
Rhein-Main-Donau A. G., Munich (West Germany).
J. Burz.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 269-277, July 1977. 3 fig, 5 tab.

Descriptors: *Suspended load, *Sediment discharge, *Rivers, *Semiarid climates, Climates, Discharge(Water), Sampling, On-site investigations, Analytical techniques, Analysis, Foreign countries, Foreign research, Data collections, Equations, *Peru, *Rio Chira, *Rio Chancay, *Rio Jequetepeque, Sediment concentration.

The outstanding characteristic of hydrological processes in semiarid regions is their variability. This effects above all the bed-load and suspended-load discharge. This paper dealt with the variations of the water and suspended-load discharge of three rivers in the north of Peru. The relationships between water discharge and suspended-load concentration and suspended-load discharge were investigated by means of regression and correlation analysis. The results showed that the degree of association is relatively high except for years with a very low correlation coefficient. The marked variations between the seasons of the year require segregation of data by seasons. The combination of hydrological factors common in dry seasons may be virtually nonexistant during wet seasons. A particular combination of factors may exist for only a few days in several years and may render computations based on average values grossly erroneous. The high altitude zone is the only part of the basin in which precipitation is received regularly. Therefore, water and sediment discharge values expressed as discharge per square kilometre (yield) should be used with caution. The transfer of these results to other basins cannot be recommended because the physical characteristics of individual basins are different. The available data are not suitable for frequency and probability studies. (See also W78-11113) (Humphreys-ISWS)
W78-11141

EROSION AND SOLID MATTER TRANSPORT IN INLAND WATERS WITH REFERENCE TO THE NILE BASIN,
Ministry of Irrigation, Cairo (Egypt). Water Research Center.
M. S. E. Shalash.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; July 1977: International Association of Hydrological Sciences Publication No. 122, p 278-283, July 1977. 1 fig, 2 tab.

Descriptors: *Watersheds(Basins), *Rivers, *Suspended load, *Sediment discharge, Erosion, Sediment yield, Sediment transport, Soil erosion, Foreign countries, Foreign research, On-site data collections, Sediments, Gravels, Sands, Silts, Clays, *Nile River.

The River Nile catchment covers an area of 2,900,000 sq km, extends from latitude 4 deg S to latitude 31 deg N, and experiences a great variety of climate. The vegetation within the Nile basin includes alpine flora in the higher parts, dense tropical forest, tall elephant grass, thin savanna forest, thick vegetation of tropical swamps, thorny forest, and scanty vegetation of desert country. Also, there are dense crops grown on irrigated lands. In general, the Nile basin may be divided into four main sub-basins: (1) The White Nile, whose head waters rise south of the equator. Its runoff is 29% of the total Nile runoff and its water is clear. (2) The atbara River which rises in north Ethiopia. This is a flashy river and is dry for half the year. Its runoff is muddy and constitutes 14% of the total Nile runoff. (3) The Blue Nile which also rises in north Ethiopia. Its runoff equals 57% of the total runoff of the Nile. The flow is muddy dur-

ing the rainy season. (4) The Main Nile which flows northwards to the sea. Within the Nile basin there are only two main catchment areas; the Blue Nile and Atbara River, which erode and supply the Main Nile with suspended sediment. The average annual suspended sediment load measured in the Main Nile is 134 million tons. The total sediment derived from rainstorms over the Eastern Desert of Egypt amounts to 1 million tons. As there are no direct measurements of the sediment load for the individual basins, it is difficult to estimate the eroded land in each basin separately. The mechanical analysis of the deposited sediment within the main Nile Valley confirms its origin in the eroded surface soil of the Atbara and Blue Nile sub-basins. The rate of annual soil erosion in the Blue Nile and Atbara River basins is about 0.1 mm, and less than that within the main river basin. (See also W78-11113) (Humphreys-ISWS)
W78-11142

A STUDY OF SOLID TRANSPORT DURING A TRADITIONAL MANAGEMENT PROGRAMME USING SURFACE RUNOFF TO NOURISH OLIVE PLANTATIONS IN THE SAHEL REGION OF TUNISIA (CONTRIBUTION A L'ETUDE DES TRANSPORTS SOLIDES DANS UN AMENAGEMENT TRADITIONNEL D'UTILISATION DES EAUX DE RUISSELLEMENT POUR L'ALIMENTATION DES PLANTATIONS D'OLIVIERS DANS LA REGION DU SAHEL DE TUNISIE),
Centre de Recherche de Genie Rural, Tunis (Tunisia).
Z. Chaabouni.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 284-291, July 1977. 4 fig, 2 tab, 3 ref, 1 append.

Descriptors: *Africa, *Surface runoff, *Sediment transport, *Watersheds(Basins), Sediment yield, On-site investigations, Rainfall intensity, Rainfall, Sheet erosion, Soil erosion, Suspended load, Suspended solids, Sediments, Clays, Sands, Foreign research, Foreign countries, Hydrologic aspects, *Tunisia, *Sahel region(Tunisia).

A traditional hydrological study called 'Meskat' using water from surface runoff to nourish olive plantations, is being carried out in the Sahel region of Tunisia. The results of the first measuring program in 1975-1976 yielded the following erosion data: solid transport in the surface runoff on a catchment takes place in such a way that particles of clay and coarse sand are selected at the cost of loam. Erosion increases sharply with slope. The solid transport load depends on the maximum intensity of the rainfall, the slope of the regression rising with the slope of the basin. Erosion caused by surface runoff occurs when the maximum intensity of rainfall exceeds a certain limit. (See also W78-11113) (Humphreys-ISWS)
W78-11143

THE EFFECTS OF HYDRAULIC CONSTRUCTIONS ON SOLID TRANSPORT IN NORTH AFRICA (EFFETS SUR LES TRANSPORTS SOLIDES DES OUVRAGES HYDRAULIQUES EN AFRIQUE DU NORD),
Office de la Recherche Scientifique et Technique Outre-Mer, Tunis (Tunisia).
J. Colombani.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publications No. 122, p 295-300, July 1977. 1 fig, 2 tab, 5 ref.

Descriptors: *Reservoir silting, *Deposition(Sediments), *Sediment yield, *Africa, Lakes, On-site investigations, Surveys, Measurement, Reservoirs, Flood plains, Hydraulic structures, Soil erosion, Foreign countries, Foreign research, Dams, Semiarid climates, Watersheds(Basins).

The silting up of artificial lakes is one of the most important problems of dam engineers. By their very presence, dams unquestionably modify the solid transport regime downstream, in some cases causing a resumption of erosion. Existing artificial lakes are without doubt the best means of estimating the hazards of sedimentation. Measurements from the Nebeur Reservoir on the Mellegue River were given as an example. Lastly, the possible effects of hydraulic constructions on flood plains and on the marine environment were mentioned. These phenomena are particularly emphasized in North Africa because of the irregular nature of its semiarid climate and the intensity of erosive forces. (See aslo W78-11113) (Humphreys-ISWS)
W78-11144

SEDIMENTOLOGICAL ASPECTS OF WITHDRAWING WATER FROM RIVERS,
Waterloopkundig Lab., Delft (Netherlands).
For primary bibliographic entry see Field 4D.
W78-11145

PROBLEMS OF SEDIMENT CONTROL AT AN INTAKE STRUCTURE ON THE HABLE-RUD RIVER AND ITS INFLUENCE ON THE SEDIMENT REGIME OF THE RIVER,
Water Resources Research Inst., Tehran (Iran).
For primary bibliographic entry see Field 4D.
W78-11146

A CRITERION FOR DEPOSITION (UN CRITERE DE DEPOT),
Ecole Polytechnique Federale de Lausanne (Switzerland). Lab. d'hydraulique.
G. Pazis.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 325-329, July 1977. 3 fig. 2 tab, 5 ref.

Descriptors: *Deposition(Sediments), *Rivers, *Sediment transport, *Mathematical models, Model studies, Analytical techniques, Hydraulics, Flow, Stream erosion, Foreign research, Movement, Tractive forces, Silting, Sedimentology, Deposition critria, Two-phase flow.

In river hydraulics it is more difficult to predict for different flow conditions the deposition of the transported material than the erosion. Erosion criteria are presently well established; on the other hand, hydraulic criteria for sediment deposition are scarce or non-existent. From direct experimental observation of the deposition phenomenon and using independent variables, especially shear stress, a quantitative evaluation method has been established by considering hydraulic conditions of two-phase flows. The results are encouraging and show the possibility using a relationship based on the Shield's function, which is a well accepted criterion for the erosion phenomenon, for the deposition. (See also W78-11113) (Humphreys-ISWS)
W78-11147

SEDIMENT PROBLEMS AT INTAKES FOR HYDROPOWER PLANTS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
For primary bibliographic entry see Field 8B.
W78-11148

A NEW TYPE OF INTAKE STRUCTURE SUITABLE FOR ARID CONDITIONS,
Technische Univ., Darmstadt (West Germany). Inst. fuer Wasserbau und Wasserwirtschaft.
For primary bibliographic entry see Field 4D.
W78-11149

SEDIMENT PROBLEMS RELATED TO INCREASED DISCHARGES AT THE INTAKE OF A RUN-OF-RIVER CANAL SYSTEM IN HARYANA (INDIA),
Office of the Chief Engineer, Chandigarh (India). Irrigation Works.
For primary bibliographic entry see Field 4D.
W78-11150

THE RECENT HISTORY OF PRODUCTIVITY IN SELECTED BERKSHIRE LAKES,
Massachusetts Univ., Amherst. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11203

MODELING SEDIMENT MOVEMENT IN THE TURBIDITY MAXIMUM OF AN ESTUARY,
Virginia Inst. of Marine Science Gloucester Point.
For primary bibliographic entry see Field 2L.
W78-11213

FACTORS INFLUENCING EQUILIBRIUM OF A MODEL SAND BEACH,
Texas A and M Univ., College Station. Dept. of Oceanography; and Texas A and M Univ., College Station. Ocean Engineering Program.
For primary bibliographic entry see Field 2L.
W78-11221

DETAILED BATHYMETRY OF SELECTED AREAS OF THE INNER CONTINENTAL SHELF OF THE VIRGINIAN SEA: SOUTHEASTERN VIRGINIA, VIRGINIA BEACH AND VACHAPREAGUE, VIRGINIA,
Virginia Inst., of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W78-11225

GEOCHEMISTRY OF THE MATTOLE RIVER OF NORTHERN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resouces Div.
For primary bibliographic entry see Field 2K.
W78-11255

2K. Chemical Processes

INTERACTION BETWEEN BEDROCK AND PRECIPITATION AT TEMPERATURES CLOSE TO 0C,
Oslo Univ. (Norway). Dept. of Geology.
H. G. Rueslatten, and P. Jorgensen.
Nordic Hydrology, Vol 9, No 1, p 1-6, 1978. 3 fig, 2 tab, 8 ref.

Descriptors: *Snowmelt, *Melt water, *Bedrock, *Water chemistry, Chemical analysis, Ions, Cations, Sodium, Calcium, Magnesium, Potassium, Acids, Acidic water, Humus, Rocks, Leaching, Weathering.

After a long period of snow melting and leaching, samples of snow and meltwater were collected. Chemical analysis revealed that the water composition changed radically during flow across the bedrock surface, even at low temperatures (0-2C). A rapid increase in proton content occurred while the water was flowing along the bedrock/humus interface, followed by a rapid decrease and an equivalent increase in the content of Na(+), Ca(++), Mg(++), and K(+). The proton content was attributed to proton producing reactions in the vegetation and in the humic laer, while the other cations were supposed to originate from the bedrock surface. Data for water samples collected in August illustrated the influence of higher temperature upon biological processes and the rate of weathering. Water in fractures has high electrolyte content due to long contact time. Scanning electron photomicrographs of the bedrock surface

revealed that distinctive etch pits were developed on the feldspar surfaces due to the weathering effects of the acid water. (Sims-ISWS)
W78-10527

WATER QUALITY RESEARCH IN NEW ZEALAND 1976,
National Water and Soil Conservation Organization, Christchurch (New Zealand).
For primary bibliographic entry see Field 5G.
W78-10531

TRACE METAL CONCENTRATIONS IN SOME ICELANDIC SEAWEEDS,
Slovenska Akademija Znanosti in Umetnosti, Ljublijana (Yugoslavia). Biological Inst.
For primary bibliographic entry see Field 5A.
W78-10581

SOIL NITRATE-NITROGEN DETERMINED BY CORING AND SOLUTION EXTRACTION TECHNIQUES,
Agricultural Research Service, Lafayette, IN.
For primary bibliographic entry see Field 2G.
W78-10592

STABILIZATION OF CALCIUM BY SURFACE CHARGE VARIATION IN AN OXISOL,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W78-10594

AN ALKALINE OXIDATION METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-10596

RELATIONSHIPS BETWEEN SOIL UREASE ACTIVITY AND OTHER SOIL PROPERTIES,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-10600

ON THE CHEMICAL FOUNDATION OF THE SODIUM ADSORPTION RATIO,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 2G.
W78-10608

ION EXCHANGE REACTIONS IN NONDRIED CHAMBERS MONTMORILLONITE HYDROXY-ALUMINUM COMPLEXES,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-10611

EVALUATION OF SOIL NITROGEN MINERALIZATION POTENTIALS UNDER MODIFIED FIELD CONDITIONS,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 2G.
W78-10613

EFFECT OF REDOX POTENTIAL AND PH ON THE UPTAKE OF CADMIUM AND LEAD BY RICE PLANTS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
C. N. Reddy, and W. H. Patrick, Jr.
Journal of Environmental Quality, Vol. 6, No. 3, p 259-262, July-September 1977. 8 fig, 2 tab, 21 ref.

Descriptors: *Cadmium, *Lead, *Rice, Heavy metals, Sediments, Saturated soils, *Flooded soils, *Oxidation-reduction potential, *Hydrogen ion concentration.

Redox potential and pH are two of the major factors influencing the mobilization and immobilization of heavy metals in flooded soils and sediments, and their availability to plants. A system developed for growing plants in soil suspensions where redox potential and pH can be controlled was used to study the uptake of cadmium (Cd) and lead (Pb) by rice plants. Uptake of Cd and Pb by root and shoot tissue, and their translocation from root to shoot, was determined at six different redox potentials (-200, -100, 0, +100, +200, and +400 mV) and four pH values (5, 6, 7, and 8). The effects of redox potential and pH on the levels of water-soluble Cd and Pb in the soil suspensions were also studied. Almost all Cd entering the rice plants accumulated in the shoots. Total Cd uptake and shoot uptake increased with an increase in suspension redox potential and a decrease in pH. Water-soluble Cd in the soil suspension was significantly correlated with total plant Cd and Cd uptake by shoot. Total Pb uptake, including Pb associated with roots, decreased with an increase in suspension redox potential and pH. (Skogerboe-Colorado State)
W78-10614

EFFECT OF INORGANIC AND ORGANIC COMPOUNDS ON THE EXTRACTABILITY OF 239PU FROM AN ARTIFICIALLY CONTAMINATED SOIL,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 2G.
W78-10616

THE ASSESSMENT OF PLANT-AVAILABLE CADMIUM IN SOILS,
Wye Coll., Ashford (England). Dept. of Physical Sciences.
For primary bibliographic entry see Field 2G.
W78-10617

HYDROLOGIC RECONNAISSANCE OF THE YAMPA RIVER DURING LOW FLOW, DINOSAUR NATIONAL MONUMENT, NORTHWESTERN COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10632

SOME PROPERTIES OF THE GEOMETRIC MEAN AND ITS USE IN WATER QUALITY STANDARDS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-10641

APPROXIMATE ANALYTICAL SOLUTION FOR SOLUTE FLOW DURING INFILTRATION AND REDISTRIBUTION,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-10920

A TWO-ELEMENT CERAMIC SENSOR FOR MATRIC POTENTIAL AND SALINITY MEASUREMENTS,
Forest Service (USDA), Albuquerque, NM. Rocky Mountain Forest and Range Experimental Station.
For primary bibliographic entry see Field 2G.
W78-10921

WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS.
National Sanitation Foundation, Ann Arbor, MI.
For primary bibliographic entry see Field 5A.
W78-10927

CHEMICAL CHARACTERISTICS OF A DESERT STREAM IN FLASH FLOOD,
Arizona State Univ., Tempe. Dept. of Zoology.
S. G. Fisher, and W. L. Minckley.
Journal of Arid Environments, Vol. 1, No. 1, 1978, p. 25-33. 6 fig, 3 illus, 25 ref.

Descriptors: *Flash floods, *Water chemistry, *Floods, *Peak discharge, Flow characteristics, Arizona, Southwest U.S., Reservoirs, Hydrograph analysis, Nitrates, Phosphates, Flow measurement, Suspended solids.

Flash flooding, a common hydrologic phenomenon in arid regions, has profound physical and biological influences upon receiving systems such as reservoirs. While numerous accounts document the profound effects of desert flash floods upon human settlements, many of which are located upon alluvial fans and debris cones of steep mountains, there is little data available on the transport characteristics of a flash flooding desert stream. This paper reports upon the water chemistry of a single flash flooding event on Sycamore Creek, Arizona, and discusses implications of flash flooding on water resources in desert regions. Water samples were taken before, during and for 2 days after a flash flood event on Sept. 26, 1976. Sample were subsequently analyzed for conductivity, nitrate, phosphate, iron, suspended sediments, organic particulate matter and total alkalinity. Results indicated that particulate materials incrase to exceedingly high concentrations during flooding, peaking at the leading edge of the initial flood wave. Total dissolved substances, however, decline regularly during flooding, due to the dilution effect and fail to respond to minor increase in discharge. Some dissolved constituents such as nitrate and phosphate are found to increase with flooding and this suggests that leaching provides a major source of these nutrients. Because of the short-lived nature of these floods, peak dischrges seldom exceed 25 percent of the normal flood peaks for the U.S. in general, and flows of less than 10 times the median discharge account for only 7 percent of the total runoff in Sycamore Creek in particular. It is suggested that analysis of flood waters in the Southwestern desert be concentrated on only those peak flows of 10 times the median charge. (Tickes-Arizona).
W78-10964

NITRIFICATION IN THREE SOILS AMENDED WITH ZINC SULFATE,
Georgia Univ., Experiment. Dept. of Agronomy.
D. O. Wilson.
Soil Biology and Biochemistry, Vol 9, No 4, p 277-280, 1977. 3 fig, 2 tab, 11 ref.

Descriptors: Soils, Soil investigations, *Zinc, *Nitrification, Soil properties, Soil chemistry, *Soil chemical properties, Nitrogen, *Sulfates.

The introduction of metals into soils by such routes as land application of sewage sludge and the deposition of airborne particulates from mining operations can significantly increase the native soil concentration of these metals. Heavy metals are commonly present in domestic sewage sludge at rather high concentrations and often at extremely high concentrations in industrial sludges. Elevation of the metal content of agricultural soils is of particular concern because of possible toxic effects on plant growth and other biological processes. Zinc is considered one of the metals most likely to produce phytotoxicity as a result of sludge application to soil (Webber, 1972). Since soils exhibit a wide range of physical and chemical properties, it is difficult to compare and extrapo-

late results of various workers with respect to the effects of Zn on soil N mineralization processes. Reported are the results of a study relating nitrification to various rates of Zn added to three agriculturally important soils. (Skogerboe-Colorado State)
W78-11029

STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS--I. DISTRIBUTION OF IMMOBILIZED NITROGEN AMONGST SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
J. N. Ladd, J. W. Parsons, and M. Amato.
Soil Biology and Biochemistry, Vol 9, No 5, p 309-318, 1977. 5 fig, 5 tab, 27 ref.

Descriptors: *Nitrogen, *Mineralization, *Calcareous soils, Soils, Soil investigations, Soil texture, Soil density, Glucose, Wheat, Soil amendments, Soil moisture, Soil chemistry, *Particle size, *Particle density.

Studies of the relative availability of nitrogenous components of soils have mostly been chemically based. Of the chemically 'defined' components, acid-hydrolyzable amino acid-N appears to contribute most to inorganic-N if judged by the amounts of N lost from this organic-N pool during periods of net mineralization. However, measurements of the percentage decrease of N from soil chemical fractions how that no component is consistently of greater biological availability. (See also W78-11033) (Skogerboe-Colorado State)
W78-11032

STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS--II. MINERALIZATION OF IMMOBILIZED NITROGEN FROM SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
J. N. Ladd, J. W. Parsons, and M. Amato.
Soil Biology and Biochemistry, Vol 9, No 5, p 319-325, 1977. 1 fig, 5 tab, 23 ref.

Descriptors: *Nitrogen, *Mineralization, *Calcareous soils, Soils, Soil investigations, Soil texture, Soil density, Glucose, Wheat, Soil amendments, Soil moisture, Soil chemistry, *Particle size, *Particle density.

15N03(-) was immobilized in a calcareous sandy soil and a calcareous clay soil each incubated with glucose and wheat straw. Net mineralization of organic-15N was more rapid in the sandy soil, irrespective of C amendment, and in soils amended with glucose. Intermittent drying and wetting of soils during incubation stimulated mineralization of 15N-labelled and native soil organic-N in all treatments. The availability (percentage mineralization) of recently-immobilized 15N consistently exceeded that of the native soil N. Ratios of the availability of labelled and unlabelled N were similar in the sandy and clay soils but varied according to C amendment, drying and wetting cycle and incubation period. (See also W78-11032) (Skogerboe-Colorado State)
W78-11033

SOIL MICROBIAL AND BIOCHEMICAL CHARACTERISTICS IN RELATION TO SOIL MANAGEMENT AND FERTILITY,
Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.
For primary bibliographic entry see Field 2G.
W78-11035

SULFUR OXIDATION AND RESPIRATION IN 54-YEAR-OLD SOIL SAMPLES,
Pacific Northwest Forest and Range Experiment Station, Corvallis, OR. Forestry Sciences Lab.
W. B. Bollen.
Soil Biology and Biochemistry, Vol 9, No 6, p 405-410, 1977. 3 tab, 15 ref.

Descriptors: *Sulfur, *Respiration, Sampling, *Oxidation, *Soil chemistry, Soil investigations, Soil properties, *Soil tests, Soils.

Soil samples in dry storage for 54-yr retain their ability to respire and to oxidize S. Three of the soils had lower S-oxidizing capacity and three oxidized more S at 1 g kg-1 than did the samples when originally collected. When the experiment was repeated with all apparatus sterilized by autoclaving and sterlized in flowing steam, a greater proportion of the S was oxidized. This was not due to heat treatment of the S. In all cases, S additions and incubation resulted in a lowering of the soil pH, suggesting that Thiobacillus thiooxidans was responsible and had survived the prolonged storage. When the soils, before and after incubation, were added to Thiobacillus media, only Gram-positive bacteria, mostly Bacillus spp., were found. (Skogerboe-Colorado State)
W78-11036

PHOSPHATASES IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
F. Eivazi, and M. A. Tabatabai.
Soil Biology and Biochemistry, Vol 9, No 3, p 167-172, 1977. 4 fig, 4 tab, 26 ref.

Descriptors: Soils, Soil investigations, *Soil chemistry, *Soil chemical properties, *Phosphates, Alkaline soils, *Phosphatase activity(Soils).

Most studies on phosphatase activity in soils have been concerned with acid phosphatase. This study was conducted to determine the activity of phosphomonoesterases (acid and alkaline phosphatases), phosphodiesterase, and 'phosphotriesterase'. The results indicate that acid phosphatase is predominant in acid soils and that alkaline phosphatase is predominant in alkaline soils. With universal buffer, the pH optima of phosphodiesterase and phosphotriesterase were at pH 10. The activities of these phosphatases in soils were much lower than those of the acid and alkaline phosphatases in soils indicated that air-drying increased the activity of acid phosphatase and phosphotriesterase, decreased the activity of alkaline phosphatase, but did not affect the activity of phosphodiesterase. (Skogerboe-Colorado State)
W78-11037

EFFECT OF BIURET CONTENT ON TRANSFORMATION OF UREA NITROGEN IN SOIL,
Indian Agricultural Research Inst., New Delhi Div. of Agricultural Chemicals.
K. L. Sahrawat.
Soil Biology and Biochemistry, Vol 9, No 3, p 173-175, 1977. 2 tab, 16 ref.

Descriptors: *Urea, *Nitrogen, Nutrients, Fertilizers, Fertilization, *Soil chemistry, *Nitrites, Ammonia.

The effect of the biuret content on transformations of urea-N was studied in a sandy loam (pH 7.7). While biuret did not affect urea hydrolysis, it inhibited the conversion of NH4(+) to N02(-) and the subsequent oxidation of N02(-) to N03(-). This resulted in the accumulation of larger amounts of both NH4(+)-N and N02(-)-N in soil as compared to soil receiving urea alone. The results suggest that biuret impurity in urea fertilizer is likely to enhance nitrite toxicity. (Skogerboe-Colorado State)
W78-11038

ACETYLENE INHIBITION OF NITROUS OXIDE REDUCTION AND MEASUREMENT OF DENITRIFICATION AND NITROGEN FIXATION IN SOIL,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Microbiology.
For primary bibliographic entry see Field 2G.
W78-11039

EFFECT OF NITROGEN DIOXIDE ON NITRITE OXIDATION AND NITRITE-OXIDIZING POPULATIONS IN SOIL,
Cornell Univ., Ithaca, NY. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 2G.
W78-11043

NITROGEN ISOTOPE DISCRIMINATION IN DENITRIFICATION OF NITRATE IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
A. M. Blackmer, and J. M. Bremner.
Soil Biology and Biochemistry, Vol. 9, No. 2, p 73-77, 1977. 2 fig, 4 tab, 21 ref.

Descriptors: *Nitrogen, *Denitrification, *Nitrates, Soils, Soil investigations, *Soil chemistry, *Isotopes, Soil chemical properties.

Nigrogen isotope discrimination during denitrification in soils of nitrate containing natural concentrations of 14N and 15N was studied by determining the amount and the 15N content of nitrate-N and (nitrate + nitrite)-N in nitrate-treated soils incubated under anaerobic conditions (He atmosphere) for various times after treatment with glucose to promote denitrification. Analyses performed showed that the nitrate-N lost on incubation of these soils could largely be accounted for as products of denitrification. (Skogerboe-Colorado State)
W78-11052

AMMONIA VOLATILIZATION FROM SURFACE APPLICATIONS OF AMMONIUM COMPOUNDS TO CALCAREOUS SOILS: VI. EFFECTS OF INITIAL SOIL WATER CONTENT AND QUANTITY OF APPLIED WATER,
Texas A and M Univ., El Paso. Agricultural Research Station.
For primary bibliographic entry see Field 2G.
W78-11054

SEARCH FOR NITRIFYING AGENTS IN WATER AND SOILS AS SOURCES OF NITRATES IN SURFACE WATER,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5B.
W78-11063

LOW TEMPERATURE ADAPTED SUBMERSIBLE SPECTROPHOTOMETERS FOR USE IN FLOATING ICE RESEARCH,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
W. A. Adams, and P. A. Flavelle.
Scientific Series No. 82, 1978, 15 p, 18 fig, 9 ref, 3 tab.

Descriptors: *Spectrophotometry, *Spectrometers, *Adaptation, *Floating, *Ice, Penetration, *Solar radiation, Limnology, Glaciology, Calibrations, *Low temperature, *Submersible spectrophotometers, Spectroscopic techniques.

The calibration and operation of underwater spectrometers in the visible region (400 nm to 750 nm) are described. The application of the spectrometers for the measurement of the penetration of solar radiation through floating ice presented with examples of systems used for a variety of ice conditions. The methods used for handling the data,

both analog and digital, are given. Also discussed is the role of these spectroscopic techniques in glaciological and limnological studies. (WATDOC)
W78-11190

INTERLABORATORY QUALITY CONTROL STUDY NO. 14 MAJOR IONS: CALCIUM, MAGNESIUM, SODIUM POTASSIUM, HARDNESS, ALKALINITY, CHLORIDE, SULPHATE AND NITRATE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-11191

TURBULENT DIFFUSION PROCESSES IN THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-11193

INTERLABORATORY QUALITY CONTROL STUDY NO. 15 TOTAL PHOSPHORUS IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-11194

ATMOSPHERIC BULK PRECIPITATION IN THE LAKE ERIE BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-11195

CHARGE CHARACTERISTICS OF SPODIC HORIZONS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-11200

INORGANIC PHOSPHORUS SPECIES AND TRANSFER MECHANISMS IN SOILS TO SEDIMENTS FOR TWO SMALL KANSAS WATERSHEDS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5B.
W78-11206

GEOCHEMISTRY OF THE MATTOLE RIVER OF NORTHERN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resouces Div.
V. C. Kennedy, and R. L. Malcolm.
Open-file report 78-205, December 1977. 324 p, 56 fig, 108 tab, 171 ref.

Descriptors: *Geochemistry, *Rainfall, *Runoff, *Ion exchange, *Water chemistry, Sediment discharge, Soils, Trace elements, Nutrients, Subsurface runoff, Estuaries, Storms, Streamflow, *California, *Mattole River, Mendocino County(Calif).

The chemical composition of streams can vary greatly with changing discharge during storm runoff. These chemical changes are related to the pathways of various water parcels from the time they fall as rain until they enter the stream, and to the interactions between water and sediment during transport downstream. In order to understand better the chemical variations during storms, an extensive investigation was made of the Mattole River, a chemically clean coastal stream in Mendocino County, California. The Mattole drains a topographically mature basin of 620 sw km which has relief of about 1200 m, a long summer dry season, and mean annual rainfall of about 2300 mm. The stream flow is composed of seasonally varying proportions of four flow components, namely, surface runoff, quick-return flow (rainfall having brief and intimate contact with the soil before entering the surface drainage), delayed-return flow, and base runoff. Each component is identified by its characteristic chemistry and by the time delay between rainfall and entrance into the stream. Information is also presented on rain chemistry, adsorption reactions of suspended sediments in the fresh and brackish environments, and compositional variation of river sediments with particle size. (Woodard-USGS)
W78-11255

DETERMINATION OF DISSOLVED BORON IN FRESH, ESTUARINE, AND GEOTHERMAL WATERS BY D.C. ARGON-PLASMA EMISSION SPECTROMETRY,
Geological Survey, Menlo Park, CA. Water Resources Div. and Geological Survey, Menlo Park, CA. Geologic Div.
For primary bibliographic entry see Field 5A.
W78-11256

MONITORING WATER-QUALITY DURING PILOT DREDGING IN THE WILLAMETTE AND COLUMBIA RIVERS, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11261

STRATIGRAPHIC TEST WELL, NANTUCKET ISLAND, MASSACHUSETTS,
Geological Survey, Reston, VA. Geologic Div.
For primary bibliographic entry see Field 4B.
W78-11266

2L. Estuaries

MODELLING OF WATER EXCHANGE IN AN ESTUARY,
National Board of Waters, Helsinki (Finland). Hydrological Office.
J. Sarkkula, and M. Virtanen.
Nordic Hydrology, Vol 9, No 1, p 43-56, 1978. 5 fig, 9 ref.

Descriptors: *Estuaries, *Water circulation, *Bridges, *Model studies, mathematical models, Regression analysis, Flow, Discharge(Water), Mixing, Tidal waters, Coasts, Rivers, Winds, Circulation, Numerical analysis, *Finland.

A two-dimensional horizontal hydrodynamical model was used to estimate the changes that a harbor road will cause in the water exchange of an estuary. The research area was the Kokemaenjoki river estuary on the coast of the Gulf of Bothnia in western Finland. The numerical model was verified on the basis of a regression model describing the water exchange of the estuary at present with a multiple correlation squared of 0.9. The factors having an influence on the water exchange were the wind, the sea level fluctuation, and the river discharge. The changes in the water exchange were considered during a dry spell, a flood period, and an average year with three different cross section areas of the road line. The accuracy and reliability of the estimation were found to be very satisfactory. (Sims-ISWS)
W78-10529

ASSESSMENT OF PROBABILITY OF THE PROBABLE MAXIMUM HURRICANE EVENT AND ITS ASSOCIATED FLOODING POTENTIAL,
Boston Edison Co., MA. Environmental Science.
F. J. Mogolesko.
Journal of Applied Meteorology, Vol 17, No 7, p 921-925, July 1978. 3 fig, 4 tab, 10 ref.

Descriptors: *Hurricanes, *Maximum probable flood, *Model studies, *Mathematical models, Probability, Floods, Nuclear powerplants, Coasts, Hazards, Data processing, Analytical techniques, Storms, Statistics, Climatology.

The development of a model for hurricane-induced coastal flooding and the assignment of a probability distribution for each contributing event make it possible to estimate the probability of occurrence versus flood elevation. Additionally, this procedure could be used to establish the probability associated with the Probable Maximum Hurricane (PMH). A probabilistic analysis of PmH parameters and tidal elevation was made to estimte the frequency of a combined pMH induced surge and high tide event. Another probability analysis was made for the recored high water elevation at a nearby tide-gage station. As a result of the above analysis, it was suggested that PMH water levels are excessively conservative. (Sims-ISWS)
W78-10532

THE IMPACT OF FRENCH NUCLEAR INSTALLATIONS ON THE AQUATIC ENVIRONMENT, IMPACT DES INSTALLATIONS NUCLEAIRES FRANCAISES SUR L'ENVIRONNEMENT AQUATIQUE,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Section de radioecologie.
For primary bibliographic entry see Field 5C.
W78-10555

MARINE POLLUTION IN SURUGA BAY AND ASSOCIATED ENVIRONMENTAL CHANGE IN RELATION TO FISHERIES (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W78-10573

ALGAL METABOLITES AND FISH KILLS IN A BAYOU ESTUARY: AN ALTERNATIVE EXPLANATION TO THE LOW DISSOLVED OXYGEN CONTROVERSY,
University of West Florida, Pensacola. Faculty of Biology.
For primary bibliographic entry see Field 5C.
W78-10582

SURFACE WATER RECORDS OF COOK INLET BASIN, ALASKA, THROUGH SEPTEMBER 1975,
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10621

A PROGRESS REPORT ON ESTUARY MODELING BY THE FINITE-ELEMENT METHOD,
Geological Survey, Reston, VA. Water Resources Div.
W. G. Gray.
Open-file report 78-479, May 1978. 79 p, 15 fig, 12 ref.

Descriptors: *Model studies, *Estuaries, *Finite element analysis, *Computer models, *Tidal effects, Mathematical models, Analytical techniques, Flow characteristics, Equations.

Various schemes are investigated for finite-element modeling of two-dimensional surface-water flows. The first schemes investigated combine finite-element spatial discretization with split-step time stepping schemes that have been found useful in finite-difference computations. Because of the large number of numerical integrations performed in space and the large sparse matrices solved, these finite-element schemes were found to be economically uncompetitive with finite-difference schemes. A very promising leapfrog scheme is proposed which, when combined with a novel very

fast spatial integration procedure, eliminates the need to solve any matrices at all. Additional problems attacked included proper propagation of waves and proper specification of the normal flow-boundary condition. This report indicates work in progress and does not come to a definitive conclusion as to the best approach for finite-element modeling of surface-water problems. The results presented represent findings obtained between September 1973 and July 1976. (Woodard-USGS)
W78-10648

SHORE EROSION CONTROL STRUCTURE,
Sandgrabber, Inc., Bay City, MI. (Assignee).
For primary bibliographic entry see Field 8A.
W78-10704

UNDERWATER TRUSSES FOR BREAKWATER STRUCTURE,
For primary bibliographic entry see Field 8A.
W78-10713

CADMIUM IN PORT PHILLIP BAY MUSSELS,
La Trobe Univ., Bundoora (Australia) Dept. of Inorganic and Analytical Chemistry.
For primary bibliographic entry see Field 5B.
W78-10743

BIOASSAY DATA FOR MARINE POLLUTION USING SEA URCHIN EGGS, 1974,
Seto Marine Biological Lab. (Japan).
For primary bibliographic entry see Field 5A.
W78-10744

BENTHIC MOLLUSCAN ASSEMBLAGES IN RELATION TO SEDIMENT GRADIENTS IN NORTHEASTERN LONG ISLAND SOUND, CONNECTICUT,
City Univ. of New York. Inst. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-10747

CONSERVATION PROBLEMS IN THE NORFOLK BROADS AND RIVERS OF EAST ANGLIA, ENGLAND-PHYTOPLANKTON, BOATS AND THE CAUSES OF TURBIDITY,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-10752

COASTAL CONFLICTS AND THE COURTS,
For primary bibliographic entry see Field 6E.
W78-10779

FLORIDA REGIONAL COASTAL ZONE STUDIES: EXISTING LEGAL AUTHORITIES.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Coastal Zone Planning.
For primary bibliographic entry see Field 6E.
W78-10780

LAND SUBSIDENCE: MENACE TO THE TEXAS GULF COAST,
Harris-Galveston Coastal Subsidence District, Houston, TX.
For primary bibliographic entry see Field 6E.
W78-10782

THE VIRGINIA COAST RESERVE: ACQUISITION STRATEGIES FOR COASTAL ZONE PRESERVATION,
Nature Conservancy, Arlington, VA.
For primary bibliographic entry see Field 6F.
W78-10787

CURRENT STATUS OF THE WASHINGTON COASTAL ZONE MANAGEMENT PROGRAM AMENDMENT,
Washington State Dept. of Ecology, Olympia. Shoreline Div.
For primary bibliographic entry see Field 6E.
W78-10831

EMERGING PATTERNS OF DECISIONS (THE APPLICATION OF POLICY IN THE ADMINISTRATION OF THE SHORELINE MANAGEMENT ACT IN WASHINGTON),
Shorelines Hearings Board, Lacey, WA.
For primary bibliographic entry see Field 6E.
W78-10832

SURFACE WATER: TEXAS GULF COAST ALTERNATIVE TO SUBSIDENCE,
Harris-Galveston Coastal Subsidence District, Houston, TX.
For primary bibliographic entry see Field 6E.
W78-10840

COASTAL ZONE IMPACTS OF OFFSHORE OIL AND GAS DEVELOPMENT: AN ACCOMMODATION THROUGH THE CALIFORNIA COASTAL ACT OF 1976,
For primary bibliographic entry see Field 6E.
W78-10859

WAVE SETUP ON A SLOPING BEACH,
Coastal Engineering Research Center, Fort Belvoir, VA.
J. R. Lesnik.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 358, Price codes: A02 in paper copy, A01 in microfiche. Report CERC-CETA-77-5, September 1977. 16 p, 4 fig, 5 ref.

Descriptors: *Waves(Water), *Ocean waves, *Beaches, *Model studies, Mathematical models, Berms, Coasts, Coastal engineering, Coastal structures, Wave setup.

Design of coastal structures requires consideration of abnormally high water levels produced by storms. An important component of the storm surge can be the rise in water level produced by wave action. The wave train approaching the coast and breaking offshore causes the water to pile up on the beach. Depending upon the wave characteristics (height and period) and beach slope, this accumulation of water will continue until the slope of the water surface in the onshore-offshore direction results in a head which balances the forces tending to drive the water onto the beach. This rise in water level is commonly called wave setup. This report combined the material previously presented in Sections 2.62 and 3.85 of the Shore Protection Manual. Computation of wave setup on beaches as steep as 1 on 10 (m=0.01) can be easily determined by graphical means when incident wave conditions are defined. Practical applications were discussed and two example problems were provided. (Sims-ISWS)
W78-10929

A THREE-DIMENSIONAL NUMERICAL MODEL FOR PREDICTING POLLUTANT AND SEDIMENT TRANSPORT USING AN EULERIAN-LAGRANGIAN MARKER PARTICLE TECHNIQUE,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5B.
W78-10933

WAVE OVERTOPPING EQUATION,
Coastal Engineering Research Center, Fort Belvoir, VA.
J. R. Weggel.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A042 678, Price codes: A02 in paper copy, A01 in microfiche. CERC Reprint 77-7, August 1977. 47 p, 8 fig, 1 tab, 5 ref, 1 append. Reprinted from: Proceedings of the 15th Coastal Engineering Conference, Honolulu, Hawaii, July 11-17, 1976, p 2737-2755.

Descriptors: *Waves(Water), *Ocean waves, *Shores, *Structures, Beaches, Coasts, Lakes, Model studies, Mathematical models, Equations, Levees, Slopes, *Wave overtopping.

Some available data on wave overtopping by monochromatic waves were reevaluated before publication of the Shore Protection Manual. The analysis of earlier data was made in order to summarize and present it in a more readily usable form. This paper provided empirical equations which can be used to predict overtopping rates for various structure slopes and structure types if accurate predictions of runup are available. (Sims-ISWS)
W78-10936

MODELING OF ECOLOGICAL SUCCESSION AND PRODUCTION IN ESTUARINE MARSHES,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
J. C. Zieman, and W. E. Odum.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A051 929, Price codes: A13 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-35, November 1977. 265 p, 63 fig, 8 tab, 79 ref, 3 append.

Descriptors: *Estuarine environment, *Model studies, *Salt marshes, Plant growth, Salinity, *Ecological succession, *Dredged material, Spartina alterniflora, Spartina patens, Distichlis spicata.

Three parallel studies were conducted with the development of a simulation model of plant growth and succession on a salt marsh being the ultimate objective. Field studies showed that Spartina alterniflora exhibited a strong positive correlation with the elevation and tidal inundations at the two major study sites, Taskinas Creek and Bennett's Creek, in Virginia. S. alterniflora showed a negative correlation with soil salinity and significant positive correlation with available iron. Responses of S. patens and Distichlis spicata were more variable, but where regular flooding occurred there was a strong positive correlation with S. patens abundance and negative correlation with D. spicata. Records from the continuous monitoring study reinforce the concept of tidal inundation acting as a master variable. A model was developed which depicted plant growth and succession across a transect. The model was driven by solar radiation, temperature, soil salinity, and tidal inundation. The model showed plant growth controlled primarily by tidal inundation, with influences felt from radiation and temperature, but little influence due to salinity. (WES)
W78-10945

STABILITY TESTS OF NAWILIWILI BREAKWATER REPAIR,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-10948

HABITAT DEVELOPMENT FIELD INVESTIGATIONS, WINDMILL POINT MARSH DEVELOPMENT SITE, JAMES RIVER, VIRGINIA; APPENDIX C: ENVIRONMENTAL IMPACTS OF MARSH DEVELOPMENT WITH DREDGED

MATERIAL: ACUTE IMPACTS ON THE MACROBENTHIC COMMUNITY,
Virginia Inst. of Marine Science, Gloucester Point. Div. of Biological Oceanography.
For primary bibliographic entry see Field 5C.
W78-10954

SEAGRASS LITERATURE SURVEY,
Virginia Univ., Charlottesville. Dept. of Environmenta Sciences.
For primary bibliographic entry see Field 2L.
W78-10958

SEAGRASS LITERATURE SURVEY,
Virginia Univ., Charlottesville. Dept. of Environmenta Sciences.
J. C. Zieman, K. W. Bridges, and C. P. McRoy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A054 480, Price codes: A10 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report D-78-4, Jan. 1978. 213 p, 2 append.

Descriptors: Surveys, *Bibliographies, *Literautre reviews, Plant populations, *Seagrasses, Water quality, Productivity, Plant physiology.

An extensive review of the literature pertaining to seagrasses was accomplished through a search of published literature and unpublished documents up to mid 1977. Broad scientific subject areas that relate to seagrasses such as anatomy, ecology, morphology, taxonomy, and physiology were considered together with more specific factors such as substrate selectivity, water quality, productivity, colonization, effect of physical energy (waves, tidal currents, sediment transport), propagation, and tolerance to disturbance. The bibliography is divided into two main reference sections consisting of a bibliographic citations section and a keyword index section. Also, two supplementary reference sections consisting of an author index section and a source index section appear as appendices in microfiche form. (WES)
W78-10958

AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX B: ROLE OF DISPOSAL OF PCB-CONTAMINATED SEDIMENT IN THE ACCUMULATION OF PCB'S BY MARINE ANIMALS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-10959

AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; APPENDIX E: DEMERSAL FISH AND DECAPOD SHELLFISH STUDIES,
National Marine Fisheries Service, Hammond, OR.
For primary bibliographic entry see Field 5C.
W78-10960

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON; APPENDIX E: RELEASE AND DISTRIBUTION OF POLYCHLORINATED BIPHENYLS INDUCED BY OPEN-WATER DREDGE DISPOSAL ACTIVITIES,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-10962

OIL POLLUTION ON ISRAELI COASTS,
Oil Pollution South East Kent, Dover (England).
For primary bibliographic entry see Field 5B.
W78-10968

POLLUTION EFFECTS ON INTERTIDAL MACROBENTHIC COMMUNITIES,
Napier Coll. of Commerce and Technology Edinburgh (Scotland).
For primary bibliographic entry see Field 5C.
W78-11007

BENTHOS AROUND AN OUTFALL OF THE WERRIBEE SEWAGE-TREATMENT FARM, PORT PHILLIP BAY, VICTORIA,
Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group.
For primary bibliographic entry see Field 5C.
W78-11024

INSTITUTIONAL ARRANGEMENTS FOR EFFECTIVE GROUNDWATER MANAGEMENT TO HALT LAND SUBSIDENCE,
Texas A and M Univ., College Station. Dept. of Animal Science.
For primary bibliographic entry see Field 4B.
W78-11057

AQUACULTURE OF THE GREEN MUSSEL, MYTILUS VIRIDIS LINNAEUS, IN MALAYSIA,
Universiti Sains malaysia, Penang. Pusat Pengajian Sains Kajihayat.
P. M. Sivalingam.
Aquaculture, Vol 11, No 4, August 1977, p 297-312, 13 fig, 4 tab, 51 ref.

Descriptors: Environmental effects, *Temperature, *Salinity, Hydrogen ion concentration, *Mussels, Spawning, *Aquiculture.

Induced spawning studies with M. viridis indicated that neither plain temperature jumps, pH nor salinity variations were effective but four temperature cycles of 20 min. duration between 25 and 35C in a seawater medium containing 0.2% NH40H induced spawning. Salinity, between 24 and 80%, 50% temperature tolerant between 10 and 35C and 50% pH tolerant between pH 3.5 and 9. Under natural conditions, spawning occurs twice a year, in March and April, and October and November. (Chilton-ORNL)
W78-11099

INTERIM ASSESSMENT OF WASHINGTON STATE SHORELINES MANAGEMENT,
Washington Univ., Seattle. Dept. of Geography.
For primary bibliographic entry see Field 6E.
W78-11164

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME IV, TURBULENT ENERGY COMPUTATION,
Rand Corp., Santa Monica, CA.
J. J. Leendertse, and S. K. Liu.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-285 964, Price codes: A04 in paper copy, A01 in microfiche. Completion Report No. R-2187-OWRT, May 1977. 59 p, 40 fig, 1 tab, 16 ref, 2 append. OWRT C-7072(6231)(2).

Descriptors: *Three-dimensional flow, *Estuaries, *Mathematical models, *Numerical methods, Tides, Fluid dynamics, Computer models, Coastal engineering, Development of models, Finite differences, Simulation, Unsteady flow, Computation, Turbulent energy.

Three-dimensional flows in water bodies with nonhomogeneous density can be computed by use of a finite difference model which contains an equation of continuity, equations describing conservation of momentum, salinity, temperature, subgridscale energy, and an equation of state. In the model, vertical accelerations are neglected, but not the vertical velocities. The vertical exchange coefficients are computed from the subgridscale energy intensity. Experiments made with the model produced velocity distributions which typically occur in coastal areas. (See also W78-11210; W76-07016; W75-10900 and W74-04301)
W78-11209

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME V, TURBULENT ENERGY PROGRAM,
Rand Corp., Santa Monica, CA.
S. K. Liu, and A. B. Nelson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 965, Price codes: A05 in paper copy, A01 in microfiche. Completion Report No. R-2188-OWRT, May 1977. 90 p, 4 ref, 4 append. OWRT C-7072(No. 6231)(3).

Descriptors: *Three-dimensional flow, *Estuaries, *Mathematical models, *Numerical methods, Tides, Fluid dynamics, *Computer models, Coastal engineering, Development of models, Finite differences, Simulation, Unsteady flow, *Computer programs, Turbulent energy(Flow), Computation.

A computer program of a three-dimensional model, including subgridscale turbulent energy for nonhomogeneous estuaries and coastal seas is presented. The computer code is programmed for the implementation of computation methods described by Leendertse and Liu (A Three-Dimensional Model for Estuaries and Coastal Seas: Volume IV, (See W78-11209). The program can perform numerical integration of the equations of motion, continuity, transport of salt, heat, turbulent energy and a pollutant constituent. The dynamic fields of salinity and temperature are coupled to the equations of motion through the use of a nonlinear equation of state. The effect of the vertical density gradient on the vertical exchange is evaluated by the Richardson number computed using the local turbulent energy level. In addition to the main computer program, the variable definitions, input parameters, implementation and operational aspects are described, followed by a sample case. (See also W76-07016; W75-10900 and W74-04301)
W78-11210

MODELING SEDIMENT MOVEMENT IN THE TURBIDITY MAXIMUM OF AN ESTUARY,
Virginia Inst. of Marine Science Gloucester Point.
A. Kuo, M. Nichols, and J. Lewis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 989, Price codes: A05 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 111, June 1978. 76 p, 23 fig, 32 ref, 1 append. OWRT B-077-VA(1).

Descriptors: *Estuaries, *Sediment transport, Model studies, Turbidity, Simulation analysis, Tides, Salinity, Distribution patterns, *Mathematical models, Turbidity maximum.

This research developed a two-dimensional, time-dependent numerical model to simulate the movement of water and suspended sediment in the turbidity maximum of an estuary. This model is a systematic sequence of mathematical procedures derived from the mass-balance equation and the equation of motion. Lateral integration is used to obtain two-dimensional equations; these equations are integrated with depth over the height of successive layers. Finite difference equations then are written for each layer and solved numerically using prescribed boundary conditions. The model yields values for time-varying tidal height, current speed, salinity, and suspended sediment concentration (turbidity) throughout the estuary. In turn, these variations reveal the response to tidal current fluctuations of both salinity and sediment distributions within the maximum. Residual values of each parameter are obtained by averaging respec-

tive values over a tidal cycle. By examining the time-varying and tidal-average transport at landward and seaward transects, sediment transport through the turbidity maximum may be studied in detail. Using this numerical model permits analyses of hydraulic processes that lead to suspended sediment accumulation.
W78-11213

FACTORS INFLUENCING EQUILIBRIUM OF A MODEL SAND BEACH,
Texas A and M Univ., College Station. Dept. of Oceanography; and Texas A and M Univ., College Station. Ocean Engineering Program.
D. C. Smith, IV, J. B. Herbich, and T. W. Spence.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 401, Price codes: A05 in paper copy, A01 in microfiche. Sea Grant Program Report No. TAMU-SG-77-203, November 1976. 97 p, 39 fig, 7 tab, 24 ref, 3 append. Also as: COE Report No. 189. SG-04-6-158-44012.

Descriptors: *Beaches, *Shore protection, *Erosion, Baseline studies, Resources development, Environmental effects, Outer Continental Shelf, Beach profiles.

Characteristics of a two-demsional model beach subjected to wave action and with initial slope 1:60 were investigated. The hypothesis that the beach profile reaches a repeatable equilibrium form was tested. It was found that the entire profile did not have a repeatable equilibrium shape, possibly due to minor uncontrollable water level variations. Certain features of the profile were found to exhibit better qualities than others. The maximum height of the beach crest above stillwater was determined to have a repeatable and stable shape. For other test data with initial slopes 1:20 and 1:30, the maximum height of the beach crest was found to correlate well with the deepwater wavelength. The initial slope was determined to have a significant effect on the determined relations. (Sinha-OEIS)
W78-11221

DREDGING IN ESTUARIES - A GUIDE FOR REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS. SYMPOSIUM/WORKSHOP PROCEEDINGS, MARCH 1977, RESTON, VIRGINIA,
Research Triangle Inst., Research Triangle Park, NC.; and Oregon State Univ., Corvallis.
M. F. Massoglia.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 799, Price codes: A11 in paper copy, A01 in microfiche. National Science Foundation, Research Applied to National Needs Report No. NSF/RA-770284, March 1977. 276 p, 3 append. AEN 71-01908A03.

Descriptors: *Estuaries, *Dredging, *Environmental effects, *Water pollution effects, Resources development, Environmental impact statements, Workshops.

The purpose of this symposium/workshop was to familiarize various user groups with the 'Guidelines for Impact Assessment of Dredging in Estuaries' prepared by Oregon State University (OSU). The guidelines provide a methodology that is intended to ensure that the quality of the data contained in an Environmental Impact Statement (EIS) is adequate to comply with the intent of the National Environmental Policy Act of 1969 (NEPA). The guidelines, used in conjunction with this symposium/workshop proceedings report, are intended to assist the Corps of Engineers, the Environmental Protection Agency, the Maritime Administration, estuary managers, and individuals in the extremely important process of evaluating and preparing environmental impact statements for dredging in estuaries. The symposium/workshop consists of a series of presentations by the OSU research team; four concurrent workshop sessions; presentations by individuals from public and private organizations involved in planning, decision making, regulation, and evaluation of estuarine dredging; and a public session. (Sinha - OEIS)
W78-11222

DETAILED BATHYMETRY OF SELECTED AREAS OF THE INNER CONTINENTAL SHELF OF THE VIRGINIAN SEA: SOUTHEASTERN VIRGINIA, VIRGINIA BEACH AND VACHAPREAGUE, VIRGINIA,
Virginia Inst., of Marine Science, Gloucester Point.
C. H. Sutton, V. Goldsmith, and A. H. Sallenger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 204, Price codes: A03 in paper copy, A01 in microfiche. Virginia Institute of Marine Science Special Report in Applied Marine Science and Ocean Engineering, No. SRAMSOE-69, 1976. 15 p, 4 fig, 3 tab, 5 plate, 5 infold maps.

Descriptors: *Continental Shelf, *Virginia, *Bathymetry, Resources development, Baseline studies, Water quality control, Outer Continental Shelf.

The increased need for information involving the physical processes affecting the inner continental shelf has led to the preparation of detailed compilations of the nearshore bathymetric data of the Virginian coastline. Contrived short-term and the apparent long-term shortages of fuel have initiated an intensive study of the adjacent continental shelf area for possible future sites of offshore drilling rigs, power plants and port facilities. Among the basic oceanographic information required in all such studies is detailed depth information. To help meet these needs detailed bathymetric maps containing significantly more information than has previously been compiled have been prepared and made available from this region of the Atlantic shelf. (Sinha-OEIS)
W78-11225

HYDROGRAPHY OF OREGON ESTUARIES PRIOR TO JUNE 1956,
Oregon State Coll., Corvallis. School of Science.
W. V. Burt.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A106 790-9, Price codes: A02 in paper copy, A01 in microfiche. Data Report No. 2, Reference 56-2, June 1956, 24 p. ONR-1286(02).

Descriptors: *Oregon, *Estuaries, *Hydrography, Baseline studies, Resources development, Environmental effects, Water quality, Outer Continental Shelf.

The data presented in this report consists of hydrographic information for ten Oregon estuaries. Most of the sampling stations are listed by some land mark. Most of the readily available unpublished hydrographic data for Oregon Estuaries which was collected prior to June 1956 have been tabulated. Data on water temperature, salinity and velocity are presented. Data collected by the Navy Hydrographic Office and the USC and GS are not included. (Sinha-OEIS)
W78-11226

BRUNSWICK ESTUARY STUDY.
Georgia Dept. of Natural Resources Atlanta. Environmental Protection Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 784, Price codes: A04 in paper copy, A01 in microfiche. August 1976. 56 p, 4 fig.

Descriptors: *Georgia, *Estuaries, *Water quality, *Water pollution sources, Hydrography, Baseline studies, Resouces development, Outer Continental Shelf.

Intensive surveys of the Brunswick and Medway Estuaries were conducted from August 4 through August 5, 1976 by the Environmental Protection Division of the Georgia Department of Natural Resources. The purpose of the surveys was to determine present dissolved oxygen levels in Burnswick Estuary during a warm weather period, estimate dissolved oxygen levels if there were no pollution entering the Estuary, and predict the effect additional organic loadings would have on the Estuary. The Brunswick Estuary has two major sources of organic wastewaters. There are Brunswick Pulp and Paper Company and the City of Brunswick Wastewater Treatment Facility. Other sources of pollution include a large discharge from Hercules Incorporated and several seafood related industries located along Brunswick Harbor. Graphs of diel data and other field data are included in this report as well as conclusions drawn from this study and recommendations for future studies. (Sinha-OEIS)
W78-11227

PHYSICAL, CHEMICAL AND BIOLOGICAL EFFECTS OF DREDGING IN THE THAMES RIVER (CT) AND SPOIL DISPOSAL AT THE NEW LONDON (CT) DUMPING GROUND.
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-11229

EXCHANGE OF MANGANESE, IRON, COPPER, AND ZINC BETWEEN DISSOLVED AND PARTICULATE FORMS IN THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-11230

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOLUME IX, THE COMPUTER PROGRAM,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 5B.
W78-11231

INTERIM HIERARCHICAL REGIONAL CLASSIFICATION SCHEME FOR COASTAL ECOSYSTEMS OF THE UNITED STATES AND ITS TERRITORIES,
Fish and Wildlife Service Fort Collins, CO.
T. T. Terrell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 691, Price codes: A03 in paper copy, A01 in microfiche. Fish and Wildlife Service, Office of Biological Services Report No. FWS/OBS-77/48, September 1977. 46 p, 4 fig, 2 tab, 55 ref.

Descriptors: *Coasts, *Ecosystems, *United States, *Baseline studies, Bibliographies, Resources development, Water quality, Environmental effects, Outer Continental Shelf.

The literature on coastal classifications is reviewed. Those existing classifications classify coastal areas on functional, structural, or regional (geographical) attributes. The problem of predicting impacts on coastal ecosystems by various types of perturbations, such as offshore mineral development or reduced freshwater inflow into estuaries, at various levels of resolution is posed. A classification system which wil permit and aid in data collection to address this problem is necessary for solving this problem. Existing systems are found wanting, and a hierarchical regional classification scheme for coastal ecosystems of the United States and its territories, based on the physical, hydrological, chemical, biological, geological, and structural characteristics of those areas is presented. (Sinha - OEIS)
W78-11233

A CASE HISTORY OF PORT MANSFIELD CHANNEL, TEXAS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-11235

LABORATORY INVESTIGATION OF TIDAL INLETS ON SANDY COASTS,
California Univ. Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 8B.
W78-11236

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME I: PROCESSING SYSTEMS SUMMARY.
Dames and Moore, Salt Lake City, UT.; and EIC Corp., Newton, MA.
For primary bibliographic entry see Field 5C.
W78-11239

FEEDING BY AN OMNIVOROUS PLANKTONIC COPEPOD AETIDEUS DIVERGENS BRADFORD,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-11283

TRACE METAL CONCENTRATIONS AND PARTITIONING IN ZOOPLANKTON, NEUSTON, BENTHOS FROM THE SOUTH TEXAS OUTER CONTINENTAL SHELF,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-11285

NUTRIENT DISTRIBUTION IN THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec) Marine Sciences Centre.
For primary bibliographic entry see Field 5C.
W78-11290

FEEDING RATES OF PLANKTONIC COPEPODS FROM A TROPICAL SEA,
Australian Inst. of Marine Science, Townsville.
For primary bibliographic entry see Field 5C.
W78-11294

SEASONAL VARIATIONS IN SALT-MARSH MACROALGAE PHOTOSYNTHESIS. II. FUCUS VESICULOSUS AND ULVA LACTUCA,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W78-11297

THE RELATIONSHIP OF 'SPARTINA ALTERNIFLORA' TO MEAN HIGH WATER,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
L. Lagna.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 932, Price codes: A06 in paper copy A01 in microfiche. Report No. SS-409 to National Oceanic and Atmospheric Administration, Washington, D.C., May 1974. 105 p, 13 fig, 7 tab, 54 ref, 2 append. Sea Grant No. 2-35281.

Descriptors: *Spartina alterniflora, *High water mark, *Long Island(NY), *Tidal effects, *Tidal marshes, *Marsh plants, *Jurisdiction, *Legal aspects, *Public lands, Wetlands, Mean high water, Salt marshes, Salinity, Topography, Navigable waters, Ponds, Flax Pond(NY), Mattituck Inlet(NY), Orient Point(NY), Iron Point(NY), Gunning Point(NY), Shores.

A study of Spartina alterniflora zonation in five tidal salt marshes on Long Island, New York, showed that vegetation cannot be used to indicate the line of mean high water (MHW) on the marsh surface. Neither species distribution nor plant vigor were closely correlated with tidal elevation. The use of the S. alterniflora-S. patens ecotone to indicate the boundary between public and private ownership or the upper limit of jurisdiction in navigable waters is therefore not recommended. The five marshes studies were Flax Pond, Mattituck Inlet, Orient Point, Iron Point, and Gunning Point. In some areas S. alterniflora was found growing well above MHW, and it should not be assumed that most of the S. alterniflora marsh is under protection of publicownership or navigable waters. The upland border of the five marshes likewise failed to coincide with any particular tidal datum. A tidal plane used in a wetlands definitions should be only one of several criteria, such as reduced number of certain plant species, occurrence of salt marsh peat at the surface level, or height above mean low water equal to a predetermined factor times the local tide range. Factors which appear tomodify the tide-elevation effect include salinity and substrate. Tide elevation may influence vegetation more in terms of topography than an absolute species-elevation relationship; for example, an area surrounded by higher surfaces may support a growth of vegetation usually found at lower elevations. (Lynch-Wisconsin)
W78-11300

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PREPARATION OF COMPOSITE HOLLOW-FIBER REVERSE OSMOSIS MEMBRANES BY PLASMA POLYMERIZATION,
Research Triangle Inst., Research Triangle Park, NC.
N. Morosoff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 383, Price codes: A06 in paper copy, A01 in microfiche. Final Report RTI No. 31U-1085, August 1978. 112 p, 31 fig, 8 tab, 16 ref. S-0092(7537)(1).

Descriptors: Plasma polymerization, Glow discharge, Polymerization, *Reverse osmosis membrane, *Hollow fibers, *Desalination processes, *Membranes, *Membrane processes, Polymers, Desalination apparatus.

A tandem plasma polymerization apparatus for continuous coating of hollow fibers has been built. The apparatus allows two treatments of a moving substrate to be carried out in successive chambers with no cross-contamination. The apparatus employs internal electrodes and can be used at a variety of frequencies. High flow rates can be achieved at low pressures. A study of the effects of changing plasma polymerization variables on the properties of the resultant plasma polymer has been carried out using tetrafluoroethylene in this apparatus. This sytem is unusually sensitive to power input and the plasma polymer is exceptionally easy to characterize by ESCA. Pressures below 100 millitorr have been indicated for appreciable deposition on the substrate. The distribution of plasma power density has been found to be non-uniform within the interelectrode gap in keeping with the known physics of glow discharges. The reverse osmosis properties of plasma polymer coated hollow fibers are described. Salt rejections of 87-93% have been achieved at fluxes of 1.5-4.0 g.f.d. with fiber take up rate of 50-100 cm/min. All plasma polymerization were studied at a frequency of 10 kHx using magnetic enhancement. Pyridine and Acetylene + Nitrogen are the monomers employed. The reverse osmosis properties obtained were sensitive to the nature of the hollow fiber, presumably because of surface pore size.
W78-10619

HIGH STRENGTH CAST MODULES FOR SUPPORTING REVERSE OSMOSIS MEMBRANES.
Union Carbide Corp., New York. (Assignee)
J. F. Meier, and J. D. B. Smith.
U.S. Patent No 4,076,626, 8 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 967, no 4, p 1572, February 28, 1978.

Descriptors: *Patents, *Desalination, *Reverse osmosis, *Water treatment, *Water quality control, Membrane processes, Separation techniques, Semipermeable membranes, Desalination apparatus.

The major advantage of reverse omsosis as a saline or contaminated water purification process is the low-energy requirements as compared to other processes. The function of a cell for the reverse osmosis process is to bring a saline or contaminated water solution at high pressure into contact with a supported semipermeable membrane. Problems of resin formulation shelf life and improved dry compressive and wet burst strengths are solved by using a low viscosity, 100% solids, solventless, latent catalyzed resin formulation, consisting essentially of: an admixture of a liquid epoxy resin, a liquid organic acid anhydride curing agent, a liquid diepoxide reactive diluent and a quaternary ammonium, phosphonium or arsonium salt latent catalyst, as a filter coating. The resin formulation is then used in casting a quantity filler particles and casting the coated filler. This provides, upon cure, a rigid hollow open pore strongly consolidated body, which is generally made in tubular form. This tube is especially strongly consolidated and suitable as a reverse osmosis membrane support having improved strength properties, i.e. wet burst strengths of at least 750 psi. (Sinha-OEIS)
W78-10733

ENERGY FROM SALT - A POSSIBILITY FOR ARID ZONE DEVELOPMENT,
Ben-Gurion Univ. of the Negev, Beersheba (Israel). Applied Research Inst.
J. Schechter.
Journal of Arid Environments, Vol. 1, No. 2, June 1978, p. 105-115, 6 fig, 2 pic, 17 ref.

Descriptors: *Vapor pressure, *Energy conversion, *Saline water, *Thermodynamics, *Brines, Salts, *Desalination, Aqueous solutions, Salinity, Water treatment, Saline water systems, Water quality, Treatment facilities, Free energy, Heat balance, Heat flow, Kinetics, Osmosis(Pressure retarded), Electrodialysis(Reversed), Arid lands.

Many arid and semi-arid regions are as deficient in energy sources as they are abundant in concentrated salts. This fact has stimulated scientists recently to investigate the possibility of extracting useful energy from salt deposits or from concentrated salt brines. Salt utilization for energy, as reviewed in here, relates not only to the common table salt, sodium chloride, but also to the other numerous dissolved sea minerals including magnesium and calcium chlorodes and sulphates. Unlike solar energy, salt and saline water resources in arid regions are always available and easily stored. Thermodynamically, large quantities of free and useful energy is made available by the mining of a concentrated and a dilute solution. This study is so new, however that commercial equipment capable of utilizing this energy has yet to be developed. Basically the extraction of energy from the concerntration difference of the two solutions is the opposite of water desalination processes. Just as energy is required to reduce salt concentrations in saline streams, energy is related from the process

of increasing the salt concentrations. Three processes to accomplish this task are discussed: Reversed electrodialysis, pressure retarded osmosis, and vapor pressure differential, all of which are the reverse of conventional desalination methods. Rapid progress is expected in perfecting these techniques into commercially accepted methods. While predictions are premature at this point, scientists are optimistic about this new-found energy source. (Tickes-Arizona)
W78-10966

PERFORMANCE IMPROVEMENT OF HORIZONTAL EVAPORATOR - CONDENSER DESALINATION UNITS,
Technion - Israel Inst. of Tech., Haifa. Dept. of Chemical Engineering.
S. Sideman, D. Moalem, and R. Semiat.
Desalination, Vol. 21, 1977, p. 221-233, 8 figs, 14 ref.

Descriptors: *Desalination, *Saline water-conversion, *Salt extraction, Separation techniques, *Desalination processes, Theoretical analysis, Water chemistry, *Evaporator-condenser units, Water properties, *Condensers, *Evaporators, Desalination apparatus.

This study compares theoretical calculations with experimental result of Horizontal evaporator - condenser desalination units. This economically promising multiple-effect distillation process operates by simultaneous film evaporation outside and condensation inside horizontal tubes. All parameters were measured from an evaporator - condenser unit 2.4 m long and 0.8 m in diameter using deionized tap water rather than sea water to minimize scale deposition problems. Preliminary resuls inidcate that major effects of the various parameters can be prediced by means of theoretical calculations; however, once drops falling onto the tubes causes the Reynolds number to go above 150, the models must be modified to account for the resulting ripples and waves. Additionally, the evaporating film Reynolds number and the nominal temperature driving force were found to have an insignificant effect upon the overall heat transfer coefficient. (Tickes-Arizona)
W78-10970

ENGINEERING ASPECTS OF GEOTHERMAL DEVELOPMENT WITH EMPHASIS ON THE IMPERIAL VALLEY OF CALIFORNIA,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
For primary bibliographic entry see Field 4B.
W78-11078

WATER TREATMENT FOR SMALL PUBLIC SUPPLIES,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5F.
W78-11208

3B. Water Yield Improvement

COMPRESSED AIR SEEDING OF SUPER-COOLED FOG,
Army Terrestrial Sciences Center, Hanover, NH.
J. R. Hicks.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 819, Price codes: A02 in paper copy, A01 in microfiche. Special Report 76-9, October 1976. 10 p, 1 fig, 3 tab, 1 ref.

Descriptors: *Weather modification, *Fog, *Laboratory tests, Ice, Crystals, Drops(Fluids), Particle size, Measurement, Data processing, Meteorology, *Compressed air.

Two series of experiments, 25 in a light fog and 25 in a heavy fog, were conducted in the CRREL cold cloud chamber. Compressed air was used to glaciate the -4C fog. The gage air pressure was 413.7 kPa. These tests showed that the number of ice crystals produced exceeded the number of water droplets in the fog by a factor of 21 for a light fog and 133 for a heavy fog. Approximately 2.6 times as many ice crystals were created in a heavy fog than were created in a light fog. (Sims-ISWS)
W78-10931

3C. Use Of Water Of Impaired Quality

IRRIGATION WATER SALT CONCENTRATION INFLUENCES ON SEDIMENT REMOVAL BY PONDS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 5G.
W78-10521

LYSIMETER MEASUREMENTS OF NITRATE AND CHLORIDE LOSSES FROM SOIL UNDER CONVENTIONAL AND NO-TILLAGE CORN,
Kentucky Univ., Lexington. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-10590

SALINITY MANAGEMENT OPTIONS FOR THE COLORADO RIVER, DAMAGE ESTIMATES AND CONTROL PROGRAM IMPACTS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W78-10735

SALINITY MANAGEMENT ALTERNATIVES FOR OIL SHALE WATER SUPPLIES,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-10825

ENERGY FROM SALT - A POSSIBILITY FOR ARID ZONE DEVELOPMENT,
Ben-Gurion Univ. of the Negev, Beersheba (Israel). Applied Research Inst.
For primary bibliographic entry see Field 3A.
W78-10966

STERILITY IN RICE CULTIVARS AS INFLUENCED BY MSMA RATE AND WATER MANAGEMENT,
Arkansas Agricultural Experiment Station, Stuttgart. Rice Branch Experiment Station.
For primary bibliographic entry see Field 5B.
W78-11053

PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME I. SUMMARY REPORT AND VERIFICATION.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W78-11088

3D. Conservation In Domestic and Municipal Use

MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEM ANALYSIS - APPLICATION TO MEDIUM SIZE COMMUNITIES: URBAN STORM-DRAINAGE SYSTEMS PLANNING,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-11058

CALIBRATION AND SENSITIVITY ANALYSIS OF THE CONTINUOUS RUNOFF SIMULATION MODEL 'STORM',
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 2A.
W78-11060

MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND,
Colorado State Univ., Fort Collins. Dept. of Earth Sciences.
For primary bibliographic entry see Field 4C.
W78-11064

WATER SUPPLY AND CONTROL DEVELOPMENTS SUMMARIZED: ARIZONA.
From the State Capitals, p 1-2, September 1, 1978.

Descriptors: *Water utilization, *Water conservation, Artificial recharge, *Arizona, Irrigation practices, Landscaping.

According to a study by the Arizona Water Commission, water conservation in Arizona can be achieved without financial hardship or major changes in lifestyle. The study said that prices currently charged for urban and most surface irrigation water are far below levels which would effect a meaningful long term reduction in use. It also said that the largest opportunity for urban water savings is through a reduction in outside use through improved irrigation practices and conversion to desert landscaping. Statistical comparisons show that industrial uses in Arizona are much lower than the national average, but that municipal water system uses are higher. The study discussed the legal implications of ground-water recharge as a means of water conservation. (Purdin-NWWA)
W78-11076

SOME POLITICAL-INSTITUTIONAL FACTORS AFFECTING EFFORTS TO CONSERVE WATER IN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W78-11212

3E. Conservation In Industry

A SURVEY OF POTENTIAL METHODS FOR RESOURCE RECOVERY FROM BLACK WATER OF THE UPPER GREEN RIVER BASIN,
Wyoming Univ., Laramie. Dept. of Mineral Engineering; and Wyoming Univ., Laramie. Graduate School.
T. E. Phillips.
Master of Science Thesis, May 1976. 80 p, 11 fig, 9 tab, 25 ref.

Descriptors: *Water analysis, *Analytical techniques, *Oil shales, *Water chemistry, *Organic matter, *Wyoming, Shales, Brines, Water pollution, Chemical analysis, Fossil fuels, Solvent extractions, Oil, Fuels, Water quality, Water types, Alkaline water, *Black water, *Resource recovery, *Separation methods, *Upper Green River Basin(Wyo), *Eden Valley(Wyo).

Black water is found in the lean oil shales of the Upper Green River Basin of Wyoming. A variety of methods were examined for the separation of organic matter and salts from black water. Black water consists primarily of 5-8% organic acids and 4-6% sodium carl onate and bicarbonate dissolved in water. The solution has a pH of 10. Acidifying

the black water solution to pH 3 precipitates the organic acids. The black water can be concentrated by evaporation of the water or by natural freezing. Both liquid-liquid extraction of the black water and leaching of the dehydrated black water with a wide range of polar and non-polar solvents do not appear to be effective methods of separating the organic acids from the salts. Retorting the black water under a carbon monoxide atmosphere converts the black water to a sodium bicarbonate solution and 44% of the original organic acid to a benzene soluble oil. (Henely-ISWS)
W78-10534

PURIFYING INDUSTRIAL EFFLUENTS AND ADSORPTION MATERIAL THEREFOR.
Ciba-Geigy, Basel (Switzerland).
For primary bibliographic entry see Field 5D.
W78-10672

WATER RECOVERY AND EFFLUENT TREATMENT FOR THE PAPER INDUSTRY,
For primary bibliographic entry see Field 5D.
W78-10687

NEW GRAVITY SCREEN MAKES OF WASTEPAPER PRACTICAL AT PAPER MILLS,
Albany International Co., Glens Falls, NY.
For primary bibliographic entry see Field 5D.
W78-10692

ENVIRONMENTAL PROBLEM OF BLEACHERIES (BLEKERIETS MILJOVARDSPROBLEM),
IVL-Konsult A.B., Stockholm (Sweden).
For primary bibliographic entry see Field 5D.
W78-10695

CLOSED PROCESS WATER LOOP IN NSSC CORRUGATING MEDIUM MANUFACTURE,
Green Bay Packaging Inc., WI.
For primary bibliographic entry see Field 5D.
W78-10699

METHOD FOR PRODUCING GEOTHERMAL ENERGY AND MINERALS,
Exxon Production Research Co., Houston, TX. (Assignee).
L. D. Christian.
U.S. Patent No. 4,074,754, 4 p, 1 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 955, February 21, 1978.

Descriptors: *Patents, *Geothermal studies, Boreholes geophysics, Thermal conductivity, Thermal properties, Temperature, Saline water, Energy transfer, Mineral water.

A method for producing geothermal energy and minerals from subterranean high temperature and high salinity water reservoirs is described. Low salinity water is injected at ambient surface temperature into the reservoir through a well bore. The injected water is allowed to become heated in the reservoir and then the water is produced through the well bore to the surface for use as a source of energy and, optionally, minerals. Simultaneously with the employment of certain wells for injection-production cycles, other wells may be employed predominantly for injection of water to displace heat and in-situ well brines to well bores which produce such water and brines to the surface for utilizaton of their heat energy and dissolved minerals. (Sinha-OEIS)
W78-10715

TREATMENT OF LIQUIDS CONTAINING COMPLEXED HEAVY METALS AND COMPLEXING AGENTS,
Photocircuits Corp., Glen Cove, NY. (Assignee)
For primary bibliographic entry see Field 5D.
W78-10726

WATER SUPPLIES FOR INDUSTRIAL FIRE PROTECTION,
Peerless-Midwest, Inc., Granger, IN.
For primary bibliographic entry see Field 4B.
W78-11070

THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS AND MINING OPERATIONS: AN OIL AND GAS LAWYER'S VIEW,
Hanna and Morton, Los Angeles, CA.
For primary bibliographic entry see Field 5G.
W78-11153

THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS, AND MINING OPERATIONS: BITTERSWEET OR UNPALATABLE,
Saunders, Snyders, Ross and Dickerson, Denver, CO.
For primary bibliographic entry see Field 5G.
W78-11154

GEOTHERMAL RESOURCE DEVELOPMENT IN TEXAS,
For primary bibliographic entry see Field 6E.
W78-11161

WATER SUPPLY DILEMMAS OF GEOTHERMAL DEVELOPMENT IN THE IMPERIAL VALLEY OF CALIFORNIA,
California Univ., Livermore. Lawrence Livermore Lab.
D. W. Layton.
Paper presented to Twelfth American Water Resources Conference and Symposium, Chicago, Illinois, September 19-20, 1976. 21 p, 4 fig, 22 ref.

Descriptors: *Imperial Valley(CA), *Water supply, *California, *Geothermal energy, *Electric powerplants, *Cooling water, Geothermal studies, Groundwater, Colorado River, Imported water, Powerplants, Cooling towers, Salton Sea(CA), Salinity, Irrigation water, Water resources, Water management(Applied), Institutional constraints, Economics, Rivers, Inland seas, Alternative planning.

Although four of six known geothermal resource areas in California's Imperial Valley are exploitable for electrical power, with a combined potential of 4000-55000 megawatts sustainable for 25 years, serious water supply problems for cooling must be solved. Available water resources include: (1) water imported from the Colorado River, (2) agricultural waste waters, (3) water from the Salton Sea, (4) groundwater, and (5) steam condensate from the geothermal plants. Problems arising from geothermal development are: (1) institutional considerations, (2) water supply costs, (3) technical problems, and (4) environmental impact on the Salton Sea. To sustain 5500 mw of energy production, over 300,000 acre-feet of freshwater would be required for wet cooling towers, amounting to 10% of water annually diverted to the valley from the Colorado River, primarily for irrigation. Colorado River water salinity is the principal water quality problem in the valley; the water contains nearly 1.2 tons of salt/acre-foot. The geothermal resource areas in the valley suffer from thermal inefficiencies caused by low reservoir temperatures, producing more waste heat per unit of electrical output and greater need for cooling water. Constraints on obtaining more water will mainly be determined by the quantity of irrigation water allocated by the Imperial Irrigation District to geothermal projects and potential subsidence control policies. The consequences of each alternative are evaluated. (Lynch-Wisconsin)
W78-11299

3F. Conservation In Agriculture

A PHYSICALLY-BASED MODEL TO PREDICT RUNOFF UNDER VARIABLE RAIN INTENSITY,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 2G.
W78-10525

PREDICTED AND MEASURED DRAINABLE POROSITIES FOR FIELD SOILS,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-10526

CHARACTERIZATION OF YIELD AND ECONOMIC LOSS FROM NONUNIFORM FERTILIZER DISTRIBUTION USING COMPUTER SIMULATION,
Nebraska Agricultural Experiment Station, Lincoln.
R. C. Sorensen, and R. A. Wiese.
Soil Science Society of America Journal, Vol 41, No 2, p 382-385, March-April, 1977. 4 fig, 2 tab, 10 ref.

Descriptors: Model studies, *Simulation analysis, Computer programs, *Fertilizers, *Fertilization, Nutrients, *Crop production.

A simple computer program has been developed to predict yield losses from uneven broadcast fertilizer distribution on the basis of distribution pattern, yield response curve, fertilizer distribution on the basis of distribution pattern, yield response curve, fertilizer rate, soil test rating and amount of fertilizer swath overlap. Losses were serious only on soils classed 'very low' in nutrient supply. Losses for a highly responsive crop are less than for a less responsive crop. Overlapping succeeding swaths may improve the appearance of a field, but has a small effect on yield loss unless the amount of overlap is greater than 50%. Visually evident streaks in plant growth patterns may not necessarily indicate high yield loss. (Skogerboe-Colorado State)
W78-10595

DECOMPOSITION OF RICE STRAW IN SOILS AS AFFECTED BY SOME MANAGEMENT FACTORS,
California Univ., Davis. Dept. of Land, Air, and Water.
For primary bibliographic entry see Field 2G.
W78-10597

ASSESSING TWO DIAGNOSTIC METHODS FOR ENUMERATION OF NITRATE REDUCING AND DENITRIFYING BACTERIA IN SOIL-PLANT ROOT ASSOCIATIONS,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 2G.
W78-10599

A STEADY-STATE CONCEPTUAL NITROGEN MODEL FOR ESTIMATING NITROGEN EMISSIONS FROM CROPPED LANDS,
Joint FAO/IAEA Div. of Atomic Energy in Agriculture, Vienna (Austria).
For primary bibliographic entry see Field 5B.
W78-10601

BORDER-IRRIGATION HYDRAULICS WITH ZERO INERTIA,
California Univ., Davis. Dept. of Land, Air, and Water.
T. Strelkoff, and N. D. Katopodes.

Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol. 103, No. IR3, p 325-342, September 1977. 7 fig, 19 ref.

Descriptors: *Border irrigation, *Surface irrigaton, Irrigation, *Irrigation practices, Irrigation systems, Irrigation engineering, *Model studies.

A model of border irrigation based on the Saint-Venant equations with the acceleration (inertia) terms deleted has been constructed. For the test cases presented, agreement with more complex (and costly) models and with experiment has been satisfactory. (Skogerboe-Colorado State)
W78-10604

ALGEBRAIC COMPUTATION OF FLOW IN BORDER IRRIGATION,
California Univ., Davis. Water Science and Engineering Section.
T. Strelkoff.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 103, No. IR3, p 357-377, September 1977. 10 fig, 6 ref.

Descriptors: *Border irrigation, *Surface irrigation, *Model studies, Simulation analysis, Infiltration, Irrigation design.

The elements of a model of surface irrigation in a border have been presented. A sufficient number of physical assumptions have been made to allow the phenomena to be described by algebraic equations. This involves adaptation of simple shapes to both the surface and subsurface profiles. The absolute value of depth at key point in the surface profile is related to discharge through assumption that the depth is normal. In the subsurface profile, the depth at key points is related to the time water has been available there for infiltration through an infilration-time formula. (Skogerboe-Colorado State)
W78-10605

IMMOBILIZATION OF FERTILIZER NITRATE APPLIED TO A SWELLING CLAY SOIL IN THE FIELD,
Texas Agricultural Experiment Station, Temple.
For primary bibliographic entry see Field 2G.
W78-10607

PHOSPHORUS SORPTION CHARACTERISTICS OF FLOODED SOILS,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2G.
W78-10610

EFFECT OF REDOX POTENTIAL AND PH ON THE UPTAKE OF CADMIUM AND LEAD BY RICE PLANTS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W78-10614

THE POTENTIAL PRIMARY PRODUCTIVITY OF PENINSULAR MALAYSIA,
Guelph Univ. (Ontario), Dept of Geography.
For primary bibliographic entry see Field 2D.
W78-10650

METHODOLOGY AND EMPIRICAL ESTIMATES OF THE RESPONSE FUNCTION OF SORGHUM TO IRRIGATION AND SOIL MOISTURE,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soil and Water.
H. Bielorai, and D. Yaron.
Water Resources Bulletin, Vol 14, No 4, p 966-977, August 1978. 3 tab, 4 fig, 17 ref.

Descriptors: *Methodology, *Irrigation, *Soil moisture, *Sorghum, *Crop response, Estimating, Equations, Systems analysis, Response function, Critical days.

Presented is a methodology for the estimation of response functions of crops to irrigation and soil moisture. A systems analysis framework is applied to describe the relationships involved. Two subsystems are distinguished, with the first one involving the relationship between irrigation decision variables and soil state variables, and the second involving the relation between soil state variables and crop yield. A method for tracing and predicting soil moisture profile variations over time and depth is presented, and empirical estimates of the response function of grain sorghum to soil moisture are derived. In the specification of the response function the concept of 'critical days' is applied with a 'critical day' being defined as one where the soil moisture is depleted below a certain critical level. The paper provides empirical evidence for the usefullness of the approach. (Bell-Cornell)
W78-10659

DRIP LEVEL IRRIGATION,
Hydro-Plan Engineering Ltd., Tel-Aviv. (Israel). (Assignee).
R. Mehoudar.
U. S. Patent No. 4,060,200, 7 p, 15 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 964, No 5, p 1495, November 29, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Flow control, Application equipment, Drip irrigation.

Drip level irrigation installations using conduits which are relatively thin waled and can therefore be mass produced at relatively low cost are designed for one-season use after which they can be replaced by new installations. In view of the flimsy nature of the disposal conduit it has been found to be extremely difficult to couple any of the known forms of emitter units with which a controlled pressureless discharge rate can be obtained. It is an object of this invention to provide for a new and improved emitter unit which can be readily coupled to a relatively flimsy conduit. A process for the production of a drip level irrigation conduit comprises the steps of: dispensing an elongated, substantially retangular flexible strip; coupling constituent components of successive emitter drip units to each other via the interposed strip at spaced apart intervals; effecting flow communication through the strip; and bonding the longitudinal edges of the strip so as to form a conduit. The components can be suitably press fastened to each other through the strips. In this way the portion of the strip which separates the two components can itself constitute a wall which serves to define, with the elongated groove formed in the unit, a flow restricting flowpath. (Sinha-OEIS)
W78-10702

WATE GATE CONTROL SYSTEM,
T. Nomura.
U.S. Patent No. 4,073,147, 10 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 422, February 14, 1978.

Descriptors: *Patents, *Irrigation, *Water control, *Flow control, Irrigation systems, Irrigation practices, Irrigation efficiency, Water level, Equipment, Water gates.

The water gates of the type described are widely used to raise the level of a stream for securing water for irrigation or industrial purposes. In general, the gate is usually held in upright position, but when the level of a stream or water-way exceeds a predetermined level, the gate is swung to the downstream direction to permit the discharge of excess water. A water gate control system selects either the automatic mode or forced mode. In the automatic mode the gate is automatically swung depending upon the level of a stream between the upright or closing position and the flat or opening position by a single- or double-acting hydraulic cylinder in which a directly or indirectly spring loaded piston is displaced depending upon the hydraulic pressure acting on the gate. In the forced mode, the working oil under pressure is introduced into the hydraulic cylinder for swinging the gate to and holding it in a desired angular position independently of the water level. (Sinha-OEIS)
W78-10705

IRRIGATION APPARATUS,
Harold (Raymond D.), Walla Walla, WA. (Assignee).
A. D. Fraser, and D. A. Inglis.
U.S. Patent No. 4,073,309, 13 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 475, February 14, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, Irrigation efficiency, Irrigation practices, Application equipment, Conveyance structures, Control systems, Electronic equipment.

A pivotal irrigation system consists of end-coupled adjacent irrigation pipes extending radially outward from a pivot center. Each of the sections is supported by a tower driven by some type of drive means causing the system to rotate around the pivot point. This invention is a control system for maintaining the linear alignment of the irrigation apparatus, and for interrupting power to the drive means when any adjacent sections are in gross linear misalignment uncorrectable by the control system. A magnetic reed switch and permanent magnet combination, together with a metallic shield interposed between them, act as alignment sensors and overtravel sensors to open or close the reed switch in accordance with the alignment status of the irrigation system. A logic circuit utilizing an exclusive OR-gate is disclosed which causes the function of the alignment control sensors to reverse whenever the direction of the irrigation apparatus reverses, and also, an electronic circuit utilizing a digital capacitance meter to indicate which tower is in gross linear misalignment, if any, should the apparatus automatically shut down. (Sinha-OEIS)
W78-10706

SPRINKLER HEAD,
Nelson Irrigation Corp., Walla Walla, WA. (Assignee).
L. P. Meyer.
U.S. Patent No. 4,073,438, 8 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 519, February 14, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation efficiency, Irrigation practices, Application equipment.

A sprinkler head utilizes a ball and socket type assembly for connecting a nozzle type water distributing structure within a sprinkler body structure for rotational movement about an upright axis and for orbital movement in which the rotational axis of the water distributing structure describes a pair of cones whose apexes join at a point coinciding with the center of the ball and socket assembly, the latter also serving as a liquid-tight seal for a water chamber within the sprinkler body structure in communication with the inlet of the water distributing structure. Within the chamber in operative relation with the water distributing structure is a simple structural arrangement operable by the internal flow of water to effect the orbital movement of the water distributing member. The preferred form of the orbiting arrangement consists of a swirl plate within the chamber and an integral inverted cup-like portion on the lower end of a tabular water distributing nozzle member which is moved orbitaly by the swirling motion of

the water established by the swirl plate. (Sinha-OEIS)
W78-10707

WATER DRIVE SYSTEM FOR A CENTER PIVOT IRRIGATION UNIT OR THE LIKE,
Lindsay Mfg. Co., NE. (Assignee).
K. E. Arndt, L. E. Otto, Jr., and D. A. Siekmeier.
U.S. Patent No. 4,074,783, 10 p, 7 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 964, February 21, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, Irrigation practices, Irrigation efficiency, Hydraulic systems, Application equipment.

A water drive system for a center pivot irrigation system has a string of pipe which pivots in a circle or oscillates about a center pivot or upright with the pipe supported on towers at intervals. Each tower is independently driven by a power mechanism which is operated by the pressure of the water in the string of pipe. It includes a mechanism to prevent one or more towers from rolling ahead on a downhill slope, a diaphragm valve arrangement for controlling the cycling of the drive, and an enlarged bellows or bladder for operating the water drive mechanism. (Sinha-OEIS)
W78-10716

GREENHOUSE WATERING APPARATUS,
Union Carbide Copr., New York. (Assignee).
D. Williams, B. A. Lentz, and H. E. LeVeque.
U.S. Patent No. 4,074,856, 14 p, 13 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 991, February 21, 1978.

Descriptors: *Patents, *Irrigation, *Greenhouses, *Irrigation practices, *Irrigation efficiency, Water conveyance, Water delivery, Structures, Application equipment.

The greenhouse watering apparatus includes a horizontally and longitudinally placed support member which may be a straight cylindrical pipe suspended from the roof of the greenhouse. A carriage has a yoke at its upper end with trolley wheels mounted to roll on two opposite upper surface portions of the support member. The wheels roll along paths located on opposite sides of the suspension means for the support member, so that the suspension does not interfere with back-and-forth travel of the carriage. An electric motor is supported by the carriage for rotating a drive wheel in engagement with the bottom of the support member to provide carriage travel in both directions along the support member. A hose reel is mounted on the carriage and has a central pipe with an inlet fitting to which a liquid-supplying hose is secured. Valves are provided to enable each boom to be used separately from the other, so that one boom sprays one half of the greenhouse while the carriage moves in one direction, and the other boom sprays the other half while the carriage moves in the opposite direction. This serves to prevent overwatering at the ends of the greenhouse. (Sinha-OEIS)
W78-10717

EXTREME EVAPOTRANSPIRATION BY IRRIGATED ALFALFA: A CONSEQUENCE OF THE 1976 MIDWESTERN DROUGHT,
Nebraska Univ., Lincoln. Agricultural Meteorology Section.
For primary bibliographic entry see Field 2D.
W78-10923

WATERWEEDS: FLIES IN THE IRRIGATION OINTMENT,
For primary bibliographic entry see Field 4A.
W78-10969

SYRIA'S EUPHRATES DAM PROMISES RAPID AGRICULTURAL DEVELOPMENT,
S. Pitcher.
Foreign Agriculture, Dec. 23, 1974, Vol. 12, NSI, p 14-16. 6 photos.

Descriptors: *Irrigation programs, *Resettlement, *Dams, Post project analysis, Water resources development, Water management, *Syria(Euphrates River), Cotton, Crop production, Rotations, Wheat, Reservoirs, *Tabaqah Dam(Syria).

Completion of the Tabaqah Dam in 1973 has brought several years closer the objective of increasing Syria's irrigated land by one third. The Dam's reservoir, Lake Assad, will have a surface area of 243 sq. miles, and irrigate 1.6 million acres of land in six regions, but full use of the system awaits development of irrigation systems and new farm land, and resettlement of displaced villages. A pilot project in Balikh basin indicates that with the water made available and the introduction of modern farming methods, crop yields of wheat and cotton can be increased up to 40 percent. Funding for the project came from the World Bank and the Syrian Government, with the Soviet Union providing the major material, financial, and technical input for building the structure itself. Newly irrigated areas will be farmed cooperatively by resettlement villages financed be the Syrian Government, together with assistance from UNICEF and the World Food Program. The new availability of water, together with crop rotation and improved strains will eventually help put a brake on the ancient dependence of farm productivity on rainfall fluctuations. (Tickes-Arizona).
W78-10976

DROUGHT AND THE NIGERIAN FARMER,
Ibadan Univ. (Nigeria). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W78-10979

PROBABLE MAXIMUM RAINFALL FOR CONDITIONS OF IRAQ,
Ministry of Irrigation, Bagdad (Iraq).
For primary bibliographic entry see Field 2B.
W78-10980

A PORTABLE CHAMBER FOR RAPID EVAPOTRANSPIRATION MEASUREMENTS ON FIELD PLOTS,
South Carolina Agricultural Experiment Station, Florence.
For primary bibliographic entry see Field 2D.
W78-11028

DRIP/TRICKLE PIPE NETWORK DESIGN,
A. G. Water, Shafter, CA.
F. Hamisch.
Drip/Trickle Irrigation, Vol 2, No 1, p 23-26, January/February 1977. 1 fig, 1 tab.

Descriptors: Irrigation engineering, Irrigation systems, *Irrigation design, Hydraulics, Hydraulic design, Head loss, Friction, Flow rates, Networks, Distribution systems.

The piping network is the means for taking water from its source and delivering it to the emitter in adequate amounts and with the appropriate pressure. The design of this system must be made from a sound engineering approach. The total system must be the most cost effective for the particular application. The least initial captial cost frequently is not the least expensive system for the user. The addition of higher pressures and their related annual operating costs may exceed the initial savings of the 'least expensive' system in a short time. Power, water, and other costs are rising rapidly, and it is the designer's responsibility to consider the total costs. (Skogerboe-Colorado State)
W78-11030

ON THE ALLOCATION OF PRIME AGRICULTURAL LAND,
Harza Engineering Co., Chicago, IL.
J. A. Gibson.
Journal of Soil and Water Conservation, Vol 32, No 6, p 271-275, November-December 1977. 27 ref.

Descriptors: Land, Land classification, Land development, *Land management, Land resources, *Land use, *Agriculture, Environment, Environmental control, *Economics, Urbanization.

How land is used in the future likely will vary considerably from how land should be used according to economic theory. Asymmetry characterizes the effectiveness and efficiency of our system of economic incentives. A major part of land use is formed by the sum of many individual local actions. The present market system stimulates the exploitation of land resources very well, but it fails almost completely with respect to preservation. For example, climate, topography, and soils exert all-important effects upon the use of land for agricultural purposes. The location factor is of little significance for agriculture in the absence of a suitable physical base. (Skogerboe-Colorado State)
W78-11031

STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS--I. DISTRIBUTION OF IMMOBILIZED NITROGEN AMONGST SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 2K.
W78-11032

STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS--II. MINERALIZATION OF IMMOBILIZED NITROGEN FROM SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 2K.
W78-11033

SOIL MICROBIAL AND BIOCHEMICAL CHARACTERISTICS IN RELATION TO SOIL MANAGEMENT AND FERTILITY,
Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.
For primary bibliographic entry see Field 2G.
W78-11035

NITROGEN AND PHOSPHORUS MOVEMENT FROM AGRICULTURAL WATERSHEDS,
Agricultural Research Service, Columbia, CO.
For primary bibliographic entry see Field 5B.
W78-11040

MEASURING THE AMOUNTS OF CROP RESIDUE REMAINING AFTER TILLAGE,
Agricultural Research Service, Morris, MN.
L. L Sloneker, and W. C. Moldenhauer.
Journal of Soil and Water Conservation, Vol. 32, No. 5, p 231-236, September-October, 1977. 6 fig, 5 tab, 10 ref.

Descriptors: *Cultivation, *Mulching, *Crop production, Organic matter, Soils, Soil investigations.

A simple method of estimating percent residue cover, and how to convert percent residue cover to tons per acre was devised. Under certain conditions, more than one fall mulch tillage operation

can be performed without losing a large percentage of residue cover. The percentage of cover remaining after row-crop planting using various tillage methods on different soils at three locations was also determined. (Skogerboe-Colorado State)
W78-11041

FACTORS INFLUENCING THE LOSS OF ORGANIC CARBON FROM WHEAT ROOTS,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 2G.
W78-11042

EMITTER SELECTION,
L. Gladigau.
Drip/Trickle Irrigation, Vol. 2, No. 1, p 11-15, January/February 1977. 2 fig, 1 tab.

Descriptors: *Irrigation efficiency, *Irrigation engineering, Irrigation systems, Irrigation design, Hydraulics, Hydraulic design, Head loss, Friction, Flow rates.

Initially, emitter selection depends on the soil, plant requirement, emitter discharge, water quality, and terrain of a particular location. Evaluation will also include emitter cost and system risks. Generally, the emitters offering the more desirable features and lower system risks have a higher unit cost. The initial emitter considered will have an influence on the cost of the mainline and filtration system and may need to be reevaluated before a final selection is made. (Skogerboe-Colorado State)
W78-11044

SOURCES, RATES, AND FREQUENCIES OF N APPLICATION IN SUBIRRIGATED HAY MEADOWS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
L. A. Daigger, and W. J. Moline.
Agronomy Journal, Vol. 69, No. 4, p 644-647, July-August 1977. 4 fig, 2 tab, 10 ref.

Descriptors: *Subsurface irrigation, Irrigation systems, *Nitrogen, Fertilizers, Fertilization, *Nutrients, Soil investigations, Urea, *Application rates.

Inadequate supplies of soil nutrients often limit hay production of western United States subirrigated meadows. The effectiveness was evaluated of three N-sources at various rates in alternating sequences of N-applied annually, biennially, and triennially for meadow hay production. (Skogerboe-Colorado State)
W78-11046

3-WHEELED 'MOSQUITO' IRRIGATES FROM DITCH,
J. White.
Irrigation Age, Vol. 11, No. 7, p 80-81, 86, April, 1977. 2 fig.

Descriptors: Irrigation, Irrigation systems, *Irrigation practices, *Irrigation efficiency, *Equipment.

A farmer has designed a self-propelled irrigation 'tractor' that looks similar to a mechanical mosquito. The 'Mosquito' combines the advantages of circular pivot irrigation systems with the low cost of gravity irrigation. This new machine has helped increase yields on corn, wheat, barley and lettuce, the primary crops in the San Luis Valley in Southern Colorado, because the 'Mosquito' provides more efficient use of water. The 'Mosquito' also requires less supervision than some other irrigation systems. (Skogerboe-Colorado State)
W78-11047

AUTOMATION ASSURES PRECISE DELIVERY, CUTS LABOR.
Irrigation Age, Vol. 11, No. 8, p 31-32, May-June, 1977. 1 fig.

Descriptors: *Automation, Irrigation, Irrigation systems, *Irrigation practices, *Irrigation efficiency, Arizona.

A study was undertaken in the Wellton-Mohawk Valley area to automate two common methods of turning water into a field/jack-gates and tile outlets. Farmers who grow wheat, alfalfa or cotton in the Wellton-Mohawk Valley operate on fairly tight soils, either clay loams or silty clay loams. Fields are generally dead-leveled (level basins) and jack-gates and tile outlets were used. Both types of systems could be successfully automated. However, jack-gates have been more effective. (Skogerboe-Colorado State)
W78-11048

NITRATE DISTRIBUTION AND VARIABILITY IN IRRIGATED FIELDS OF NORTHEASTERN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
A. E. Ludwick, P. N. Soltanpour, and J. O. Reuss.
Agronomy Journal, Vol. 69, No. 4, p 710-713, July-August, 1977. 1 fig, 6 tab, 16 ref.

Descriptors: *Nitrates, Irrigation, *Irrigation effects, *Colorado, Fertilizers, *Fertilization, *Nitrogen, Nutrients, Soil profiles, Sampling, Water pollution sources.

Fertilizer N recommendations in the Great Plains and Western United States are commonly based on soil NO3- tests, although NO3- content within soil profiles is subject to rapid change. The purpose of this study was to evaluate NO3- distribution within diverse soil profiles and determined NO3- changes occurring over winter. Twenty-six irrigated farm fields were systematically sampled in 1974 and 1975 by dividing them into 61 x 61 m grids (0.37 ha) and sampling to a 120-cm depth by 30-cm increments. Eleven fields were resampled for fall versus spring comparisons. Nitrate content tended to be greatest in the surface 30-cm and decrease with depth; only three fields deviated markedly from the general pattern. (Skogerboe-Colorado State)
W78-11049

SAMPLING DISTRIBUTION OF NITRATES IN IRRIGATED FIELDS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
J. O. Reuss, P. N. Soltanpour, and A. E. Ludwick.
Agronomy Journal, Vol. 69, No. 4, p 588-592, July-August 1977. 2 fig, 5 tab, 12 ref.

Descriptors: *Sampling, *Nitrates, Irrigation, Irrigation effects, *Irrigation practices, Colorado, Nebraska, Laboratory tests, Fertilizers, Fertilization.

The object was to determine the components of variability encountered in sampling farmers' fields for soil nitrates. This information is required for formulating recommendations for sampling plan and intensity. Twenty-four irrigated farm fields in northeastern Colorado and Western Nebraska were sampled on 61 x 61 m grids. One soil core was taken in 30-cm increments from each grid to a depth of 120 cm. Duplicate cores were obtained from each third grid to allow determination of within grid variability. The laboratory-induced variability was also estimated. The results indicated that within and among grid standard deviations increased as the means increased. The standard errors of laboratory determinations (subsampling plus analytical errors) also increased as the means increased. (Skogerboe-Colorado State)
W78-11051

WATER RELATIONS OF COTTON. II. CONTINUOUS ESTIMATES OF PLANT WATER POTENTIAL FROM STEM DIAMETER MEASUREMENTS,
Agricultural Research Service, Auburn, AL.
M. G. Huck, and B. Klepper.
Agronomy Journal, Vol. 69, No. 4, p 593-597, July-August, 1977. 3 fig, 19 ref.

Descriptors: *Cotton, Sampling, Crop response, *Plant growth, *Plant physiology, Plant population.

Information about plant water potential is often required at very frequent intervals in studies with small numbers of plants. Two methods for inferring plant water potential continuously and nondestructively are described for cotton plants. Both methods require continuous monitoring of stem diameter and occasional destructive sampling of tissue for determination of water potential by conventional methods. The computed results are compared with experimental measurements of plant water potential. (See also W76-00804) (Skogerboe-Colorado State)
W78-11055

LARGE CROP YIELD IS A MAJOR GOAL OF IRRIGATION,
Universal Oil Products, Inc., Saint Paul, MN. Johnson Div.
T. L. Davis.
The Johnson Drillers Journal, Vol. 50, No. 3, p 1-4, May-June, 1978.

Descriptors: *Irrigation systems, *Crop production, *Sprinkler irrigation, *Gravity irrigation, Infiltration rates, *Soil moisture.

The ultimate use of irrigation is to assure maximum crop yields rather than prevent crop loss. There is greater certainty of maximum yields and improved quality when adequate moisture is present in the soil at planting and during fertilization. Irrigation systems fall into two categories: gravity systems and sprinkler systems. Sprinkler systems can be used on sloping land and can be adapted to any water intake rate. Other factors to consider in selecting an irrigation system are: type of crop, cost, shape of the area, amount of crop land, and wind conditions. Sprinkler systems are growing in popularity since they are more efficient. The most popular type are: solid set, side-wheel-roll, traveling gun, center pivot, and 'trickle' sprinkler systems. Good irrigation management requires knowing when and how much water to apply. Certain plants can be used as indicators of low soil moisture conditions, but it is better to use electrical resistance, tensiometers, soil probes or even 'feel'. A third method is to estimate crop water use from tables. Preventive maintenance is another aspect of good management. If ground water is used, well records should be kept. The decision whether or not to irrigate ultimately depends on the cost-benefit ratio. (Purdin-NWWA)
W78-11068

THE TWO-TIERED MARKET IN WESTERN WATER,
New Mexico Univ., Albuquerque. School of Law.
For primary bibliographic entry see Field 6E.
W78-11157

GENERAL RULES GOVERNING IRRIGATION.
For primary bibliographic entry see Field 6E.
W78-11184

THE IMPACT OF ENERGY RESOURCE DEVELOPMENT ON WATER RESOURCE ALLOCATIONS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6B.
W78-11211

SOME POLITICAL-INSTITUTIONAL FACTORS AFFECTING EFFORTS TO CONSERVE WATER IN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W78-11212

WATER PROBLEMS IN THE RURAL ENVIRONMENT--ALTERNATIVE SOLUTIONS FOR WATER SUPPLY AND WASTEWATER DISPOSAL.
Proceedings of a Conference on November 4, 5, 1976, Lincoln, Nebraska, Institute of Agriculture and Natural Resources, Lincoln, Nebraska. 136 p.

Descriptors: *Institutional constraints, *Rural sociology, *Water supply, *Waste water disposal, Agriculture, Legal aspects, Legislation, Regulation, Nebraska, Rural areas, Water law, Water management(Applied), Water quality, Water requirements, Water resources, Water rights, Water sources, Water utilization.

Providing an adequate supply of safe water for rural residents has been a long-term problem in the United States as well as in most countries of the world. Renewed growth of non-urban populations and increasing per capita use of water are constraining the capacity of many rural water systems to provide adequate service. The biggest problems for local communities are regulation and financing. Regulations pertaining to facility design, operations and output have been taken care of at the state and federal level. This has meant the imposition of standards which may be quite legitimate and necessary, but which communities cannot meet with their financial resources. A problem peculiar to rural water systems is that of scale. For rural water systems, small size tends to preclude the attainment of potential economies of scale in source of supply, transmission, and treatment. The cost of supplying safe drinking water in rural areas will remain large. However, the supply of water can be used to shape plans and develop residential regions, natural resources, and industries. This conference examines the water problem encountered by rural communities and the various technological alternatives available to ensure adequate water supplies. (Jordan-Florida)
W78-11244

WATER SUPPLY DILEMMAS OF GEOTHERMAL DEVELOPMENT IN THE IMPERIAL VALLEY OF CALIFORNIA,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 3E.
W78-11299

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

WATER DISCHARGE OF RIKHA SAMBA KHOLA IN HIDDEN VALLEY, MUKUT HIMAL,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
For primary bibliographic entry see Field 2C.
W78-10506

OPTIMAL IDENTIFICATION OF NONLINEAR SURFACE RUNOFF SYSTEMS WITH COPOSITIVITY THRESHOLD CONSTRAINTS,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Industrial and Management Engineering.
For primary bibliographic entry see Field 2E.
W78-10515

A PHYSICALLY-BASED MODEL TO PREDICT RUNOFF UNDER VARIABLE RAIN INTENSITY,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 2G.
W78-10525

THE PHYSIOGRAPHIC INFLUENCE ON RECESSION RUNOFF IN SMALL NORWEGIAN RIVERS,
Norsk Inst. for Vannforskning, Blindern.
T. Tjomsland, E. Ruud, and K. Nordseth.
Nor dic Hydrology, Vol 9, No 1, p 17-30, 1978. 5 fig, 2 tab, 22 ref, 2 append.

Descriptors: *Runoff, *Water storage, *Lakes, *Rivers, Watersheds(Basins), Drainage, Regression analysis, Correlation analysis, Discharge(Water), Bedrock, Hydrology, Geology, *Norway.

This paper presented a statistical correlation procedure to predict a master depletion curve by use of basin characteristics and the specific storage of water available for runoff at a particular recession discharge in small watersheds. Percentual lake area, drainage density, and a weighted lake inflow area index were the most significant parameters to explain differences in specific storage among basins. The significance showed time-dependency. Percentual lake area had a decreasing contribution to a total explanation from high to low specific discharges, while drainage density increased its importance. (Sims-ISWS)
W78-10528

BORDER-IRRIGATION HYDRAULICS WITH ZERO INERTIA,
California Univ., Davis. Dept. of Land, Air, and Water.
For primary bibliographic entry see Field 3F.
W78-10604

ALGEBRAIC COMPUTATION OF FLOW IN BORDER IRRIGATION,
California Univ., Davis. Water Science and Engineering Section.
For primary bibliographic entry see Field 3F.
W78-10605

SURFACE WATER RECORDS OF COOK INLET BASIN, ALASKA, THROUGH SEPTEMBER 1975,
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10621

LOW-FLOW FREQUENCY OF GEORGIA STREAMS,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-10623

FLOOD PROFILES FOR LOWER BROOKER CREEK, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-10624

WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1976.
Geologica Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10627

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1977.
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10628

WATER RESOUCES DATA FOR NEVADA, WATER YEAR 1977.
Geological Survey, Carson City, NE. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10629

FLOOD FREQUENCY ANALYSIS WITH A GENERALIZED SKEW COEFFICIENT,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-10639

RESERVOIR STORAGE WITH DEPENDENT, PERIODIC NET INPUTS,
Geological Survey, Denver, CO. Water Resources Div.
B. M. Troutman.
Water Resources Research, Vol 14, No 3, p 395-401, June 1978. 5 fig, 20 ref.

Descriptors: *Reservoirs, *Reservoir storage, *Storage capacity, *Projections, *Stochastic processes, Inflow, Water demand, Time series analysis, Seasonal, Storms, Droughts, Autoregressive inflows, Asymptotic distributions, Brownian motion, Deficit analysis, Dependent inflows, Hurst phenomenon, Periodic inflows, Range of cumulative sums, Sequent peak method, Serial correlation of inflows.

Two random quantities, the range and the maximum deficit, which may provide a measure of the required storage capacity of a reservoir over a fixed length of time, are considered. Interest in the range from an engineering point of view was initiated by Hurst (1951), who demonstrated that for certain geophysical time series, sample values of the range exhibit a property that has subsequently become known as the 'Hurst phenomenon'. This property is discussed briefly, primarily with the intention of showing that the Hurst phenomenon can be interpreted so as to be consistent with the asymptotic results on the range. The second quantity, the maximum deficit, is simply the storage obtained when one applied the sequent peak algorithm. Of primary concern is the manner in which the statistical behavior of these quantities is affected by dependence and periodicity in the net inputs to the reservoir. Dependence, sometimes referred to as persistence or serial correlation, is seen, for example, in the fact that a large stream discharge on a given day will tend to be followed by a large discharge on the next day. The periodicities are due primarily due to seasonal variations in factors such as precipitation and demand for stored water. (Woodard-USGS)
W78-10640

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE LOWER WISCONSIN RIVER BASIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-10643

A COMPREHENSIVE METHODOLOGY FOR ASSESSING ENVIRONMENTAL IMPACT,
British Columbia Univ., Vancouver. Dept of Soil Science.
For primary bibliographic entry see Field 6G.
W78-10652

LARGE-SCALE PLANNING PROJECTS: THE TENNESSEE VALLEY AUTHORITY AND THE BRATSK-ILIMSK COMPLEX,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6B.
W78-10655

REAL-TIME CONTROL OF WATER QUALITY AND QUANTITY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 5G.
W78-10657

AN APPROXIMATE METHOD FOR SIZING DETENTION RESERVOIRS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
S. R. Abt, and N. S. Grigg.
Water Resources Bulletin, Vol. 14, No. 4, p 956-965, August 1978. 6 fig, 3 tab, 7 ref.

Descriptors: *Detention reservoirs, *Water storage, *Storm water, *Estimating, *Sizing, *Placement, Urban drainage, Management, Runoff, Watersheds(Basins), Hydrographs, Effects, Floods, Equations, Mathematical models, Systems analysis, Comparative analysis.

The detention reservoir is an effective measure for the management of storm water runoff, but random or unplanned placement may aggravate potential flood hazards. An approximate method for the sizing and placement of detention reservoirs is presented. The procedure is based upon the application of a storage estimation equation. The results show that the procedure closely approximates the results produced by the U. S. Army Crops of Engineers HEC-1 Flood Hydrograph Package in computing reservoir capacities on a hypothetical watershed. Pending further tests, the use of the procedure is very limited, but it is an initial step towards incorporating detention storage into regional storm water management plans. (Bell-Cornell)
W78-10662

WSP2 COMPUTER PROGRAM. A WATER SURFACE PROFILE COMPUTER PROGRAM FOR DETERMINING FLOOD EVALUATIONS AND FLOOD AREAS FOR CERTAIN LOW RATES. USER'S GUIDE,
Soil Conservation Service, Washington, DC. Engineering Div.
For primary bibliographic entry see Field 7C.
W78-10669

AQUATIC HERBICIDES,
Nalco Chemical Co., Oak Brook, IL. (Assignee).
For primary bibliographic entry see Field 5G.
W78-10722

SALINITY MANAGEMENT OPTIONS FOR THE COLORADO RIVER, DAMAGE ESTIMATES AND CONTROL PROGRAM IMPACTS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W78-10735

GUIDELINES FOR EPA REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS ON PROJECTS INVOLVING IMPOUNDMENTS.
Curran Associates, Inc., Northhampton, MA.
For primary bibliographic entry see Field 6G.
W78-10761

MODEL ORDINANCE FOR STORM DRAINAGE SYSTEMS AND IMPROVEMENTS.
Central Midlands Regional Planning Council, Columbia, SC.
For primary bibliographic entry see Field 6E.
W78-10774

DETERMINING PRIORITY OF FEDERAL RESERVED RIGHTS,
For primary bibliographic entry see Field 6E.
W78-10777

DEFERENCE TO STATE COURTS IN THE ADJUDICATION OF RESERVED WATER RIGHTS,
Holland and Hart, Denver, CO.
For primary bibliographic entry see Field 6E.
W78-10778

AN ANALYSIS OF THE SCOPE OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT ON THE GARRISON DIVISION UNIT PROJECT: APPLYING A TOTALITY OF CIRCUMSTANCES TEST,
For primary bibliographic entry see Field 6G.
W78-10785

GOOD TIMES FOR SOIL AND WATER CONSERVATION,
Library of Congress, Washington, DC. Congressional Research Service.
For primary bibliographic entry see Field 6E.
W78-10791

PLANNING AND SELECTING SITES FOR WATER STORAGE FACILITIES,
For primary bibliographic entry see Field 6E.
W78-10792

SPECIFIC PROBLEM ANALYSIS. 1975 NATIONAL ASSESSMENT OF WATER AND RELATED LAND RESOURCES (MISSOURI REGION).
Missouri River Basin Commission, Omaha, NE.
For primary bibliographic entry see Field 6E.
W78-10798

REVIEW OF EXISTING STATE LAND USE REGULATION IN FLORIDA--AN OVERVIEW,
Florida Law Revision Council, Tallahassee. Office of Statutory Revision.
For primary bibliographic entry see Field 6E.
W78-10802

GONE WITH THE WATER--DRAINAGE RIGHTS AND STORM WATER MANAGEMENT IN PENNSYLVANIA,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 6E.
W78-10807

PROBLEM IDENTIFICATION, LEGAL ASPECTS OF FLOOD CONTROL, ALTERNATIVE CONTROL MEASURES.
Pikes Peak Area Council of Governments, Colorado Springs, CO.
For primary bibliographic entry see Field 6E.
W78-10827

INTERGOVERNMENTAL CONFLICT IN LAND USE PLANNING: THE CALIFORNIA COASTAL ZONE CONSERVATION COMMISSION V. THE LOCAL REDEVELOPMENT AGENCIES,
For primary bibliographic entry see Field 6E.
W78-10833

FLORIDA'S AREA OF CRITICAL STATE CONCERN: AN UPDATE,
Florida Bureau of Land and Water Management, Tallahassee. Div. of State Planning.
For primary bibliographic entry see Field 6E.
W78-10835

EVOLUTION IN THE BRITISH INSTITUTIONAL FRAMEWORK FOR WATER MANAGEMENT,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6E.
W78-10838

FEDERAL PARTICIPATION IN SHORE, HURRICANE, AND TIDAL AND LAKE FLOOD PROTECTION.
Department of the Army, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-10844

AN EXAMINATION OF THE LAW OF WATER BOUNDARIES AND ACCRETIONS IN MANITOBA,
Tallin Knitjansson, Winneipeg (Manitoba).
For primary bibliographic entry see Field 6E.
W78-10849

THE PUBLIC TRUST DOCTRINE AND OWNERSHIP OF FLORDA'S NAVIGABLE LAKES,
For primary bibliographic entry see Field 6E.
W78-10850

FLUID ROUTING BY CHARACTERISTIC METHODS,
Lanchester Polytechnic, Coventry (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-10918

SUBSURFACE DRAINAGE IN SOILS WITH HIGH HYDRAULIC CONDUCTIVITY LAYERS,
North Carolina State Univ., at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W78-10922

LONG-TERM SURFACE-WATER SUPPLY AND STREAMFLOW TRENDS IN THE UPPER COLORADO RIVER BASIN,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
For primary bibliographic entry see Field 2E.
W78-10940

TEMPERATURE ANALYSIS AND SELECTIVE-WITHDRAWAL DESIGN STUDY TALLAHALA CREEK LAKE, MISSISSIPPI; MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5B.
W78-10946

THE RELIEF AND LAND FORM MAP OF AUSTRALIA: DOES IT SHOW ROCK TYPES AND LAND FORMS OF HYDROLOGIC SIGNIFICANCE,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W78-10963

CHEMICAL CHARACTERISTICS OF A DESERT STREAM IN FLASH FLOOD,
Arizona State Univ., Tempe. Dept. of Zoology.
For primary bibliographic entry see Field 2K.
W78-10964

WATERWEEDS: FLIES IN THE IRRIGATION OINTMENT,
J. Tinker.
New Scientist, Vol. 61, Mar. 21, 1974, p 747-749, 2 fig.

Group 4A—Control Of Water On The Surface

Descriptors: *Aquatic weed control, *Biocontrol, *Aquatic plants, *Clogging, *Canals, Ditches, Aquatic algae, Floating plants, Rooted aquatic plants, Submerged plants, Aquatic weeds, Irrigation water.

Aquatic plants are causing serious problems by clogging drainage ditches and irrigation canals throughout Asia and Africa. In reservoirs and Canals water lacks the turbulence of rivers and is consequently clear, allowing light to penetrate and stimulate weed growth. Additionally, the increasing use of fertilizers has added nutrients to these waters and further stimulates growth. There are at least 5 major groups of vegetation that account for much of the problem: (1) water hyacinth, duckweed, water lettuce and water fern all float freely on the surface without rooting, (2) rooted floating plants like the lotus and water lily, (3) rooted weeds whose foliage remains beneath the surface such as wild celery, potamogeton, and Hydrilla verticilata, (4) water weeds that root themselves along the edges with their foliage above water such as bulrush typha and alligator weed, (5) algae. These weeds cause problems not only with clogging but also by encouraging the deposition of silt, robbing water through evapotranspiration, and sometimes creating a new habitat advantageous for samll fish and mosquitoes. Not confined only to Africa and Asia, problems such as these exist the world over and have their own particular characteristics and solutions. A wide range of herbicides are presently being used with consequent worries over their effect on fish and environmental contamination. Some of the capital-poor, labor-rich countries have found success with hand weeding and manual removal, making possible the utilization of some of these weeds for animal feeds, paper and rayon. Some countries are experimenting with biological control with the manatee, the khaki campbell duck, and carp. (Tickes-Arizona).
W78-10969

FEDERAL RECLAMATION AND WATER RIGHTS IN NEVADA,
California State Univ., San Diego. Dept. of History.
For primary bibliographic entry see Field 6E.
W78-10974

SYRIA'S EUPHRATES DAM PROMISES RAPID AGRICULTURAL DEVELOPMENT,
For primary bibliographic entry see Field 3F.
W78-10976

POTENTIALS AND PREDICTIONS CONCERNING RECLAMATION OF SEMIARID MINED LANDS,
Montana Agricultural Experiment Station, Bozeman.
For primary bibliographic entry see Field 5G.
W78-10985

SOME APPLICATIONS OF HYDROLOGIC SIMULATION MODELS FOR DESIGN OF SURFACE MINE TOPOGRAPHY,
Agricultural Research Service, Fort Collins, CO.
For primary bibliographic entry see Field 5G.
W78-10986

SKYLINE HARVESTING IN APPALACHIA,
Northeastern Forest Experiment Station, Broomall, PA.
For primary bibliographic entry see Field 4C.
W78-10988

DRIP/TRICKLE PIPE NETWORK DESIGN,
A. G. Water, Shafter, CA.
For primary bibliographic entry see Field 3F.
W78-11030

ON THE ALLOCATION OF PRIME AGRICULTURAL LAND,
Harza Engineering Co., Chicago, IL.
For primary bibliographic entry see Field 3F.
W78-11031

MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEM ANALYSIS - APPLICATION TO MEDIUM SIZE COMMUNITIES: URBAN STORM-DRAINAGE SYSTEMS PLANNING,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-11058

CALIBRATION AND SENSITIVITY ANALYSIS OF THE CONTINUOUS RUNOFF SIMULATION MODEL 'STORM',
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 2A.
W78-11060

MATHEMATICAL MODELING OF A SOCIOLOGICAL AND HYDROLOGIC DECISION SYSTEM,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6A.
W78-11061

REASONABLE-BENEFICIAL USE: NEW STATUTORY STANDARD FOR WATER RESOURCES ALLOCATION-INTERPRETATION AND RECOMMENDATIONS,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W78-11152

POLICY AND PROGRAM ANALYSIS OF AN OPEN LAND APPROACH TO FLOOD PLAIN MANAGEMENT,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 6F.
W78-11201

THE IMPACT OF ENERGY RESOURCE DEVELOPMENT ON WATER RESOURCE ALLOCATIONS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6B.
W78-11211

WATER RESOURCES DATA FOR OREGON, WATER YEAR 1977.
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11252

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11253

WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1977.
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11254

STUDY TO DETERMINE DISCHARGE AT 50-PERCENT FLOW DURATION AND ORDINARY HIGH WATER FOR STREAMS IN LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-11260

FLOODS OF JUNE 4 AND 12, 1976, AT CULBERTSON, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-11262

CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART A. EARTH SCIENCE IN CLIMATE RESEARCH.
Geological Survey, Menlo Park, CA. Geologic Div.
For primary bibliographic entry see Field 2B.
W78-11263

CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART B. CURRENT RESEARCH BY THE GEOLOGICAL SURVEY.
Geological Survey, Menlo Park, CA. Geologic Div.
For primary bibliographic entry see Field 2B.
W78-11264

CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART C. GEOLOGICAL SURVEY CLIMATE PLAN.
Geological Survey, Menlo Park, CA. Geologic Div.
For primary bibliographic entry see Field 2B.
W78-11265

DISCHARGE, GAGE HEIGHT, AND ELEVATION OF 100-YEAR FLOODS IN THE HUDSON RIVER BASIN,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-11271

A SIMPLE-HARMONIC MODEL FOR DEPICTING THE ANNUAL CYCLE OF SEASONAL TEMPERATURES OF STREAMS,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-11274

4B. Groundwater Management

INTEGRODIFFERENTIAL EQUATIONS FOR SYSTEMS OF LEAKY AQUIFERS AND APPLICATIONS 3. A NUMERICAL METHOD OF UNLIMITED APPLICABILITY,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Investigacion en matematicas Aplicadas Sistemas.
For primary bibliographic entry see Field 2F.
W78-10587

PREDICTING PHOSPHATE MOVEMENT THROUGH SOIL COLUMNS,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 5B.
W78-10589

GROUND-WATER RESOURCES OF TANGIPAHOA AND ST. TAMMANY PARISHES, SOUTHEASTERN LOUISIANA,
Geological Survey, Baton Rouge, I.A. Water Resources Div.

D. J. Nyman, and L. D. Fayard.
Louisiana Department of Transportation, Baton Rouge, Office of Public Works Water Resources Technical Report No 15, 1978. 76 p, 25 fig, 13 plates, 21 tab, 29 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water yield, *Water level fluctuations, Water quality, Hydrogeology, Groundwater movement, Potentiometric level, Water utilization, Drawdown, Groundwater recharge, Water management(Applied), *Louisiana, St. Tammany Parish, Tangipahoa Parish.

In Tangipahoa and St. Tammany Parishes in southeastern Louisiana north of Lake Pontchartrain there are 12 major aquifers. Wells as deep as 3,354 feet produce freshwater. Water levels range from as much as 80 feet below land surface in shallow aquifers to nearly 100 feet above land surface in deep aquifers. Water levels in aquifers less than 1,000 feet deep are declining less than 1 foot per year; in aquifers deeper than 1,500 feet the average water-level decline is about 2 feet per year. during 1974 an average of 43 million gallons per day was discharged from the aquifers; of this amount, more than 20 million gallons per day was discharged from uncontrolled, or partially controlled, flowing wells. The hardness of water from the aquifers generally is less than 30 mg/liter, the iron and manganese concentration generally is less than 0.5 mg/lite, and dissolved solids generally are less than 350 mg/liter. Water from most of the shallow aquifers and from many of the deep aquifers in the north half of the area tends to be corrosive. (Woodard-USGS)
W78-10620

A GROUND-WATER INVENTORY OF THE WAIALUA BASAL-WATER BODY, ISLAND OF OAHU, HAWAII,
Geological Survey, Lakewood, CO. Water Resources Div.
R. H. Dale.
Open-file report 78-24, January 1978. 71 p, 22 fig, 3 tab, 11 ref.

Descriptors: *Hydrogeology, *Hydrologic budget, *Groundwater, *Aquifer characteristics, *Saline water-freshwater interfaces, Groundwater availability, Water yield, Groundwater potential, Hawaii, *Oahu, *Waialua, *Groundwater management.

The Waialua basal-water body underlies an area of about 18 square miles on the north shore of the island of Oahu, Hawaii. The basal-water body is a body of fresh ground water that floats on saline ground water in a highly permeable and porous basaltic aquifer. Inflow to the basal-water body is from the deep infiltration of applied irrigation water and from leakage through a low permeability ground-water dam. Outflow from the basal-water body is from basal-water pumpage and leakage through low-permeability boundaries that separate the basal-water body from the ocean. The basal-water flux, computed as either the sum of the inflow terms or the sum of the outflow terms, is about the same value. The basal-water flux is 55 million gallons per day, based on the sum of the outflow terms. The effective porosity was computed at 0.09 by a time-series analysis of basal water in storage is estimated to be 1.4 x 10 to the 11th power gallons. Pumpage from the basal-water body can be increased. The most efficient development method is the skimming shaft. If shafts were used, an additional 15 million gallons per day could be pumped on a sustaned basis. (Woodard-USGS)
W78-10622

HYDROLOGIC MONITORING OF A DEEP-WELL-INJECTION SYSTEM NEAR PENSACOLA, FLORIDA, MARCH 1970-MARCH 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-10625

WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1976.
Geologica Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10627

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1977.
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10628

WATER RESOUCES DATA FOR NEVADA, WATER YEAR 1977.
Geological Survey, Carson City, NE. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10629

GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1971-75,
Geological Survey, Lawrence, KA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10630

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--HAWAII REGION,
Geological Survey, Honolulu, HI. Water Resources Div.
K. J. Takasaki.
Available from Supt. of Documents, GPO, Washington DC, 20402; price $1.50. Professional Paper 813-M, 1978. 29 p, 15 fig, 3 tab, 103 ref.

Descriptors: *Groundwater resources, *Hawaii, *Hydrology, *Regional analysis, Evaluation, Water resources development, Islands, Groundwater availablity, Potential water supply, Economic feasibility, *Groundwater appraisal.

The ground-water resources in the Hawaiian Islands offer bettern prospects for supplying additional water needs in the future than the surface-water resources. Most of the easily developable surface supplies have been fully utilized where needed, and conduits and reservoirs necessary to develop new or additional supplies would generally require large and often prohibitive outlays of capital. In 1975, ground water supplied 46 percent, and surface water 54 percent of the water needs but, in the years ahead, these percentages will likely be reversed as fuller ground-water development takes place. Total water use, in 1975, averaged about 1,775 million gallons per day, of which about 810 million gallons per day was ground water. The water use is divided into public supply, 11 percent; self-supplied industrial use, 23 percent; and agricultural, 66 percent. Ground-water recharge has been estimated at about 6.5 billion gallons per day or roughly 30 percent of the rainfall. Most fresh ground water is stored in the underground space below sea level in porous lava flows, much of it in basal-water lenses floating on heavier saline ground water. (Woodard-USGS)
W78-10635

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--SOURIS-RED-RAINY REGION,
Geological Survey, St. Paul, MN. Water Resources Div.
H. O. Reeder.
Avalable from Supt. of Documents, GPO, Washington, DC 20402; price, $1.40. Professional Paper 813-K, 1978. 25 p, 14 fig, 7 tab, 36 ref.

Descriptors: *Groundwater resources, *Regional analysis, Water resources development, *Water management(Applied), Hydrogeology, Aquifer characteristics, Water quality, Groundwater availablity, Evaluation, Planning, Montana, North Dakota, South Dakota, Minnesota, *Souris-Red-Rainy Region(Northcentral U.S.).

A broad-perspective analysis of the ground-water resources and present and possible future water development and management in the Souris-Red-Rainy Region is presented. The region includes the basins of the Souris River within Montana and North Dakota; the Red River of the North in South Dakota, North Dakota, and Minnesota; and the Rainy River within Minnesota. The region includes 59,645 square miles, mostly in North Dakota and Minnesota. This report is one of a U.S. Geological Survey series that summarizes information on the Nation's ground water for the guidance of planners. New data were not collected for this appraisal, but information from many sources has been utilized. In addition to summarizing the knowledge of ground-water resources of the region, the report points out deficiencies in knowledge. The primary objective of evaluating information deficiencies is to direct attention to types of studies and information that will lead to fuller understanding and description of groundwater reservoirs for better evaluation, planning, and management of the region's water resources. With proper knowledge, utilization, and conjunctive management of all water resources, ground water can assume greater significance in the region's development. (Woodard-USGS)
W78-10636

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--TENNESSEE REGION,
Geological Survey, Nashville, TN. Water Resources Div.
A. Zurawski.
Available from Supt. of Documents, GPO, Washington DC, 20402; price, $1.60. Professional Paper 813-L, 1978. 35 p, 23 fig, 4 tab, 61 ref.

Descriptors: *Groundwater resources, *Regional analysis, *Tennessee, *Aquifers, *Water quality, Water utilization, Groundwater availability, Hydrogeology, Groundwater recharge, River basins, Water resources development, Planning, Evaluation, *Tennessee Region.

Ground water is an abundant but underdeveloped resource in the water-rich Tennessee Region. The estimated recharge to aquifers in the region is one-fifth to one-third of the precipitation, or about 8 trillion gallons per year. Less than one percent of this amount of ground water was used in 1970. The aquifers of the Tennessee Region are composed of carbonate rocks, unconsolidated granular material, and fractured noncarbonate rocks. Because of their great areal extent the carbonate aquifers have the greatest potential for ground-water development. Although ground water has been a little used resource in the Tennessee Region, it could play a significant role in regional water supply. However, optimum development would require a degree of knowledge of ground-water occurrence, movement and interaction with surface water that is unavailable in most of the region. Because it is an integral part of the region's water resources, ground water deserves further study and consideration in regional development planning. (Woodard-USGS)
W78-10637

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--GREAT LAKES REGION,
Geological Survey, Indianapolis, MO. Water Resources Div.

W. G. Weist, Jr.
Available from Supt. of Documents, GPO, Washington, DC 20402; price, $1.50. Professional Paper 813-J, 1978. 30 p, 14 fig, 5 tab, 35 ref.

Descriptors: *Groundwater resources, *Great Lakes Region, *Groundwater availability, *Water quality, *Groundwater potential, Groundwater movement, Groundwater recharge, Water wells, Aquifer characteristics, Injection wells.

Ground water available from storage in the Great Lakes Region is estimated to be 35,000 billion cubic feet. Ground-water discharge to stream and lakes in the region is estimated to be 26 billion gallons per day. Despite this abundance or ground water, only 1.8 billion gallons per day was used in the region in 1970. This is about 11.6 percent of the total water used, excluding thermoelectric power use. Ground water is available throughout the Great Lakes Region. However, the amount available locally varies widely. The most productive aquifers, those along the valleys of major streams, yield as much as 5,000 gal/min. Yields in excess of 1,000 gal/min have been obtained from the bedrock in some areas. In addition to being a potential source of water to meet increasing municipal and industrial demands, ground water can be used to augment low streamflow, to dilute water or poorer quaity, and to maintain lake levels and wetlands, among other uses. (Woodard-USGS)
W78-10638

NUMERICAL SIMULATION OF STEADY STATE THREE-DIMENSIONAL GROUND-WATER FLOW NEAR LAKES,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-10642

HYDROLOGIC RECONNAISSANCE OF THE DUGWAY VALLEY-GOVERNMENT CREEK AREA, WEST-CENTRAL UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10644

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1978,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-10645

PROBABLE YIELDS OF WELLS IN THE SAND-AND-GRAVEL AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10646

PROBABLE YIELDS OF WELLS IN THE SANDSTONE AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10647

GROUND-WATER POLLUTION BY NITROGEN COMPOUNDS AT OLEAN, NEW YORK--PROGRESS REPORT, JUNE 1977,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-10649

A STUDY OF NEAR WELL GROUNDWATER FLOW AND THE IMPLICATIONS IN WELL DESIGN,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 8B.
W78-10668

METHOD FOR PRODUCING GEOTHERMAL ENERGY AND MINERALS,
Exxon Production Research Co., Houston, TX. (Assignee).
For primary bibliographic entry see Field 3E.
W78-10715

CONFLICTS BETWEEN PRIVATE APPROPRIATORS OF STREAM FLOWS AND USERS OF GROUND WATER IN NEBRASKA,
For primary bibliographic entry see Field 6E.
W78-10781

LAND SUBSIDENCE: MENACE TO THE TEXAS GULF COAST,
Harris-Galveston Coastal Subsidence District, Houston, TX.
For primary bibliographic entry see Field 6E.
W78-10782

DEVELOPMENTS IN GROUNDWATER LAW,
Arizona Univ., Tucson. School of Law.
For primary bibliographic entry see Field 6E.
W78-10794

WATER WARS OR STREAMS OF PARADISE: DO WE HAVE A CHOICE.
For primary bibliographic entry see Field 5G.
W78-10799

PROPERTY RIGHTS TO GEOTHERMAL RESOURCES (PART ONE),
California Univ., Berkeley. School of Law.
For primary bibliographic entry see Field 6E.
W78-10806

EVOLUTION IN THE BRITISH INSTITUTIONAL FRAMEWORK FOR WATER MANAGEMENT,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6E.
W78-10838

SURFACE WATER: TEXAS GULF COAST ALTERNATIVE TO SUBSIDENCE,
Harris-Galveston Coastal Subsidence District, Houston, TX.
For primary bibliographic entry see Field 6E.
W78-10840

REVIEW OF PROJECTS AFFECTING THE EDWARDS UNDERGROUND RESERVOIR, A DESIGNATED SOLE SOURCE AQUIFER IN THE SAN ANTONIO, TEXAS AREA.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-10856

NEBRASKA WELL-INTERFERENCE PROBLEMS--A PROPOSAL,
For primary bibliographic entry see Field 6E.
W78-10858

STEADY-STATE DRAWDOWNS IN COUPLED AQUIFERS,
Geraghty and Miller, Inc., Tampa, FL.
For primary bibliographic entry see Field 2F.
W78-10917

A COMPARISON OF HYDROTHERMAL RESERVOIRS OF THE WESTERN UNITED STATES.
Geonomics, Inc., Berkeley, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as EPRI ER-364 1276, Price codes: A08 in paper copy, A01 in microfiche. Topical Report 3, EPRI ER-364, Dec. 1976. 180 p, 33 fig, 9 tab, 193 ref, 3 append.

Descriptors: *Thermal power, *Thermal water, *Geothermal studies, Geology, Petrology, Groundwater, Aquifers, Salinity, Hydrothermal studies, Heat, Powerplants, Thermal powerplants.

This report presented a portion of the results from a one-year feasibility study to assess the feasibility of constructing a 25 to 50 MWe geothermal power plant using low salinity hydrothermal fluids as the energy source. It contained the results of a comparative study of 16 hydrothermal reservoirs in the US. The reservoirs were selected for comparison on the basis of available data, development potential, and representativeness of known hydrothermal reservoirs in the US. Six reservoir and fluid criteria were considered the most important in determining the development and power conversion potential: depth and lithology, reservoir temperature, tested flow rate per well, fluid chemistry, magnitude of the reserve, and reinjection potential. These criteria were evaluated for each of the selected reservoirs. (Sims-ISWS)
W78-10928

INSTITUTIONAL ARRANGEMENTS FOR EFFECTIVE GROUNDWATER MANAGEMENT TO HALT LAND SUBSIDENCE,
Texas A and M Univ., College Station. Dept. of Animal Science.
W. J. Brah, and L. L. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 786, Price codes: A09 in paper copy, A01 in microfiche. Texas Water Resources Institute, College Station, Technical Report No. TR-95, May 1978. 194 p, 4 tab, 3 fig, 131 ref. OWRT B-200-TEX(1), 14-34-0001-6122.

Descriptors: *Land subsidence, *Management, *Institutions, Texas, *Groundwater, *Subsidence, Conjunctive use, Water utilization, Alternative water use, *Texas Gulf Coast, *Houston-Galveston area(Tex).

Alternative political and economic structures for comprehensive management of the complex water problems to halt land subsidence in the Texas Gulf Coastal are of Harris and Galveston counties. Alternative arrangements of legal, economic and political insitutions with the capacity and ability to conjunctively manage regional ground and surface water resources to abate and control subsidence are developed and examined. These alternative institutional arrangements are based on both practical and theoretical management methods advanced in the literature on water resource management for solving commonality problems in the use of groundwater resources.
W78-11057

WATER SUPPLIES FOR INDUSTRIAL FIRE PROTECTION,
Peerless-Midwest, Inc., Granger, IN.
R. J. Williams.
Water Well Journal, Vol 32, No 7, p 55, July, 1978.

Descriptors: *Water wells, *Fire protection systems, National Fire Protection Association.

A good fire protection system is required for industries to obtain insurance and comply with state safety codes. Such a system may use as many as three of the nine approved water sources. Water sources which are certain to deliver water to the fire under any circumstance are called primary sources. Secondary sources are acceptable only as

a back-up for a primary source. Most authorities accept fire wells as primary sources but some underwriters will require two wells, one with an electric pump and one with a diesel pump, to guarantee primary status. Codes require a well to produce 50% over its rated capacity for eight hours. Drillers should be familiar with all NFPA codes before installing a well. A fire well without pumping equipment can be installed for under $25,000. (Purdin-NWWA)
W78-11070

REGIONAL GEOLOGY SERIES: PART VII,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8B.
W78-11071

DRILLING IN THE YEAR 2025,
For primary bibliographic entry see Field 8C.
W78-11072

PHENOL POISONING DUE TO CONTAMINATED DRINKING WATER,
Bureau of Epidemiology, Atlanta, GA. Cancer and Birth Defects Div.
For primary bibliographic entry see Field 5C.
W78-11075

WATER SUPPLY AND CONTROL DEVELOPMENTS SUMMARIZED: ARIZONA.
For primary bibliographic entry see Field 3D.
W78-11076

ENGINEERING ASPECTS OF GEOTHERMAL DEVELOPMENT WITH EMPHASIS ON THE IMPERIAL VALLEY OF CALIFORNIA,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
M. Goldsmith.
Energy, Vol 3, p 127-148, April, 1978. 5 fig, 10 tab, 14 ref.

Descriptors: *Geothermal studies, Civil engineering, *Economics, *Thermal power plants, Drilling, Injection, Desalination processes, Distillation, Pipe lines, California, Imperial Valley(Calif).

Engineering considerations involved in the geothermal development plan of the County of Imperial are summarized. Acreage requirements for geothermal drilling and electric generating stations are discussed. Drilling costs vary roughly as the square of the depth beyond 5000 feet. Cost optimization requires a balance between drill cost, set-up cost, transmission pipe cost, land fees, etc. Offshore dilling and construction of a power plant over the Salton Sea are considered. In this case, environmental impact is more important and affects the cost. Problems associated with the reinjection and transmission of geothermal fluids are presented. A section on power plants attempts to give scaling relationships for land area, cost and performance, according to size and reservoir temperature. The problem of cooling power plants is important, particularly in an acid agricultural area. Cooling requirements, water availability and water suitability are discussed. The feasibility of desalting geothermal brine by distillation is considered. The simplest distillation process is to condense and capture the exhaust steam. However unless major reductions in capital cost are realized, geothermal brine desalting in the Imperial Valley will not be economical. (Purdin-NWWA)
W78-11078

REASONABLE-BENEFICIAL USE: NEW STATUTORY STANDARD FOR WATER RESOURCES ALLOCATION-INTERPRETATION AND RECOMMENDATIONS,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W78-11152

LOS ANGELES V. SAN FERNANDO: GROUND WATER MANAGEMENT IN THE GRAND TRADITION,
Southern California Metropolitan Water District of Los Angeles.
For primary bibliographic entry see Field 6E.
W78-11165

GROUNDWATER MANAGEMENT IN NEBRASKA WITHOUT A LEGISLATIVE SOLUTION: IS THERE AN ALTERNATIVE,
For primary bibliographic entry see Field 6E.
W78-11168

INSTITUTIONAL ALTERNATIVES FOR MANAGING GROUNDWATER RESOURCES: NOTES FOR A PROPOSAL,
Arizona Univ., Tucson. School of Law.
For primary bibliographic entry see Field 6E.
W78-11170

ARTESIAN WELLS.
For primary bibliographic entry see Field 6E.
W78-11180

WATER RESOURCES DATA FOR OREGON, WATER YEAR 1977.
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11252

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11253

WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1977.
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11254

AQUIFER TESTS - THE STATE OF THE ART IN HYDROLOGY,
Geological Survey, Lubbock TX. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-11257

STRATIGRAPHIC TEST WELL, NANTUCKET ISLAND, MASSACHUSETTS,
Geological Survey, Reston, VA. Geologic Div.
D. W. Folger, J. C. Hathaway, R. A. Christopher, P. C. Valentine, and C. W. Poag.
Available from the Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202. Circular 773, 1978. 28 p, 11 fig, 2 tab, 47 ref.

Descriptors: *Test wells, *Stratigraphy, *Groundwater, *Water quality, Freshwater, Brackish water, Depth, Sediments, Aquifers, Islands, Atlantic Ocean, Massachusetts, *Nantucket Island.

The U.S. Geological Survey, in cooperation with the Massachusetts Water Resources Commission and the Nantucket Conservation Foundation, continuously cored 514 m of sediment and volcanic rock in a stratigraphic and water-quality test near the geographic center of Nantucket Island. Stratified sediments were divided texturally into three zones: the upper zone (0-128 m) contains mostly coarse sand and gravel; the middle zone (128-349 m) contains mostly silty clay and a few beds of sand and silt; and the lower zone (349-457 m) contains soft, unconsolidated, clayey sand. Below the lower zone, a saprolite, composed mostly of clay, grades abruptly downward at 470 m into partially altered basalt that extends to the bottom of the hole at 514 m. Calculations based on the Ghyben-Herzberg principle predicted a zone of freshwater 120-150 m thick. This principle is the theory of hydrostatic equilibrium between freshwater and more dense seawater in a coastal aquifer; it states that for each meter of groundwater elevation above sea level, the freshwater lens will depress the saltwater interface about 40 m below sea level. Freshwater or low-salinity brackish water was found in sediments far below the depth predicted by the Ghyben-Herzberg principle. These interstitial waters are probably relict ground water emplaced during times of low sea level during the Pleistocene. (Woodard-USGS)
W78-11266

WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, SEPTEMBER 1977.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11270

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1974-78,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11273

JANUARY 1978 WATER LEVELS, AND DATA RELATED TO WATER-LEVEL CHANGES SINCE 1940 OR 1950, WESTERN KANSAS,
Geological Survey, Garden City, KS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11275

GROUNDWATER DATA FOR THE SALT BASIN, EAGLE FLAT, RED LIGHT DRAW, GREEN RIVER VALLEY, AND PRESIDIO BOLSON IN WESTERNMOST TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11276

4C. Effects On Water Of Man's Non-Water Activities

INFLUENCE OF VEGETATION ON WATER REPELLENCY IN SELECTED WESTERN WISCONSIN SOILS,
North Dakota State Univ., Fargo.
For primary bibliographic entry see Field 2G.
W78-10520

IMPLICATIONS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT,
Pennsylvania State Univ., University Park. Dept. of Forestry.
J. A. Lynch, E. S. Corbett, and R. Hoopes.
Fisheries, Vol. 2(2), 1977, p 16-22. 50 ref.

Descriptors: *Streams, *Water quality, Fresh water fish, Trout, *Water temperature, *Sediments, Nutrients, Organic matter, Food webs, Food habits, Streamflow, *Timber harvest, *Logging, *Clearcutting, Allochthonous organic detritus.

Forestry management practices affect small headwater streams adversely. Clear, cutting, timber harvesting can be damaging. Other parameters affected are water temperature, turbidity and sedimentation, dissolved nutrients, allochthonous organic detritus and streamflow. (EIS-Katz)
W78-10565

EFFECTS OF URBAN DEVELOPMENT ON THE FLOOD-FLOW CHARACTERISTICS OF THE WALNUT CREEK BASIN, DES MOINES METROPOLITAN AREA, IOWA,
Geological Survey, Iowa City, IA. Water Resources Div.
O. G. Lara.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 093, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-11, February 1978. 31 p, 9 fig, 1 tab, 14 ref.

Descriptors: *Urban runoff, *Urban hydrology, *Urbanization, *Model studies, *Rainfall-runoff relationships, Baseline studies, Flood flow, Flood frequency, Analytical techniques, Hydrograph analysis, Gaging stations, *Iowa, *Des Moines metropolitan area(Iowa).

Model studies were made to determine the probable impact of urban development on the magnitude and frequency of flooding in the lower reach of the Walnut Creek basin, Des Moines metropolitan area, Iowa. Stream-modeling techniques, which include complete defintion of unit hydrographs and precipitation loss-rate criteria, were utilized to evaluate the effects of urban development as measured by percentages of impervious area over the basin. A mathematical model, called HEC-1, was calibrated by using concurrent rainfall-runoff data collected at three gaging stations in the basin. The model parameters were regionalized to allow future users to estimate the model parameters for ungaged areas within the basin. Long-term rainfall data recorded at two nearby stations were employed as basic input to the calibrated model to generate annual peak discharges corresponding to selected degrees of urbanization. Results are presented in tables and graphs, which compare the preurban and urban floodflow characteristics of the lower reach of the Walnut Creek basin. (Woodard-USGS)
W78-10633

THE IMPACT OF HUMAN TRAMPLING ON PHOSPHORUS LOADING TO A SMALL LAKE IN GATINEAU PARK, QUEBEC, CANADA,
Brock Univ., St. Catharines (Ontario). Dept of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-10653

WATER WARS OR STREAMS OF PARADISE: DO WE HAVE A CHOICE.
For primary bibliographic entry see Field 5G.
W78-10799

THE IMPACT OF WATER RIGHTS AND LEGAL INSTITUTIONS ON LAND AND WATER USE IN 2000,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 6D.
W78-10803

LOCALLY HEAVY SNOW DOWNWIND FROM COOLING TOWERS,
National Weather Service Forecasting Office, Charleston, WV.
R. E. Otts.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 390, Price codes: A02 in paper copy, A01 in microfiche. Technical Memorandum NWS ER-62, December 1976. 9 p, 4 fig, 3 ref.

Descriptors: *Snowfall, *Cooling towers, *Powerplants, *West Virginia, Weather, Weather forecasting, Snow, Precipitation(Atmospheric), Moisture, Heat, Nuclear powerplants, Effects, Winds, Meteorology, Cooling towers effects.

Previous studies have speculated about the environmental impact of cooling towers at power plants. Of particular concern has been the extent to which heat and moisture pollution may influence the behavior of the atmosphere. Two locally heavy snowfalls were observed near Charleston, West Virginia, in synoptic situations which experienced forecasters normally associate with light snowfall or snow flurry activity. In both cases, the heaviest snowfall occurred downwind from the John E. Amos Power Plant (2900 MWe), a complex that includes three of the largest cooling towers in the United States. The power plant is located about 15 miles west northwest of Kanawha County Airport, the location of the National Weather Service observation site. Conditions favoring the development of locally heavy snows downwind from cooling towers appear to be as follows: (1) a strong influx of cold air into the area, (2) high relative humidity and an unstable lapse rate in the lower layers of the atmosphere, (3) a strong inversion layer near 5,000 feet (1,500 m), topping the unstable lower layer, (4) cyclonic curvature of the flow pattern, (5) an average temperature of minus 10C or colder in the lower layer (from the ground to the bottom of the inversion), and (6) some initial orographic lifting or some other type of forced ascent to the airflow. Strongest effects occur downwind from the source near the axis of the mean wind in the 1,000 - 4,000 foot layer. (Sims-ISWS)
W78-10942

SOIL EROSION AND ITS CONTROL IN EASTERN WOODLANDS,
Northeastern Forest Experiment Station, Broomall, PA.
For primary bibliographic entry see Field 2J.
W78-10987

SKYLINE HARVESTING IN APPALACHIA,
Northeastern Forest Experiment Station, Broomall, PA.
J. N. Kochenderfer, and G. W. Wendel.
Research paper NE-400, 1978. 9 p, 4 fig, 7 ref.

Descriptors: Partial cutting, Hardwoods logging, Forest roads, Land management, *Skyline harvesting, Forest management, *Appalachian mountains regions.

The URUS, a small standing skyline system, was tested in the Appalachian Mountains of north-central West Virginia. Some problems encountered with this small, mobile system are discussed. From the results of this test and observation of skyline systems used in the western United States, the authors suggest some machine characteristics that would be desirable for use in the Appalachians. (Forest Service)
W78-10988

SOIL EROSION IN THE EASTERN FOREST,
Northeastern Forest Experiment Station, Broomall, PA.
J. H. Patric.
Journal of Forestry, Vol 74, No 10, October, 1976, 5 fig, 3 tab, 64 ref.

Descriptors: Forests, *Erosion, Timber harvest, Logging roads, Stream channels, *Lumbering, *Soil erosion, *Eastern United States(Forests).

An overview is presented of what is known about forest soil erosion in eastern United States. By most accounts, erosion from undisturbed as well as carefully managed forest land is 0.05 to 0.10 ton/acre/year; that is less than the geologic norm (0.18 to 0.30) and far less than maximum tolerable rates for agricultural land (1 to 5 tons/acre/year). Eroded material is about equal parts of particulate and dissolved matter. Responsibly managed timber harvest causes only minor increases in forest soil erosion, usually from channels and logging roads, but irresponsible timber harvest can increase erosion of particulate matter to unacceptable levels. (Forest Service)
W78-10990

AREA IN SKIDROADS, TRUCK ROADS, AND LANDINGS IN THE CENTRAL APPALACHIANS,
Northeastern Forest Experiment Station, Broomall, PA.
J. N. Kochenderfer.
Journal of Forestry, Vol 75, No 8, p 507-508, August 1977. 3 fig, 6 ref.

Descriptors: *Logging roads, Road density, Soil disturbance, Lumbering, Road construction, *Appalachian mountain region, Wheeled skidders, Jammers.

In nine central Appalachian areas logged with wheeled skidders, there was 1 mile of road for every 19.8 acres; roads and landings occupied 10.3 percent of the area. In two areas logged with jammers, there was 1 mile of road for every 31.1 acres; roads and landings occupied 7.8 percent of the area. (Forest Service)
W78-10993

MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND,
Colorado State Univ., Fort Collins. Dept. of Earth Sciences.
D. O. Doehring, and M. E. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 708, Price codes: A06 in paper copy, A01 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report No. 83, January 1978. 95 p, 38 fig, 4 tab, 30 ref, 3 append. OWRT B-147-COLO(1), 14-34-0001-6136.

Descriptors: Runoff, *Floodplains, *Urbanization, Floodplain hydrology, *Urban watersheds, Hydrology, *Flood hazards, *Model studies, *New England, Flood control.

Flood hazard delineation in the United States has been usually based on the assumption that one percent annual flood expectancy is static, and that subsequent urbanization of the catchment will have no significant impact on that expectancy. Research during the past three years demonstrates that this assumption is incorrect in certain settings where the hydrologic response of a watershed to extensive urban growth is conditioned by geologic, pedalogic and morphometric parameters. These relationships have been synthesized into an algorithm which predicts the change in discharge corresponding to indices of urban land use changes, surficial properties of the catchment, and the configuration of the network of drainage. Flood expectancies were calculated by standard statistical analyses of annual maxima. The final algorithm was developed by a stepwise multiple regression technique and utilized data from 18 watersheds in southeastern New England. Similar evaluations of monthly maxima of average daily discharge produced comparable results and indicate an absence of seasonal or climatic control over observed hydrologic change accompanying urbanization.
W78-11064

WATER PROBLEMS IN THE RURAL ENVIRONMENT--ALTERNATIVE SOLUTIONS FOR WATER SUPPLY AND WASTEWATER DISPOSAL.
For primary bibliographic entry see Field 3F.
W78-11244

URBAN STORMWATER RUNOFF DATA FOR A RESIDENTIAL AREA, POMPANO BEACH, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11258

FLOOD INVESTIGATIONS IN NEVADA THROUGH 1977 WATER YEAR, PROGRESS REPORT 17,
Geological Survey, Carson City, NY. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-11269

SUPPLEMENTARY HYDRAULIC ANALYSIS OF PROPOSED BRIDGE SITE ON MOHAWK RIVER, WHITESBORO, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
R. Lumia.
Open-file report 78-348, April 1978. 4 p, 1 fig, 1 tab, 3 ref.

Descriptors: *Bridge design, *Flood discharge, *Design flood, *Peak discharge, *New York, Road design, Overflow, Hydraulics, *Mohawk River, *Whitesboro(NY).

As a supplement to a 1975 report, titled 'Floodflow Characteristics at Proposed Bridge Site on Mohawk River, Whitesboro, New York,' by Bernard Dunn (U.S. Geological Survey open-file report), in which the hydraulic effects of two alternative highway plans during a large-magnitude flood were evaluated, a hydraulic analysis was made for a third highway plan. The two plans evaluated in the original report were found to be infeasible by the State Department of Transportation. A design-flood discharge of 18,200 cubic feet per second was used in the new evaluation, as in the original report. The recurrence interval of that flood is approximately 100 years. The corresponding peak flood stage at the proposed bridge site was determined by the New York State Department of Transportation to be 411.8 feet. During the design flood, the new proposed alternative would cause a 0.1-foot increase in water-surface elevation from the bridge to the approach section; 1,300 cubic feet per second would overflow the road north of the bridge and 6,800 cubic feet per second south of it. Discharge through the bridge would be 10,100 cubic feet per second. (Woodard-USGS)
W78-11272

4D. Watershed Protection

IRRIGATION WATER SALT CONCENTRATION INFLUENCES ON SEDIMENT REMOVAL BY PONDS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 5G.
W78-10521

EFFECT OF MULCHING ON SEDIMENT IN RUNOFF FROM SIMULATED RAINFALL,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
M. J. Singer, and J. Blackard.
Soil Science Society of America Journal, Vol 42, No 3, p 481-486, May-June 1978. 2 fig, 2 tab, 22 ref.

Descriptors: *Erosion control, *Mulching, *Simulated rainfall, Laboratory tests, Erosion, Soil erosion, Litter, Leaves, Runoff, Infiltration, Data processing, Sediments, Sediment control, Effects, Redwood litter, Oakleaf mulch, Oat straw mulch.

Simulated rainfall was used to test the relationship between sediment in runoff and percent of the soil that was mulch covered. Oak leaves, redwood litter, and oat straw were used as mulches on a 0.37 sq m plot of Auburn (loamy, mixed, thermic, Ruptic-Lithic Xerochrepts) surface soil at a 9% slope. Cover percentage was related to sediment in surface runoff by a parabolic relationship. The relationship between redwood and oak covers and sediment in runoff was not significantly different, but both were significantly different from oat straw. Cover shape or distribution of inter-cover space appears to be important in affecting sediment loss. Runoff volume was reduced significantly by high cover levels which protected the soil from sealing and helped maintain a high infiltration rate. (Sims-ISWS)
W78-10522

RAINFALL-RUNOFF DATA FOR SELECTED BASINS, PORTLAND, OREGON, AND VANCOUVER, WASHINGTON, 1973-77,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10631

EFFECTS OF URBAN DEVELOPMENT ON THE FLOOD-FLOW CHARACTERISTICS OF THE WALNUT CREEK BASIN, DES MOINES METROPOLITAN AREA, IOWA,
Geological Survey, Iowa City, IA. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-10633

ECONOMICS OF MULTIPLE-USE FORESTRY,
Victoria Univ. (British Columbia).
For primary bibliographic entry see Field 6B.
W78-10654

WATER QUALITY OF NORMAL AND STORM-INDUCED SURFACE WATER RUNOFF: KANE'OHE BAY WATERSHED OAHU, HAWAII FEBRUARY 1974 TO MARCH 1975,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 5C.
W78-10665

REGULATORY PROGRAMS FOR NONPOINT POLLUTION CONTROL: THE ROLE OF CONSERVATION DISTRICTS,
National Association of Conservation Districts, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10797

SOIL EROSION IN THE EASTERN FOREST,
Northeastern Forest Experiment Station, Broomall, PA.
For primary bibliographic entry see Field 4C.
W78-10990

NITROGEN AND PHOSPHORUS MOVEMENT FROM AGRICULTURAL WATERSHEDS,
Agricultural Research Service, Columbia, CO.
For primary bibliographic entry see Field 5B.
W78-11040

MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND,
Colorado State Univ., Fort Collins. Dept. of Earth Sciences.
For primary bibliographic entry see Field 4C.
W78-11064

EROSION AND SOLID MATTER TRANSPORT IN INLAND WATERS SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
For primary bibliographic entry see Field 2J.
W78-11113

METHODS FOR COMPUTATION OF RUNOFF AND SEDIMENT YIELD FROM SLOPES USED FOR AGRICULTURAL NEEDS,
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).
For primary bibliographic entry see Field 2J.
W78-11119

THE EFFECT OF EXOGENOUS AND ENDOGENOUS FACTORS ON WATER EROSION DEVELOPMENT IN THE USSR,
Gosudarstvennyi Gidrologicheskii Inst., Moscow (USSR).
For primary bibliographic entry see Field 2J.
W78-11120

SEDIMENT YIELD IN RELATION TO DRAINAGE BASIN CHARACTERISTICS IN SOME INDIAN RIVER VALLEY PROJECTS,
Council of Scientific and Industrial Research, New Delhi (India).
For primary bibliographic entry see Field 2J.
W78-11123

THE EFFECT OF FARMING UPON SOLID TRANSPORT IN THE RIVER ALMOND, SCOTLAND,
Baghdad Univ. (Iraq). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-11126

SUSPENDED LOAD IN CAMEROUN (TRANSPORTS SOLIDES EN SUSPENSION AU CAMEROUN),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de Yaounde.
For primary bibliographic entry see Field 2J.
W78-11128

TRANSPORT OF BED LOAD AND SUSPENDED LOAD BY RIVERS FROM LOW RAINFALL AREAS IN AFRICA,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 2J.
W78-11129

SEDIMENT TRANSPORT IN THE HOPE RIVER, JAMAICA: A TROPICAL DRAINAGE BASIN CHARACTERIZED BY SEASONAL FLOW,
University of the West Indies Kingston (Jamaica). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-11130

SEDIMENT DELIVERY RATIOS DETERMINED WITH SEDIMENT AND RUNOFF MODELS,
Agricultural Research Service, Temple, TX. Grassland Forage Research Center.
For primary bibliographic entry see Field 2J.
W78-11132

A SEDIMENT YIELD INDEX AS A CRITERION FOR CHOOSING PRIORITY BASINS,
All Indian Soil and Land Use Survey, New Delhi.
For primary bibliographic entry see Field 2J.
W78-11133

BASIN SEDIMENT YIELD MODELLING USING HYDROLOGICAL VARIABLES,
Queens Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-11134

PIPING IN THE MILK RIVER CANYON, SOUTHEASTERN ALBERTA-A CONTEMPORARY DRYLAND GEOMORPHIC PROCESS,
Queens Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-11138

STREAM DISCHARGE, SUSPENDED SEDIMENT AND EROSION RATES IN THE RED DEER RIVER BASIN, ALBERTA, CANADA,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-11139

EROSION MODALITIES IN THE LOWER BASIN OF THE OUED ELHADJEL (CENTRAL TUNISIA) (CAUSES ET MODALITIES DE L'EROSION DANS LE BASSIN VERSANT INFERIEUR DE L'OUED EL-HADJEL (TUNISIE CENTRALE),
Office del Recherche Scientifique et Technique Outre-Mer, Tunis (Tunisia).
For primary bibliographic entry see Field 2J.
W78-11140

A STUDY OF SOLID TRANSPORT DURING A TRADITIONAL MANAGEMENT PROGRAMME USING SURFACE RUNOFF TO NOURISH OLIVE PLANTATIONS IN THE SAHEL REGION OF TUNISIA (CONTRIBUTION A L'ETUDE DES TRANSPORTS SOLIDES DANS UN AMENAGEMENT TRADITIONNEL D'UTILISATION DES EAUX DE RUISSELLEMENT POUR L'ALIMENTATION DES PLANTATIONS D'OLIVIERS DANS LA REGION DU SAHEL DE TUNISIE),
Centre de Recherche de Genie Rural, Tunis (Tunisia).
For primary bibliographic entry see Field 2J.
W78-11143

THE EFFECTS OF HYDRAULIC CONSTRUCTIONS ON SOLID TRANSPORT IN NORTH AFRICA (EFFETS SUR LES TRANSPORTS SOLIDES DES OUVRAGES HYDRAULIQUES EN AFRIQUE DU NORD),
Office de la Recherche Scientifique et Technique Outre-Mer, Tunis (Tunisia).
For primary bibliographic entry see Field 2J.
W78-11144

SEDIMENTOLOGICAL ASPECTS OF WITHDRAWING WATER FROM RIVERS,
Waterloopkundig Lab., Delft (Netherlands).
G. J. Klaassen, and M. de Vries.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 301-313, July 1977. 8 fig, 1 tab, 16 ref.

Descriptors: *Model studies, *Diversion structures, *Erosion control, *Rivers, *Sediment control, Mathematical models, Analytical techniques, Analysis, Deposition(Sediments), Sediment transport, Intakes, Trapping, Trap efficiency, Foreign countries, Foreign research, Sedimentology, Sediments, River beds, Running waters, Equations, Withdrawal.

Withdrawing water from rivers, notably for irrigation, may cause a number of sedimentological problems. The problems can be categorized in three groups: (1) How is the river bed reacting to any artificial change of water discharge. (2) How can the entry of sediment into the conveyance system be reduced as much as possible. (3) How can the sediment, still withdrawn together with the water, be trapped downstream of the intake structure. The use of mathematical models to obtain insight into the various phenomena was advocated. As an example, the morphological changes to be expected due to the withdrawal of water from the Tana River in Kenya were determined. Furhtermore, sedimentation in a sand trap downstream of an intake structure was simulated using a mathematical model. The validity of the method outlined has not yet been tested extensively by experiments either in the field or in a laboratory. (See also W78-11113) (Humphreys-ISWS)
W78-11145

PROBLEMS OF SEDIMENT CONTROL AT AN INTAKE STRUCTURE ON THE HABLE-RUD RIVER AND ITS INFLUENCE ON THE SEDIMENT REGIME OF THE RIVER,
Water Resources Research Inst., Tehran (Iran).
F. Parhami.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 314-324, July 1977. 8 fig, 1 tab.

Descriptors: *Sediment control, *Model studies, *Diversion structures, *Hydraulic models, Laboratory tests, Sediment transport, Intakes, Foreign countries, Foreign research, Rivers, Canals, Bed load, Distribution patterns, Flow, Erosion, Sediment distribution, Suspended load, Sediment discharge, *Iran, *Hable-Rud River(Iran), Movable bed model.

The paper described model investigation of a canal intake structure carried out at the Hydraulic Laboratory of the Ministry of Energy, Iran. The investigations have led to an improvement in design as regards sediment control. The paper also presented a study and an analysis of the sediment carried by the Hable-Rud River, both in suspension and as bed load, and its variation throughout the year. The concentration of sediment ranged from 0.1 to 200 kg/cu m during flood periods. The characteristics of the river which lead to these conditions were discussed. The problem of sediment elimination at the diversion headworks of a canal is particularly difficult; and, in this case, a considerable reduction was achieved by careful design of the entrance to the intake, which resulted in favorable conditions for the control of movement of bed load sediment. The paper included several photographs and maps to illustrate the distribution of bed material near the intake structure for different flow conditions and showed the profile of the river bed upstream and downstream of the diversion dam. The model study proved to be a useful means of assessing the hydraulic performance of the intake structure and of improving the preliminary designs. The details of the particle size analyses indicated that the materials used in the tests were close to the required grading curve. The final intake structure design prevents bed load entering the canal at various discharges with different sediment concentrations and also facilitates the flushing of the bed load material deposited in front of the intake. (See also W78-11113) (Humphreys-ISWS)
W78-11146

SEDIMENT PROBLEMS AT INTAKES FOR HYDROPOWER PLANTS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
For primary bibliographic entry see Field 8B.
W78-11148

A NEW TYPE OF INTAKE STRUCTURE SUITABLE FOR ARID CONDITIONS,
Technische Univ., Darmstadt (West Germany). Inst. fuer Wasserbau und Wasserwirtschaft.
W. Schroder, and P. Sulser.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 338-343, July 1977. 4 fig, 2 ref.

Descriptors: *Intakes, *Model studies, *Diversion structures, *Sediment control, Bypasses, River training, Hydraulic models, Arid climates, Rivers, Running waters, Movable dams, Foreign research, Foreign countries, Sediment transport, *Tunisia, Inflatable dams.

A completely new type of intake structure was developed by hydraulic model investigation for taking 5 cu m/s irrigation water from the Medjerda near Bou Salem, Tunisia, (median discharge about 22 cu m/s. It is suitable for rivers in arid or semiarid regions, characterized by great discharge differences and high sediment loads. It works in the following way: (1) A short and low inflatable dam maintains a proper water level. When the dam is deflated, the stream flow may wash away the sediment which has settled on the bottom of the river near the intake. (2) A training wall of smooth curvature connects the dam with the opposite bank. Its crest is a little higher than that of the inflated dam. (3) There is a low section in the training wall causing the flow upstream to be divided. The sediment laden bottom flow mainly passes through this gap and does not reach the intake. Moreover, the gap creates a spiral motion in the stream branch passing the intake, reducing further the sediment content of intake water. (4) The intake is arranged at an acute angle to the flow direction to prevent eddy formation at the entrance. (5) A special bank form upstream of the intake guarantees a smooth flow-adapted boundary. (6) Rip rap of different stone weights is needed to protect parts of the river bottom and parts of the banks against flood flow attacks. A scour hole in the river bottom downstream of the structure is inevitable. It must be kept well downstream of the structure and off the banks, mainly by a suitable trace of the upper part of the training wall. (See also W78-11113) (Humphreys-ISWS)
W78-11149

SEDIMENT PROBLEMS RELATED TO INCREASED DISCHARGES AT THE INTAKE OF A RUN-OF-RIVER CANAL SYSTEM IN HARYANA (INDIA),
Office of the Chief Engineer, Chandigarh (India). Irrigation Works.
D. D. Taneja.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 344-352, July 1977. 1 fig, 5 tab, 5 ref.

Descriptors: *Intakes, *Diversion structures, *Sediment control, *Alluvial channels, Canals, Rivers, Irrigation canals, Desilting, Bypasses, Data collections, Foreign countries, Foreign research, Sediment discharge, Running waters, *India, Sediment concentration.

The original wide and shallow weirs located in a boulder lined river beach, with intake regulators located at different positions and at different levels, do not provide effective stilling pond conditions for feeding the canals; consequently, only a limited sediment-free discharge can be withdrawn into the canals. With increasing intake dischage on the Western Yamuna Canal in Haryana (India), the intensity of sediment ingress increases markedly in the rainy months when the river carries a high sediment load. Solution of the problem seems possible by using an existing crossing of the canal by a hill torrent, as a sediment trapping and flushing device, without wastage of canal supplies. This simple and inexpensive method can be used profitably on canals in similar situations in India and other countries. The sediment regime of a river is affected by the construction of weirs and

barrages. Initially, the slopes upstream are reduced and the levels downstream are lowered due to retrogression as a consequence of reduction of discharge and sediment load. With time, however, due to the occurence of floods, the original regime is recovered except for a change in the size range and roughness of material downstream. Model experiments are being conducted now to provide suggestions for the construction of suitable spreaders or diffusers, to be located at the inlet of the canal at the channel crossing, and to enable the incoming discharge to spread uniformly over the entire width of the pond. (See also W78-11113) (Humphreys-ISWS)
W78-11150

INORGANIC PHOSPHORUS SPECIES AND TRANSFER MECHANISMS IN SOILS TO SEDIMENTS FOR TWO SMALL KANSAS WATERSHEDS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5B.
W78-11206

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

SENSITIVITY ANALYSIS OF GENERALIZED STREETER-PHELPS MODELS,
Consiglio Nazionale delle Richerche, Milan (Italy). Centro Teoria dei Sistemi.
For primary bibliographic entry see Field 5B.
W78-10516

APPARATUS FOR THE CONTINUOUS DISSOLUTION OF POORLY WATERSOLUBLE COMPOUNDS FOR BIOASSAYS,
California Univ., Berkeley. Sanitary Engineering Research Lab.
S. Krugel, D. Jenkins, and S. A. Klein.
Water Research, Vol. 12, p 269-272, 1978. 3 fig, 1 tab.

Descriptors: *Bioassay, *Equipment, Analytical techniques, Laboratory tests, Fuels, Solubility, Aqueous solutions, Toxicity, Water quality, Water analysis, Gas chromatography, Methodology, Laboratory equipment.

An apparatus was designed and constructed to supply a continuous flow of water, saturated with soluble components of JP8 jet fuel. The product water, used to supply continuous flow bioassays, was found to be comparable in quality to that obtained with static dissolution techniques. The apparatus is constructed of inert materials and operates without pumps or other electro-mechanical regulating devices. (EIS-Deal)
W78-10541

SOME OBSERVATIONS UPON THE CHEMICAL COMPOSITION OF THE STARFISH ASTERIAS RUBENS L., WITH PARTICULAR REFERENCE TO STRONTIUM UPTAKE,
London Univ (England). Dept. of Zoology.
J. Binyon.
Journal of the Marine Biological Association of the United Kingdom, Vol. 58, p 441-449, 1978. 3 fig, 4 tab, 13 ref.

Descriptors: *Chemical analysis, *Invertebrates, *Strontium, *Adsorption, *Animal physiology, Metals, Path of pollutants, Sodium Potassium, Calcium, Ions, Trace elements, Marine benthos, Tissue analysis, Asterias, *Starfish, *Echinoderms, Bioaccumulation.

The relative values of the body components of the starfish have been evaluated, together with a crude breakdown into total water, organic matter and skeletal material. The concentrations of sodium, potassium, calcium, and strontium in these tissues have been measured and, in the case of the latter two elements, the total ionic load carried by these tissues calculated. The effect of a short period of immersion in sea water containing an elevated level of strontium has shown that the soft tissues quickly reach a new equilibrium. The skeletal material shows little change in the short term and it is suggested that further strontium will only be incorporated when growth in that component occurs. (EIS-Katz)
W78-10547

CHRONIC AND SIMULATED USE-PATTERN EXPOSURES OF BROOK TROUT (SALVELINUS FONTINALIS) TO 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM),
Fish and Wildlife Service, Columbia, MO. National Fisheries Research Lab.
For primary bibliographic entry see Field 5C.
W78-10558

THE HYDROPSYCHE TOXICITY TEST, TESTED WITH FENETH CARB, DER HYDROPSYCHE-TOXIZITATSTEST, ERPROBT AN FENETHCARB,
Landensanstalt fuer Unweltschultz (Baden-Wurttemberg, Karlsruhe (West Germany).
W. K. Besch, I. Schreiber, and D. Herbst.
Swiss Journal of Hydrology, Vol. 39(1), p 69-85, 1977. 11 fig, 8 ref. (English summary).

Descriptors: *Bioassay, Toxicity, *Methodology, *Laboratory test, Laboratory equipment, Aquatic insects, *Animal behavior, Insecticides, *Carbamate pesticides, *Fenethcarb, *Sublethal concentrations, *Hydropsyche, *Nest-building, Toxicity tests.

Fenethcarb (3.5-diethyl-phenyl-N-methylcarbamate) was used to test how far the presence of toxins in various concentrations can cause changes in the net building behavior of Hydropsyche angustipennis (Trichoptera). To evaluate this, features of the net structure which could be measured and counted were used. The statistical significance of the resuls was calculated. (EIS-Katz)
W78-10566

ISOLATION OF XENOBIOTIC CHEMICALS FROM TISSUE SAMPLES BY GEL PERMEATION CHROMATOGRAPHY,
Environmental Research Lab.-Duluth, MN.
D. W. Kuehl, and E. N. Leonard.
Analytical Chemistry, Vol. 50, 1978, p 182-183, 2 tab, 2 fig, 10 ref.

Descriptors: *Methodology, *Laboratory techniques, Laboratory equipment, *Analytical methods, Chromatography, Spectroscopy, *Organic compounds, Organic wastes, Freshwater fish, Arochlor, Polychlorinated hydrocarbons, DDE, Chlorinated hydrocarbon pesticides, *Path of pollutants, Polarigraphic analysis, Polar compounds, *Low molecular weight organics.

Gel permeation chromatography is used to identify organic substances in the tissue of the fathead minnow. The objective of the study was to develop an efficient rapid method for the isolation of low molecular weight polar organics in fatty tissue for subsequent gas-liquid chromatographic-mass spectrometric analysis. (EIS-Katz)
W78-10578

THE SEA URCHIN EGG AS A TEST OBJECT IN OIL POLLUTION STUDIES,
Tromsoe Univ. (Norway). Inst. of Biology and Geology.
For primary bibliographic entry see Field 5C.
W78-10580

TRACE METAL CONCENTRATIONS IN SOME ICELANDIC SEAWEEDS,
Slovenska Akademija Znanosti in Umetnosti, Ljublijana (Yugoslavia). Biological Inst.
I. M. Munda.
Botanica Marina Vol. XXI, 1978, p. 261-263. 1 tab, 12 ref.

Descriptors: *Copper, *Cobalt, *Zinc, *Manganese, Metals, Chemical analysis, Atlantic Ocean, *Marine algae, Chemical analysis, Salinity, Icelandic waters, Fucus, *Rhodophyceae, Phaeophyceae, Iceland.

The concentrations of the trace elements Co, Ca, Zn and Mn were determined in some red and brown algae from the Icelaada Coast. Differences between species were observed. In the case of fucoid species the question of salinity influence on the trace metal concentration was considered. (EIS-Katz)
W78-10581

PETROLEUM: EFFECTS ON MALLARD EGG HATCHABILITY,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5C.
W78-10584

DETERMINATION OF ORTHOPHOSPHATE IN AQUEOUS SOLUTIONS CONTAINING LABILE ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS,
Iowa Univ., Ames. Dept. of Agronomy.
W. A. Dick, and M. A. Tabatabai.
Journal of Environmental Quality, Vol. 6, No. 1, p 82-85, January-March 1977. 4 fig, 3 tab, 16 ref.

Descriptors: Sampling, Water quality, Water quality control, *Phosphrous compounds, Laboratory tests, Fertilizers, Nutrients, *Pollutant identification, *Orthophosphates, *Colorimetry, *Phosphates.

A simple and precise colorimetric method of determining orthophosphate in aqueous solutions containing labile organic and inorganic P compounds is described. It involves a rapid formation of molybdenum blue color by the reaction of orthophosphate with molybdate ions in the presence of ascorbic acid-trichloracetic acid and citrate-arsenite reagents and complexation of the excess molybdate ions to prevent further formation of blue color from the phosphate derived from hydrolysis of the acid-labile P compounds. The color is stable up to 24 hours. The method is sensitive and accurate, and it permits determination of microgram quantities of orthophosphate in samples and containing large amounts of acid-labile P compounds. Tests with a wide range of condensed phosphate and organic phosphate compounds showed that none of the P compounds studied interfered with this method. Results by this method are compared with those obtained by the method of Murphy and Riley. (Skogerboe-Colorado State)
W78-10588

AN ALKALINE OXIDATION METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-10596

EFFECT OF INORGANIC AND ORGANIC COMPOUNDS ON THE EXTRACTABILITY OF 239PU FROM AN ARTIFICIALLY CONTAMINATED SOIL,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 2G.

W78-10616

THE ASSESSMENT OF PLANT-AVAILABLE CADMIUM IN SOILS,
Wye Coll., Ashford (England). Dept. of Physical Sciences.
For primary bibliographic entry see Field 2G.
W78-10617

HYDROLOGIC MONITORING OF A DEEP-WELL-INJECTION SYSTEM NEAR PENSACOLA, FLORIDA, MARCH 1970-MARCH 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-10625

WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1976.
Geologica Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10627

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1977.
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10628

WATER RESOUCES DATA FOR NEVADA, WATER YEAR 1977.
Geological Survey, Carson City, NE. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10629

HYDROLOGIC RECONNAISSANCE OF THE YAMPA RIVER DURING LOW FLOW, DINOSAUR NATIONAL MONUMENT, NORTHWESTERN COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10632

SOME PROPERTIES OF THE GEOMETRIC MEAN AND ITS USE IN WATER QUALITY STANDARDS,
Geological Survey, Reston, VA. Water Resources Div.
J. M. Landwehr.
Water Resources Research, Vol 14, No 3, p 467-473, June 1978. 4 fig, 7 tab, 17 ref.

Descriptors: *Water quality standards, *Coliforms, *Water analysis, *Analytical techniques, *Statistical methods, Properties, Sampling, Evaluation, Water sports, *Swimming facilities, *Geometric mean.

The geometric mean is often used to express acceptable levels of fecal coliform counts in Federal and State water quality criteria or standards. The expected value of the geometric mean is shown to be a function of the sample size and to be very sensitive to the skew as well as to the form of the underlying distribution function. Implications of these findings are discussed with regard to standards. In particular, it is noted that great care must be taken in specifying the minimal sample size to be used. (Woodard-USGS)
W78-10641

HYDROLOGIC RECONNAISSANCE OF THE DUGWAY VALLEY-GOVERNMENT CREEK AREA, WEST-CENTRAL UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-10644

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1978,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-10645

ANALYSIS OF ORGANOCHLORINE COMPOUNDS IN EFFLUENTS FROM BLEACHERIES BY NEUTRON ACTIVATION ANALYSIS AND GAS CHROMATOGRAPHY/MASS SPECTROMETRY,
Central Inst. for Industrial Research, Oslo (Norway).
A. Bjorseth, G. Lunde, and N. Gjos.
Acta Chemica Scandinavica, Vol. 31B, No. 9, p 797-801, 1977. 3 fig, 16 ref, 2 tab.

Descriptors: *Bleaching wastes, *Organic compounds, *Chlorine compounds, *Waste identification, Neutron activation analysis, Pulp wastes, Pulp and paper industry, Wastes, Industrial waste, Water pollution sources, *Gas chromatography, *Mass spectrometry, Sulfite liquors, Kraft mills, Sulfite pulp mills, Bromine compounds, Terpenes, Wood extractives, Phenols, *Pollutant identification.

The total amounts of nonpolar and halogenated phenolic compounds in effluents from chlorine bleacheries of sulfite and kraft paper mills were investigated using neutron activation analysis. In the kraft mill, nonpolar (cyclohexane extractable) and phenolic (butyl acetate extractable) chlorinated compounds are present in concentrations of 0.36 and 1.7 ppm, respectively. In the sulfite mill, both chlorinated and brominated compounds are present in average concentrations of 0.67 ppm Cl and 0.06 ppm Br for nonpolar compounds and 1.1 ppm Cl and 0.1 ppm Br for phenolic compounds. The occurrence of organobromine compounds in the sulfite mill is due to the use of seawater in the first chlorination stage. The effluents were also analyzed by gas chromatography/mass spectrometry, and several halogenated aromatic hydrocarbons have been identified, including chloro-p-methylisopropylbenzene (2 isomers), dichloro-p-methylisopropylbenzene (2 isomers), bromo-p-methylisopropylbenzene, chloro-p-methylisopropenylbenzene (2 isomers), and dichloro-p-methylisopropylbenzene, chloro-p-methylisopropenylbenzene (2 isomrs), and dichloro-p-methylisopropenylbenzene (2 isomers). These compounds are presumably formed by substitution reactions of the parent molecules which are formed by the cooking of the terpenes naturally present in wood. (Witt-IPC)
W78-10670

DEVELOPMENT OF AN EFFICIENT SAMPLING STRATEGY TO CHARACTERIZE DIGESTED SLUDGES,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Centre.
For primary bibliographic entry see Field 5D.
W78-10673

EFFECT OF PH ON BIOASSAYS IN FRESH AND SEAWATER,
British Columbia Research Council, Vancouver.
For primary bibliographic entry see Field 5C.
W78-10680

QUALITATIVE AND QUANTITATIVE DETERMINATION OF CHLORINATED ORGANIC COMPOUNDS IN BLEACHERY EFFLUENTS BY MEANS OF GAS CHROMATOGRAPHY-MASS SPECTROMETRY (QUALITATIVE UND QUANTITATIVE BESTIMMUNG VON CHLORIERTEN ORGANISCHEN VERBINDUNGEN IN BLEICHEREIABWAESSERN MITTELS GASCHROMATOGRAPHIE-MASSENSPECKTROMETRIE),
Swedish Forest Products Research Lab., Stockholm.
K. Lindstrom.
Das Papier, Vol 31, No 12, p 517-525, December, 1977. 15 fig.

Descriptors: *Bleaching wastes, *Waste identification, *Chlorine compounds, Pulp wastes, Wastes, Industrial wastes, Water pollution sources, *Pollutant identification, *Gas chromatography, Spectroscopy, Pulp and paper industry, Organic compounds, Aromatic compounds, Phenols, Sweden, Foreign countries, *Mass spectroscopy.

The chemical composition of pulp mill bleachery effluents is very complicated. This investigation, conducted at the Swedish Forest Products Research laboratory, Stockholm, Sweden, has identified 14 chlorinated phenols in the phenol fraction of a bleachery effluent with the help of a gas chromatograph/mass spectrometer computer system. The phenols were ethylated and analyzed. The compounds found were dichloro-phenol, 2,4,6-trichlorophenol, three isomeric dichloroguaiacols, four isomeric trichloroguaiacols, dichlorocatechol, trichlorocatechol, tetrachloroguaiacol, monochloropropiovanillone, and tetrachlorocatechol. (Ward-IPC)
W78-10688

DETERMINATION OF INORGANIC CHLORINE COMPOUNDS AND TOTAL CHLORINE IN SPENT BLEACHING LIQUORS. PART 2. SPECTROPHOTOMETRIC METHODS FOR CHLORINE DIOXIDE AND CHLORINE,
Swedish Forest Products Research Lab., Stockholm.
L. Sjostrom, and D. Tormund.
Svensk Papperstidning, Vol 81, No 4, p 114-120, March 10, 1978. 3 fig, 12 ref, 5 tab.

Descriptors: *Bleaching wastes, *Waste identification, *Spectrophotometry, *Chlorine compounds, Wastes, Industrial wastes, Water pollution sources, Chlorine, Pulp wastes, Pulp and paper industry, Analytical techniques, Inorganic compounds, Lignins, Suspended solids, Chlorine dioxide.

The method described permits the quantitative determination of chlorine dioxide (directly) plus chlorine (indirectly or via active chlorine determination) in bleach plant effluents. The absorbance of chlorine dioxide in the UV range is measured at its maximum (357 nm) and corrected for absorbances of chlorine, lignin compounds, and suspended solids (at 322, 278, and 500 nm). If chlorine is a major component, the active chlorine is first determined titrimetrically; chlorine dioxide is then analyzed spectrophotometrically, and the chlorine concentration is calculated from the difference. If chlorine is a minor constituent, the recommended procedure utilizes the reaction of chlorine with chlorite in acid solution; it yields a molar quantity of chlorine dioxide which is exactly twice that of the chlorine. The sample is treated with a chlorite solution, and the chlorine dioxide concentration is determined spectrophotometrically, once before and once after the treatment; the cholorine concentration of the sample is then calculated from the difference. The proposed methods have given satisfactory results on actual spent bleaching liquors and on synthetic chlorine/chlorine dioxide mixture. The procedure is highly selective, permitting a smallest amount either component to be analyzed in the presence of a large excess of the other component. The accuracy is satisfactory for concentrations down to 0.1 millimole/liter. (Brown-IPC)
W78-10694

BIOASSAY DATA FOR MARINE POLLUTION USING SEA URCHIN EGGS, 1974,
Seto Marine Biological Lab. (Japan).
N. Kobayashi.
Publications of the Seto Marine Biological Laboratory, Vol 22, p. 405-407, 1976. 5 tab.

Descriptors: *Bioassay, Toxicity, *Methodology, *Marine benthos, *Water quality, Monitoring, Laboratory tests, Seasonal, Juvenile growth stages, Eggs, Pacific Ocean, Inhibition, *Japan, Sea Urchins, Developmental stages.

Bioassays were made with sea urchin eggs to evaluate marine pollution in the vicinity of the Seto Marine Biological Laboratory. The degree of inhibitory effect was greatest near the bottom. (Katz-EIS)
W78-10744

VARIABILITY OF AQUATIC MODEL ECOSYSTEM-DERIVED DATA,
Agricultural Research Lab., Beltsville, MD. Pesticide Degradation Lab.
A. R. Isensee.
International Journal of Environmental Studies. Vol 10, p. 35-41, 1976. 5 tab, 15 ref.

Descriptors: *Herbicides, *Bioassay, Laboratory test, Methodology, Environmental effects, Water analysis, Algae, Snails, *Daphnia, Freshwater fish, Radiochemical analysis, Organic compounds, Path of pollutants, Food chain, Statistical analysis, *Arsenic compounds, *Bioaccumulation, *Diuron, Endothal,2,4,5-T, Atrazine, Mirex, 14C-Cacodylic acid.

Experiments were conducted to determine the bioaccumulation potential of several pesticides in aquatic model ecosystems and the variability of these results. Bioaccumulation ratios were low for four herbicides (10 to 290), intermediate (320 to 3740) for hexachlorobenzene and high (2580 to 14,550) for mirex. Coefficients of variation (CV) averaged 30 to 40 percent with a range of one to 75 percent. This model ecosystem derived data was about twice as variable as microcosm metabolism measurements and single species experiments, but one half to one fourth as variable as microcosm population responses. (Katz-EIS)
W78-10746

GAS CHROMATOGRAPHIC ANALYSIS OF BERYLLIUM IN THE MARINE SYSTEM. INTERFERENCE, EFFICIENCY, APPARENT BIOLOGICAL DISCRIMINATION AND SOME RESULTS,
Alaska Univ., College. Inst. of Marine Science.
T. A. Gosink.
Marine Science Communications Vol 2, No 3 and 4, p 183-199, 1976. 1 fig, 7 tab, 12 ref.

Descriptors: *Beryllium, *Metals, Water pollution effects, Alaska, Water quality, *Mining wastes, Mining industry, Gas chromatography, Methodology, *Calcium, Analytical techniques, Water analysis, Mussels, Molluscs, Crustaceans, Clams, *Biological discrimination, *Gulf of Alaska, *Barnacles, Sea Urchins, Echinoderms, Fossils.

Electron capture detection gas chromatography offers the most sensitive instrumental method for the detection of beryllium. Analytical problems including calcium interference and extraction efficiencies for the trifluoroacetylacetonate derivative are discussed. Analyses indicate that calcareous marine organisms virtually exclude beryllium from their structure, even in areas where the element is naturally, relatively abundant, and that the concentrations present are on the outer periodstracum or epithelial layer with its assorted bacteria. (Katz-EIS)
W78-10750

WATER QUALITY COMPARISON STUDY, ESCAMBIA RIVER AND OTHER NORTHWEST FLORIDA STREAMS.
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, Virginia 22161 as PB-255 162. January, 1972, 14 p.

Descriptors: *Florida, *Organic compounds, Water properties, *Water quality, Aerobic conditions, Carbon, Coliforms, Color, Dissolved oxygen, Nitrogen, Nutrients, Phosphous, Physical properties, Turbidity, Water pollution, Water quality control, Rivers, Streamflow, Waste disposal.

A limited survey was conducted by the Environmental Protection Agency to produce data for use in comparing the water and nutrient quality of the Escambia River with other streams in the northwest Florida area. The relative nitrogen, phosphorus, and organic concentrations were of particular interest. The study area was between and included the Perdido and Choctawhatchee River Basins. Streams in this area drain the Florida panhandle and extreme Southern Alabama. Land use is primarily agriculture and forestry. There was strong evidence that quality among all the streams studied was comparable. At low flow, the results of waste discharge from the Container Corporation at Brewton, Alabama were evident in the increased color and total organic carbon values in the Escambia River. However, the study concluded that when concentration for various water quality constitutents are converted to loading (lbs./day), there will be an appreciable difference among river basins in the study area. Differences among the estuarine ecosystems for each river basin are to be expected - possibly as a result of differing streamflow. Therefore, enforcement actions should be formed on controllable factors rather than on effect of flow which is largely a natural phenomenon. (Jordan-Florida).
W78-10759

FEASIBILITY STUDY FOR DEVELOPMENT AND IMPLEMENTATION OF A MODEL STATE INFORMATION SYSTEM (M.S.I.S.) FOR EPA'S SAFE DRINKING WATER PROGRAM.
American Management Systems, Inc. Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-10762

INTRODUCTION TO THE MODEL STATE INFORMATION SYSTEM (MSIS).
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-10810

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM, VOLUME II: EXHIBITS.
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-10811

A TWO-ELEMENT CERAMIC SENSOR FOR MATRIC POTENTIAL AND SALINITY MEASUREMENTS,
Forest Service (USDA), Albuquerque, NM. Rocky Mountain Forest and Range Experimental Station.
For primary bibliographic entry see Field 2G.
W78-10921

EFFECTS OF TRACE CONTAMINANTS FROM COAL COMBUSTION.
Department of Energy, Washington, DC. Div. of Biomedical and Environmental Research.
For primary bibliographic entry see Field 5B.
W78-10926

WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS.
National Sanitation Foundation, Ann Arbor, MI.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 328, Price codes: A12 in paper copy, A01 in microfiche. Research Report, May 1971. 201 p, 48 fig, 19 tab, 69 ref. EPA 1R01 EC00318-01 and -02.

Descriptors: *Monitoring, *Water quality, *Potable water, *Pollutant identification, Electrodes, Equipment, Sampling, Ions, Cations, Hydrogen ion concentration, Hardness(Water), Nitrates, Chlorides, Fluorides, Calcium carbonate, Trace elements, Heavy metals, Organic compounds, Chlorine, Turbidity.

The overall objective of this project was to develop basic scientific criteria and specifications for a continuous monitoring system for use in the detection and control of water quality deterioration in distribution systems, and in quality control of water purification processes. Specific aims included: (1) developing new sensor systems, (2) establishing the analytical feasibility of commercially available sensors for potable water quality monitoring applications, and (3) evaluating under laboratory and field conditions the performance characteristics of each sensor in the system. This report discussed the evaluating of the sensors. The sensors reported were for the measurement of these parameters: (1) ions, (2) hardness, (3) nitrates, (4) chlorides, (5) fluorides, (6) calcium carbonate, (7) trace metals, (8) gross organics, (9) residual chlorine, and (10) turbidity. (See also W78-06284) (Sims-ISWS)
W78-10927

LOCALLY HEAVY SNOW DOWNWIND FROM COOLING TOWERS,
National Weather Service Forecasting Office, Charleston, WV.
For primary bibliographic entry see Field 4C.
W78-10942

SEDIMENT OXYGEN DEMAND STUDIES OF SELECTED NORTH-EASTERN ILLINOIS STREAMS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2J.
W78-10943

CHEMICAL CHARACTERISTICS OF A DESERT STREAM IN FLASH FLOOD,
Arizona State Univ., Tempe. Dept. of Zoology.
For primary bibliographic entry see Field 2K.
W78-10964

BIOGENIC HYDROCARBONS AND PETROLEUM FRACTIONS,
Institut Francais du Petrole, Rueil-Malmaison (France).
C. Bovard, C. Gatellier, N. Petroff, Ph. Renault, and J. C. Roussel.
Rapports et Proces-Verbaux des Reunions, Conseil International pour L'Exploration de la Mer, Vol. 171, p 91-93, 1977. 21 ref.

Descriptors: *Oil, *Carbon radioisotopes, *Carbon cycle, *Organic compounds, *Phytoplankton, *Algae, *Pollutant identification, *Chemical analysis, Analytical techniques, Chromatography, Cyanophyta, *Biogenic hydrocarbons, *Alkanes, Sarcinia.

Knowledge of the differences between biogenic hydrocarbons and those from petroleum is reviewed, and the problem of making this differentiation are discussed. The value of 14C techniques is considered in some cases. (EIS-Katz)
W78-11001

POLLUTION EFFECTS ON INTERTIDAL MACROBENTHIC COMMUNITIES,
Napier Coll. of Commerce and Technology Edinburgh (Scotland).
For primary bibliographic entry see Field 5C.
W78-11007

THE APPROACHING CRISIS IN THE REGISTRATION OF FISHERY CHEMICALS,
Fish and Wildlife Service, La Crosse, WI. Fish Control Lab.
For primary bibliographic entry see Field 5G.
W78-11008

DETERMINATION OF PCB AND PCT RESIDUES IN FISH BY TISSUE ACID HYDROLYSIS AND DESTRUCTIVE CLEAN-UP OF THE EXTRACT,
Public Health Inst. of Slovenia Ljubljana (Yugoslavia).
J. Jan, and S. Malnersic.
Bulletin of Environmental Contamination and Toxicology. Vol. 19, p 772-780, 1978. 3 fig, 1 tab, 26 ref.

Descriptors: *Polychlorinated biphenyls, *Chemical analysis, Analytical techniques, *Hydrolysis, *Pollutant identification, Organic compounds, Pesticide residues, Fish physiology, Gas chromatography, Chemical reactions, Chlorination, Trout, Acids, Chemicals, Tissue analysis, *Polychlorinated terphenyl.

This investigation shows that preliminary acid hydrolysis of fish tissue increases the efficiency of subsequent extraction of PCB-PCT residues. The experimental data indicates that the analyst has to be aware that the destructive clean-up can influence some PCB-PCT isomers. On the other hand, the destructive method has proved to be practicable for the clean-up of fish extracts; especially because they eliminate some coextracting compounds from biological material. The usefulness of the perchlorination procedure is accepted because it eliminates some other residues which could interfere on PCB-PCT total peak area quantification. (EIS-Katz)
W78-11009

CADMIUM IN NORTHEAST PACIFIC WATERS,
California Univ. Santa Cruz. Div. of Natural Sciences.
For primary bibliographic entry see Field 5B.
W78-11011

THE SUB-LETHAL EFFECTS OF WATER-SOLUBLE EXTRACTS OF CRUDE OIL ON THE FERTILISATION AND DEVELOPMENT OF FUCUS SERRATUS L. (SERRATED WRACK),
Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Brewing and Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-11015

WATER SOLUBLE EXTRACTIVES FROM PETROLEUM OILS: CHEMICAL CHARACTERIZATION AND EFFECTS ON MICROALGAE AND MARINE ANIMALS,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5C.
W78-11017

PHENOL POISONING DUE TO CONTAMINATED DRINKING WATER,
Bureau of Epidemiology, Atlanta, GA. Cancer and Birth Defects Div.
For primary bibliographic entry see Field 5C.
W78-11075

INTERLABORATORY QUALITY CONTROL STUDY NO. 14 MAJOR IONS: CALCIUM, MAGNESIUM, SODIUM POTASSIUM, HARDNESS, ALKALINITY, CHLORIDE, SULPHATE AND NITRATE,
Canada Centre for Inland Waters, Burlington (Ontario).
J. M. Carron, and K. I. Aspila.
Report Series No. 51, 1978, 29 p, 9 fig, 5 ref, 14 tab, 2 append.

Descriptors: *Ions, *Water quality control, *Laboratory tests, *Sampling, *Absorption, Hardness(Water), Alkalinity, Analysis, Parametric hydrology.

The results of interlaboratory quality control study No. 14 are described. This study was carried out during the spring and summer of 1975. It included three natural waters and two standard solutions. Data were submitted from 36 participating Canadian laboratories. The parameters were calcium, magnesium, sodium, potassium, hardness, alkalinity, chloride, sulphate and nitrate. Samples were at concentrations similar to natural inland waters. All samples were distributed without preservatives. (WATDOC)
W78-11191

TURBULENT DIFFUSION PROCESSES IN THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-11193

INTERLABORATORY QUALITY CONTROL STUDY NO. 15 TOTAL PHOSPHORUS IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
K. I. Aspila, and J. M. Carron.
Report Series No. 52, 1978, 10 p, 3 fig, 5 ref, 7 tab, 2 append.

Descriptors: *Laboratory tests, *Phosphorus, *Quality control, *Water sampling, *Water properties, Data collections, Analytical techniques.

The purpose of this study was to provide test samples to Canadian laboratories engaged in analysis of total phosphorus in natural water samples and to use the results to comment on the comparability of the data and the methods employed. The analytical data in this report were obtained from December 1975 to July 1976. Thirty-two laboratories participated. The analytical methods used by participants for total phosphorus analysis were very diverse. For the overall results, the interlaboratory standard deviation for the five test samples varied from about 0.0007 mg per L to 0.045 mg per L P. Laboratories known to analyze for total phosphorus on a regular basis demonstrated better precision and accuracy than laboratories which only did such analyses occasionally. (WATDOC)
W78-11194

ATMOSPHERIC BULK PRECIPITATION IN THE LAKE ERIE BASIN,
Canada Centre for Inland Waters, Burlington (Ontario).
K. W. Kuntz.
Report Series No. 56, 1978, 7 p, 4 fig, 6 ref, 6 tab.

Descriptors: *Precipitation(Atmospheric), *Chemical analysis, *Lake Erie, *Sampling, Filters, Data collections, Winter, Summer, Water pollution, Wastes, *Loading calculations.

A wide variety of chemical constituents of atmospheric bulk precipitation in the Lake Erie Basin have been analyzed on a monthly basis since 1970. Data are compared on the basis of summer months (April to November inclusive) and winter months (December to March inclusive) and on the basis of sampler type. Concentrations for specific conductance, total Kjeldahl nitrogen, total phosphorus, and potassium are significantly higher in summer samples as a result of contamination by soil particles, insects, bird feces and windblown debris. Variations between samplers showed that in summer only sodium was significantly higher in the 'Type A' samplers, probably because of the use of a glass wool prefilter from 1970 to July 1974. In winter, nitrate-nitrogen, extractable zinc, sodium and sulphate are significantly higher and total phosphorus is significantly lower in the 'Type A' sampler. These high concentrations of sodium and sulphate and the low concentrations of total phosphorus are also attributed to the use of the glass wool prefilter. From these data, atmospheric loading estimates to the lake surface are calculated and compared with those of an independent analysis and also with 1975 Detroit River loadings to Lake Erie. This comparison shows that the atmosphere is a significant source of nitrogen for Lake Erie. (WATDOC)
W78-11195

RECOVERY OF SANITARY-INDICATOR BACTERIA FROM STREAMS CONTAINING ACID MINE WATER,
West Virginia Univ., Morgantown. Water Research Inst.
M. L. Savio, J. A. Double, and G. K. Bissonnette.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-285 962, price codes: A03 in paper copy, A01 in microfiche. Information Report 11, (WRI-WVU-78-02), 1978. 30 p. 2 fig. 15 tab. 54 ref. OWRT-A-033-WVA(2), 14-34-0001-6051.

Descriptors: *Acid mine water, Analytical techniques, *Bioindicators, *Coliforms, *E. coli, *Sewage bacteria, Domestic wastes, Membrane processes, Microorganisms, Mine water, Sewage effluents, Testing procedures, Water pollution, Water quality, Pollutant identification, Waste identification, Bacterial-recovery methods, Enriched culture medi.

Bacteriological studies were conducted on several streams affected by acid-mine water and organic-waste pollution. Conventional membrane filtration techniques were inadequate to recover sublethally injured coliforms from such environments when compared to recovery obtained by multiple-tube fermentation techniques. Substantially enhanced recovery of injured coliforms resulted upon the inclusion of an enrichment step when using the membrane filtration procedure. Qualitatively, several members of the Enterobacteriaceae were identified. Quantitative detection of fecal streptococci from the streams affected by acid-mine water was accomplished with relative ease, indicating that consideration should be given to employing this group as reliable indicators of bacteriological quality of aquatic environments affected by acid-mine drainage. Qualitatively, all members of the fecal streptococcal group were isolated from the streams affected by acid-mine water, with the exception of Streptococcus bovis and Streptococcus equinis. 'Total' plate counts reflected negligible differences in quantitative detection of bacteria as a function of three different incubation temperatures (10, 20, and 35C). Prolonged incubation of the 'total' bacteria plates gave rise to chromagenic colonies. The numbers of chromagenic colonies on the plates were correlated with the relative absence or presence of acid mine water.
W78-11217

REFRACTORY ORGANIC COMPOUNDS IN TREATED EFFLUENT AND THEIR REMOVAL BY SOIL, MILILANI, OAHU, HAWAII,
Hawaii Univ. Honolulu. Water Resources Research Center.
C. Fischer, R. E. Green, and N. C. Burbank, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 928,

Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 115, December 1977. 39 p, 10 fig, 5 tab, 31 ref, append. OWRT A-058-HI(1), 14-34-0001-6012, 7025, 7026.

Descriptors: *Sewage effluent, *Organic compounds, *Adsorption, *Soils, *Resins, Chlorination, Effluent reuse, Irrigation water, Sugarcane, Gas chromatography, *Hawaii, Pollutant identification, *XAD-2 resin, Mililani, Oahu.

Increased water consumption on O'ahu has encouraged the use of treated sewage effluent for irrigation. This study seeks to identify organic compounds in treated effluent and to determine if such compounds are adsorbed by soil so that the groundwater is not adversely affected. XAD-2 resin is used to extract and concentrate trace organic compounds in treated effluent. Electron capture gas chromatography and combined gas chromatography-mass spectrometry (GC/MS) indicate that some of the organic compounds in the treated effluent are chlorinated. Gas chromatography tests also confirm the presence of naphthalene and bromobenzene in the treated effluent. Organic compounds which could be detected by electron capture gas chromatography data are effectively removed by the Lahaina soil when the treated effluent is applied as irrigation water to a sugarcane field. On the other hand, GC/MS results indicate that the Lahaina soil only partially adsorbs organics, such as paraffins and steroids. Laboratory measurements of adsorption of organic compounds from effluent do not adequately represent the extent of adsorption measured in the field.
W78-11220

GEOCHEMISTRY OF THE MATTOLE RIVER OF NORTHERN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resouces Div.
For primary bibliographic entry see Field 2K.
W78-11255

DETERMINATION OF DISSOLVED BORON IN FRESH, ESTUARINE, AND GEOTHERMAL WATERS BY D.C. ARGON-PLASMA EMISSION SPECTROMETRY,
Geological Survey, Menlo Park, CA. Water Resources Div. and Geological Survey, Menlo Park, CA. Geologic Div.
J. W. Ball, J. M. Thompson, and E. A. Jenne.
Analytica Chimica Acta, Vol 98, p 67-75, 1978. 1 fig, 6 tab, 17 ref.

Descriptors: *Water analysis, *Boron, *Analytical techniques, *Spectrometers, Freshwater, Estuaries, Geothermal studies, Trace elements, Evaluation, *d. c. argon plasma spectrometer, *Carmine method.

A d.c. argon-plasma emission spectrometer is used to determine dissolved boron in natural (fresh and estuarine) water samples. Concentrations ranged from 0.02 to 250 mg/liter. The emission--concentration function is linear from 0.02 to 1000 mg/liter. Achievement of a relative standard deviation of less than or equal to 3 percent requires frequent restandardization to offset sensitivity changes. Dilution may be necessary to overcome high and variable electron density caused by differences in alkali-metal content and to avoid quenching of the plasma by high solute concentrations of sodium and other easily ionized elements. The proposed method was tested against a reference method and found to be more sensitive, equally or more precise and accurate, less subject to interferences, with a wider liner analytical range than the carmine method. Analyses of standard reference samples yielded results in all cases within one standard deviation of the means. (Woodard-USGS)
W78-11256

MONITORING WATER-QUALITY DURING PILOT DREDGING IN THE WILLAMETTE AND COLUMBIA RIVERS, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
J. F. Rinella, and S. W. McKenzie.
Open-file report 78-554, 1978. 16 p, 1 fig, 9 tab, 7 ref.

Descriptors: *Dredging, *Environmental effects, *Water quality, *Columbia River(Ore), Bottom sediments, Water analysis, Physical properties, Chemical analysis, Nutrients, Suspended solids, Particle size, *Willamette River(Ore).

Water quality was monitored in the Willamette and Columbia Rivers during a pilot dredging operation on December 16, 1977. Monitoring included in-situ measurements of pH, temperature, dissolved oxygen, and conductivity in the Willamette and Columbia Rivers; analyses of dissolved ammonia, dissolved manganese, suspended-sediment concentration and particle size, loss on ignition, and total organic carbon in river-water samples; and analyses of percent moisture, particle size, density, selected nutrients, total organic carbon, and loss on ignition in dredged material and barge-overflow samples. (Woodard-USGS)
W78-11261

GROUNDWATER DATA FOR THE SALT BASIN, EAGLE FLAT, RED LIGHT DRAW, GREEN RIVER VALLEY, AND PRESIDIO BOLSON IN WESTERNMOST TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11276

TRACE METAL CONCENTRATIONS AND PARTITIONING IN ZOOPLANKTON, NEUSTON, BENTHOS FROM THE SOUTH TEXAS OUTER CONTINENTAL SHELF,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-11285

5B. Sources Of Pollution

SENSITIVITY ANALYSIS OF GENERALIZED STREETER-PHELPS MODELS,
Consiglio Nazionale delle Richerche, Milan (Italy). Centro Teoria dei Sistemi.
S. Rinaldi, and R. Soncini-Sessa.
Advances in Water Resources, Vol. 1, No. 3, p 141-146, March 1978. 7 fig, 5 ref.

Descriptors: *Biochemical oxygen demand, *Dissolved oxygen demand, *Dissolved oxygen, *Model studies, Mathematical models, Water pollution, Temperature, Water temperature, Thermal pollution, Flow, Analytical techniques, Foreign research, *Streeter-Phelps models, Sensitivity analysis.

The aim was twofold: first, to show how the sensitivity of a given river quality model can be analyzed by means of the so-called sensitivity theory. For this, the main ideas of sensitivity theory were surveyed; and then in the rest of the paper the theory was applied as an exercise to simple Streeter-Phelps models. Second, it was pointed out that the result of this study proves that Streeter-Phelps models are flexible and abound with relevant consequences if one knows how to analyze them. (Sims-ISWS)
W78-10516

ON THE SPREADING OF POWER PLANT COOLING WATER IN A TIDAL RIVER APPLIED TO THE RIVER ELBE,
Swedish Meteorological and Hydrological Inst., Norrkoping.
I. Bork, and E. Maier-Reimer.
Advances in Water Resources, Vol. 1, No. 3, p 161-168, March 1978. 8 fig, 15 ref.

Descriptors: *Thermal pollution, *Cooling water, *Powerplants, *Model studies, Mathematical models, Monte Carlo method, Rivers, Estuaries, Nuclear powerplants, Heated water, Diffusion, Dispersion, Temperature, Water temperature, Heat transfer, Hydrodynamics, *Elbe River(Germany).

By means of a simple one-dimensional model, some basic features of the spreading of cooling water were discussed. Based on the idea of equilibrium temperature, a numerical technique for the simulation of diffusion and cooling processes was presented. The technique was applied to a two-dimensional time-dependent model of the tide in the lower river Elbe. The measurements at the outlet of an existing nuclear power plant (Stade) were reproduced quantitatively. (Sims-ISWS)
W78-10518

VORTEX PAIRS AND POWER STATION COOLING WATERS,
Central Electricity Generating Board, Leatherhead (England). Central Electricity Research Labs.
J. F. MacQueen.
Advances in Water Resources, Vol. 1, No. 3, p 169-174, March 1978. 5 fig, 13 ref.

Descriptors: *Thermal pollution, *Cooling water, *Powerplants, *Model studies, Mathematical models, Estuaries, Coasts, Heated water, Mixing, Dispersion, Vortices, Water circulation, Water temperature, Buoyancy, Turbulence.

Cooling water discharged from power stations in the United Kingdom frequently is released from an outlet in an estuary or the sea. The warm water forms a thermal plume which is slightly buoyant and which spreads horizontally over the water surface while mixing vertically downwards with the cooler ambient water. In this paper, the possibility of vortex pair production at the cooling water outlet was considered as a mechanism contributing to this spreading of the warm water. The motion of a vortex pair contained between two rigid plane boundaries is an idealization of the flow between the water surface and the sea bed. The resulting motion was calculated from potential theory, and viscous effects were neglected. The problem of deciding what strength to assign the vortices was discussed, and specific consideration of shear and buoyancy at the outlet was detailed. It was observed that bifurcation of the vortex pair is determined by the initial position of the vortices and is unlikely to occur in conditions relevant to United Kingdom power station discharges. It was calculated that, in absence of turbulence, the motion of such vortex pairs would result in horizontal spreading of the warm water which is greater than that observed at site surveys. It was concluded that turbulence in the ambient receiving water is sufficient to destroy vortices produced by the discharge during the early stages of the plume development. (Sims-ISWS)
W78-10519

NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW,
Texas A and M Univ., College Station.
J. M. Sweeten, and D. L. Reddell.
Transactions of the American Society of Agricultural Engineers, Vol 21, No 3, p 474-483, May-June 1978. 3 fig, 2 tab, 62 ref.

Descriptors: *Water pollution sources, Agriculture, *Pollutants, Nutrients, Nitrogen, Phosphorus, Biochemical oxygen demand, Chemical oxygen demand, Sediments, Erosion, Farm management, Pesticides, Farm wastes, Feed lots, Water pollution, Path of pollutants, *Nonpoint pollution sources.

During the past few years, the term nonpoint pollution source has become exceedingly important to agriculture. In 1972, Federal legislation (Public Law 92-500) was passed bringing many forms of agriculturally related nonpoint pollution under regulatory authority. Section 208 of Public Law 92-500 created a cooperative local/state/Federal system for areawide wter quality planning. Nonpoint pollution sources are a major concern to these Section 208 planners. During the past, both basic and applied research have been conducted on such classical soil and water conservation topics as erosion control, sediment transport, soil chemistry and physics, crop production, range management, agricultural chemicals, animal science, and forestry. The challenge today is to locate, interpret, and compile this past knowledge into forms useful for Section 208 planners. This paper reviewed the current knowledge concerning the occurrence of nonpoint pollution sources such as sediment, nutrients, pesticides, and fecal contaminants. Sediment transport equations were reviewed and described, and the pollution potential of range and pasture livestock production was discussed. (Sims-ISWS)
W78-10524

LIQUID AND WATERBORNE WASTES RESEARCH IN NEW ZEALAND 1976,
National Water and Soil Conservation Organization, Christchurch (New Zealand)
S. F. Davis.
Water and Soil Technical Publication No. 1, p 18, (1977).

Descriptors: *Pollutants, *Wastes, *Water pollution, *Water pollution sources, *Projects, Research and development, Sampling, Surveys, Foreign countries, Farm wastes, Foreign research, Industrial wastes, Municipal wastes, Waste water treatment, Sewage treatment, Water quality, *New Zealand.

Research projects relating to liquid and waterborne wastes conducted by organizations in New Zealand during 1976 were listed. These projects were classified by subject and by organization. Addresses of contributors to this report were listed. Wastewater treatment and industrial wastes were the principal subjects for classification. (Sims-ISWS)
W78-10530

WATER QUALITY RESEARCH IN NEW ZEALAND 1976,
National Water and Soil Conservation Organization, Christchurch (New Zealand).
For primary bibliographic entry see Field 5G.
W78-10531

DISPERSION OF POLLUTANTS IN CHANNELS WITH NON-UNIFORM VELOCITY DISTRIBUTION,
Nova Scotia Technical Coll., Halifax (Nova Scotia). Dept. of Chemical Engineering.
S. T. Wang, A. F. McMillan, and B. H. Chen.
Water Research, Vol 12, No 6, p 389-394, 1978. 5 fig, 11 ref.

Descriptors: *Water pollution, *Dispersion, *Pollutants, *Model studies, Mathematical models, Channels, Channel flow, Unsteady flow, Path of pollutants, Mixing, Diffusion, Convection, Rivers, Streams, Pollutant concentration.

The concentration distribution of a pollutant arising from an instantaneous point source in a two dimensional water channel with non-uniform velocity distribution was obtained by employing Gill's method to solve the convection-diffusion equation. The solution was illustrated by plotting equi-concentration curves for three positions of the flow velocity maximum of the stream while the pollutant source position was held fixed. It was found that the position of the maximum has a great influence on the concentration distribution of the pollutant, particularly in the transverse direction. A velocity profile was proposed for fitting experimental flow data, and procedures for fitting were outlined. (Sims-ISWS)
W78-10533

THE MUSSEL MYTILUS EDULIS AS A BIOASSAY ORGANISM FOR MERCURY IN SEAWATER,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W78-10537

THE AMOCO CADIZ OIL SPILL,
Cremer and Warner, London, (England).
For primary bibliographic entry see Field 5C.
W78-10538

COMPOSITION AND SOURCES OF POLLUTANT HYDROCARBONS IN THE SEVERN ESTUARY,
Bristol Univ. (England). Organic Geochemistry Unit.
S. Thompson, and G. Eglinton.
Marine Pollution Bulletin, Vol. 9, p 133-136, 1978. 2 fig, 2 tab, 20 ref.

Descriptors: *Oil pollution, *Oil, *Bottom sediments, *Biodegradation, *Fossil fuels, Aromatic compounds, Organic compounds, Water pollution sources, Path of pollutants, Chemical analysis, Chromatography, Air pollution, Runoff, Estuaries, *Crude oil, *Carcinogens, *Aliphatic compounds, Benzo(a)pyrene.

Hydrocarbon distributions in sediment from the Severn Estuary can be explained mainly in terms of a pollution origin. The aliphatic hydrocarbon distribution is similar to that found in biodegraded crude oils. The distribution of polycyclic aromatic hydrocarbons, including the carcinogens benzo(a)pyrene, is similar to that derived from the pyrolysis of fossil fuels, especially petroleum. (EIS-Deal)
W78-10542

TOTAL AND ORGANIC MERCURY IN BENTHIC ORGANISMS NEAR A MAJOR SUBMARINE WASTEWATER OUTFALL SYSTEM,
Southern California Coastal Water Research Project, El Segundo.
R. P. Eganhouse, and D. R. Young.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, p 758-766, 1978. 3 fig, 5 tab, 14 ref.

Descriptors: *Mercury, *Benthic fauna, *Municipal wastes, *Outfall sewers, Heavy metals, Sediments, Industrial wastes, Crabs, Snails, Path of pollutants, Animal metabolism, Biodegradation, California, Marine benthos, Commercial fish, Marine fish, Waste disposal, Waste dilution, Tissue analysis, Bioaccumulation, *Methylmercury, Los Angeles, California.

Selected tissues of Dover sole, crab, prawn, snail, urchin, and sea slug were analyzed for total and organic mercury content. While the regional sediments were highly contaminated with mercury from a Los Angeles County municipal wastewater outfall, the tissue concentrations in these benthic organisms were low and apparently similar to those found for related animals from other parts of the world. In no instance did a specimen exceed the U.S. Food and Drug Administration guideline for edible seafood of 0.5 ppm mercury. (EIS-Deal)
W78-10544

THE USE OF PERIPHYTON AS A MONITOR OF TRACE METALS IN TWO CONTAMINATED INDIANA LAKES,
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W78-10545

TRENDS IN PCB CONTAMINATION IN DUTCH COASTAL AND INLAND FISHERY PRODUCTS 1972-1976,
Rijksinstituut voor Visserijonderzoek, Ymuiden (Netherlands).
P. Hagel, and L. G. M. Th. Tuinstra.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, p 671-676, 1978. 1 fig, 1 tab, 4 ref.

Descriptors: *Polychlorinated biphenyls, *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Fish physiology, Path of pollutants, Residues, Pesticides, Pesticide kinetics, Animal metabolism, Eels, Pikes, Mussels, Gas chromatography, *Tissue analysis.

Samples of the edible parts of sole, pike-perch, eel, and mussel were collected over the period from January 1972 to December 1976. No significant changes over time of PCB content were detected by gas chromatography analysis. All fish contained PCB concentrations on the order of 20 ppm on a fat base. (EIS-Deal)
W78-10546

A COMPARISON OF HYDROCARBONS IN ANIMALS AND THEIR BENTHIC HABITATS,
Woods Hole Oceanographic Institution, MA.
J. M. Teal, and J. W. Farrington.
Rapports et Proces-Verbeaux des Reunions, Conseil International pour L'Exploration de la Mer, Vol. 171, p 79-83, 1977. 2 fig, 3 tab, 8 ref.

Descriptors: *Absorption, *Estuarine environment, *Marshes, *Benthic fauna, *Oil spills, *Oil, *Path of pollutants, *Adsorption, *Sediments, *Mussels, Habitats, Benthos, Metabolism, Animal physiology, Organic compounds, Bottom sampling, Intertidal areas, Environmental effects, Minnows, Shellfish, Invertebrates, *Fundulus.

Studies in several estuarine and marsh areas have shown significant differences between the composition of petroleum hydrocarbons in benthic animals and their habitat. When subjected to an oil spill some animals take up a mixture of petroleum hydrocarbons with a composition similar to that of the spilled oil found in the substratum. Others develop the ability to metabolize or otherwise modify their hydrocarbon content possibly by selective uptake such that it approaches the pre-spill conditions. When sediments are pulsed with petroleum hydrocarbons from an oil spill, degradation occurs at rates which are significantly different for different classes of compounds. Some classes persist for more than five years in significantly elevated concentrations. In contrast, biogenic hydrocarbons in relatively unpolluted sediments seem to be subjected to little degradation over 10 to 50 year periods after deposition. (EIS-Katz)
W78-10550

DDE AND PCBS IN EGGS OF NORWEGIAN SEABIRDS,
Tromso Univ., (Norway). Inst. of Biology and Geology.
N. Fimreite, J. E. Bjerk, N. Kveseth, and E. Brun.
Astarte, Vol. 10, 1977, p. 15-20, 1 tab, 1 fig, 24 ref.

Descriptors: *Aroclor, *Polychlorinated biphenyls, DDE, *DDT, *Bird eggs, Birds, *Gulls, On-site investigation, Animal pathology, Animal physiology, Reproduction, Chemical analysis, Water birds, Gannets, Razorbills, Guillemot, Kittiwake, Norway, Sata bassana, Larns argentus, Alco torda, Uria aalge, Rissa tridaetyla.

Concentrations of DDE and polychlorinated biphenyls (PCBs) were measured in 203 seabird eggs collected from 10 localities along the coast of

Norway (58 deg 57'N - 71 deg 05'N). The average concentrations of DDE were, on a wet weight basis, 2.05, 1.57, 1.20, 0.80 and 0.37 ppm in eggs of Gannet, Herring gull, Razorbill, Guillemot and Kittiwake, respectively. The corresponding concentrations of PCBs were 7.71, 8.49, 5.40, 2.19, and 2.87 ppm. Some geographical variation was found, but no south-north gradient. The possible biological effects are discussed. (EIS-Katz)
W78-10553

REPRODUCTIVE PARAMETERS AND EGG CONTAMINANT LEVELS OF GREAT LAKES HERRING GULLS,
Canadian Wildlife Service, Ottawa (Ontario). Toxic Chemical Section.
A. P. Gilman, G. A. Gox, D. B. Peakall, S. M. Teelple, and T. R. Carroll.
Journal of Wildlife Management Vol. 41(3), 1977. p 458-468, 5 tab, 2 fig, 35 ref.

Descriptors: *Gulls, *Eggs, *Chlorinated hydrocarbon insecticides, Great Lakes, *Lake Ontario, Reproduction, Water pollution effects, Path of pollutants, *DDT, DDE, DDD, Dieldrin, Mercury, *Polychlorinated biphenyl, Heptachlor epoxide, *Mirex, Hexachlorobenzene, Herring gull.

Poor reproductive success and declines in colony size of herring gulls (Larus argentatus) have occurred in Lake Ontario at a time that dramatic increases of this species have been reported on the Atlantic seaboard. In 1975 herring gull productivity on Scotch Bonnet Island, Lake Ontario, was 0.15 chicks per pair of adults, one-tenth the productivity of colonies studied on Lake Erie, Huron and Superior. Reduced nest site defense and decreases in eggs found, egg hatchability and chick survival were observed in the Lake Ontario colony. The major causes of egg failure were disappearance and embryonic death. Hatching success of Lake Ontario eggs by artificial incubation was 23-26 percent compared to 53-79 percent for eggs from other areas. Analyses of eggs from 9 gull colonies for organochlorine contaminants indicated that the pattern of relative contamination was: Lake Ontario>Michigan>Superior>Huron>Erie. Mirex levels were nearly 10 times higher in Lake Ontario than in the other lakes. Movements of herring gulls within the Great Lakes basin are offered as an explanation of variation in individual egg residues in each colony and the moderately high levels of chemical residues in some Lake Superior eggs. (EIS-Katz)
W78-10556

RETENTION OF SMALL PARTICLES BY THE GILLS OF THE JAPANESE OYSTER (IN JAPANESE),
Hiroshima Prefecture Fisheries Experiments Station, Ondo (Japan).
Y. Kusuki.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43(12), 1977, p 1391-1396, 4 tab, 17 ref. (English summary).

Descriptors: *Oysters, Commercial shellfish, *Sediments, Animal behavior, Sediment distribution, *Algae, Filters, Sea water, *Filtration, Phytoplankton, Suspended solids, *Particle size, Laboratory test, Hiroshima Bay, *Japanese oyster.

Efficiency of the retention of small particles by the gills of the Japanese oyster was investigated. From the resuls thus obtained and measurements of the size distribution of particulate material suspended in sea water, estimation of the quantity of particulte matter as food for oysters was also discussed. Particle filtration by the oyster was studied in the 1.5 to 6.0 u size range in relation to naturally occurring particles. The oyster usually retained particles larger than 3 u, but could retain particles of sizes down to 2.0 or smaller, when larger particles became scarce. There was a sharp increase in removal efficiency as particle size increased from 1.5 to 3.0 u. Larger sizes showed no evidence of further change in efficiency. The particulate matter in Hiroshima Bay consisted mainly of particles smaller than 40 microns in diameter and this portion accounted for more than 90% (dry basis) of all particulate matter. (EIS-Katz)
W78-10560

EFFECTS OF MARBLE CUTTING AND POLISHING INDUSTRIES WASTEWATER DISPOSAL (WESTERN SICILIAN COAST) ON THE PHITOBENTHOS COMMUNITIES AND ON THE YELD OF TUNA FISHING WITH TUNA FISHING TRAPS (IN ITALIAN),
For primary bibliographic entry see Field 5C.
W78-10564

DISTRIBUTION OF MACROBENTHIC SPECIES IN LAKE ONTARIO IN RELATION TO SOURCES OF POLLUTION AND SEDIMENT PARAMETERS,
National Field Investigations Center-Cincinnati, OH.
For primary bibliographic entry see Field 5C.
W78-10569

CHANGE IN FISH TOXICITY OF LAS DURING BIODEGRADATION, (IN JAPANESE),
Lion Fat and Oil Co. Ltd., Tokyo (Japan)
For primary bibliographic entry see Field 5C.
W78-10571

MONITORING OF THE ACCUMULATION OF ORGANO CHLORINES IN FISH (UBERWACHUNG DER SPEICHERUNG VON CHLORIERTEN KOHLENWASSERSTOFFEN IM FISCH,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Inst. fuer Kuesten- und Binnenfischerei.
E. Huschenbeth.
Archiv fur Fischerei Wissenschaft, Vol 28, (2/3), 1977, p 173-186, 9 tab, 8 ref.

Descriptors: *Chlorine hydrocarbon pesticides, *Commercial fish, Commercial fisheries, *Monitoring, Herring, Eels, DDT, Dieldrin, Endrin, Aldrin, Commercial shellfish, Crustaceans, Mollusks, Polychlorinated biphenyls, Heptachlor, Hexachlor, *North Sea, *Baltic, Chlordane, Methoxychlor, Hexachlorobenzene, Heptachloroepoxide, Caviar.

Analysis were carried out on 762 fishes, crustaceans and bivalves in 1973-1976 to determine the accumulation of pesticides (DDT and metabolites, Lindane and Dieldrin). Further, some cod livers and gonads of Cod and herring were investigated concerning Hexachlorobenzene, Hepatachlor, Hepatochlorepoxide, Aldrin, Endrin, a-Hexachlorocyclohexane, Methoxychlor, a- and B-Chlordan. As compared with earlier investigations, conducted from 1970 to 1972, all lean fish analyzed of the North-Atlantic, the North-Sea and the Baltic disclosed values below 0.1 ug/g total DDT in the fillet. The concentrations in fat fish are several times higher, but seldon exceed the value of 1.0 ug/g. A declining trend derives from these investigations. The PCB-values of the North-Sea and the Baltic once more amounted up to 0.2 ug/g in lean fish, in fat fish of the North-Sea up to 0.5 ug/g and of the Baltic up to 0.8 ug/g. (EIS-Katz)
W78-10572

ISOLATION OF XENOBIOTIC CHEMICALS FROM TISSUE SAMPLES BY GEL PERMEATION CHROMATOGRAPHY,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-10578

STUDIES ON THE BIOMASS DISTRIBUTION OF AQUATIC MASSES IN THE SELF PURIFYING SECTION OF A BREWERY-WASTE-WATER-POLLUTED STREAM, UNTERSUCHUNGEN ZUR BIOMASSENVERTEILUNG SUBMERSER BRYOPHYTEN IN DER SELBSTRAININGUNGSSTRECKEEINES BRAUEREIABWASSERVORFLUTERS (METTMA, HOCHSCHWARZWALD),
For primary bibliographic entry see Field 5C.
W78-10579

THE BACTERIAL PATHOGEN FLEXIBACTER COLUMNARIS AND ITS EPIZOOTIOLOGY AMONG COLUMBIA RIVER FISH, A REVIEW AND SYNTHESIS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-10585

PREDICTING PHOSPHATE MOVEMENT THROUGH SOIL COLUMNS,
Connecticut Agricultural Experiment Station, New Haven.
B. L. Sawhney.
Journal of Environmental Quality, Vol. 6, No. 1, p 86-89, January-March 1977. 5 fig, 21 ref.

Descriptors: Groundwater, Phosphorus, Soils, Soil investigations, Soil properties, Waste water, Sorption, *Phosphates, *Path of pollutants, Water pollution sources, *Forecasting.

To assess the potential pollution of ground water with P from septic tank drainfields, sorption capacities of various soils were determined over an extended period of time and related to P movement through soil columns using solutions having P concentrations similar to waste waters. The amounts of P sorbed by fine sandy loam (fsl) and silt loam (sil) soil columns before breakthrough occurred were approximately equal to the sorption capacities determined from isotherms obtained over a sufficiently long reaction time of about 200 hours. In Merrimac fsl, breakthrough occurred after about 50 pore volumes of waste water had passed through the column while about 100 pore volumes passed through Buxton sil before the breakthrough occurred. Following breakthrough, concentration of P in the effluent continued to increase and approached the influent concentration after several hundred pore volumes of effluent had passed through the columns. The results suggest that while most deep soils should effectively remove P from waste water, ground water under drainfields installed in soils of low P sorption capacity after prolonged use may contain undesirably large concentrations of P. (Skogerboe-Colorado State)
W78-10589

LYSIMETER MEASUREMENTS OF NITRATE AND CHLORIDE LOSSES FROM SOIL UNDER CONVENTIONAL AND NO-TILLAGE CORN,
Kentucky Univ., Lexington. Dept. of Agronomy.
D. D. Tyler, and G. W. Thomas.
Journal of Environmental Quality, Vol 6, No 1, p 63-66, January-March 1977. 6 fig, 15 ref.

Descriptors: *Lysimeters, *Nitrates, *Chlorides, *Corn(Field), Soils, Soil investigations, *Soil water movement, Salts, *Leaching, Nitrogen, *Mulching, Measurement.

Salt and water movement was studied using steel pan lysimeters in the field under corn grown in killed sod and with conventional tillage. The study was done to determine the actual leaching losses of nitrogen under the two tillage systems. Losses of nitrate nitrogen and chloride used as a tracer of nitrate ion were higher under the no-tillage system as measured in the leachate collected after rainfall. This loss could occur within 1 to 2 months after the application of the nitrogen. Concentrations of nitrate and chloride ions in the leachate indicated

that these mobile, surface-applied anions could be washed into natural soil cracks and channels and flow much deeper into the soil than predicted by miscible displacement theory. (Skogerboe-Colorado State)
W78-10590

A STEADY-STATE CONCEPTUAL NITROGEN MODEL FOR ESTIMATING NITROGEN EMISSIONS FROM CROPPED LANDS,
Joint FAO/IAEA Div. of Atomic Energy in Agriculture, Vienna (Austria).
K. K. Tanji, M. Fried, and R. M. Van De Pol.
Journal of Environmental Quality, Vol. 6, No. 2, p 155-159, April-June 1977. 2 fig, 5 tab, 5 ref, 1 append.

Descriptors: *Nitrogen, Model studies, *Leaching, Corn(Fields), *Crop production, *Fertilizers, Fertilization.

Details of a conceptual nitrogen model are presented. The model is based upon the principles of mass balance and steady state. It considers both water and N flows into and out of the crop root zone. Illustrative computations are given for estimating steady-state N leaching losses from two cornfield sites and comparisons are made with measured values. This model may be applied to other crops or cropping practices. (Skogerboe-Colorado State)
W78-10601

A LABORATORY STUDY ON THE ROLE OF STREAM SEDIMENT IN NITROGEN LOSS FROM WATER,
Guelph Univ. (Ontario). Dept. of Environmental Biology.
P. Sain, J. B. Robinson, W. N. Stammers, N. K. Kaushik, and H. R. Whiteley.
Journal of Environmental Quality, Vol. 6, No. 3, p 274-278, July-Septembr 1977. 4 fig, 4 tab, 14 ref.

Descriptors: *Laboratory tests, *Sediments, Sedimentation, *Nitrogen, Nitrates, *Denitrification, Temperature, Water quality, Streams.

Laboratory experiments were conducted on samples of sediment collected from a stream having an appreciable input of nitrate at its source. Earlier work had shown that the water lost much of the nitrate as it moved downstream, presumably by denitrification. Columns of sediment were reconstituted in plexiglass tubes, overlain with water containing nitrate, and incubated at 10, 15, or 22C. The water was aerated with a helium-oxygen mixture. Nitrate concentration decreased rapidly but the rate varied with temperature and depth of sediment. At 22C, in water overlying 10-cm columns of sediment, over 90% of the nitrate was removed in 3 weeks from a solution originally containing 10 mg/liter nitrate-N. Nitrate disappeared less rapidly at lower temperatures and when sediment columns were <5 cm deep. In columns <5 cm deep and at low temperatures nitrate diffused to the bottom of the columns, while columns 5 cm deep or more were effectively of infinite depth. Because of the interdependence of diffusion from the liquid phase into the sediment and denitrification, it is not possible to inter kinetics of denitrification in these columns proceeded at a rate compatible with observations made previously in the stream from which the sediment originated. (Skogerboe-Colorado State)
W78-10602

PARTITIONING AND TRANSPORT OF LEAD IN LAKE WASHINGTON,
Duke Univ., Beaufort, NC. Marine Lab.
R. W. Baier, and M. L. Healy.
Journal of Environmental Quality, Vol. 6, No. 3, p 291-296, July-September 1977. 9 fig, 3 tab, 13 ref.

Descriptors: *Lead, Runoff, Sediments, Sedimentation, *Model studies, Adsorption, Absorption, Limnology, *Path of pollutants, Water pollution sources, Lake Washington(Wash), *Lake sediments.

Input of lead to Lake Washington appears to result from the settling of airborne Pb onto surface waters and the washing of terrestrial accumulations to the lake as runoff. Some of the Pb received by the lake is associated with particles that sink, while the remainder leaves the lake with the overflow. The range in Pb concentration during 2 years of sampling was 0.04 to 6.6 ppb. The path of Pb to the sediments is not direct but involves cycling through both liquid and solid phases. Over 70% of the total Pb entering the lake is retained by sediment. Lead in top layers of sediment ranged from 242 ppm near a heavily used bridge to 4 ppm near the major tributary of the lake. A simple compartment model accounts for some of the interchanges between dissolved and particulate forms of Pb through the processes of adsorption, absorption, and complexation. The time required to achieve steady-state conditions for the model is comparable to the yearly flushing period. Large shifts in the annual timing of flushing and mixing are encountered because of meteorological changes. (Skogerboe-Colorado State)
W78-10603

NONLINEAR DIFFUSION APPLIED TO GROUNDWATER CONTAMINATION PROBLEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak, and V. V. N. Murty.
Journal of Hydrology, Vol. 35, No. 3/4, p 357-363, November 1977. 5 fig, 5 ref, 1 append.

Descriptors: Mathematical studies, *Diffusion, Groundwater, Groundwater movement, *Groundwater resources, Aquifers, Water quality, *Water pollution sources, *Path of pollutants.

An analytical solution to the problem of concentration dependent diffusion with increasing concentration at the source is presented. The solution is of traveling wave type and is applied to predict the contamination in an aquifer from a source wherein the contamination concentration is increasing with time. (Skogerboe-Colorado State)
W78-10606

HYDROLOGIC MONITORING OF A DEEP-WELL-INJECTION SYSTEM NEAR PENSACOLA, FLORIDA, MARCH 1970-MARCH 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
C. A. Pascale, and J. B. Martin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 086, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 78-27, March 1978. 61 p, 5 fig, 4 tab, 17 ref.

Descriptors: *Injection wells, *Industrial wastes, *Path of pollutants, *Groundwater movement, *Observation wells, Water quality, Monitoring, Chemical analysis, Aquifer characteristics, Confined water, Pressure head, Deep wells, *Florida, *Pensacola area(Fla).

This report presents hydraulic and chemical data collected at a deep-well waste-injection system near Pensacola, Florida. Since injection began in July 1963, about 13.3 billion gallons of industrial acidic waste containing nitric acid, inorganic salts and numerous organic compounds have been injected into a saline-water-filled limestone aquifer. Wellhead pressure at two injection wells averaged 180 pounds per square inch in March 1977 and the hydraulic pressure gradient was 0.53 pound per square inch per foot of depth to the top of the injection zone. Increases in pressure since 1970 at two wells used to monitor the injection zone at sites located 1.9 miles north and 1.5 miles south of the injection site have been about 22 and 29 pounds per square inch. The pressure in a shallow monitor well, penetrating the first permeable zone above the 220-foot-thick confining bed, declined about 4 pounds per square inch. No changes were detected in the chemical character of water from the shallow monitor well and the north monitor well, but since late 1973, concentrations of bicarbonate and dissolved organic carbon in water from the south monitor well have increased. (Woodard-USGS)
W78-10625

TRANSPORT AND DISPERSION OF FLUORESCENT TRACER PARTICLES FOR THE DUNE-BED CONDITION, ATRISCO FEEDER CANAL NEAR BERNALILLO, NEW MEXICO,
Geological Survey, Bay Saint Louis. MS. Water Resources Div.; and Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-10634

GROUND-WATER POLLUTION BY NITROGEN COMPOUNDS AT OLEAN, NEW YORK--PROGRESS REPORT, JUNE 1977,
Geological Survey, Albany, NY. Water Resources Div.
A. D. Randall.
Open-file report 78-304, March 1978. 11 p, 4 fig, 6 ref.

Descriptors: *Water pollution control, *Groundwater, *Nitrogen compounds, *Pumping, *Water wells, Groundwater movement, Aquifer characteristics, Drawdown, Artificial recharge, Water spreading, Leaching, Planning, New York, *Olean.

Ground water in an area in Olean, New York contains high concentrations of nitrogen compounds, which are being slowly flushed from the aquifer as the ground water flows toward a nearby well field where it is pumped out. Construction and regular use of a new production well in the area of nitrogen-rich water would temporarily increase the rate of nitrogen removal by causing more rapid flow of water from the silty upper part of the aquifer downward to the more permeable lower part, and by reducing the distance the water must flow through the lower part to the nearest point of withdrawal. After such a well had been in use for several months and the system had adjusted to the new conditions, the rate of further nitrogen removal would depend on the rate at which nitrogen compounds are leached from the soil by infiltrating precipitation. Alternative techniques for speeding the flushing of the aquifer include artificially increasing the amount of infiltration, changing the rates of withdrawal from existing production wells, and pumping shallow low-yield wells in the area of nitrogen-rich water. (Woodard-USGS)
W78-10649

REAL-TIME CONTROL OF WATER QUALITY AND QUANTITY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 5G.
W78-10657

A PARTITIONING PROCEDURE FOR WATER QUALITY MANAGEMENT MODELS,
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 5G.
W78-10660

WATER QUALITY OF NORMAL AND STORM-INDUCED SURFACE WATER RUNOFF:

KANE'OHE BAY WATERSHED OAHU, HAWAII FEBRUARY 1974 TO MARCH 1975,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 5C.
W78-10665

SUSPENDED SEDIMENT IN THE CHESAPEAKE AND DELAWARE CANAL,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel, A. D. Williams, and W. M. Wise.
Special Report 11, Reference 77-7, Marine Sciences Research Center State University of New York, Stony Brook, New York, October 1977. 72 p, 22 fig, 8 tab, 39 ref, 1 append.

Descriptors: *Water quality, Effects, *Salinity, *Sediments, *Temperature, *Canals, Fish eggs, Larvae, Regional analysis, Chesapeake Bay, Delaware River, Canal routes, Dredging, Mortality.

From March 1971 through February 1972, samples of suspended sediment at a series of stations along the axis of the Chesapeake and Delaware Canal were collected. On each cruise, several stations were also occupied in the approaches to the Canal in the Chesapeake Bay and the Delaware Bay. The collection program was accomplished in conjunction with studies by Pritchard and Gardner (1974). This report reviews briefly the dredging history of the Chesapeake and Delaware Canal, summarizes the suspended sediments observatins in tabular and graphical form, and assesses the biological implications of the observed suspended sediment distribution patterns. (Bell-Cornell)
W78-10666

FINAL REPORT, ENVIRONMENTAL IMPACT MODEL DEVELOPMENT FOR NAVAL OPERATIONS,
Naval Weapons Center, China Lake, CA. Public Works Dept.
For primary bibliographic entry see Field 6G.
W78-10667

QUALITY OF THERMOMECHANICAL PULPING EFFLUENTS,
MacMillan Bloedel Ltd., Powell River(British Columbia).
G. W. Holmes.
Canadian Forestry Service Ottawa, Ontario K1A OH3. Cooperative Pollution Abatement Research (CPAR) Project Report 303-2, Final report to March 31, 1976. 21 p, 2 append. 1 fig, 5 tab.

Descriptors: *Pulp wastes, *Thermomechanical pulp mills, *Water quality, Effluents, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Recycling, Softwood, Hemlock trees, Biochemical oxygen demand, Toxicity, Hydrogen ion concentration, Conductivity, Canada, Water reuse, Carbon, White water(Paper machines), Spruce trees(Picea), Mechanical pulp mills, Groundwood mills.

At the Powell river division of MacMillan Bloedel Ltd. (British Columbia), no appreciable differences were observed between thermomechanical pulp (TMP) and ordinary groundwood in effluent volumes or ecological quality of discharges. Factors of major impact in either case were the wood species used and the recycling of white water. Among two softwoods, western spruce produced twice as much BOD, total organic carbon, and toxicity as did western hemlock. Although effluenct toxicity did not increase when white water was passed through the direct-contact heat-recovery unit of the TMP plant, recycling did cause unexpected changes in pH, conductance, and BOD. Recycled pulp-mill white water is about twice as rich in environmentally deleterious material as is excess paper-machine white water. Chemical pretreatments of pulpwood chips and other TMP process variations could cause greater differences. (Brown-IPC)
W78-10677

ORIGIN AND REMOVAL OF PRECIPITATED SUSPENDED SOLIDS IN BLEACHED KRAFT PULP MILL EFFLUENTS,
British Columbia Forest Products Ltd., Mackenzie.
For primary bibliographic entry see Field 5D.
W78-10678

MIXING EFFECTS DUE TO BOATING ACTIVITIES IN SHALLOW LAKES,
Florida Technological Univ., Orlando. Dept. of Civil Engineering and Environmental Science.
Y. A. Yousef, W. M. McLellon, R. H. Fagan, H. H. Zebuth, and C. R. Larrabee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 493, Price codes: A20 in paper copy, A01 in microfiche. Environmental Systems Engineering Institute, Technical Report ESEI No. 78-10, June 1978. 352 p, 46 fig, 58 tab, 130 ref, 7 append. OWRT C-7020(6203)(1).

Descriptors: Waves, Recreational boats, *Mixing effects, Lake management, Water quality, *Sediment resuspension, *Turbidity, Water pollution sources, *Algal identification, *Chlorophyll analysis, *Phosphorus content, *Bioassay, Pollutant identification.

Recreational boats equipped with engines varying from 28 to 165 horsepower were used for agitation on Lakes Claire, Mizell, and Jessup in Central Floridal. Primary and secondary waves generated by motorboats at the water-sediment interface were recorded. When boat verlocities were greater than the square root of the acceleration of gravity and water depth, the average primary wave amplitudes decreased exponentially with depth. An empirical relationship between average wave amplitude, engine horsepower and the water depth was developed. Scour velocities for sediment particles from known wave amplitudes were calculated and verified. Mixing by motorboats in the lakes resuspended bottom sediments and increased turbidity. The increase in turbidity was accompanied by an increase in the phosphorus content, chlorophyll a, and respiration rates within the waterbody. Also, a reduction in the dissolved oxygen content may result.
W78-10734

ON THE BENTHIC FAUNA OF SOME RIVER SYSTEMS IN THE NAGASAKI DISTRICT (1) THE SASU AND THE SE RIVERS OF TSUSHIMA IN WINTER (IN JAPANESE),
Nagasaki Inst. of Health Science and Environmental Science (Japan).
For primary bibliographic entry see Field 5C.
W78-10736

POLYCHLORINATED 2-AMINODIPHENYL ETHERS IN FISH,
Karolinska Inst., Stockholm (Sweden). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-10737

CADMIUM IN PORT PHILLIP BAY MUSSELS,
La Trobe Univ., Bundoora (Australia) Dept. of Inorganic and Analytical Chemistry.
V. W. Talbot, R. J. Magee, and M. Hussain.
Marine Pollution Bulletin, Vol 7, No 5, p. 84-86, 1976. 1 fig, 3 tab, 2 ref.

Descriptors: *Australia, *Metals, *Cadmium, *Mollusks, *Mussels, *Oysters, Water pollution effects, Sediments, Estuaries, Path of pollutants, Melbourne(Australia), *Port Phillip Bay, Corio Bay, Mytilus edulis, Tissue content.

Port Phillip Bay receives the industrial and domestic effluents from Melbourne and a recent survey revealed an accumulation of a variety of heavy metals in bottom sediments. These studies have now been extended to survey the accumulation in oysters and mussels, and in most areas in the Bay these bivalves are heavily contaminated with cadmium. Oysters accumulate more of this metal than mussels. (Katz-EIS)
W78-10743

BENTHIC MOLLUSCAN ASSEMBLAGES IN RELATION TO SEDIMENT GRADIENTS IN NORTHEASTERN LONG ISLAND SOUND, CONNECTICUT,
City Univ. of New York. Inst. of Oceanography.
D. Franz.
Malacologia Vol 15, No 2, p 377-399, 1976. 6 fig, 32 ref, 4 app.

Descriptors: *Molluscs, *Benthos, *Benthic fauna, Animal populations, *Connecticut, Sediment distribution, *Sediments, Environmental gradient, Statistical analysis, *Long Island Sound, *Fishers Island Sound, Sediment particle size, Sands, Environmental effects.

Factors accounting for high dominance and low evenness in very fine sediments are discussed, and it is argued that this reflects the homogeneity of the energy resource (organic matter), the reduced pool of potential competitors, and the severely seasonal thermal environment. Sediment-correlated species associations in this area appear to be fairly stable and predictable within a framework of seasonal variability in the degree of dominance exhibited by certain species. The Classification procedure is useful in grouping stations along a gradual environmental procedure is useful in grouping stations along a gradual environmental continuum for the purpose of diversity analysis. It is not argued that these groups comprise rigid, non-overlapping associations or communities. (Katz-EIS)
W78-10747

THE ACCUMULATION OF RADIOACTIVE CAESIUM FROM WATER BY THE BROWN TROUT (SALMO TRUTTA) AND ITS COMPARISON WITH PLAICE AND RAYS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
C. J. Hewett, and D. F. Jefferies.
Journal of Fish Biology, Vol 9, No 6, p 479-489, 1976. 2 fig, 7 tab, 24 ref.

Descriptors: *Brown trout, *Radioactivity, *Metals, Freshwater fish, Marine fish, Fish physiology, Path of pollutants, Water pollution effects, Radioisotopes, Radioactivity techniques, *Radioactive Caesium, Benthic fish, *Marine flatfish, *Plaice, Rays, Fish blood, Erythrocytes.

The patterns of accumulation of caesium-137 from water by the tissues and organs of the freshwater teleost, the brown trout (Salmo trutta) are described. Estimates of the biological half-times and steady-state concentrations are derived, using a simple exponential equation. In all tissues and organs examined, other than muscle, the rate processes of the trout fall between those of the plaice and the ray. Most of the caesium accumulated by the brown trout from water enters other than by the gut, probably through the gills, but as with plaice and ray, the main source of the caesium, possibly 90%, must come from the food. Despite differences in the levels of accumulation, the ratios of the tissue to blood steady state concentrations are very similar in all three species. The steady state caesium concentration of the blood appears to be directly related to the red blood cell count of the fish. (Katz-EIS)
W78-10749

WATER QUALITY COMPARISON STUDY, ESCAMBIA RIVER AND OTHER NORTHWEST FLORIDA STREAMS.
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-10759

CARELESS KEPONE,
Hofstra Univ., Hempstead, NY. Dept. of Chemistry.
For primary bibliographic entry see Field 5G.
W78-10788

EFFECTS OF TRACE CONTAMINANTS FROM COAL COMBUSTION.
Department of Energy, Washington, DC. Div. of Biomedical and Environmental Research.
Available from the National Technical Information Service, Springfield, VA 22161 as ERDA 77-64, Price codes: A05 in paper copy, A01 in microfiche. Proceedings of a Workshop held August 2-6, 1976, Knoxville, Tennessee, Report ERDA 77-64, June 1977. 84 p, 1 fig, 6 tab, 130 ref. R.I. Van Hook and W.D. Shults, editors.

Descriptors: *Coals, *Air pollution, *Water pollution, *Effects, Water pollution effects, Air pollution effects, Water pollution sources, Powerplants, Trace elements, Public health, Environmental effects, Pollutants, Surveys, Sampling, Coal combustion, Trace contaminants.

In August 1976, 60 experts of diverse disciplines worked together for threeplus days on a common topic: Trace Contaminants from Coal Combustion Technology. The concern was with health and ecological effects of trace contaminants that are produced and may be released by large-scale combustion of coal. Accordingly, the participants were grouped into four Panels or 'centers of interest' for working purposes: Characterization and Analysis, Environmental Transport, Ecological Effects, and Health Effects. Each Panel considered the current state of knowledge and capability with respect to trace contaminants from coal combustion and developed recommendations for future research needed to assure acceptably safe implementation of coal combustion technology on the very large scale that is anticipated. The four chapters in this document comprise the reports of each of the four Panels. There was consensus recognition of the important and considerable work that has been done already in the area of trace contaminants associated with coal combustion. Much information is available, but much more and different types of information is needed. There was general agreement that physical and chemical characterization of materials are vital prerequisites to the study of health and ecological effects. It is the chemical/physical state of trace contaminant that determines the biological availability and effect. Thus, one central recommendation is for the development of methodology and of data banks that provide information about contaminant species, as opposed to total contaminant concentration. Information about compound types, oxidation states, complexation, and organometallic moieties is generally lacking. Acquisition of such data is extremely difficult and not generally amenable to routine operations. Research into methodology is warranted. Concurrently, improved and expanded information about vapor/particulate relationships is needed, particularly with respect to the sources themselves. (Sims-ISWS)
W78-10926

RADIATIVE TRANSFER MODEL FOR REMOTE SENSING OF SUSPENDED SEDIMENTS IN WATER,
MITRE Corp., McLean, VA. METREK Div.
For primary bibliographic entry see Field 2J.
W78-10930

PRELIMINARY STUDY OF SEDIMENT SOURCES IN THE POTOMAC RIVER BASIN, WASHINGTON, D.C., METROPOLITAN AREA.
Environmental Protection Agency, Washington, DC. Surveillance Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 439, Price codes: A02 in paper copy, A01 in microfiche. Report, May 1970. 10 p, 2 fig, 4 tab, 7 ref.

Descriptors: *Sediments, *District of Columbia, *Potomac River, *Water pollution sources, Surveys, Monitoring, Sampling, Photography, Discharge(Water), Erosion, Urbanization, Cities, Suspended solids, Rainfall, Precipitation(Atmospheric), Watersheds(Basins), Pollutants, Path of pollutants, *Sediment sources.

Recognizing the need for factual information on sedimentation, the Assistant Secretary of Interior, Water Quality and Research requested that the Federal Water Quality Administration, Middle Atlantic Region, conduct a sediment investigation in the Potomac River Basin between Great Falls and Hallowing Point. The investigation was designed to provide answers to the following questions: What are the sources of the sediment in the Potomac River Basin in the Washington Metropolitan area. What are the relative magnitudes of the sediment loads contributed to the Potomac River and its tributaries below Great Falls from these sources. This report summarized the results of an investigation made by the Surveillance Branch to answer the above questions. It was found that the primary sources of sediment in the Washington Metropolitan area are residential, institutional and highway construction sites, sand and gravel mining operations, and extreme erosion caused by intense runoff from parking areas, manmade stream channels, and storm sewers. Urban and suburban development are known to affect significantly sediment loads in the Potomac River Basin. Suburban areas in all parts of the Washington, D.C. area are growing at a remarkable rate. (Sims-ISWS)
W78-10932

A THREE-DIMENSIONAL NUMERICAL MODEL FOR PREDICTING POLLUTANT AND SEDIMENT TRANSPORT USING AN EULERIAN-LAGRANGIAN MARKER PARTICLE TECHNIQUE,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
D. L. Pavish, and M. L. Spaulding.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-30643, Price codes: A11 in paper copy, A01 in microfiche. Interim Report, July 1977. 233 p, 49 fig, 7 tab, 78 ref, 2 append. NASA NSG 1008.

Descriptors: *Sediment transport, *Path of pollutants, *Model studies, *Mathematical models, Wastes, Waste disposal, Diffusion, Dispersion, Settling velocity, Particle size, Oceans, Equations, Mathematics.

A computer coded Lagrangian marker particle in Eulerian finite difference cell solution to the three dimensional incompressible mass transport equation, Water Advective Particle in Cell Technique, WAPIC, was developed, verified against analytic solutions, and subsequently applied in the prediction of long-term transport of a suspended sediment cloud resulting from an instantaneous dredge spoil release. Numerical results from WAPIC were verified against analytic solutions to the three dimensional incompressible mass transport equation for turbulent diffusion and advection of Gaussian dye releases in unbounded uniform and uniformly sheared uni-directional flow, and for steady-uniform plug channel flow. WAPIC was utilized to simulate an analytic solution for non-equilibrium sediment dropout from an initially vertically uniform particle distribution in one-dimensional turbulent channel flow. Predicted sediment fallout rates and vertical concentration values as a function of downstream distance were within an absolute accuracy of 4% of the analytic values. (Sims-ISWS)
W78-10933

SEDIMENT OXYGEN DEMAND STUDIES OF SELECTED NORTH-EASTERN ILLINOIS STREAMS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2J.
W78-10943

TEMPERATURE ANALYSIS AND SELECTIVE-WITHDRAWAL DESIGN STUDY TALLAHALA CREEK LAKE, MISSISSIPPI; MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
S. T. Maynord, B. Loftis, and D. G. Fontane.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 620, Price codes: A05 in paper copy, A01 in microfiche. Technical Report H-78-1, January 1978. 93 p, 17 pl, 1 tab, 14 ref, 3 append.

Descriptors: *Dissolved oxygen, *Thermal properties, *Water temperature, Reservoirs, Outlet works, Mississippi, *Tallahala Creek Lake(Miss), *Selective withdrawal, Tallahala Creek, Mathematical models, Multilevel outlets.

A numerical simulation model was used to evaluate the thermal characteristics of the proposed Tallahala Creek Lake near Laurel, Mississippi. Several multilevel intake configurations were evaluated on the basis of capability of meeting a natural stream temperature objective. Each of the multilevel configurations exhibited similar performance in meeting the temperature objectives. One of the configurations was recommended because it will provide simpler operation. Additionally, a cursory analysis of anticipated dissolved oxygen content in and downstream of the lake was performed. Based on simulated oxygen profiles in the lake and potential reaeration through the Tallahala Creek Lake outlet works, it is expected that acceptable levels of dissolved oxygen will exist immediately downstream of the structure. (WES)
W78-10946

THE FLORA OF DREDGED MATERIALS SITES IN NAVIGATION POOL 8 OF THE UPPER MISSISSIPPI RIVER,
Wisconsin Univ.-La Crosse.
For primary bibliographic entry see Field 5E.
W78-10947

A LABORATORY STUDY OF THE TURBIDITY GENERATION POTENTIAL OF SEDIMENTS TO BE DREDGED,
Abcor, Inc., Wilmington, MA. Walden Research Div.
For primary bibliographic entry see Field 2J.
W78-10951

AVAILABILITY OF SEDIMENT-ADSORBED SELECTED PESTICIDES TO BENTHOS WITH PARTICULAR EMPHASIS ON DEPOSIT-FEEDING INFAUNA,
LFE Environmental Analysis Labs., Richmond, CA.
For primary bibliographic entry see Field 5C.
W78-10955

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON; APPENDIX E: RELEASE AND DISTRIBUTION OF POLYCHLORINATED BIPHENYLS INDUCED

BY OPEN-WATER DREDGE DISPOSAL ACTIVITIES,
Washington Univ., Seattle. Dept. of Oceanography.
S. P. Pavlou, R. N. Dexter, Hom. Wilson, and A. J. Hafferty.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-24, January 1978. 546 p, 15 tab, 21 fig, 27 ref, 5 append.

Descriptors: *Polychlorinated biphenyls, On-site investigations, Sediments, Washington, *Dredged material disposal, *Waste disposal sites, *Duwamish waterway(Wash),*Puget Sound, *Path of pollutants.

A detailed discussion of the results of a study conducted to evaluate the release of polychlorinated biphenyls (PCB's) during open-water disposal of contaminated dredged material in Elliott Bay, Puget Sound, Washington. Specific information provided consists of the following: a. A documentation of the release of PCB's from the dredged material to the water column during and after disposal of contaminated sediments from the Duwamish River. b. An evaluation of the spatial and temporal trends in PCB levels at the disposal site and its immediate vicinity. c. An examination of the dependence of PCB residues measured in water, suspended particulate matter (SPM), and sediments on physical and chemical variables (appropriate to each marine phase examined) which might affect the accumulation and release characteristics of these chemicals from the disposed material. d. An assessment of the change in the distribution characteristics of PCB's in the impact zone as compared to the prevailing embient conditions in the area prior to disposal. (WES).
W78-10962

OIL POLLUTION ON ISRAELI COASTS,
Oil Pollution South East Kent, Dover (England).
T. Dixon.
Marine Pollution Bulletin, Vol. 6, No. 5, May 1975, p 70-72. 3 fig, 2 tab, 4 ref.

Descriptors: *Oil pollution, *Oil spills, *Industrial wastes, Environmental effects, Coasts, Pollution abatement, Water pollution control, *Israel, *Water pollution sources.

While Israeli coasts have experienced the effects of oil pollution from the Eastern Mediterranean for many years, a recent study now indicates that there are additional inland problems originating from industrial waterways, general cargo ports, power stations, and oil ports which the government has had problems in effectively controlling. Recent increases in fines, detentions for repeated offenses, and the availability of barges capable of receiving oil residues from shipping, are expected to reduce the problem. Additionally, oil spillage will be controlled by equipment from neighboring ports and oil terminal, and to add further controls power stations will be supplied with fuel oil by pipeline instead of tankers. The major areas of concern are the industrial waterway on the Kishon River near Haifa, the general cargo ports of Ashdod, Eilat and Haif and oil ports at Haifa, Ashkelon, and Eilat. A general decline of marine microfauna and living corals near Eilat has recently been noticed; however, it is difficult to link these effects to any specific pollutant. (Tickes-Arizona).
W78-10968

ASSESSMENT OF WATER QUALITY IMPACTS OF A WESTERN COAL MINE,
Argonne National Lab., IL. Land Reclamation Program.
For primary bibliographic entry see Field 5G.
W78-10984

SOME APPLICATIONS OF HYDROLOGIC SIMULATION MODELS FOR DESIGN OF SURFACE MINE TOPOGRAPHY,
Agricultural Research Service, Fort Collins, CO.
For primary bibliographic entry see Field 5G.
W78-10986

SOIL EROSION AND ITS CONTROL IN EASTERN WOODLANDS,
Northeastern Forest Experiment Station, Broomall, PA.
For primary bibliographic entry see Field 2J.
W78-10987

WATER QUALITY IMPACTS OF HARVESTING AND REGENERATION PRACTICES,
Southern Forest Experiment Station, Oxford, MS. Forest Hydrology Lab.
S. J. Ursic.
In: Proceedings '208' Symposium, Non-Point Source of Pollution from Forested Land, p. 223-232. 1977. 22 refs. Southern Illinois University Carbondale.

Descriptors: Water quality, *Water quality standards, *Harvesting, *Coastal plains, *Channel erosion, *Clearcutting, Federal Water Pollution Control Act, *Water pollution control, Forest management, Pollutants, Forest practices, *Non-point source pollution, *Sediments, Undisturbed forests, Public Law 92-500, Regeneration.

Information on water quality from undisturbed southern forest lands is summarized and the impacts of harvesting and regeneration practices on non-point source pollution discussed. An urgent need is to obtain data upon which equitable water quality standards for forest lands can be based and to formulate feasible practices to help meet water quality goals. Sediment is the major pollutant of concern. Base levels of sediment concentrations for important southern forest-land cover types are suggested. Sediment contributions from channels must be evaluated apart from those caused by forestry activities to prevent placing needless restrictions on forest lands. Short-lived changes in water quality after properly planned and executed harvesting, including clearfelling, can meet reasonable standards for sediment and chemical water quality. Sufficient information is not available to evaluate activities creating greater soil disturbances than harvesting. (Forest Service).
W78-10996

FATE OF HYDROCARBONS IN FISH,
Torry Research Station, Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W78-11000

ON THE ORIGIN OF HYDROCARBONS IN MARINE ORGANISMS,
Torry Research Station, Aberdeen (Scotland).
J. Murray, A. B. Thomson, A. Stagg, R. Hardy, and K. J. Whittle.
Rapports et Proces-Verbaux des Reunions, Conseil International pur L'Exploration de la Mer, Vol. 171, p 84-90, 1977. 3 fig, 3 tab, 22 ref.

Descriptors: *Food chains, *Absorption, *Zooplankton, *Algae, *Marine algae, *Primary productivity, *Tracers, *Carbon radioisotopes, *Carbon cycle, Marine plants, Laboratory tests, Plankton, Analytical techniques, Animal physiology, Biochemistry, Carbon dioxide, Chromatography, Organic compounds, Chemical analysis, Phaeodactylum, Anabaena, *Fatty acids, *Endogenous hydrocarbons.

Using radiochemical techniques a study has been made of the aliphatic hydrocarbons of certain algae and also of a mixed zooplankton culture which had been allowed to graze on 14C labelled Phaeodactylum. In each case only a small number of specific compounds in the alkane array were labelled. The much wide range of hydrocarbons found in harvested marine mixed plankton samples suggests that some of this hydrocarbon may be of exogenous origin. (EIS-Katz)
W78-11002

ALARMING SIGNS OF MERCURY POLLUTION IN A FRESHWATER AREA OF THAILAND,
Helsinki Univ. (Finland). Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W78-11003

EFFECTS OF CADMIUM AND MERCURY ON THE BEHAVIORAL RESPONSES AND DEVELOPMENT OF EURYPANOPEUS DEPRESSUS LARVAE,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 5C.
W78-11005

ZINC, CADMIUM AND LEAD IN WATER, SEDIMENTS AND SUBMERGED PLANTS OF THE DERWENT RESERVOIR, NORTHERN ENGLAND,
Durham Univ. (England). Dept. of Botany.
J. P. C. Harding, and B. A. Whitten.
Water Research, Vol. 12, p 307-316, 1978. 9 fig, 3 tab, 25 ref.

Descriptors: *Zinc, *Cadmium, *Lead, *Bottom sediments, Reservoirs, *Copper, Nickel, Mining, On-site data collections, Reservoir silting, Sedimentation, Water chemistry, Heavy metals, Metals, Sediments, Aquatic plants, Path of pollutants, Glyceria, Nitella, *Derwent Reservoir(England).

A partial budget is presented of the zinc, cadmium and lead entering the Derwent Reservoir. The mean levels in the water column upstream of the site of inflow are: Zn, 0.216 mg/l; Cd, 0.003 mg/l; Pb, 0.065 mg/l. The levels after passage through the 4.1 square km reservoir fall by 70.3%; 98.3% and 89.2% for Zn, Cd and Pb, respectively. Most of these metals are deposited in sediments, the mean values for which are 1035, 13 and 827 micro gr/gr, respectively. Lead, a higher percentage of which occurs as particulate matter, is deposited more rapidly than zinc; this effect is especially obvious when streaming of colder water along the bottom of the reservoir takes place at the time of floods. Macroscopic plants are only occasionally in this reservoir, due perhaps in part to heavy metal toxicity. Of the two most common submerged species, Nitella flexis probably accumulates almost all of its metal content directly from the water, but the data suggest that sediments are a source of some of the heavy metals accumulated by Glyceria fluitans. (EIS-Katz)
W78-11006

DETERMINATION OF PCB AND PCT RESIDUES IN FISH BY TISSUE ACID HYDROLYSIS AND DESTRUCTIVE CLEAN-UP OF THE EXTRACT,
Public Health Inst. of Slovenia Ljubljana (Yugoslavia).
For primary bibliographic entry see Field 5A.
W78-11009

CADMIUM IN NORTHEAST PACIFIC WATERS,
California Univ. Santa Cruz. Div. of Natural Sciences.
K. W. Bruland, G. A. Knauer, and J. H. Martin.
Limnology and Oceanography, Vol. 23, No. 4, p 618-625, 1978. 4 fig, 3 tab, 14 ref.

Descriptors: *Cadmium, *Trace elements, *Water quality, *Nitrates, *Phosphates, *Methodology,

*Oceans, Geochemistry, Nutrients, Mathematical models, Surface waters, Metals, Chemical analysis, Sea water, Water analysis, Water chemistry, Upwelling plankton.

Northeast Pacific water was collected by five different methods and the Cd in it was preconcentrated by both chelex-ion exchange and chelation-organic extraction techniques. All sampling and preconcentration methods yielded essentially the same data. Cadmium was very significantly correlated with phosphate and nitrate at all depths and it appears that the resulting equations, ng Cd/liter = -3.6 + 34.9 micro mol PO4/liter and ng Cd/liter = 5.1 + 2.45 (micro mol NO3/liter), can be used to predict oceanic Cd values. Cadmium concentrations are lowest in nutrient-depleted surface waters (4.5 + or - 0.4 ng/liter) and greatest (125 ng/liter) at the depths of the PO4 and NO3 maxima. Hence, Cd has one of the highest deep enrichment:surface depletion ratios (approximately 30) yet observed. Cadmium and phosphorus are also correlated in microplankton, and it is apparent that these organisms and their orgaic remains are a dominant factor in the biogeochemical cycling of this element. (EIS-Katz)
W78-11011

PASSAGE OF METALS TO FRESHWATER FISH FROM THEIR FOOD,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-11012

THE ALKANES OF MARINE ORGANISMS FROM THE UNITED KINGDOM AND SURROUNDING WATERS,
Torry Research Station, Aberdeen (Scotland).
K. J. Whittle, P. R. Mackie, R. Hardy, A. D. McIntyre, and R. A. A. Blackman.
Rapports et Proces-Verbaux Des Reunions, Conseil International Pour L'Exploration de la Mer, Vol. 171, p 72-78, 1977. 4 tab, 5 fig, 14 ref.

Descriptors: Pollutants, *Organic compounds, *Plankton, *Path of pollutants, *Marine fish, *Absorption, *Baseline studies, *Crabs, *Shrimp, *Coasts, Industrial wastes, Invertebrates, Marine plants, Benthos, Commercial shellfish, Herring, Commercial fish, Distribution, Food webs, Tissue analysis, Clupea, Morone, Mytilus, Bioaccumulation.

At sites originally selected on the basis of expected hydrocarbon input, mixed plankton samples and various tissues from 11 species of invertebrates and 19 species of fish, representing some 255 samples in total, have been analysed for alkanes by capillary gas-liquid chromatography. On a comparative weight-basis, the plankton samples had the highest n-alkane values particularly at the coastal site adjacent to industrial urban areas. The remaining animal samples fell within a range of means from 0.1 to 20 micro gr/gr wet weight, the higher value usually found in fatty tissues. Different tissues exhibited different n-alkane distribution profiles. It was extremely difficult to determine the origin of the n-alkanes identified. (EIS-Katz)
W78-11013

NITROGEN AND PHOSPHORUS MOVEMENT FROM AGRICULTURAL WATERSHEDS,
Agricultural Research Service, Columbia, CO.
R. E. Burwell, G. E. Schuman, H. G. Heinemann, and R. G. Spomer.
Journal of Soil and Water Conservation, Vol. 32, No. 5, p 226-230, September-October, 1977. 6 tab, 13 ref.

Descriptors: *Nitrogen, *Phosphorus, Nutrients, Fertilizers, Fertilization, Watersheds(Basins), Iowa, Runoff, Erosion, *Soil erosion, *Path of pollutants, *Agricultural watersheds, *Agricultural runoff.

A five-year study on Missouri Valley deep loess watersheds near Treynor, Iowa, to characterize the movement of nitrogen (N) and phosphorus (P) as influenced by applied fertilizer and conservation practices was conducted. Presented is watershed budget-accounting information for measured N and P movement that included (1) corn crop use, (2) surface runoff losses, (3) deep percolation, and (4) subsurface discharge. Erosion control and the application of N and P fertilizer at rates recommended for annual crop use minimized losses of these nutrients from the watersheds. (Skogerboe-Colorado State)
W78-11040

NITRATE DISTRIBUTION AND VARIABILITY IN IRRIGATED FIELDS OF NORTHEASTERN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W78-11049

SAMPLING DISTRIBUTION OF NITRATES IN IRRIGATED FIELDS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W78-11051

STERILITY IN RICE CULTIVARS AS INFLUENCED BY MSMA RATE AND WATER MANAGEMENT,
Arkansas Agricultural Experiment Station, Stuttgart. Rice Branch Experiment Station.
B. R. Wells, and J. T. Gilmour.
Agronomy Journal, Vol. 69, No. 3, p 451-454, May-June, 1977. 3 tab, 16 ref.

Descriptors: *Rice, Crop production, Arkansas, Cotton, Soils, Soil investigations, Soil water, Saturated soils, *Water management(Applied), *Monosodium methanearsonate.

An expansion of rice acreage in Arkansas has resulted in rice being produced on soils with a history of cotton production. Most of these cotton soils have had repeated applications on monosodium methanearsonate (MSMA) as a herbicide. There is some evidence that arsenical residues in the soil can lead to sterility in rice. A field experiment was conducted on a Crowley silt loam soil in 1975 to evaluate the influence of MSMA on plant growth and yield of rice. (Skogerboe-Colorado State)
W78-11053

MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEM ANALYSIS - APPLICATION TO MEDIUM SIZE COMMUNITIES: URBAN STORM-DRAINAGE SYSTEMS PLANNING,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-11058

CALIBRATION AND SENSITIVITY ANALYSIS OF THE CONTINUOUS RUNOFF SIMULATION MODEL 'STORM',
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 2A.
W78-11060

SEARCH FOR NITRIFYING AGENTS IN WATER AND SOILS AS SOURCES OF NITRATES IN SURFACE WATER,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
N. A. Phillips, and R. L. Todd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 700, Price codes: A05 in paper copy, A01 in microfiche. Report ERC-02-78, February 1978. 89 p, 9 tab, 61 ref, append. OWRT A-066-GA(1), 14-34-0001-6011.

Descriptors: Ammonia, *Nitrate-nitrogen, Fertilizer, Calcium, Magnesium, Sodium, Soils, *Nitrates, *Water pollution sources, Soil chemistry, *Nitrosomonas, *Nitrobacter, *Nitrifying bacteria, Silicon, Total nitrogen.

The soil and surrounding water of seventeen diverse types of watersheds were analyzed over a one-year sampling period for a variety of parameters. Terrestrial nitrifying populations were quantified. Concentrations of ammonia, nitrate, and total nitrogen and pH were measured from soil extracts. The water was analyzed for concentrations of nitrate, ammonia, and seven selected cations. The terrestrial nitrifying bacteria were positively correlated to nitrate and cation loss from so-called 'natural' systems, i.e., ones that were not fertilized. Those heavily managed (fertilized) systems showed no relationship between nitrate and cation discharge and numbers of nitrifying bacteria. The average concentration of nitrate-nitrogen lost from natural systems was 0.07 mg/l over the year. That lost from the fertilized systems averaged 0.47 mg/l, approximately a 7-fold increase. Similar relationships were found for average cation discharge.
W78-11063

PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME I. SUMMARY REPORT AND VERIFICATION.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W78-11088

PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW, VOLUME V, DETAILED RETURN FLOW SALINITY AND NUTRIENT SIMULATION MODEL,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W78-11092

A MATHEMATICAL MODEL OF THE ACCUMULATION OF RADIONUCLIDES BY OYSTER (C. VIRGINICA) AQUACULTURED IN THE EFFLUENT OF A NUCLEAR POWER REACTOR TO INCLUDE MAJOR BIOLOGICAL PARAMETERS,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
C. T. Hess, C. W. Smith, and A. H. Price.
Health Physics, Vol 33, No 2, August 1977, p 121-130, 10 fig, 14 ref.

Descriptors: Environmental effects, *Water pollution, Radioactive wastes, *Radioisotopes, Nuclear powerplants, *Oysters, Effluent, Absorption, *Mathematical models.

A mathematical model for the uptake, accumulation and loss of radionuclides by oysters cultured in the effluent of a nuclear power reactor is presented. Field measurements of these variables were made at four stations. Comparison of monthly measurements of the specific activity for Co58, Co60, Mn54, Csl34 and Csl37 in oysters from these stations with model calculations showed close agreement over all ranges of variation seen. It was noted that one of the real values of this model, in addition to the one of predicting the time dependence of the specific activity of radionuclides in oysters located at various positions with respect to the discharge point of source of radionuclides, is that it can be used in reverse to calculate optimum release schedules from the nuclear power plant. (Chilton-ORNL)
W78-11112

EFFECT OF A THERMAL GENERATING STATION ON DISSOLVED SOLIDS AND HEAVY METALS IN A PRAIRIE RESERVOIR,
Saskatchewan Dept. of the Environment, Regina. Inland Waters Directorate.
R. J. Allan, and D. J. Richards.
Scientific Series No. 93, 1978, 20 p, 13 fig, 30 ref, 8 tab.

Descriptors: *Thermal powerplants, *Dissolved solids, *Heavy metals, *Reservoir operation, *Reservoir releases, Bottom sediments, Bottom sampling, Toxicity, Canada, *Boundary Dam Reservoir(Sask), *Lake Wabamun(Sask), *Long Creek(Sask), *Saskatchewan.

Boundary Dam Reservoir, in the suthern Prairie region of Saskatchewan provides condenser cooling water used in thermal electric power generation. The reservoir was formed by damming a typical Prairie stream of generally poor water quality (in terms of dissolved and suspended solids) and intermittent flow. Since 1960, recorded data for dissolved solids show that downstream water quality has been generally better than that of the inflowing stream (when flow occurred) and that no continual trend to higher downstream concentrations has been recorded. Downstream dissolved solids are primarily controlled by: (1) the efficiency of the spring runoff in replacing high dissolved solids winter reservoir water with much lower dissolved solids spring runoff water derived largely from snowmelt; (2) post-runoff loading of salts to the reservoir by the inflowing stream; and (3) sedimentation/precipitation especially in low flow years. In the context of these normal 'Prairie reservoir' processes, the continued effect of forced evaporation is apparently negligible at the generating capacities up to 1977. Toxic metal analyses of water at Boundary were inconclusive because of low concentrations, but bottom sediments showed a tendency for metal concentration behind the dam, a phenomenon common in the reservoirs. Surface sediment concentrations of zinc at Boundary and zinc, lead and copper at Wabamun may be elevated due to the operation of the generating stations but are still of a magnitude commonly found in lakes where no contamination is suspected. (WATDOC)
W78-11189

TRANSVERSE DISPERSION IN MEANDERING CHANNELS,
Canada Centre for Inland Waters, Burlington (Ontario).
B. G. Krishnappan, and Y. L. Lau.
Scientific Series No. 75, 1977, 98 p, 23 fig, 11 ref, 2 tab, 4 append.

Descriptors: *Flow, *Dispersion, *Distribution patterns, *Velocity, *Pollutants, *Natural streams, *Channels, Channel flow, Meanders, Currents(Water), Erosion, Deposition(Sediments), Laboratory tests, Theoretical analysis.

The transverse dispersion process in meandering channels has been studied in the Hydraulics Laboratory of the Canada Centre for Inland Waters and a detailed description of the study is presented in this report. Using the theory of dimensions, it has been established that the dimensionless dispersion coefficient in the transverse direction in meandering channels is a function of the friction factor, ratio of meander amplitude to width and the ratio of width to hydraulic radius. An attempt is made to establish the functional relationship by measuring the dispersion coefficients for various values of the above-mentioned parameters. The meandering channels used for this study has realistic bottom configurations which resulted from the scouring and desposition of the sand forming the bottom of the channels in contrast to the rigid bottom channels used in the previous studies. The dispersion coefficients were evaluated using the Generalized Change of Moment Method, proposed by Holley, with the measured values of the flow depth, velocity and concentration of salt solution, which is used as a tracer solution in this present study. A numerical method has been developed in this study to predict the concentration distribution of a pollutant that is injected continuously into a meandering channel. (WATDOC)
W78-11196

QUALITY OF IRRIGATION WATER AND SURFACE RETURN FLOWS FROM SELECTED AGRICULTURAL LANDS IN NEVADA DURING THE 1974 IRRIGATION SEASON,
Max C. Fleischmann Coll. of Agriculture, Reno, NV.
W. W. Miller, J. C. Guitjens, and C. N. Mahannah.
Journal of Environmental Quality, Vol. 6, No. 2, p 193-200, April-June 1977. 6 fig, 3 tab, 26 ref.

Descriptors: *Return flow, *Water quality, *Irrigation water, *Nevada, Water quality control, Tailwater, Phosphorus, Pollutants.

Agriculture has been identified as a major contributor of pollutants to surface waters. The purpose of this investigation was to gain knowledge of pollutants and pollutant loads carried in surface return flows to receiving waters. Information of this nature is needed by those agencies having administrative responsibility for water quality control. Quantitative and qualitative measurements of irrigation applications (head water) and surface return flows (tail water) were conducted on four sites at three locations in the Carson Valley area of Nevada to investigate the change in pollutant loads of surfave waters entering and leaving agricultural units. Dissolved oxygen (DO), biochemical oxygen demand (BOD), total dissolved solids (TDS), NO3-N, PO4-P, SO4, and turbidity were considered as major constituents of water quality. Concentrations were combined with flow volumes to compute the constituent loading per irrigation and net infiltrated amounts or seasonal contributions in the surface return flow. Phosphorus and BOD were the major agricultural pollutants contributed by irrigation surface return flows. Net infiltrated amounts of TDS, NO3(-)N, and other soluble constituents were recorded. Dissolved oxygen concentrations in head and tail waters were critically low. River standards for DO might be better expressed as a maximum permissible dissolved oxygen deficit for water at a given temperature carrying a given amount of BOD. Additional investigations should be undertaken to delineate possible interactions amoung pollutant constituents. Water quality variations of individual samples should be expressed in statistical terms so that it is possible to identify pollutant interdependencies and to establish an optimized sampling frequency. (Skogerboe-Colorado State)
W78-11199

INORGANIC PHOSPHORUS SPECIES AND TRANSFER MECHANISMS IN SOILS TO SEDIMENTS FOR TWO SMALL KANSAS WATERSHEDS,
Kansas Water Resources Research Inst., Manhattan.
C. W. Kimbrough, C. E. Burkhead, and E. E. Angino.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 955, Price codes: A09 in paper copy, A01 in microfiche. Contribution No. 196, July 1978. 189 p, 27 fig, 13 tab, 146 ref, 6 append. OWRT A-082-KAN(1), 14-34-0001-7035.

Descriptors: *Phosphorus, Soils, *Sediments, Solubility, Phosphorus compounds, Management, Water pollution sources, Transfer mechanisms, Rural watersheds, *Kansas lakes, *Watershed management.

The soils of two small eastern Kansas rural watersheds and the sediments of their catchment basins were sampled during 1976 and 1977. The objective of the study was to determine the nature of the chemical reaction products controlling orthophosphate availability as the sediments were subjected to varying conditions during their movement from the watershed and into the inundated soils of the basins. Samples were collected on the basis of soil use and drainage patterns. Sediments were obtained as undisturbed cores with a sampler developed during this research. Cores were frozen in liquid nitrogen upon collection and thawed just prior to sectioning and drying. Solubility criteria were used to identify the inorganic phosphate compounds in the samples. Cation content and pH appeared to determine the dominant orthophosphate. As acid sediments were transported into areas of limestone outcroppings and into hard waters, phosphorus availability was controlled by the calcium phosphate compounds. In acid soil phosphorus availability was determined by iron (strengite) and aluminum (variscite) phosphates. The eastern shore of one of the lakes had been fertilized with superphosphate for several years in an effort to increase the biomass. Within sediments of this lake, there was uniform availability of phosphate within strata.
W78-11206

BENZIMIDAZOLE FUNGITOXICANTS IN VIRGINIA SOILS: MOVEMENT, DISAPPEARANCE, AND EFFECT ON MICROORGANISMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.
D. B. Janutolo, and R. J. Stipes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 932, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 113, June 1978. 64 p, 12 fig, 11 tab, appendix (13 tab), 45 ref. OWRT A-068-VA(1).

Descriptors: *Fungicides, *Pesticides, Surfactants, Soil thin-layer chromatography, Plant disease control, *Virginia, *Path of pollutants, Water pollution effects, Pollutant identification, *Fungitoxicants, Fungistats, Residues, Benomyl, Benlate, Lignasan BLP, Carbendazim, Plant chemotherapy.

Knowing movement, degradation, disappearance, and effect of a soil-applied pesticide on microorganisms in soil is essential before its widespread usage is permitted. This study sought to: (1) determine the movement benzimidazole fungitoxicants in Appling, Sassafras, Wickham, and Frederick soil types by soil thin-layer chromatography (STLC), soil columns, and in situ models; (2) study the disappearance of soil-applied benzimidazole compounds at different concentrations and soil temperatures; and (3) observe the effect of benzimidazole fungitoxicants on microbial populations. Results by STLC showed that Tween 20 and Tween 80 surfactants moved the compounds farther in distance than water and Span 60 surfactants. The fungitoxicants moved farther in the A horizon than in the B horizon (except in Wickham). Movement of the fungitoxicants through artificially packed laboratory soil columns was greater with Tween 80 than with water for all soils. Benomyl was confined to the top 5 cm of soil when leached with water through in situ columns, while MBCH3PO4 was detected at a 25-cm depth. Without the aid of surfactants, benomyl essentially was immobile in soil, while MBC and its salts had limited mobility. Adding surfactants greatly increased mobility of all compounds. The in situ movement data agreed with the other results. Results indicate that the half-life of MBC in soil is 3-6 months, and its disappearance is more rapid in high-pH soils than in low pH-soils; soil temperature had little effect. Over time, MBCH3PO4 incorporation did not unduly disrupt soil microbial populations. The research suggests that these specific fungitoxicants would not pose a serious problem as soil or water contaminants.
W78-11215

REFRACTORY ORGANIC COMPOUNDS IN TREATED EFFLUENT AND THEIR REMOVAL BY SOIL, MILILANI, OAHU, HAWAII,
Hawaii Univ. Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W78-11220

DREDGING IN ESTUARIES - A GUIDE FOR REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS. SYMPOSIUM/WORKSHOP PROCEEDINGS, MARCH 1977, RESTON, VIRGINIA,
Research Triangle Inst., Research Triangle Park, NC.; and Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2L.
W78-11222

A CRITICAL TECHNICAL REVIEW OF SIX ADDITIONAL HAZARD ASSESSMENT MODELS,
Enviro Control, Inc., Rockville, MD.
A. H. Rausch, R. M. Kumar, and C. J. Lynch.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 198, Price codes: A10 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Report No. CG-D-54-77, March 1977. 202 p, numerous fig, tab, 4 append. DOT-CG-33,377-A.

Descriptors: *Hazards, *Model studies, *Oil spills, *Chemical wastes, Transportation, Dispersion, Water pollution, Reviews, *Outer Continental Shelf, *Hazardous materials, Spreading.

A critical technical review is presented of six simulation models currently being used in connection with the following U.S. Coast Guard research programs; the Vulnerability Model, a simulation system for assessing damage resulting from spills of hazardous materials; the Chemical Hazards Response Information System (CHRIS), as described in Assessment Models in Support of the Hazard Assessment Handbook (AMSHAH); and the Hazard Assessment Computer System (HACS). These research programs are concerned with describing, in a predictive manner, the behavior of maritime spills of hazardous materials and the damages that may result from such spills. The primary objective of this review is to evaluate the validity of the models. (Sinha - OEIS)
W78-11224

EXCHANGE OF MANGANESE, IRON, COPPER, AND ZINC BETWEEN DISSOLVED AND PARTICULATE FORMS IN THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
Oregon State Univ., Corvallis. School of Oceanography.
D. W. Evans.
Available from the National Technical Information Service, Springfield, VA 22161 as RLO-2227 T1211, Price codes: A11 in paper copy, A01 in microfiche. Ph D Thesis, June 1977. 238 p, 24 fig, 21 tab, 185 ref, 3 append.

Descriptors: *Metals, *Water quality, *Baseline studies, Manganese, Iron, Copper, Zinc, North Carolina, Estuaries, Outer Continental Shelf, Newport River Estuary(NC), Exchange processes.

Exchange of manganese, iron, copper, and zinc between solution and particulate phases was studied in the Newport River estuary, North Carolina. Metal analyses were by flameless atomic absorption spectromphotometry, those is solution after concentration by Chelex-100 resin. Longitudinal sampling transects in the estuary in October 1974, and February and April 1975, showed trends of dissolved metal concentrations versus salinity interpretable in terms of exchange of the metals between solution and particulate phases. A simple mixing model explained variations of dissolved metal concentrations within the estuary by river and seawater inputs and outputs and internal sources and sinks relecting the exchange processes. Metal concentrations on suspended particulate matter provided corollary evidence of metal exchanges. (Sinha - OEIS)
W78-11230

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOLUME IX, THE COMPUTER PROGRAM,
Rand Corp., Santa Monica, CA.
J. J. Leendertse, and A. B. Nelson.
Report No. R-2298-RC, April 1978. 90 p, 3 ref, 3 append.

Descriptors: *Water quality, *Water pollution sources, *Computer programs, *Coasts, *Estuaries, Baseline studies, Environmental effects, Resources development, Models, New York, Outer Continental Shelf, Simulation models.

The computer program in its present form can be used to compute the flow and pollutant distributions in a certain region if: the hydrodynamic and transport equations described are representative of the fluid motions and transport of constituents; information is available about depth to a certain reference level; the bathymetry can be approximated with sufficient detail (computer memory and computer time requirements per run are proportional to the second and roughly third power, respectively, of the reciprocal of the space grid size); sufficient data are available for model adjustment; input water level histories at a single boundary at the left side of the model are available for forcing the model; time-varying wind and discharge information is available; and currents are relatively weak and the system quite well dampended so that stability conditions of the advection terms are not exceeded. (See also W76-13093; W76-08317; W75-07042; W72-06980; W73-07935; and W71-04038. (Sinha - OEIS)
W78-11231

LABORATORY AND FIELD STUDIES ON THE LONG-TERM EFFECTS OF PETROLEUM HYDROCARBONS ON BENTHIC MARINE INVERTEBRATES,
Battelle Pacific Northwest Lab., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-11237

GEOCHEMISTRY OF THE MATTOLE RIVER OF NORTHERN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resouces Div.
For primary bibliographic entry see Field 2K.
W78-11255

URBAN STORMWATER RUNOFF DATA FOR A RESIDENTIAL AREA, POMPANO BEACH, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11258

CHEMICAL AND BIOLOGICAL QUALITY OF LAKES FAITH, HOPE, AND CHARITY, AT MAITLAND, FLOIDA, WITH EMPHASIS ON THE EFFECTS OF STORM RUNOFF AND BULK PRECIPITATION, 1971-74,
Geological Survey, Tallahassee, FL. Water Resources Div.
N. G. Gaggiani, and A. G. Lamonds.
Open-file report 77-491, March 1978. 94 p, 7 fig, 23 tab, 12 ref.

Descriptors: *Lakes, *Water quality, *Inflow, *Rainfall, *Storm runoff, Water pollution effects, Nutrients, Algae, Thermal stratification, Dissolved solids, Data collections, Baseline studies, Road construction, Florida, *Maitland(Fla), *Lake Faith, *Lake Hope, *Lake Charity.

Located in a closed basin, near Orlands, Fla., Lake Faith, Hope, and Charity cover a combined area of 132 acres and are surrounded by residential, citrus grove and undeveloped areas. All of these areas affect the water quality of the lakes through storm runoff and transport of windborne material. During a study from April 1971 to June 1974, stages of Lakes Faith, Hope, and Charity declined 1.5, 1.4, and 3.0 ft, respectively, because the rainfall was 3.78 in. below average for the area. Inflow to the lakes during this 3-year period was approximately 1,966 acre-ft of which 84 percent was by rainfall and 16 percent was by storm runoff. Rainfall and runoff brought in 82 tons of dissolved solids of which storm runoff carried 51 tons and bulk precipitation carried 32 tons. Dissolved solids concentrations in the lakes were relatively low, averaging 91, 132, and 212 mg/liter for Lakes Faith, Hope, and Charity, respecetively. Major ions, trace elements and nutrients were present in the lakes in relatively low concentrations. Phytoplankton and coliform population showed sharp seasonal fluctuations with the maximum population generally occurring during the warmer months. Blue-green algae predominated in all three lakes. (Woodard-USGS)
W78-11259

NITRATE-NITROGEN REMOVAL FROM SOIL PROFILES BY ALFALFA,
Southwestern Great Plains Research Center, Bushland, TX.
A. C. Mathers, B. A. Stewart, and B. Blair.
Journal of Environmental Quality, V. 4, No. 3, p 403-405, July-Sept., 1975. 3 fig, 3 tab, 12 ref.

Descriptors: *Nitrates, *Soil profiles, *Alfalfa, Crop response, Leaching, Farm wastes, *Land application, Groundwater quality.

Previously utilized Pullman clay loam plots that had received 0, 22, 45, 112, and 224 metric tons/ha of manure or ammonium nitrate (224 kg N/ha) annually for 3 years were used in a new study to determine the extent that nitrate could be removed by alfalfa. Nitrate-nitrogen and water contents of the soil profile were determined by 30-cm increments to a 6-m depth prior to planting. It was found that the amount of nitrate-nitrogen removed and the removal depth would depend upon such factors as available water and root activity. The depth of nitrate-nitrogen removal will depend on the rooting of the alfalfa. Alfalfa roots can extend to depths greater than 6 m. Alfalfa seems to have the capability to remove nitrate-nitrogen at depths below the rooting depth of most crops. Planting alfalfa on soil high in nitrate-nitrogen could reduce the amounts of nitrate-nitrogen leaching into groundwater. Total nitrogen uptake by alfalfa was directly related to alfalfa yield. (Merryman-East Central)
W78-11277

NUTRIENT DISTRIBUTION IN THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec) Marine Sciences Centre.
For primary bibliographic entry see Field 5C.
W78-11290

VERTICAL AND SEASONAL DISTRIBUTION OF CHLOROPHYLL A IN LAKE MICHIGAN,
Wisconsin Univ.-Milwaukee. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11291

INHIBITION OF PHOTOSYNTHESIS AND NITROGEN FIXATION IN ALGAE BY VOLATILE NITROGEN BASES,
Agricultural Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 5C.
W78-11295

5C. Effects Of Pollution

THE MUSSEL MYTILUS EDULIS AS A BIOASSAY ORGANISM FOR MERCURY IN SEAWATER,
Marine Lab., Aberdeen (Scotland).
I. M. Davies, and J. M. Pirie.
Marine Pollution Bulletin, Vol 9, p 128-132, 1978. 5 fig, 1 tab, 14 ref.

Descriptors: *Mercury, *Bioassay, *Mussels, Path of pollutants, Heavy metals, Metals, On-site data collections, Chemical analysis, Analytical techniques, Water analysis, Animal populations, Growth rates, Water quality, Estuaries, Firth of Forth, Scotland.

Surveys of natural populations of mussels have identified areas of mercury contamination in the Firth of Forth, Scotland. A field bio-assay technique has been devised which accurately reflects the mean total mercury concentration in the surrounding seawater. The detection limit of the technique is estimated at 5-20 nanograms Hg l.-1., and consequently, the method can detect comparatively small enhacements over background mercury concentrations, in estuarine and sea water. (EIS-Deal)
W78-10537

THE AMOCO CADIZ OIL SPILL,
Cremer and Warner, London, (England).
A. J. O'Sullivan.
Marine Pollution Bulletin, Vol 9, p 123-128, 1978. 2 fig, 1 ref.

Descriptors: *Oil, *Oil spills, *Oil pollution, *Disasters, Organic compounds, Water pollution effects, Water pollution sources, Water birds, Aquatic populations, Beaches, Coasts, Commercial shellfish, Algae, Wildlife, Economic impact, *Crude oil, *Oil tankers, *Amoco cadiz, Brittany Coast.

This report gives a preliminary account of the events surrounding the wreck of the Amoco Cadiz on the Brittany coast in March, which caused the most massive oil pollution on record. The initial effects of the oil on sheltered coves, sandy shores, vegetation, wildlife, and the regional economy are discussed. An outline of studies being undertaken on the long-term effects of the spill is presented.
W78-10538

EFFECTS OF NO. 2 FUEL OIL ON COMMON EIDER EGGS,
Fish and Wildlife Service, laurel, MD. Patuxent Wildlife Research Center.
P. H. Albers, and R. C. Szaro.
Marine Pollution Bulletin, Vol 9, p 138-139, 1978. 1 tab, 17 ref.

Descriptors: *Oil, *Oil spills, *Oil pollution, *Toxicity, *Common Eider Duck, *Bird eggs, Mortality, Waterfowl, Embryonic growth, Stage, Clutch, Nests, Organic compounds, Water pollution effects, Path of pollutants, Reproduction, Hatching, Nesting, *No. 2 Fuel Oil.

An oil spill near a breeding colony could result in the transfer of oil from the plumage and feet of incubating birds to their eggs. Microlitre amounts of No. 2 fuel oil were applied externally to common eider eggs in an island breeding colony in Maine. Clutches of eggs treated with 20 microliters of fuel oil had significantly greater embryonic mortality than the control clutches when they were examined 7 days after treatment. The results are similar to those of an earlier study of artificially incubated common eider eggs and indicate that nest site conditions do not affect embryo-toxicity of No. 2 fuel oil. (EIS-Deal)
W78-10539

EFFECT OF QUATERNARY AMMONIUM COMPOUNDS ON SOME AQUATIC PLANTS,
Canterbury Univ., Christchurch (New Zealand). Dept. of Botany.
J. R. L. Walker, and S. Evans.
Marine Pollution Bulletin, Vol. 9, p 136-137, 1978. 2 fig, 1 tab, 5 ref.

Descriptors: *Ammonium compounds, *Algicides, *Chlorella, *Toxicity, Ammonia, Algae, Growth rates, Mortality, Cytological studies, Chlorophyta, Aquatic plants, Surfactants, Bioassay, Plant pathology, Plant physiology, Mortality, *Duckweed, Quaternary ammonium compound.

The toxic effects of various types of quaternary ammonium compound (QAC) upon a unicellular green alga (Chlorella sp.) and a duckweed (Spirodela oligorhiza) have been investigated. In general all types of QAC suppressed plant growth when present at concentrations above 10 to the -5th power M (approximately 3-5 ppm). With the duckweed sublethal levels of QAC caused yellowing or browning of the frond margins and the production of smaller sized fronds, whilst with Chlorella QAC's affected both the size, shape and internal organization of the cell; death appeared to be due to disruption of the chloroplast structure. (EIS-DEAL)
W78-10540

APPARATUS FOR THE CONTINUOUS DISSOLUTION OF POORLY WATERSOLUBLE COMPOUNDS FOR BIOASSAYS,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 5A.
W78-10541

COMPOSITION AND SOURCES OF POLLUTANT HYDROCARBONS IN THE SEVERN ESTUARY,
Bristol Univ. (England). Organic Geochemistry Unit.
For primary bibliographic entry see Field 5B.
W78-10542

HEPATIC STORAGE ALTERARION OF VITAMIN B12 BY CADMIUM IN A FRESHWATER FISH,
European Atomic Energy Community, Ispra (Italy). Dept. of Physical and Natural Sciences.
M. Merlini.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, p 767-771, 1978. 2 tab, 8 ref.

Descriptors: *Cadmium, *Fish physiology, *Sunfishes, *Toxicity, *Vitamins, Animal metabolism, Mode of Action, Freshwater fish, Biochemistry, Metabolism, Nutrients, Heavy metals, Metals, Water pollution effects, Tissue analysis, Liver, Bioaccumulation.

The antimetabolic effect of cadmium on hepatic and renal metabolism of vitamin B12 was examined. Controlled studies using immature sunfish demonstrated that the presence of cadmium sulfate resulted in a decreased hepatic storage of vitamin B12. The cadmium acted to stimulate biliary excretion of the vitamin into the intestine and elimination through the gills. Renal activity was not found to be significantly altered. (EIS-Deal)
W78-10543

THE USE OF PERIPHYTON AS A MONITOR OF TRACE METALS IN TWO CONTAMINATED INDIANA LAKES,
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.
G. D. Johnson, A. W. McIntosh, and G. J. Atchison.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, p 733-740, 1978. 2 fig, 3 tab, 19 ref.

Descriptors: *Eutrophication, *Periphyton, *Bioindicators, *Cadmium, *Zinc, Monitoring, Trace elements, Metals, Lentic environment, Industrial wastes, Sediments, Algae, Water pollution effects, Path of pollutants, *Methodology.

The results of this study are inconclusive as to whether or not periphyton is a reliable biological indicator of trace metal pollution in all lentic ecosystems. However, evidence indicates that where great differences exist in metal levels in water, periphyton may be a useful monitor. The presence of certain species in both lakes in areas of highest contamination may indicate a tolerance on the part of those species. (EIS-Deal)
W78-10545

TRENDS IN PCB CONTAMINATION IN DUTCH COASTAL AND INLAND FISHERY PRODUCTS 1972-1976,
Rijksinstituut voor Visserijonderzoek, Ymuiden (Netherlands).
For primary bibliographic entry see Field 5B.
W78-10546

SOME OBSERVATIONS UPON THE CHEMICAL COMPOSITION OF THE STARFISH ASTERIAS RUBENS L., WITH PARTICULAR REFERENCE TO STRONTIUM UPTAKE,
London Univ (England). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-10547

EVALUATION OF ANHYDROUS AMMONIA FOR FISHERY MANAGEMENT USES,
Texas Parks and Wildlife Dept., Ingram.
J. A. Prentice, P. P. Durocher, and D. L. Pritchard.
In: Proceedings of the Thirtieth Annual Conference, Southeastern Association of Fish and Wildlife Agencies, October 24-27, 1976, Jackson, Mississippi, p 88-89. 7 fig, 5 tab, 15 ref.

Descriptors: *Ammonia, *Fish management, *Herbicides, *Toxicity, *Mortality, *Fishkill, *Toxins, *Benthic fauna, *Fish behavior, *Catfish, *Channel catfish, *Bass, *Sunfishes, Nitrogen compounds, Benthos, Water temperature, Piscicides, Aquatic plants, Water quality, On-site investigations, Seasonal.

Anhydrous ammonia was applied to ponds at average rates of 18-40 ppm to evaluate its use as a fish toxicant and aquatic herbicide. Ponds contained toxic levels of ammonia for 3-4 weels after applications, depending on concentration, water temperature, and other factors. A regression model was developed to estimate specific dissipation times. Application of 15 ppm ammonia effected a high percent mortality to all fish species observed. Complete fish kills occurred at approximately 30 ppm ammonia. Any concentration above 15 ppm temporarily controlled most vegetation, regardless of season. Benthic organisms were reduced but not eliminated by any treatment. Anhydrous ammonia was found to be relatively inexpensive compared to other fish toxicants and aquatic herbicides. (EIS-Katz)
W78-10549

A COMPARISON OF HYDROCARBONS IN ANIMALS AND THEIR BENTHIC HABITATS,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5B.
W78-10550

THE USE OF STIGEOCLONIUM SUBSECUNDUM (CHOLOROPHYCEAE) AS A BIOASSAY ORGANISM--III. RESPONSE TO INTERMITTENT CHLORINATION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
D. M. Trotter, A. C. Hendricks, and J. Cairns.
Water Research, Vol. 2, p 371-375, 1978. 4 fig, 1 tab, 17 ref.

Descriptors: *Cytological studies, *Toxicity, *Seasonal, Organic compounds, Water analysis, Water quality, Chemical analysis, Growth rates, Carbon, Analytical techniques, Solvents, Mammals, Rodents, *Acetone, *Ethanol, *Chloroform, *Methylene chloride.

The toxicity of intermittent chlorination to an attached filamentous green alga was found to be related to the biomass of the alga at the beginning of the bioassay. Minimal resistant biomass was a term used to describe the lowest biomass of algae able to survive and continue to grow when subjected to a specific level of chlorine at intervals of 6 h for a period of one week. This ability to survive was due to changes in the morphology of the algal filaments and the algal mat. (EIS-Deal)
W78-10551

STUDIES ON THE ANEMIA OF FISH - VIII. HEMORRHAGIC ANEMIA OF CARP CAUSED BY A HERBICIDE, MOLINATE,
Freshwater Fisheries Research Lab., Tokyo (Japan).
H. Kawatsu.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43(8), 1977, p 905-912, 2 tab, 4 fig, 11 ref.

Descriptors: *Herbicides, *Toxicity, *Mortality, Bioassay, Water pollution effects, Carp, Laboratory tests, Sulfur compounds, Fish pathology, Fish physiology, Growth, Molinate, Ordram, *Hemorrhagic anemia, Hematology, *Histology, Hemoglobin.

The toxicity of the herbicide, molinate, to carp was studied. The 21-day lethal concentration for the animal was estimated at 0.18 ppm. Anemia was found in carp exposed to molinate. This anemia was characterized with a drastic decrease in RBC and Hb levels. In blood smear preparations of carp with anemia, increase in number of immature erythrocyte was observed. However, no cytopathological change was found in their erythrocytes. Microaneurysm and punctate hemorrhage were frequently observed in the gill of anemic carp. Histologically, these alterations consisted of swelling of gill lamella, dilation and PAS-positive-thickening of capillary walls, and deterioration of pillar cells. No hemosiderin was demonstrated in the spleen of carp with anemia. Thus, it is concluded that herbicide molinate evoked anemia in carp, and this anemia was due to loss of blood resulting from the alteration of gill-capillary wall. (See also W74-12736) (EIS-Katz)
W78-10552

DDE AND PCBS IN EGGS OF NORWEGIAN SEABIRDS,
Tromso Univ., (Norway). Inst. of Biology and Geology.
For primary bibliographic entry see Field 5B.
W78-10553

THE IMPACT OF FRENCH NUCLEAR INSTALLATIONS ON THE AQUATIC ENVIRONMENT, IMPACT DES INSTALLATIONS NUCLEAIRES FRANCAISES SUR L'ENVIRONNEMENT AQUATIQUE,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Section de radioecologie.
J. C. Amiard.
Vie Milieu, Vol. XXVI, fasc. 2, ser B., p 319-340, 1976.

Descriptors: *Water pollution effects, *Aquatic environment, Nuclear energy, *Nuclear power plants, Nuclear reactors, *Nuclear wastes, Radioactive wastes, Radioecology, *Radioactive pollution, *France, Marine environment.

The different sources of radioactive pollutions of the aquatic environment due to industrial utilization of nuclear energy are reviewed. Data, available in the literature, concerning radioactive pollution measurements of marine and freshwater environments are synthesized. Problems which may arise in a near or distant future because of nuclear energy utilization are then approached, and the major lacks in radioecology are listed. (EIS-Katz)
W78-10555

REPRODUCTIVE PARAMETERS AND EGG CONTAMINANT LEVELS OF GREAT LAKES HERRING GULLS,
Canadian Wildlife Service, Ottawa (Ontario). Toxic Chemical Section.
For primary bibliographic entry see Field 5B.
W78-10556

HYDROLYSIS AND PHOTOLYSIS OF THE LAMPRICIDE 2', 5-DICHLORO-4'-NITROSALICYLANILIDE (BAYER 73),
Fish and Wildlife Service, Warm Springs, GA. Southeastern Fish Control Lab.
D. P. Schultz, and P. D. Harman.
Investigation in Fish Control, No. 85, p 1-5, 3 tab, 1 fig, 6 ref. 1978.

Descriptors: *Water pollution effects, *Chemical analysis, Laboratory tests, Hydrolysis, *Degradation(Decomposition), Methodology, Hydrogen ion concentration, *Toxicity, Piscicides, Bayer 73, *Lampricide, 2'-5 Dichloro-4'-Nitrosalicylanilide, Degradation products.

The hydrolysis and photolysis of the lampricide Bayer 73 was studied by using 14C-Bayer 2353 (the non-salt form of Bayer 73). No hydrolysis of 14C-Bayer 2353 occurred in pond water or in distilled water buffered at pH 5.0, 6.9, or 8.7 after 56 days. During exposure to long-wave UV light, 14C-Bayer 2353- degraded rapidly on silica gel thin layer chromatographic plates and on glass slides. After exposures of 24 h and 168 h, less than 50 and 5%, respectively, of the remaining radioactivity was parent-compound. After exposure of an aqueous solution of 14C-Bayer 2353 to long-wave UV light for 14 days, only 5% of the remaining radioactivity was parent compound. (EIS-Katz)
W78-10557

CHRONIC AND SIMULATED USE-PATTERN EXPOSURES OF BROOK TROUT (SALVELINUS FONTINALIS) TO 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM),
Fish and Wildlife Service, Columbia, MO. National Fisheries Research Lab.
W. P. Dwyer, F. L. Mayer, J. L. Allen, and D. R. Buckler.
Investigations in Fish Control No. 84, p 1-6, 7 tab, 30 ref. (1978).

Descriptors: *Brook trout, Bioassay, *Mortality, *Toxicity, Freshwater fish, *Laboratory test, Great Lakes, Lake fisheries, Lampreys, Fish physiology, Growth, Reproduction, Fish eggs, Juvenile fish, *TFM, 3-Trifluoromethyl-4-nitrophenol, Sea Lamprey, Petromyzon marinus.

Effects of the lampricide (TFM) on brook trout (Salvelinus fontinalis) were compared under conditions of continuous (chronic) exposure, and under conditions simulating those used in the application of TFM in tributary streams of the Great Lakes for control of the sea lamprey (Petromyzon marinus). Chronic exposure of adult brook trout to concentrations of 4.0 mg/l or higher caused deleterious effects on growth, spawning, survival during spawning, and eye condition. Hatchability and viability of the eggs were reduced. Growth and survival were reduced in the fry at TFM concentrations of 1.6 mg/l or higher. No deleterious effects were noted at lower concentrations. The only effect observed in fish after simulated use-pattern exposure to TFM was a decrease in survival of adults tested at 15C. (EIS-Katz)
W78-10558

SURVIVAL OF TWO SPECIES OF FRESHWATER CLAMS, CORBICULA LEANA AND MAGNONAIAS BOYKINIANA, AFTER EXPOSURE TO ANTIMYCIN,
Fish and Wildlife Service, La Crosee, WI. Fish Control Lab.
L. L. Marking, and J. H. Chandler, Jr.
Investigations in Fish Control, No. 83, 1978, p 1-5, 4 tab, 13 ref.

Descriptors: Molluscs, *Clams, *Benthos, *Toxicity, Mortality, Bioassays, Laboratory tests, Methodology, On-site investigations, *Antimycin A, *Asiatic clam, Corbicula, Magnonaias, Latent mortalities, Flow through Bioassay.

The Asiatic clam, Corbicula leana Prime, and a clam native to the southern United States, Magnonaias Boykiniana, were exposed to the fish toxicant antimycin at several concentrations for various periods and then placed in an untreated earthen pond for posttreatment observation. Both species survived the concentrations and exposure periods usually used in field application. However, latent mortalities were observed in the pond 3 months after a 30-day flow-through exposure of Carbicula to 3.6 to 30 ug/l of antimycin. A single treatment (2 ug/l) in an earthen pond did not result in significant mortalities of Corbicula during 22 weeks. (EIS-Katz)
W78-10559

RETENTION OF SMALL PARTICLES BY THE GILLS OF THE JAPANESE OYSTER (IN JAPANESE),
Hiroshima Prefecture Fisheries Experiments Station, Ondo (Japan).
For primary bibliographic entry see Field 5B.
W78-10560

THE EFFECT OF METHYLMERCURIC CHLORIDE, CADMIUM CHLORIDE, AND LEAD NITRATE ON SIX BIOCHEMICAL FACTORS OF THE BROOK TROUT (SALVELINUS FONTAINALIS),
Environmental Research Lab.-Duluth, MN.
G. Christensen, E. Hunt, and J. Fiandt.
Toxicology and Applied Pharmacology, Vol. 42, p 523-530, 1977. 3 tab, 20 ref.

Descriptors: *Brook trout, Metals, *Mercury, Cadmium, Lead, Bioassay, Toxicity, *Water pollution effects, Biochemistry, Laboratory tests, *Fish physiology, Pathology, *Methylmercury chloride, *Cadmium chloride, *Lead nitrate, Tissue residues, *Threshold indices of toxicity.

The effect of methylmercuric chloride, cadmium chloride and lead nitrate on six biochemical factors of the brook trout (salvelinus fontinalis). Brook trout were exposed to experimental water concentrations of methylmercuric chloride at concentrations from 0.01 to 2.93 ug of Hg/liter, to cadmium chloride from 0.06 to 6.35 ug of Cd/liter, and to lead nitrate from 0.90 to 474 ug of Pb/liter. Exposures were for 2- and 8-week periods. Fish weight and length, hemoglobin, and blood plasma sodium, chloride, glucose, glutamic oxalacetic transaminase, and lactic dehydrogenase were measured. The following observed changes were statistically significant: increases in plasma sodium and chloride and decreases in hemoglobin and glutamic oxalacetic transaminase caused by lead; increases in plasma chloride and lactic dehydrogenase activity and a decrease in plasma

glucose caused by cadmium; and increases in hemoglobin and plasma sodium and chloride caused by methylmercury. Comparisons were made between these biochemical findings and published data from bioassay and tissue-residue studies regarding the determination of threshold indices of toxicity. (EIS-Katz)
W78-10561

ZOOTOXICOLOGICAL ESTIMATION OF WASTE ACCOMPANYING THE PRODUCTION OF PHOSPHATES (AQUATIC ENVIRONMENT), (IN POLISH),
W. Ogrodowczyk.
Prace Morskiego Instytuto Rybackiego, Vol 18, Series A, p 7-48, 23 tab, 10 fig, 21 ref. (English and Russian summaries) (1976).

Descriptors: *Mine wastes, Mineral industry, *Toxicity, *Bioassay, Methodology, Water pollution effects, *Environmental effects, *Phosphates, Phosphorous, Compounds, Trace elements, Oligochaetes, Hydrogen ion concentration, Water pollution effects, Fertilizers, Gypsum, *Phosphogypsum, Lumbricus.

The author determined the threshold concentration (C 50/t) both for the phosphogypsum as a whole and the analytically separated components which caused fatal shock to test objects in different periods of resorption. The toxicity of a phosphogypsum composed experimentally in the laboratory according to the results of the analysis was also studied. The toxico-dynamic characterization of phosphogypsum and its environmental toxicity was worked out on a simplified laboratory model of an aquatic ecosystem with a population of Lumbriculus variegatus Muller. The soluble components forming the toxicological complex of Phosphogypsum were identified. (EIS-Katz)
W78-10562

A REVIEW OF THE RESTORATION OF STREAM GRAVEL FOR SPAWNING AND REARING OF SALMON SPECIES,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W78-10563

EFFECTS OF MARBLE CUTTING AND POLISHING INDUSTRIES WASTEWATER DISPOSAL (WESTERN SICILIAN COAST) ON THE PHITOBENTHOS COMMUNITIES AND ON THE YELD OF TUNA FISHING WITH TUNA FISHING TRAPS (IN ITALIAN),
A. Gianguzza, M. Sortino, G. Giaccone, and G. Dia.
Memorie di Biologica Marina e di Oceanografia, N.S. Vol. 6(6), 1976, p 249-276, 7 tab, 4 fig, 16 ref. (English summary).

Descriptors: *Commerical fish, *Commercial fisheries, *Marine fish, *Mine wastes, Mineral industry, *Sediments, Benthic algae, Hydrogen ion concentration, Water pollution effects, Turbidity, Industrial wastes, *Tuna, Tuna fishery, *Marble cutting, *Marble polishing, Tuna traps, Western Sicily.

Studies on the effects of marble cutting and polishing industries waste-water disposal (western Sicilian coast) on the phytobenthos communities and on the yield of tuna fishing with tuna traps are reported. Waste-water disposal has given rise to increased turbidity and perturbations on the sediments rhythm and composition. Sea waters pH values and HCO3-CO3- relation near sludges disposal are changed. Phytobenthos communities are significantly impaired and changed. Effects on the occurrence, behavior of tunas and on the tuna fishing trends with S. cusumano and Bonagia tuna traps are not in evidence. (EIS-Katz)
W78-10564

THE HYDROPSYCHE TOXICITY TEST, TESTED WITH FENETH CARB, DER HYDROPSYCHE-TOXIZITATSTEST, ERPROBT AN FENETHCARB,
Landensanstalt fuer Unweltschultz (Baden-Wurttemberg, Karlsruhe (West Germany).
For primary bibliographic entry see Field 5A.
W78-10566

THE DYNAMICS OF LIPIDS AND DDT IN DEVELOPING BROOK TROUT EGGS AND FRY,
Purdue Univ., Lafayette. Dept. of Bionucleonics.
G. J. Atchison.
Journal of Great Lakes Research, Vol. 2(1), p 13-19, 1976. 3 fig, 17 ref.

Descriptors: *Brook trout, Bioassay, Toxicity, Mortality, *DDT, *Fish eggs, *Juvenile fish, Laboratory tests, *Radioisotopes, Methodology, Lipids, *Brook trout eggs, Radioactive carbon, *Egg yolk.

Adult brook trout, Salvelinus fontinalis, were fed p, p'-DDT-3H and linolenic acid-1-14C. Eggs obtained from these fish were fertilized and incubated. The movement of 14C and 3H from the oil droplet and yolk to the embryonic body was followed. The yolk, not the oil droplet, was found to be the main storage site for DDT. Utilization of the triglyceride oil droplet began at hatching. (EIS-Katz)
W78-10567

SPORT FISHING AT A THERMAL DISCHARGE INTO LAKE MICHIGAN,
Argonne National Lab., IL. Radiological and Environmental Research Div.
S. A. Spigarelli, and M. M. Thommes.
Journal of Great Lakes Research Vol. 2(1) p 99-110, 1976 6 tab. 17 ref.

Descriptors: *Lake Michigan, *Freshwater fish, *Trout, *Salmon, Thermal pollution, *Thermal powerplants, Thermal water, *Sport fish, *Sport fishing, Nuclear power plants, Nuclear reactors, Nuclear wastes, Recreation, *Point Beach Nuclear Plant, Catch-per-unit-effort, Fishing effort, Total catch, Fishing pressure, Economic value.

Sport fishing censuses were conducted during 1972 and 1973 at the Point Beach Nuclear Plant on Lake Michigan (Two Rivers, Wisconsin). The objectives of this study were to describe the fishery at a typical shoreline thermal discharge into the upper Great Lakes and to make comparisons with reference fisheries in unheated areas. Extensive sport fishing at this power plant resulted in a relatively large catch of trout (4 species) and sporadic catches of salmon and non-salmonid species. Species composition of the catch and catch per-unit-effort varied daily and seasonally and generally reflected trends in reference fisheries. A comparison between years showed increased fishing effort, total catch, and proportion of trout in 1973, while success (catch-per-unit-effort) decreased. Despite this heavy fishing pressure, catch-per-unit-effort was generally higher at Point Beach than in reference shoreline fisheries. The economic value of thermal discharge fisheries on Lake Michigan is estimated using available value and expenditure data. (EIS-Katz)
W78-10568

DISTRIBUTION OF MACROBENTHIC SPECIES IN LAKE ONTARIO IN RELATION TO SOURCES OF POLLUTION AND SEDIMENT PARAMETERS,
National Field Investigations Center-Cincinnati, OH.
T. F. Nalepa, and N. A. Thomas.
Journal of Great Lakes Research Vol. 2(1) p 150-163, 1976. 1 tab, 4 fig, 22 ref.

Descriptors: *Lake Ontario, Water pollution sources, *Water pollution effects, *Sediments, *Oilgochaetes, Amphipods, Eutrophic, Nutrients, *Benthos, Invertebrates, Sediment distribution, Sands, Silts, *Pontoporeia affinis, *Stylodrilus heringianus, *Limnodrilus hoffmeisteri, Toronto, Niagara River.

Bottom samples were collected in Lake Ontario during the International Field Year for the Great Lakes (IFYGL) in November 1972. Samples were collected in triplicate at 55 stations located throughout the lake. Oligochaetes and the amphipod Pontoporeia affinis accounted for 92% of all organisms collected. The former group dominated the shallow areas while the latter dominated the intermediate and deep-water zones. Stylodrilus heringianus and Limnodrilus hoffemisteri were the most widely distributed species, being collected at 51 of the 55 stations. The most obviously eutrophic areas were near the mouth of the Niagra River and off Toronto. These areas were characterized by high oligochaete densities dominated by either L. hoffmeisteri and T. tubifex. Mesotrophic conditions were evident along the southern shoreline from the mouth of the Niagra River to Rochester, New York. Stylodrilus heringianus, L. hoffmeisteri, T. tubifex and P. affinis were significantly related to some of the measured sediment parameters in either the intermediate or deep-water areas. (EIS-Katz)
W78-10569

HARMFUL EFFECT OF AMMONIA ON GROWTH OF THE BRINE SHRIMP ARTEMIA SALINA AND INHIBITION OF AMMONIA ACCMULATION WITH AN ALGA CHLORELLA (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Fisheries Lab.
H. Hanaoka.
Bulletin of Plankton Society of Japan, Vol. 24(2), 1977, p 23-31, 1 tab, 9 fig, 5 ref. (English summary).

Descriptors: *Aquiculture, *Ammonia, Ammonium compounds, Bioassay, Toxicity, Growth, Foods, *Phytoplankton, Zooplankton, *Brine shrimp, Chlorella, Protein, Fish hatchery, Algae, Artemia salina.

More than 100 ug-atms/l of ammonia inhibited food ingestion of the brine shrimp, and kept the food ingestion rate at 1/3-1/2 of the normal rate. Digestibility of food by the brine shrimp also showed a tendency to decrease by the presence of ammonia in the culture water. Adding of Chlorella showed a notable effect to decrease ammonia concentration in the water. Culture of the brine shrimp mixed with Chlorella inhibited accumulation of ammonia and kept it at low level under 50 ug-atm/l. Culture of the brine shrimp with a dry food WAKAMOTO in water containing Chlorella is considered to be a simple and efficient way to keep the growth rate at good levels. (EIS-Katz)
W78-10570

CHANGE IN FISH TOXICITY OF LAS DURING BIODEGRADATION, (IN JAPANESE),
Lion Fat and Oil Co. Ltd., Tokyo (Japan)
K. Oba, T. Sugiyama, K. Miura, and Y. Morisaki.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43(8), p 1001-1008, 1977. 3 tab, 11 fig, 15 ref. (English summary).

Descriptors: *Toxicity, *Mortality, Bioassay, Water pollution effects, Path of pollutants, Domestic wastes, *Surfactants, *Detergents, Degradation(Decomposition), *Linear alkyl sulfonates, Laboratory equipment, Chemical analysis, Japanese rice fish, Oryzias.

In case of evaluating possible effects on fish of lower levels of anionic surfactants present in the natural aquatic environment, the authors thought that it was necessary to examine the effect of LAS on Japanese killifish, Oryzias latipes, in a dynamic

system taking into account molecular change caused by biodegradation. Considering the decrease in surfactant molecules and the changes in the distribution of the homologues and isomers of LAS (linear alkylbenzene sulfate), the influence of LAS in the course of biodegradation on the mortality and hatchability of Japanese killifish was determined using a continuous flow river model. And the results were compared with the case of intact LAS in a static bioassay system. It was shown that biodegraded LAS was less toxic for every stage of killifish in the river model than was intact LAS in the static bioassay. The longer alkyl chain homologues and external phenyl isomers, although more toxic for fish, were more rapidly biodegraded. (EIS-Katz)
W78-10571

MONITORING OF THE ACCUMULATION OF ORGANO CHLORINES IN FISH (UBERWACHUNG DER SPEICHERUNG VON CHLORIERTEN KOHLENWASSERSTOFFEN IM FISCH,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Inst. fuer Kuesten- und Binnenfischerei.
For primary bibliographic entry see Field 5B.
W78-10572

MARINE POLLUTION IN SURUGA BAY AND ASSOCIATED ENVIRONMENTAL CHANGE IN RELATION TO FISHERIES (IN JAPANESE),
M. Uda, T. Nakao, and A. Kishi.
Journal of the Faculty of Marine Science and Technology, Tokai University, Vol. 10, p 147-174, 1977. 20 fig, 3 tab, 28 ref, (English summary).

Descriptors: *Water pollution effects, Commercial fisheries, Industrial wastes, *Pulp and paper industry, *Pulp wastes, *Path of pollutants, Water quality, Aquiculture, Domestic wastes, Monitoring, Marine fish, Marine fisheries, On-site investigation, *Ocean currents, *Suruga Bay, Japan, Tagonoura Harbor, Field surveys, *Kuroshio current.

In order to study the actual state of marine pollution in Suruga Bay due to the effluents of pulp-mill sludge water and other complex industrial wastes together with domestic wastes, surveys were carried out during the years 1971-76 on and around the coasts of the bay. During the years 1971-76 the condition of the fisheries, which had been very badly damaged, have recently been improving with the approach and intrusion of the Kuroshio branch current together with the strict control of industrial and domestic wastes. However, more comprehensive monitoring and management through recycling of waste resources and wise energy utilization is needed for complete protection from marine pollution in Suruga Bay in future, even when the remote-flowing Kuroshio current shifts to a different phase. (EIS-Katz)
W78-10573

TEMPERATURE TOLERANCE OF YOUNG ROCKFISH, SEBASTES THOMPSONI (JORDAN ET HUBBS) (IN JAPANESE),
K. Ouchi.
Bulletin of the Japanese Regional Fisheries Research Laboratory, Vol. 28, p 1-8, 1977. 4 tab, 2 fig, 10 ref. (English summary).

Descriptors: *Marine fish, *Water temperature, *Commercial fish, Water pollution effects, Bioassay, Mortality, Fish physiology, *Stress, Juvenile fish, Perch, Rockfish, Sebastes, *Upper incipient lethal temperature, *Ultimate upper lethal temperature, Upper thermal tolerance zone, *Temperature tolerance.

For young rockfish, Sebastes thompsoni (Jordan et Hubbs), acclimated to temperatures between 10 and 25C, the upper incipient lethal temperature (defined as the temperature at which 50% of fish die after 24 h) ranged between 25.6 and 28.8C, and it was observed that the ultimate upper lethal temperature was about 28.6C. The upper thermal tolerance zones for the fish were 334 degrees Centigrade squared; and the thermal tolerance (sum of upper and lower thermal tolerance zones) was 701 degrees Centigrade squared, being estimated by the Edsall et al.'s regression equation. In comparison of these values of the fish to those of North American fishes, it was revealed that the temperature tolerance of the fish was closely similar to that of Perca flavescens (Family Percidae). (EIS-Katz)
W78-10574

LOCOMOTOR ACTIVITY OF THE BLUEGILL LEPOMIS MACROCHIRUS: HYPERACTIVITY INDUCED BY SUBLETHAL CONCENTRATIONS OF CADMIUM, CHROMIUM AND ZINC,
Tulane Univ., New Orleans, LA. Dept. of Biology.
E. G. Ellgaard, J. E. Tusa, and A. A. Malizia, Jr.
Journal of Fish Biology, Vol. 1, p 19-23, 1978. 1 tab, 1 fig, 8 ref.

Descriptors: *Metals, *Cadmium, *Chromium, *Zinc, Water pollution effects, *Fish behavior, Fish physiology, Bioassay, Mortality, Laboratory tests, Methodology, Sunfish, Fish pathology, *Locomotor activity, *Bluegill sunfish, Lepomis macrochirus, *Sublethal concentrations.

A quantitative description of the effects of sublethal concentrations of cadmium, chromium, and zinc on the swimming activities of the bluegill is presented. Locomotor activities of fish in 0.1 and 0.25 mg l-1 cadmium are respectively 1-5 and 7-8 times the activities of control fish. Fish in 0.5 mg l-1 cadmium, a concentration killing 30% in two weeks, were less active than controls. Fish in 0.05, 2.4 and 24.0 mg l-1 chromium were respectively 1-2, 3-6 and 6-5 times as active as controls. Fish in 0.1 and 5.0 mg l-1 zinc were respectively 1.3 and 3.8 times as active as controls. Thus, metals effect hyperactive locomotor responses by the bluegill in a concentration-dependent relationship. (EIS-Katz)
W78-10575

FINDING OF A DINOFLAGELLATE AS A LIKELY CULPRIT OF CIGUATERA,
Tohoku Univ., Sendai (Japan). Lab. of Food Hygiene.
T. Yasumoto, I. Nakajima, R. Bagnis, and R. Adachi.
Bulletin of the Japanese Society of Scientific Fisheries Vol. 43(8), p 1021-1026, 1977. 1 tab, 2 fig, 7 ref.

Descriptors: Chemical analysis, *Methodology, *Toxicity, *Public health, *Commercial fish, Commercial fisheries, Marine fish, Pacific Ocean, Food chain, *Toxins, Foods, Marine algae, *Dinoflagellates, *Ciguatera, French polynesia, Gambier Islands, Toxicology, Diplosalis.

Experiments were designed to see whether a dinoflagellate, Diplopsalis sp. nov. found in a toxic sample of detritus collected from a ciguatera-endemic area is the cause of ciguatera. The dinoflagellate in the detritus was separated from other materials. Bioassay of the dinoflagellate-rich samples thus obtained proved that the toxicity of each sample was proportionally related to the number of the dinoflagellate cells in the sample. Subsequent extraction of the dinoflagellate sample afforded two major toxins: a diethyl ether soluble toxin and an acetone precipitable toxin. The former toxin was judged to be identical, or closely related, to ciguatoxin, a major toxin in ciguatera, on the basis of various column and thin layer chromatographic properties. A close similarity was also observed between the acetone precipitable toxin and maitotoxin, a secondary toxin isolated from ciguateric surgeonfish. Judging from these results, it was concluded that Diplopsalis spp. nov is very likely to be the cause of ciguatera. (EIS-Katz)
W78-10576

A SURVEY OF COMPARATIVE TOXICITY IN THE FOOD CHAIN CIGUATERA,
Tohoku Univ., Sendai (Japan) Lab. of Food Hygiene.
T. Yasumoto, R. Bagnis, S. Thevenin, and M. Garcon.
Bulletin of the Japanese Society of Scientific Fisheries Vol. 43(8), 1977. p 1015-1019, 3 tab, 7 ref.

Descriptors: *Toxicity, *Public health, *Commercial fish, Commercial fisheries, Pacific Ocean, Food chain, Food habits , *Food webs, *Food toxins, Marine fish, Molluscs, Marine algae, Coral, Diseases, Mullet, Dinoflagellates, *Ciguatera, French polynesia, Gambier Islands, Toxicology.

In order to elucidate the transmission of ciguatoxin through the food chain and thus determine the primary source of the toxin, fish and molluscs of various feeding habits were collected from three ciguatera-endemic areas of French Polynesia. The specimens included carnivores, herbivores, surface grazers, coral feeders, sediment feeders, and filter feeders. Despite such diversity in feeding habits, al the fish specimens were more or less toxic by our screening method for ciguatoxin. The molluscs were nontoxic. Subsequent tests on the diets of these fish disclosed strong toxicity in a sample consisting of algae and detritus collected from the sruface of dead coral of the Gambier Islands. Microscopic observation revealed the presence of large number of species of dinoflagellate in this sample. Comparison of similar samples from other places indicated that the dinoflaellate might be the cause of the toxicity. (EIS-katz)
W78-10577

STUDIES ON THE BIOMASS DISTRIBUTION OF AQUATIC MASSES IN THE SELF PURIFYING SECTION OF A BREWERY-WASTE-WATER-POLLUTED STREAM, UNTERSUCHUNGEN ZUR BIOMASSENVERTEILUNG SUBMERSER BRYOPHYTEN IN DER SELBSTRAININGUNGSSTRECKEEINES BRAUEREIABWASSERVORFLUTERS (METTMA, HOCHSCHWARZWALD),
W. Ostendorf, and E. Schmidt.
Gewasser und Abwasser, Vol. 62/63, p 85-96, 1977. 2 tab, 3 fig, 17 ref. (English summary).

Descriptors: *Water pollution, *Water pollution effects, Streams, Aquatic algae, Aquatic fungi, Aquatic microorganisms, Self-purification, *Primary productivity, *Biomass, Industrial wastes, Biomass distribution, West Germany, *Brewery-waste-waters, Mountain streams, Aquatic mosses.

In summer 1976 the biomass distribution of aquatic mosses from the self-purifying stretch of a brewery-waste-water polluted mountain stream (Mettma, Black Forest, West Germany) was investigated by determining the ignition loss. It is shown that most of the species are suitable as pollution indicatorss. In particular the mean degrees of saprobity, with standard deviation, ere determined. (EIS-Katz)
W78-10579

THE SEA URCHIN EGG AS A TEST OBJECT IN OIL POLLUTION STUDIES,
Tromsoe Univ. (Norway). Inst. of Biology and Geology.
S. Lonning.
Rapports et Proces-Verbaux des Reunions, Conseil International Pour l'Exploration de la Mer, Vol. 171, p. 186-188, 1977. 1 tab, 2 fig, 6 ref.

Descriptors: *Oil, *Oil pollution, *Bioassay, Toxicity, Mortality, Surfactants, Juvenile forms,

Embryonic growth stage, *Methodology, Laboratory tests, *Water pollution effects, *Sea urchin eggs, Strongylocentrotus, Ekofisk oil, *Sea urchin larvae.

Sea urchin eggs and embryos were used as test material in toxicity studies in regard to oil pollution. It was demonstrated that crude oil has surprisingly modest effects on the development of the embryo, whereas oil dispersants from various manufacturers have more serious influences on development. (EIS-Katz)
W78-10580

ALGAL METABOLITES AND FISH KILLS IN A BAYOU ESTUARY: AN ALTERNATIVE EXPLANATION TO THE LOW DISSOLVED OXYGEN CONTROVERSY,
University of West Florida, Pensacola. Faculty of Biology.
G. A. Moshiri, W. G. Crumpton, and D. A. Blaylock,.
Journal of the Water Pollution Control Federation, Vol. 50(8), 1978. p 2043-2046. 3 fig, 5 ref.

Descriptors: *Fishkills, *Mortalities, *Dinoflagellates, *Toxins, Florida, *Dissolved oxygen, Eutrophication, *Algal poisoning, Algal toxins, Phytoplankton, *Gymnodinium, *Bayou Texar, Pensacola, Florida.

Massive fish kills in the eutrophic Bayou Texar, Pensacola, Florida, might be due to toxins from algal blooms rather than dissolved oxygen deficiency. (EIS-Katz)
W78-10582

DUCK MORTALITY FROM DETERGENT-POLLUTED WATER,
Army Dugway Proving Ground, UT. Environmental and Life Sciences Div.
G. L. Choules, W. C. Russell, and D. A. Gauthier.
Journal of Wildlife Management, Vol. 42(2), 1978. p 410-414. 4 tab, 1 fig, 14 ref.

Descriptors: Colorado, *Mortality, On-site investigation, *Detergents, Surfactants, Industrial wastes, *Ducks(Wild), *Water birds, Water pollution effects, *Animal physiology, Animal behavior, Aldrin, Dieldrin, Mercury, Cadmium, Lead, Arsenic compounds, *Rocky Mountain Arsenal, Selenium.

The deaths of waterfowl, following exposure to polluted industrial waste water seemed to result from chilling by detergent wetting. Both in the laboratory and in the field swimming birds were observed to become increasingly wetted until two thirds to three fourths of their bodies were submerged. (EIS-Katz)
W78-10583

PETROLEUM: EFFECTS ON MALLARD EGG HATCHABILITY,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
R. C. Szara, P. H. Albers, and N. C. Coon.
Journal of Wildlife Management, Vol. 42(2), 1978, p. 404-406. 2 tab, 7 ref.

Descriptors: *Oil, *Oil pollution, Bioassay, *Mortaity, Toxicity, *Ducks(Wild), Water birds, Animal physiology, Laboratory tests, Methodology, Water pollution effects, Animal behavior, *Mallard ducks, *Kuwait crude oil, *South Louisiana crude oil, *No. 2 diesel.

In laboratory tests, the effects were determined of 2 crude oils (Southern Louisiana and Kuwait) and a refined oil (No. 2 fuel oil) on the survival of mallard embryos hatched from eggs that were exposed to oil on the eighth day of incubation. Ninety six hour survival and hatchability after 30 days incubation were significantly reduced in all oil treatment groups. (EIS-Katz)
W78-10584

THE BACTERIAL PATHOGEN FLEXIBACTER COLUMNARIS AND ITS EPIZOOTIOLOGY AMONG COLUMBIA RIVER FISH, A REVIEW AND SYNTHESIS,
Battelle Pacific Northwest Labs., Richland, WA.
C. D. Becker, and M. P. Fujihara.
American Fisheries Society, Washington, D.C., Monograph No. 2, 1978. 92 p, 39 tab, 25 fig, 132 ref.

Descriptors: *Fish diseases, Fish pathology, *Chinook salmon, *Columbia River, Freshwater fish, *Hydroelectric plants, Hydroelectric power, Dams, Reservoirs, *Water temperature, Nuclear energy, *Nuclear powerplants, Nuclear reactors, Water temperature, *Thermal effects, *Microorganisms, On-site investigations.

A review and synthesis was made of the studies conducted on columnaris disease, caused by the bacterium Flexibacter columnaris among resident and anadromous fish of the Columbia River. High virulence strains capable of causing extensive mortalities among adult salmonids were observed in the 1950's. There was concern that the operation of a plutonium plant complex at Hanford might influence disease epizootiology. No incidence of the effect of the Hanford works was indicated. The dominant role may be attributed to environmental modifications associated with hydroelectric development of the Columbia River. (EIS-Katz)
W78-10585

THE IMPACT OF HUMAN TRAMPLING ON PHOSPHORUS LOADING TO A SMALL LAKE IN GATINEAU PARK, QUEBEC, CANADA,
Brock Univ., St. Catharines (Ontario). Dept of Biological Sciences.
M. Dickman, and M. Dorais.
Journal of Environmental Management, Vol 5, No 4, p 335-344, October 1977. 5 fig, 1 tab, 5 plates, 17 ref.

Descriptors: *Environmental effects, *Lakes, *Phosphorus, *Eutrophication, *Visitor density, Recreation, Sampling, Water quality, Summer, Phytoplankton, Gatineau Park(Quebec).

A ten-fold increase in the annual number of visitors to Pinks Lake, Quebec has occurred over the last two decades, and the subsequent increase in trampling within its steep-sided basin has resulted in a significant reduction in plant cover. This has aggravated the erosion problem in the lake's basin, resulting in abnormally high phosphorus loading to the lake. Thirty-eight samples of recently eroded material taken from randomized sites along the lake shore contained 16 1 g leachable phosphorus per square metre. Secchi transparency in Pinks Lake decreased from an estimated 5.8 m in 1956 to 3.6 m in 1976. During the same period, visitor density at Pinks Lake increased by an order of magnitude from roughly 400 visitors per year in 1956 to over 4000 per year in 1976. Changes in summer phytoplankton species composition have also occurred. At present, diatoms and small phytoflagellates dominate in spring, while blue green algae and dinoflagellates become abundant in fall. It is felt that this is the first published account of a causal link between human trampling and lake eutrophication which can be substantiated from an annual phosphorus budget analysis. A phosphorus loading of 854 mg/sq m of lake surface places this lake among the more eutrophic lakes of North America. This is all the more unusual since the lake receives no municipal, agricultural or rural effluent discharge due to its location in a semiwilderness area within Canada's National Capital Region. The impact of human trampling, therefore, is of overriding significance to the management of this sensitive area. (Bell-Cornell)
W78-10653

WATER QUALITY OF NORMAL AND STORM-INDUCED SURFACE WATER RUNOFF: KANE'OHE BAY WATERSHED OAHU, HAWAII FEBRUARY 1974 TO MARCH 1975,
Hawaii Univ., Honolulu.
G. L. Dugan.
Technical Report No. 106, Water Resources Research Center, and HESL Technical Report No. 7, Hawaii Environmental Simulation Laboratory, University of Hawaii, Honolulu, February 1977, Cooperative Report. 74 p, 18 fig, 19 tab, 21 ref, 1 append.

Descriptors: *Hawaii, *Simulation analysis, *Environmental effects, *Water quality, *Sampling, *Streams, *Watersheds(Basins), Drainage, Land use, Runoff, Programs, Methodology, Mathematical models, Systems analysis.

The Hawaii environmental Simulation Laboratory (HESL), since its establishment in the spring of 1971, has attempted to simulate some of the consequences of alternative land-use economic decisions which include, as one of its major parameters, the effects of proposed land-use changes on the quantity and quality of water within the watershed and its succeeding watershed(s) and/or receiving water. The scope of this report, which encompasses stream water quality monitoring under both normal and storm-induced conditions within drainage areas that are subjected to different land management practices is based primarily on a 12-month routine water quality sampling and analysis program by HESL for five stream sites in the Kaneohe Bay watershed, and a companion storm-induced stream water runoff 5-month winter sampling program at one of the stream sites. In general, study results indicate that: the consitituent concentrations were related to flow rather than to the time phase of the storm (stream) runoff; the sediment and particulate carbon, nitrogen, and phosphorus increased directly with flow; and the influence of the quality of the rain became greater with increased flow, as evidenced in reduced concentrations of silica dioxide, conductivity, and nitrite and nitrate nitrogen. Dissolved organic and ammonium nitrogen and dissolved organic and phosphate phosphorous tended to decrease slightly, but in general did not present an apparent particular pattern. By using HESL investigations and technique developments, a planner--decision maker should have valuable tools for compiling adequate data for predicting water quality and quantity changes due to determinations of land-use alterations. (Bell-Cornell)
W78-10665

SUSPENDED SEDIMENT IN THE CHESAPEAKE AND DELAWARE CANAL,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W78-10666

EFFECT OF PH ON BIOASSAYS IN FRESH AND SEAWATER,
British Columbia Research Council, Vancouver.
D. J. McLeay.
Canadian Forestry Service, Ottawa, Ontario K1A OH3. Cooperative Pollution Abatement Research (CPAR) Project Report 402-1, Final Report to March 31, 1976, 86 p, 10 fig, 43 ref, 24 tab.

Descriptors: *Pulp wastes, *Hydrogen ion concentration, *Bioassay, Freshwater, Seawater, Pulp and paper industry, Wastes, Industrial wastes, Water pollution sources, Toxicity, Fish, Rainbow trout, Lethal limit, Water pollution effects, Aquatic life, Water quality, Resin acids.

The acute toxicity of bleached draft mill effluent (BKME) to fish is the same in seawater of freshwater as diluent, provided the pH of bioassay solutions is adjusted to the same value. Fish which adapted too rapidly to seawater were less tolerant to BKME in seawater bioassays. At pH 7.5 (the

pH of seawater diluent) BKME was less toxic than at pH 6.4-6.5 (the pH of freshwater diluent) in either seawater or freshwater bioassays. In freshwater bioassays of 5 BKME and one unbleached kraft effluent (with pH controlled at values between 4 and 11), the least toxic pH range to rainbow trout was 8.5-9.5, with upper and lower lethal limits of ca. 10.0 and 4.0. Using ten natural freshwaters as diluent, the observed differences in acute toxicity could be largely eliminated by adjusting the test solution pH to a common value. Remaining minor differences appeared to be associated with ionizable inorganic constituents of the dilution waters. The pH/toxicity relationship for pulp mill effluents was attributed mainly to the effect of pH on the ionization of their resin acid constituents. Monitoring and regulatory bioassays for determining inherent toxicities of pulp mill effluents from both coastal and interior mills should use rainbow trout in freshwater bioassays with test solutions adjusted to pH 7.5. Problems associated with the pH of mill discharges should be dealt with separately. (Brown-IPC)
W78-10680

SEWAGE COULD SPREAD HEALTH HAZARD.
For primary bibliographic entry see Field 5E.
W78-10728

ON THE BENTHIC FAUNA OF SOME RIVER SYSTEMS IN THE NAGASAKI DISTRICT (1) THE SASU AND THE SE RIVERS OF TSUSHIMA IN WINTER (IN JAPANESE),
Nagasaki Inst. of Health Science and Environmental Science (Japan).
Y. Machida, and S. Ishizaki.
Japanese Journal of Limnology, Vol. 36, p 122-130, 1975. 2 fig, 5 tab, 10 ref. (English summary).

Descriptors: *Zinc, Mining industry, *Mining wastes, *Copper, *Zinc, *Lead, *Cadium, Industrial wastes, *Benthic fauna, Benthos, Water pollution effects, Metals, *Aquatic insects, Environmental effects, Animal populations, *Japan, Nagasaki District, *Zinc mine, *Abandoned mines, River Sasu, River Se, Diversity index.

The benthic communities of two river systems in the Tsushima Islands were investigated to evaluate biologically the change of environmental conditions. Twelve sampling stations were in the River Sasu and seven in the River Se. The dominant species at the unpolluted stations in the Sasu was Simulium japonicum and Ephemerella sp.; the subdominant species were Chironomidae and Antocha sp. At St. 9 only seven species were recognized and the values of three different diversity indexes were significantly low. For the River Se, more than twenty species were recognized at all the stations, neither Chironomidae nor Antocha sp. being dominant. The values of diversity indexes at the stations were Epeorus latifolium dominated were comparatively lower than at the other stations. These results show that the heavy metals such as Cu, Zn, Pb or Cd contained in the effluent of the zinc mine affect the benthic communities of the river, especially the abundance of their components. (Katz-EIS)
W78-10736

POLYCHLORINATED 2-AMINODIPHENYL ETHERS IN FISH,
Karolinska Inst., Stockholm (Sweden). Dept. of Chemistry.
G. Westoo, and K. Noren.
Ambio, Vol. 6, No 4, p 232-234, 1977, 3 fig, 1 tab, 12 ref.

Descriptors: *Freshwater fish, *Dieldrin, Industrial wastes, Water pollution effects, Path of pollutants, Public health, *Gas chromatography, Spectroscopy, Chlorinated hydrocarbon pesticides, Chemical analysis, *Textiles, *Polychlorinated biphenyls, River Viskan, Polychlorinsated 2-aminodiphenyl ethers, *Mothproofing agent, Eulan WA Neu, 2,3,4,5-pentachloro-2-aminodiphenyl ether, 2,3,4,4,5,6 hexachloro-2-aminodiphenyl ether.

The flesh of fish caught downstream from factories using the mothprofing agent Eulan WA Neu contained the fat-soluble compounds 2',3,4,4',5-pentachloro-2-aminodiphenyl ether and 2',3,4,4',5,6-hexachloro-2-aminodiphenyl ether. These substances were also found as impurities in Eulan WA Neu. Larger amounts of the two ethers could be prepared by hydrolysis of the main active substances of Eulan WA Neu. (Katz-EIS)
W78-10737

MICROBIAL DEGRADATION OF EKOFISK OIL IN SEAWATER BY SACCHAROMYCOPSIS LIPOLYTICA,
Statens Inst. for Folkehelse, Oslo (Norway).
F. C. Stormer, and A. Vinsjansen.
Ambio, Vol. 5, No. 3, p 141-142, 1976. 3 fig, 10 ref.

Descriptors: Marine fungi, Maringe microorganisms, *Marine bacteria, *Oil, *Oil spills, Water pollution effects, *Degradation(Decomposition), Hydrogen ion concentration, Bioassay, Laboratory tests, Methodology, *Yeasts, Seawater, Water temperature, *Microbial degradation, *Ekofisk oil, Saccharmoycopsis lipolytica.

The yeast Saccharomycopsis lipolytica was grown in seawater with Ekofisk oil as the carbon source, and the pH was kept constant by the automatic addition of NaOH. The experiments were performed at 8C and 20C, respectively. In addition, the yeast was grown at 20C without pH control. The results indicated that the end products of biodegradation were similar in the experiments and that the oil was dispersed through the microbial activity. (Katz-EIS)
W78-10738

ACUTE EFFECTS OF OIL AND OIL/DISPERSANT MIXTURE ON LARVAE OF BALTIC HERRING,
Swedish Water and Air Pollution Lab., Nykoping.
Baltic Sea Lab.
O. Linden.
Ambio Vol 4, No 3, p 130-133, 1975. 5 fig, 11 ref.

Descriptors: *Herring, Oil, Oil spills, Water pollution effects, *Surfactants, Detergents, Methodology, *Bioassay, Toxicity, Mortality, Juvenile fish, Marine fish, Dispersion, Waste disposal, Fish behavior, *Baltic herring, *Crude oil, *Oil dispersant.

The acute toxic effects of a crude oil, either alone or dispersed by two commonly used oil spill dispersants, were tested on newly hatched herring larvae. The results show that if the oil is dispersed with a dispersant, the toxicity increases 50 to 100 times compared to the oil without the dispersant. A natural oil dispersion without the dispersant loses much of its toxicology in 24 and 72 h. If, however, the oil is dispersed by a dispersant, the high toxicity remains almost unchanged in the same time. (Katz-EIS)
W78-10740

EFFECTS OF ACID PRECIPITATION ON MACROPHYTES IN OLIGOTROPHIC SWEDISH LAKES,
Swedish Water and Air Pollution Research Lab., Gothenburg.
H. Hultberg, and O. Grahn.
In: Proceedings of First Speciality Symposium on Atmospheric Contribution to the Chemistry of Lake Waters. International Association of Great Lakes Research, September 28-October 1, 1975. J. of Great Lakes Research, Vol 2, Supplement 1, p. 208-217, 1976. 10 fig, 21 ref.

Descriptors: *Lakes, *Hydrogen Ion Concentrations, *Oligotrophy, Acidic water, Acidity, Water pollution effects, Acid streams, Aquatic environment, Aquatic plants, *Aquatic productivity, Aquatic weeds, Air pollution, Air pollution effects, Lake sediments, Lake stages, *Acid precipitation, Swedish Lakes, Sphagnum, Macrophytes, *Sweden.

Among the effects of acidification on rooted macrophytes in the investigated lakes, the indirect ones are of major importance. The Isoetides are overgrown and these species suffer seriously from acidification. Among other rooted macrophytes, Juncus bulbosus var. fluitans increase as a result of increasing organic content in the sediments. The most striking effect on macrophytes is the development of peat moss Sphagnum as a submergent rather than terrestrial plant in the lakes. Mats of Sphagnum have been observed in several acidified lakes, not only in Sweden but also in Norway. The lakes change from being a kind of 'equilibrium systems' to biologically accumulating systems similar to acid biogene peat and forest soils. This type of biologically accumulating system causes an oligotrophication and accelerates the acidification process, which in turn leads to further disorders in the lake ecosystem. (Katz-EIS)
W78-10742

CADMIUM IN PORT PHILLIP BAY MUSSELS,
La Trobe Univ., Bundoora (Australia) Dept. of Inorganic and Analytical Chemistry.
For primary bibliographic entry see Field 5B.
W78-10743

BIOASSAY DATA FOR MARINE POLLUTION USING SEA URCHIN EGGS, 1974,
Seto Marine Biological Lab. (Japan).
For primary bibliographic entry see Field 5A.
W78-10744

DEMONSTRATION OF POLLUTION EFFECTS IN AQUATIC MICROCOSMS,
Washington Univ., Seattle. Coll. of Fisheries.
F. B. Taub.
International Journal of Environmental Studies, Vol 10, p 23-33, 1976. 5 fig, 2 tab, 12 ref.

Descriptors: *Herbicide, *Insecticide, *Mercury, *Cadmium, Aroclor, *Polychlorinated biphenyls, Bioassay, Laboratory tests, *Algae, Zooplankton, DDT, Nutrients, Nitrates, Phosphates, Algicides, Water pollution effects, Herbivore, Daphnia, Methodology, Eutrophication, *Aquatic microcoms.

Trophic level interactions caused by an algicide, an insecticide, and two levels of organic enrichment were demonstrated in alga-grazer-bacteria microcosms; e.g., the insecticide caused an algal bloom by removing grazers. The technique was expanded to develop unbiased bioassay of the effects of low levels of HgC12, CdC12, Toxaphene, and Aroclor (PCB) 1242. Problems of toxicant recovery, solvent effects, repeatability, and statistical analyses were uncovered. In an algal chemostat, Aroclor 1242 generally prevented the maintenance of steady state densities. (Katz-EIS)
W78-10745

THE ACCUMULATION OF RADIOACTIVE CAESIUM FROM WATER BY THE BROWN TROUT (SALMO TRUTTA) AND ITS COMPARISON WITH PLAICE AND RAYS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5B.
W78-10749

GAS CHROMATOGRAPHIC ANALYSIS OF BERYLLIUM IN THE MARINE SYSTEM. INTERFERENCE, EFFICIENCY, APPARENT

BIOLOGICAL DISCRIMINATION AND SOME RESULTS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5A.
W78-10750

EGG SHELL CHARACTERISTICS AND INCIDENCE OF SHELL BREAKAGE FOR GREY HERONS ARDEA CINEREA EXPOSED TO ENVIRONMENTAL POLLUTANTS,
Institute of Terrestrial Ecology, Huntingdon (England). Monks Wood Experimental Station.
A. S. Cooke, A. A. Bell, and I. Prestt.
Environmental Pollution, Vol. 11, p 59-84. 1976. 11 fig, 5 tab, 41 ref.

Descriptors: *Water birds, Water pollution effects, Animal physiology, Animal behavior, *Eggs, *DDT, *DDE, *Dieldrin, Path of pollutants, Growth, Pesticides, Environmental effects, *Egg shell characteristics, Shell breakage, *Grey herons, England, Ardea cinerea, Shell thickness, Thickness index, Egg residues.

Egg shell characteristics and incidences of shell breakage have been studied for the grey heron Ardea cinerea at several colonies in eastern England. Eggs collected in the late 1960s and in the 1970s had shells which were significantly thinner than shells collected before 1946. For a sample taken in 1973, shell thickness, shell strength, mammillary layer thickness and palisade layer thickness were all inversely related to the concentration of pp'-DDE(+ pp'-DDT + pp'-TDE) in the egg contents. Shell thinning was considered to be due to a reduced availability of shell components leading to a depressed rate of shell formation. A separate mechanism resulted in increased mammillae height relative to mammillary layer thickness. Incidence of egg shell breakage was positively related to the residue levels of pp'-DDE or dieldrin in intact eggs. Eggs with shells thinner than 240 um were unlikely to survive incubation. Since such eggs tend to contain higher-than-average residues, sampling intact eggs leads to a mean egg residue figure that is lower than the real mean for the colony. Measuring shell thickness is suggested as a rapid and economical bioassay for DDE levels. (Katz-EIS)
W78-10751

CONSERVATION PROBLEMS IN THE NORFOLK BROADS AND RIVERS OF EAST ANGLIA, ENGLAND-PHYTOPLANKTON, BOATS AND THE CAUSES OF TURBIDITY,
University of East Anglia, Norwich (England). School of Environmental Sciences.
B. Moss.
Biological Conservation, Vol. 12, p 95-114. 1977, 35 ref.

Descriptors: *Turbidity, *Nutrients, *Phytoplankton, Rivers, Recreation demand, Recreation wastes, Sediments, *Turbidity, Boats, Boating, Water pollution effects, Aquatic plants, Methodology, *England(Norfolk Broads), East Anglia, Macrophytes, *Sediment disturbance, Nutrient loads, Boat activity.

The Norfolk Broads and rivers of eastern England comprise an area historically famed for the diversity of its wildlife and submerged aquatic plant communities. The latter have progressively disappeared since the early 1950s, until only four sites remain. Increases in turbidity of the water have been associated with the loss of macrophytes, and these increases have been attributed to phytoplankton and to disturbance of sediment by the many boats of visiting tourists and residents. The differential distribution of phytoplankton is discussed in terms of the nutrient loading on, and flushing coefficients of the waterway. Highly significant correlations were obtained between phytoplankton numbers and turbidity in the system as a whole and in Broads and rivers considered separately. A very weak correlation between boat activity and turbidity was shown to be non-causative. Increase in turbidity is a function of increased nutrient loading from human activities in the catchment area. Boat disturbance does not contribute significantly to the sustained turbidity. (Katz-EIS)
W78-10752

HEAVY METAL TOXICITY AND SYNERGISM TO NATURAL PHYTOPLANKTON IN THE EUTROPHIC ALPNACHERSEE AND THE MESOTROPHIC HORW BAY (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
R. Gachter.
Schweizerische Zeitschrift fur Hydrologie Vol. 38, No. 2, p 97-119, 1976. 11 fig, 6 tab, 37 ref, English summary.

Descriptors: *Phytoplankton, *Toxicity, Bioassay, Metals, *Mercury, *Copper, *Cadmium, *Zinc, *Lead, Water pollution effects, Path of pollutants, Aquatic pollution effects, Path of pollutants, Aquatic algae, *Primary productivity, Calcium, Hydrogen ion concentration, Photosynthesis, *Phytoplankton density, Dissolved organic nitrogen, Allochthonous debris, *Switzerland(Alpnachersee), Horw Bay.

The effects on phytoplankton and photosynthesis of inorganic metal salts HgCl2, CuSO4, Cd(NO3)2, ZnCl2 and Pb(NO3)2 were studied over monthly intervals. In experiments with individual metals, phytoplankton photosynthesis was not adversely affected if background levels did not exceed 10-9 mole Hg/l, 5-10-9 mole Cu/l, 2.10-8 mole Cd/l, 5.10-8 mole Zn/l and 2.10-7 mole Pb/l, respectively. However, when the concentration was increased by 5.10-10 mole Hg/l + 5.10-9 mole Cu/l + 5.10-9 mole Cd/l + 5.10-8 mole Zn/l + 5.10-8 mole Pb/l photosynthesis was significantly reduced, due to a synergetic effect of the combined metals. The influence of phytoplankton density, pH-value, concentration of calcium, dissolved organic nitrogen and allochthonous debris on heavy metal toxicity was investigated. Changes in phytoplankton composition are believed to be the main reason for the seasonal variation in the toxic effects of heavy metals. (Katz-EIS)
W78-10753

BIOLOGICAL AND CHEMICAL SUCCESSION IN NAHAL SOREQ: A FREE-FLOWING WASTEWATER STREAM,
Hebrew Univ., Jerusalem (Israel). Environmental Health Lab.
I. Dor, H. Schechter, and H. I. Shuval.
The Journal of Applied Ecology, Vol. 13, No. 2, p 475-489, 1976. 8 fig, 3 tab, 10 ref.

Descriptors: *Sewerage, Sewage treatment, Sewage disposal, *Sewage bacteria, Biochemical oxygen demand, *Self purification, *Algae, Oxygen, Photosynthesis, Benthos, *Invertebrates, Virus, Water pollution, Water pollution effects, *Eutrophication, *Environmental gradient, Water temperature, Evaporation, Seepage, *Jerusalem, Israel, *Nahal Soreq.

Nahal Soreq is a dry river bed, into which the raw domestic sewage of Jerusalem is discharged. Self-purification processes, undisturbed by dilution or additional load, may therefore be observed in their model form. Compared with most industralized countries, the sewage of Jerusalem is highly concentrated (BOD5 of 500-900 ppm) due to low per capita water use and offers a richer substrate for bacterial decomposition. High average temperatures and abundant radiant energy throughout the year promote a high rate of metabolic processes, while the long subtropical dry season, which lasts for some seven to eight months, results in stability of the system. The following aspects of the self-purification occurring in Nahal Soreq have been investigated during the past few years: successional, physical and chemical changes: rate of disappearance of the enteric bacteria and viruses; oxygen relationships; systematics of the algae and macroinvertebrates, zonation of their communities and growth rate of the epibenthic biomass. In a parallel hydrological study, discharge, flow current velocity, detention time, losses by evaporation and infiltration to the ground water and contributions from the springs and precipitation were evaluated. (Katz-EIS)
W78-10754

THE EFFECT OF HEXACHLORANE (HEXACHLOROCYCLOHEXANE (HCCH) AND CHLOROPHOS ON UNDERYEARLINGS OF THE LEAPING GRAY MULLET MUGIL SALIENS,
F. S. Zambriborshch, and B. Lay.
Journal of Ichthyology, Vol. 16, No 5, p 841-847, 1976. 5 tab, 15 ref. (translated from Russian).

Descriptors: *Chlorinated hydrocarbon insecticides, *Bioassay, *Toxicity, Mortality, Laboratory tests, *Mullets, Fish behavior, Water pollution effects, Dissolved oxygen, Fish physiology, Fish behavior, Juvenile fish, Marine fish, Leaping gray mullet, Mugil saliens, *Hexachlorane, *Chlorophos, Survival time, Oxygen consumption.

The influence of hexachlorane and chlorophos on the young of the leaping gray mullet, Mugil saliens, was examined. Hexachlorane in a concentration considerably below the maximum permissible concentration and chlorophos only slightly above the maximum permissible concentration are toxic for these fish. The equations of regression, reflecting the correlational dependence between pesticide concentrations and the length of survival of test fishes, are given. Hexachlorane and chlorophos in concentrations close to the permissible maximum concentration depress fish. In fish poisoned by these pesticides, normal breathing is not restored. (Katz-EIS)
W78-10817

THE REACTIONS OF SOME BLACK SEA ORGANISMS IN AN ELECTRIC FIELD EXPOSED TO DISSOLVED PETROLEUM PRODUCTS,
L. A. Balayev, N. D. Mazmanidi, and T. R. Bazhashvili.
Journal of Ichthyology, Vol. 16, No 4, p 647-652, 1976. 6 tab. (translated from the Russian).

Descriptors: *Oil, *Oil pollution, *Bioassay, Laboratory tests, Water pollution effects, Toxicity, Mortality, *Fish behavior, *Animal behavior, Marine fish, Shrimp, Methodology, Fish physiology, Juvenile growth stages, *Black Sea, Pelagic fish, *Flounder larvae, *Electric field.

On the basis of a study of three responses (primary, anode, electric shock) of some Black Sea organisms in an electric field exposed to dissolved petroleum products, it was established that they are all to some extent sensitive to such poisoning and that in fishes the degree of sensitivity is related to ecological groupings. (Katz-EIS)
W78-10818

IMPACT OF FLUID MUD DREDGED MATERIAL ON BENTHIC COMMUNITIES OF THE TIDAL JAMES RIVER, VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point. Div. of Biological Oceanography.
R. J. Diaz, and D. F. Boesch.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A050 915, Price codes: A05 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-45, December 1977. 75 p, 13 tab, 6 fig, 36 ref, 2 append.

Descriptors: *Benthic fauna, *Benthos, *Mud, Water pollution effects, Virginia, *James River(Va), *Dredged material disposal, *Fluid mud.

The unconfined open-water disposal resulting from the maintenance dredging of the Jordan Point - Windmill Point channel had an acute impact on the macrobenthic community. The fluid mud produced from the disposal operation probably had both physical and physiological effects on the fauna. Responses varied by species. Insects were the most sensitive and oligochaetes the least affected. Due to the resilience and opportunistic nature of the fauna the detectable impacts lasted less than 3 months. Fluid mud produced from disposal of fine-grained dredged material has properties and effects different than natural sediments. Its low density, instability and low oxygen concentration present severe problems of support, respiration, and feeding of benthic organisms. (WES)
W78-10944

MODELING OF ECOLOGICAL SUCCESSION AND PRODUCTION IN ESTUARINE MARSHES,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2L.
W78-10945

TRACE AND TOXIC METAL UPTAKE BY MARSH PLANTS AS AFFECTED BY EH, PH, AND SALINITY.
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A050 914, Price codes: A07 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-40, December 1977. 141 p, 58 tab, 75 ref, 1 fig.

Descriptors: *Metals, Trace metals, *Marsh plants, *Trace elements, Soil chemistry, Waste disposal, Salinity, *Absorption, Hydrogen ion concentration, *Dredged material disposal, Oxidation-reduction potential, Water pollution effects.

A laboratory study was conducted to develop and refine methods for growing marsh plants under conditions of controlled pH, redox potential (oxidation-reduction conditions) and salinity as well as to determine the effects of these physicochemical conditions in the rooting medium on trace and toxic metal availability to plants. Reasonably successful methods were developed for growing marsh plants in the experimental systems. The successful methods as well as procedures which were not successful are discussed as are techniques for overcoming many of the experimental difficulties. Two extractants were used on the soil suspensions following harvest to determine the linear relationships between chemical availability and plant content of metals in laboratory studies. Of the metals studied, cadmium generally gave the best linear association between measured uptake and chemical availability, although there were important species differences. Based on the results of this research, it was concluded that soil and sediment physicochemical conditions do affect the plant availability of trace and toxic metals, and it was recommended that these effects should be considered in selecting environmentally sound disposal methods for contaminated dredged sediments. (WES)
W78-10949

ENHANCEMENT OF RELEASES FROM A STRATIFIED IMPOUNDMENT BY LOCALIZED MIXING, OKATIBBEE LAKE, MISSISSIPPI,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-10950

COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME I: PRODUCTIVITY,
Louisiana State Univ., Baton Rouge.
J. G. Gosselink, C. S. Hopkinson, Jr., and R. T. Parrondo.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 094, Price codes: A08 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-44, December 1977 (In 2 volumes). 132 p, 2 tab, 7 fig, 20 ref, 3 append.

Descriptors: *Coastal marshes, *Marsh plants, *Productivity, Waste disposal, *Gulf Coast, Water pollution effects.

The study reports on the productivity of seven marsh plant species in coastal marshes of Louisiana. The Wiegert-Evans harvest technique was used to measure productivity over a two-year period of the following species: Distichlis spicata (salt grass), Juncus roemerianus (black rush), Phragmites communis (common reed), Spartina alterniflora (saltmarsh cordgrass), Spartina patens (saltmeadow cordgrass), and Sagittaria falcata (bulltongue). Productivity was found to be related to the growth habit and turnover rate. S. patens, J. roemerianus, and D. spicata were found to be more productive than S. alterniflora, a species that was known to be highly productive. Productivity was higher in the fresh and brackish marsh species than in the salt marsh species and was higher for species that grow throughout the winter than those that die to the ground in late fall. An evaluation was also made of several techniques for measuring productivity, including harvest, phenometric, and gasometric methods. The study showed that peak standing crop seriously underestimates production in Gulf Coast marshes and that the Wiegert-Evans harvest technique is the most realistic method presently available. (See also W78-10953)
W78-10952

COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME II: GROWTH DYNAMICS,
Louisiana State Univ., Baton Rouge.
J. G. Gosselink, C. S. Hopkinson, Jr., and R. T. Parrondo.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 095, Price codes: A09 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-44, December 1977 (In 2 volumes). 202 p, 25 ref, 3 tab, 15 fig, 7 append.

Descriptors: *Marsh plants, *Coastal marshes, *Salt marshes, *Plant growth, Physiological ecology, *Gulf Coast, Water pollution effects, Waste disposal.

As part of the U. S. Army Corps of Engineers Dredged Material Research Program, administered by the Environmental Effects Laboratory of the U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, a study of the growth physiology of marsh plants common to the Gulf Coast area was conducted. The growth physiology study, concerned with the physiological ecology of stress, reports on several experiments on the ability of marsh plants to survive, particularly under stresses of salinity and inundation. Although several species are investigated, including Distichlis spicata, Juncus roemerianus, Phragmites communis, Saggitaria falcata, Spartina cynosuroides, and Spartina patens, major emphasis is given to the adaptability and edaphic requirements of Spartina alterniflora: the response of this species is contrasted with that of the other species. Emphasis is given to the substrate qualities to which Spartina alterniflora can adapt and to the adaptation mechanisms. Results of the studies are integrated in a general conceptual model that has application to the development of marshes on dredged material. (See also W78-10952) (WES)
W78-10953

HABITAT DEVELOPMENT FIELD INVESTIGATIONS, WINDMILL POINT MARSH DEVELOPMENT SITE, JAMES RIVER, VIRGINIA; APPENDIX C: ENVIRONMENTAL IMPACTS OF MARSH DEVELOPMENT WITH DREDGED MATERIAL: ACUTE IMPACTS ON THE MACROBENTHIC COMMUNITY,
Virginia Inst. of Marine Science, Gloucester Point. Div. of Biological Oceanography.
R. J. Diaz, and D. F. Boesch.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A055 319, Price codes: A08 in paper copy, A01 in microfiche. Army Engineed Waterways Experiment Station, Vicksburg, Miss., Technical Report D-77-23, Nov. 1977. 153 p, 19 tab, 16 ref, 2 append.

Descriptors: *Benthos, *Marshes, Environmental effects, *Habitats, *Wetlands, Virginia, *Dredged material disposal, *James River(Va), Waste disposal sites, Windmill Point, Waste disposal, Water pollution effects.

Macrobenthos was sampled in a tidal freshwater portion of the James River, Virginia, near Windmill Point, in the area of construction of a wetlands habitat from dredged material. The habitat development was directed by the U.S. Army Engineer Waterways Experiment Station under the Dredged Material Research Program with the cooperation of the U.S. Army Engineer District, Norfolk. The benthic communities in the area of the habitat development site were dominated by the bivalve Corbicula manilensis; the oligochaetes Limnodrilus spp., Ilyodrilus templetoni, Limnodrilus hoffmeisteri; and larvae of the insects Coelotanypus scapularis and Hexagenia mingo. The dominant organisms are generally eurytopic with respect to sediments; many had higher densities in muddy sediments, although Corbicula preferred sand. Most of the important species were highly opportunistic and thus the community was able to recover quickly from perturbations. This characteristic minimized the effects of habitat development. Acute impacts were detected at the habitat site where organisms were buried by construction and at the excavation where organisms were removed along with the sand and gravel used in construction of the dike. (WES)
W78-10954

AVAILABILITY OF SEDIMENT-ADSORBED SELECTED PESTICIDES TO BENTHOS WITH PARTICULAR EMPHASIS ON DEPOSIT-FEEDING INFAUNA,
LFE Environmental Analysis Labs., Richmond, CA.
M. W. Nathans, and T. J. Bechtel.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A055 506, Price codes: A05 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report D-77-34, Nov. 1977. 83 p, 16 tab, 12 fig, 24 ref, 2 append.

Descriptors: *Aquatic animals, *Benthos, *DDT, *Pesticides, *Sediments, Absorption, *Deposit-feeding, *Dredged materials, *Infauna.

As part of the Dredged Material Research Program, a study was undertaken to determine the availability of sediment adsorbed DDT (and its metabolites) by several species of deposit-feeding benthic infauna that may form a link for the entry of DDT into aquatic food webs. The experiments species studied were Capitella capitata, a nonselective feeding marine polychaete; Nephtys californiensis, a selective feeding marine polychaete; and Tubifex tubifex, a nonselective

feeding freshwater oligochaete. Sediments were artificially composited from silica sand, clay, and aged baby cereal for Tubifex, and from fired beach sand, clay, and aged baby cereal for Capitella. The clay and cereal components were tagged separately with radioactively labeled DDT prior to mixing with the sand, the final theoretical concentrations being 1 ppb 14C-labeled DDT and 1 ppb 3H-labeled DDT. For Nephyts the sediment of its natural habitat was tagged with 14C-labeled DDT to a final concentration of 0.6 ppb. DDT with both labels was found to accumulate in Capitella and in Tubifex. This indicates that at least some of the DDT is available when adsorbed on clay and on organic matter. Accumulation was also found in Nephyts, but most of the DDT originated from clay. (WES)
W78-10955

PRIMARY PRODUCTIVITY OF MINOR MARSH PLANTS IN DELAWARE, GEORGIA, AND MAINE,
Georgia Univ., Brunswick. Marine Resources Extension Center.
R. J. Reimold, and R. A. Linthurst.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A051 164, Price codes: A06 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report D-77-36, Nov. 1977. 138 p, 14 tab, 21 fig, 21 ref, 4 append.

Descriptors: *Coastal marshes, *Marsh plants, *Plant growth, Maine, Georgia, Delaware, *Salt marshes, *Wetlands, *Primary productivity, Plant populations, *Dredged material disposal, Waste disposal, Water pollution effects.

Summaries are presented of the importance of common species of salt marsh plants inhabiting wetlands of the eastern U.S. coast. An evaluation of the ecological significance of the plants is based on their rates of primary production, morality, and contribution of detritus to the estuarine dependent systems. The data are important in reaching decisions relative to the deposition of dredged material in these coastal wetland systems. (WES)
W78-10956

SEAGRASS LITERATURE SURVEY,
Virginia Univ., Charlottesville. Dept. of Environmenta Sciences.
For primary bibliographic entry see Field 2L.
W78-10958

AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX B: ROLE OF DISPOSAL OF PCB-CONTAMINATED SEDIMENT IN THE ACCUMULATION OF PCB'S BY MARINE ANIMALS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
V. F. Stout, and L. G. Lewis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A055 218, Price codes: A03 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report D-77-24, Nov. 1977. 40 p, 13 tab, 18 ref.

Descriptors: *Marine animals, *Polychlorinated biphenyls, Sediments, Washington, *Dredged material disposa, *Puget Sound, *Waste disposal sites, *Duwamish Waterway(Wash), Absorption, English sole, Pink shrimp, Mussels, Sea cucumber.

This report describes studies concerning the possible transfer to marine animals of polychlorinated biphenyls (PCB's) as a result of the open-water disposal of PCB-laden dredged material. Dredged material from the Duwamish River in Seattle, Washington, was deposited at an experimental site in nearby Elliott Bay. The PCB content of indigenous animals, English sole (Parophrys vetulus) and Alaska and Oregon pink shrimp (Pandalus borealis and P. jordani), and animals caged at the site, spot shrimp (P. platyceros), sea cucumber (Parastichopus californicus), and mussel (Mytilus edulis) was determined. It was not possible to ascertain whether or not marine animals concentrate PCB's as the result of deposition of PCB-laden dredged material. The small increase in PCB level observed in mussels may have been related to the flux of PCB's resulting from the disposal operation. Alternatively, it may have issued from the PCB burden normally carried downstream by the Duwamish River. These data indicate that no obvious changes have occurred in the PCB levels in marine animals in Elliott Bay as the result of depositing PCB-laden dredged material at the experimental site. (WES)
W78-10959

AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; APPENDIX E: DEMERSAL FISH AND DECAPOD SHELLFISH STUDIES,
National Marine Fisheries Service, Hammond, OR.
J. T. Durkin, and S. J. Lipovsky.
Available from the National Technical Information Service, Springfied, VA 22161 as AD-A648 412, Price codes: A09 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-30, November 1977. 182 p, 5 tab, 81 ref, 48 fig, 5 append.

Descriptors: *Fish, *Columbia River estuary, *Fish populations, *Shellfish(Decapods), *Demersal fish, Fish food organisms, *Dredged material disposal, Waste disposal sites, Estuaries, Waste disposal, Water pollution effects.

Information is provided on 51 finfish and 13 decapod shellfish found at five sites off the Columbia River mouth. The effects of a controlled sediment release by hopper dredges on these indigenous species were studied between October 1974 and April 1976. An initial nine-month phase provided biological information at four sites with a fifth site included in July 1975, as an experimental deposition area. Nonparametric test indices of community diversity usually decreased at the experimental test site during and after sediment deposition. However, diversity indices subsequently recovered and were comparable to those of the other sites by April 1976. Characteristics of dominant species are described including size range, food preference, and seasonal availiability. Using data on dominant species, statistical tests indicated catch differences usually occurred between sites and between months; further, individuals at the test site were smaller. Tests were limited by small numbers of species and individuals taken at the test site during and after sediment deposition. (WES).
W78-10960

WATERWEEDS: FLIES IN THE IRRIGATION OINTMENT,
For primary bibliographic entry see Field 4A.
W78-10969

ACUTE LETHALITY, AND SUB-LETHAL EFFECTS OF ACETONE, ETHANOL, AND PROPYLENE GLYCOL ON THE CARDIOVASCULAR AND RESPIRATORY SYSTEMS OF RAINBOW TROUT (SALMO GAIRDNERI),
Fisheries and Marine Service Winnipeg (Manitoba). Freshwater Inst.
H. S. Majewski, J. F. Klaverkamp, and D. P. Scott.
Water Research, Vol. 13, p. 217-221, 1978. 4 fig., 19 ref.

Descriptors: *Toxicity, *Lethal limit, Fish physiology, *Rainbow trout, Animal metabolism, Organic compounds, Growth stages, Fry, Animal physiology, Respiration, Bioassay, Mortality, Solvents, *Acetone, *Ethanol, *Propylene glycol, Cardiovascular system.

The 24 h LC50 for acetone and ethanol in a flow-through bioassay system at 10C plus or minus 0.5, are 6100 mgl-1 and 11,200 mgl-1, respectively. No mortality to fingerling trout was produced by propylene glycol at 50,000 mgl-1 during at 24 h exposure period in a static system. Acetone and ethanol, at about 0.48 and 0.26 of the fingerling LC50, respectively, affected cardiovascular/respiratory parameters in adult rainbow trout. Aceton produced an increase in ventilation rate to a maximum of 158% of control values, as well as an increase in buccal pressure amplitude attaining a maximum of 410% of control values. Ethanol exposed fish exhibited a slight depression in ventilation rate and buccal pressure emplitude during initial stages of the 24 h exposure period. Ethanol had no effect on heart rate, despite a significant decrease in Q-T interval. Propylene glycol, at less than 0.08 of a concentration not producing apparent stress in fingerlings, had a mildly stimulatory effect on ventilation rate, and heart rate in adults. It is concluded that of the three solvents employed in this study, propylene glycol is most suitable for use as a solvent in fish toxicity tests. (EIS-Katz).
W78-10997

EFFECTS OF PETROLEUM HYDROCARBONS ON THE GROWTH OF MARINE ORGANISMS,
Texas A and M Univ., College Station. Dept. of Biology.
J. W. Anderson.
Rapports et Proces-Verbaux des Reunions, Conseil International pour L'Exploration de la Mer, Vol. 171, p. 157-165, 1977. 4 fig., 4 tab., 29 ref.

Descriptors: *Shrimp, *Oysters, *Commercial shellfish, *Growth rates, *Reproduction, *Oil, Hatching, *Phytoplankton, Water pollution effects, *Annelids, Marine fish, Shellfish, Invertebrates, Environmental effects, Animal growth, Laboratory tests, Larvae, Embryonic growth stage, Oil spills, Penaeus, Crassostrea, *Crude oil, *Sublethal effects, Cyprinodon, Fundulus.

Several species of marine organisms, ranging from phytoplankton to fish, have been tested for various growth and reproduction parameters in response to exposure to two crude (Kuwait and South Louisiana) and two refined oils (No. 2 fuel oil and Venezuelan Bunker C). The growth of oysters (Crassostrea virginica) and brown shrimp (Penaeus aztecus) was not affected by oil exposures, while 3.5 mg/litre of total dissolved hydrocarbons (from No. 2 fuel oil) reduced embryonic heart beat and hatching success of two fish species and 0.3 to 0.7 mg/litre decreased the growth rates of larval Palaemonetes pugio, juvenile Neanthes arenaceodentata, and three species of phytoplankton. (EIS-Katz).
W78-10998

FISH DIVERSION AND TRANSPORTATION SYSTEM FOR POWER PLANT APPLICATION,
Stone and Webster Engineering Corp., New York.
For primary bibliographic entry see Field 8I.
W78-10999

FATE OF HYDROCARBONS IN FISH,
Torry Research Station, Aberdeen (Scotland).
K. J. Whittle, J. Murray, P. R. Mackie, R. Hardy, and J. Farmer.
Rapports et Proces-Verbaux des Reunions, Conseil International pour L'Exploration de la Mer, Vol. 171, p 139-142, 1977. 2 tab, 8 ref.

Descriptors: *Food chains, *Herring, *Absorption, *Carbon radioisotopes, *Path of pol-

lutants, *Oil, *Distribution patterns, Laboratory tests, Tracers, Fish physiology, Metabolism, Analytical techniques, Organic compounds, Tissue analysis, *Hexadecane, *Benzo(a)pyrene, Bioaccumulation, Depuration.

Juvenile herring were fed an experimental diet of squid containing (14C)-labelled hexadecane and benzo(a)pyrene and the distribution of activity in various tissues and organs was assayed 43-45 h later. 24-25% of the activity fed was recovered in the tissue and organs examined but the distribution of activity in these was quite different for each hydrocarbon. Most of the hexadecane recovered was found in the muscle but most of the benzo(a)pyrene remained in the stomach. (EIS-Katz)
W78-11000

BIOGENIC HYDROCARBONS AND PETROLEUM FRACTIONS,
Institut Francais du Petrole, Rueil-Malmaison (France).
For primary bibliographic entry see Field 5A.
W78-11001

ON THE ORIGIN OF HYDROCARBONS IN MARINE ORGANISMS,
Torry Research Station, Aberdeen (Scotland).
For primary bibliographic entry see Field 5B.
W78-11002

ALARMING SIGNS OF MERCURY POLLUTION IN A FRESHWATER AREA OF THAILAND,
Helsinki Univ. (Finland). Dept. of Environmental Science.
S. Suckcharoen, P. Nuorteva, and E. Hasanen.
Ambio, Vol. 7, No. 3, p 114-116, 1978. 4 fig, 3 tab, 19 ref.

Descriptors: *Mercury, *Metals, Freshwater fish, *Public health, Water pollution effects, Path of pollutants, *Industrial wastes, Birds, *Human pathology, Aquatic animals, Chemical industry, Chemical wastes, *Thailand, *Aquatic birds, Caustic soda factory, Mercury accumulation.

Freshwater fish hold a position of prime importance in the diet of the population of Thailand. The present observations show that the baseline mercury contaminations of Thai fish are among the lowest in the world (mean 0.07 ppm, range 0.002-0.30 ppm in flesh). The amount of mercury in human hair was also rather low in unpolluted areas (mean 2.33 ppm, range 0.77-14.0 ppm). Aquatic birds had a mean mercury content in the pectoral muscle of 0.27 ppm (range 0.15-1.56 ppm). A local increase was, however, observed in the flesh of the fish Ophiocephalus striatus in the vicinity of a recently established Japanese caustic soda factory, where the observed mercury values varied from 0.32 ppm to 3.6 ppm. Signs of mercury accumulation in the tip portion of human hair were observed in males but not in females living in the polluted area. (EIS-Katz)
W78-11003

MODIFICATION IN THE CELLULAR FORM OF BOERGESENIA FORBESII BY POTASSIUM, CALCIUM AND MAGNESIUM IONS,
Kochi Univ. (Japan). Dept. of Biology.
S. Mizuta.
Reports of the USA Marine Biological Station, Vol. 24, No. 1-2, p 27-36, December, 1977. 12 fig, 13 ref.

Descriptors: *Potassium, *Magnesium, *Calcium, *Algae, *Nutrients, Plant physiology, *Absorption, Biochemistry, Laboratory tests, Methodology, Aquatic plants, Growth rates, Plant growth, Metals, Ions, Environmental effects, Water properties, *Boergesenia, Bioaccumulation.

The effects of K+, Ca++, and Mg++ on the growth of Boergesenia forbesii were examined. The cell grew most rapidly in 16 mM equiv. K+ in the presence of low concentrations of Ca++ and Mg++, and the cellular form proved to be regulated by the concentration of K+. Low concentrations of K+ induced slender cells but increasing concentrations of K+ made the cells globular. The cellular form showed a close relationship to the balance of K+ to Na+ concentrations in the vacuoule. When the cells were cultured at lower concentrations of K+, the vacuolar K+ concentration became lower and Na+ higher. Even in the medium, containing higher concentrations of K+ than in the control culture a similar relation between the vacuolar K+ and Na+ concentrations was observed. The effects of Ca++ and Mg++ on K+ and Na+ ion concentrations in the vacuoles were also tested, but the effects proved to be less conspicuous that that of K+. When one of the K+, Ca++ and Mg++ ions was removed from the culture media, the concentration of vacuolar K+ rapidly decreased and that of Na+ increased and then the cells died in a few days. It is considered that K+, Ca++ and Mg++ are all required for the integrity of the cell. (EIS-Katz)
W78-11004

EFFECTS OF CADMIUM AND MERCURY ON THE BEHAVIORAL RESPONSES AND DEVELOPMENT OF EURYPANOPEUS DEPRESSUS LARVAE,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
D. Z. Mirkes, W. B. Vernberg, and P. J. DeCoursey.
Marine Biology, Vol. 47, p 143-147, 1978. 5 fig, 28 ref.

Descriptors: *Animal behavior, *Larvae, *Cadmium, *Mercury, *Crabs, *Growth rates, *Mortality, *Path of pollutants, Behavior, Estuarine fisheries, Laboratory tests, Swimming, Metals, Heavy metals, Water pollution effects, Toxicity, Toxins, Bioassay, Crustaceans, Larval growth stage, *Eurypanopeus, *Sublethal effects.

Larval stages of the estuarine mud crab Eurypanopeus depressus were exposed to either 10 ppb cadmium or 1.8 ppb mercury in a flow-through rearing system. Development time from the megalopa to juvenile crab was extended in the cadmium-exposed individuals. Cadmium elevated the swimming rates of the late zoeal stages, while mercury depressed swimming rates of the early stages. Increased mortality of Stage I zoeae was observed after 24 h exposure to cadmium; increased mortality was also noted for megalopa and early crab stages reared in cadmium. (EIS-Katz)
W78-11005

ZINC, CADMIUM AND LEAD IN WATER, SEDIMENTS AND SUBMERGED PLANTS OF THE DERWENT RESERVOIR, NORTHERN ENGLAND,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W78-11006

POLLUTION EFFECTS ON INTERTIDAL MACROBENTHIC COMMUNITIES,
Napier Coll. of Commerce and Technology Edinburgh (Scotland).
P. A. Read, T. Renshaw, and K. J. Anderson.
Journal of Applied Ecology, Vol. 15, p 14-31, 1978. 10 tab, 17 ref.

Descriptors: Analytical techniques, *Statistical methods, Water pollution effects, *Dominant organisms, *Distribution, *Seasonal, *Intertidal areas, Biological communities, Ecological distribution, On-site investigations, Environmental effects, Temporal distribution, Spatial distribution, Benthos, Probability of interspecific encounters, *Species diversity, *Firth of Forth(Scotland).

Changes in macrobenthic community structure along a pollution gradient in the Firth of Forth were observed and quantified using four different measures of 'diversity'. The four diversity indices were found to be closely correlated with one another, the probability of interspecific encounter (PIE) being the one nearest to the centroid of the four. Similar changes were observed along the pollution gradient for all, but the Eveness index which reflected a somewhat different tendency. Results show that gross pollution diminishes both 'dominance diversity' and 'species diversity', whereas more moderate pollution reduces 'species diversity' but is less effective in regulating 'dominance diversity'. Differences in diversity and abundance between traverses and between levels at any one site can be explained by reference to various environmental factors. Temporal changes in species numbers and individuals are apparent at all sites and these are reflected in the PIE values. The smallest temporal changes in PIE are associated with a grossly polluted beach (a stressed community) whereas the largest relate to a relatively unpolluted beach (an unstressed community). This conflicts with the view that temporal change is large under physiological stress conditions in unstable environments and small under minimal stress conditions in physically stable environments. (EIS-Katz)
W78-11007

EFFECTS OF MOSQUITO CONTROL INSECTICIDES ON NITROGEN FIXATION AND GROWTH OF BLUE-GREEN ALGAE IN NATURAL PLANKTON ASSOCIATIONS,
California Univ., Davis. Div. of Wildlife and Fisheries Biology.
W. A. Wurtsbaugh, and C. S. Apperson.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, p 641-647, 1978. 1 fig, 1 tab, 18 ref.

Descriptors: *Cyanophyta, *Nitrogen fixation, *Growth rates, Pesticides, Plankton, Zooplankton, Nitroge cycle, Mode of action, Pesticide kinetics, Toxicity, Mortality, Insecticides, Chlorophyll, Photosynthesis, *Temephos, *Methyoxychlor, *Methoprene, *Proxopur, *Dimilin.

Regardless of whether pesticides act directly on blue-green algae or indirectly through actions upon other organisms, our study indicates that normaly used dosages of pesticides can markedly affect N2-fixation rates and growth of blue-green algae, and consequently the nitrogen flow in aquatic systems. The significance of this effect depends upon the particular aquatic habitat to which the pesticides are applied. Certainly an increase of N2-fixation in a rice field would be desireable. Conversely, higher rates of N2-fixation and growth of blue-green algae in a recreational lake or potable water supply would have a detrimental effect on water quality. (EIs-Katz)
W78-11010

PASSAGE OF METALS TO FRESHWATER FISH FROM THEIR FOOD,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
F. M. Patrick, and M. W. Loutit.
Water Research, Vol. 12, p 395-398, 1978. 2 fig, 2 tab, 19 ref.

Descriptors: *Bacteria, *Tubificids, *Food chains, Copper, Chromium, Manganese, Iron, Lead, Zinc, Worms, Metals, Heavy metals, Fish physiology, Animal metabolism, Freshwater fish, Food chains, Water pollution effects, Path of pollutants, *Tissue analysis, *Bioaccumulation, *Biomagnification.

Following work showing that Cr, Cu, Mn, Fe, Pb, and Zn could be concentrated by tubificid worms after ingesting metal-enriched heterotrophic bacteria, experiments were carried out in which fish,

fed these worms, showed increased metal levels in their tissues after four days. Only Pb was found in increased concentrations after a shorter period of two days. Both young and older fish were used in the experiment. The results indicate that increased levels of most metals in the fish reflect the concentrations of the metals in their food were exposed to the food for longer than two to four days, and that the age of the fish has an effect on their final metal concentrations. (EIS-Katz)
W78-11012

THE ALKANES OF MARINE ORGANISMS FROM THE UNITED KINGDOM AND SURROUNDING WATERS,
Torry Research Station, Aberdeen (Scotland).
For primary bibliographic entry see Field 5B.
W78-11013

THE EFFECTS OF OIL ON SEABIRDS,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
J. P. Croxhall.
Rapports et Process-Verbaux des Reunions, Conseil International Pour L'Exploration de la Mer, Vol. 171, p 191-195, 1977. 3 tab, 25 ref.

Descriptors: *Waterbirds, *Oil pollution, *Oil, Water pollution effects, *Mortality, *Environmental effects, Animal physiology, *Biochemistry, *Organic compounds, *Oil spills, Birds, Wildlife, Dispersion, Ducks(Wild), Gulls, Path of pollutants, Laboratory tests, *Auks, *Sublethal effects.

Seabirds are not only the most obvious victims of oil pollution but perhaps the only group where oil pollution may pose a survival threat. The external effect of oil in destroying plumage waterproofing is detailed and the state of knowledge of the direct and indirect internal effects of crude and fuel oils reviewed, inevitably in rather general terms. The need for more precise information on the behavior of oil slicks and oil/disperdant mixtures and films at sea is emphasised in relation to potential techniques and strategies for minimising the high risk to seabirds (whether at breeding colonies or on wintering grounds) from oil slicks. (EIS-Katz)
W78-11014

THE SUB-LETHAL EFFECTS OF WATER--SOLUBLE EXTRACTS OF CRUDE OIL ON THE FERTILISATION AND DEVELOPMENT OF FUCUS SERRATUS L. (SERRATED WRACK),
Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Brewing and Biological Sciences.
C. S. Johnston.
Rapports et Proces-Verbaux des Reunions, Conseil International pour L'Exploration de la Mer, Vol. 171, p 184-185, 1977. 3 ref.

Descriptors: *Oil spills, *Marine plants, *Shores, *Oil pollution, *Plant populations, *Fertilisation, *Bioassay, *Organic compounds, *Embryonic growth stage, Laboratory tests, Environmental effects, Water pollution effects, Aquatic populations, Reproduction, Plant physiology, *Fucus, *Crude oil, *Sublethal effects.

Many studies of oil pollution have shown that shore algae frequently flourish following elimination or severe reduction of the more sensitive grazing organisms. Preliminary studies suggest that although adult fucoid plants can tolerate exposure to spillsk of crude oil, the young developing zygote is sensitive to relatively low concentrations of 'water soluble' extracts of crude oils. (EIS-Katz)
W78-11015

THE EFFECT OF MINERAL OILS ON THE DEVELOPMENT OF EGGS AND LARVAE OF MARINE SPECIES. A REVIEW AND COMPARISON OF EXPERIMENTAL DATA IN REGARD TO POSSIBLE DAMAGE AT SEA,
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
W. W. Kuhnhold.
Rapports et Proces-Verbaux des Reunions, Conseil Internation pour L'Exploration de la Mer, Vol. 171, p 175-183, 1977. 5 tab, 3 fig, 26 ref.

Descriptors: *Reviews, Toxicity, *Metabolism, *Life cycles, *Oil spills, Oil, *Water pollution effects, *Organic compounds, *Food chains, *Path of pollutants, *Marine pollutants, *Larval growth stage, *Embryonic growth stage, Growth stages, Oil wastes, Biological communities, Mollusks, Shrimp, Absorption, Fish eggs, Laboratory tests, Invertebrates, Oysters, Crustaceans, Herrings, Lethal limit, Mortality.

The paper gives a review of relevant publications. There are astonishingly few papers on the toxicological or metabolic effects on the generally most susceptible stages of the life cycle. Most experiments were carried out with different experimental parameters (temperature, salinity, species). The most important data are lacking: contents and spectrum of hydrocarbons in the test medium. The data given in the papers are tabulated and compared. It is, however, impossible to draw a general conclusion of a connecting pattern of influence of hydrocarbons. Corresponding field observations on eggs and larvae do not exist. (EIS-Katz)
W78-11016

WATER SOLUBLE EXTRACTIVES FROM PETROLEUM OILS: CHEMICAL CHARACTERIZATION AND EFFECTS ON MICROALGAE AND MARINE ANIMALS,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
K. Winters, C. Van Baalen, and J. A. C. Nicol.
Rapports et Proces-Verbaux des Reunions, Conseil International pour L'Exploration de la Mer, Vol. 171, p 166-174, 1977. 8 tab, 5 fig, 6 ref.

Descriptors: *Chlorella, *Algae, *Diatoms, *Toxicity, *Mortality, Fuels, *Oil, *Bioassay, *Aromatic compounds, *Animal behavior, *Embryonic growth stage, *Larvae, *Crabs, *Crustaceans, *Reproduction, *Marine animals, Aquatic microorganisms, Cyanophytoa, Clorophyta, Oil wastes, Chemical analysis, Organic compounds, Invertebrates, Coccochloris, Dunaliella, Melitta, Balanus, Artemia, Amphora, Toluidines, Dimethylanilines.

Chemical analyses of four lots of No. 2 fuel oils were carried out. They were Montana, Baytown, New Jersey and Baton Rouge, supplied by Exxon Corporation. The major components of aromatics in the water were identified and concentrations determined. The fuel oils were tested against six strains of microalgae, two blue greens PR-6 (Agmenellum quadruplicatum), 17A (Coccochloris elabens); two greens DUN (Dunaliella tertiolecta) 580 (CHlorella autotrophica); and two diatoms N-1 (Cylindrotheca sp.) and AMP-1 (Amphora sp.). Microalgae differed in sensitivity to an oil; an alga differed in sensitivity to several oils. Data are presented for toxicities of aromatic compounds found in oils; toluidines were especially toxic to blue-green algae. Animals- barnacle eggs, anuplii, sand dollar eggs and embryos, crab larvae, a pteropod- were exposed to crude oils, fuel oil and aromatic compounds, and mortalities determined. Fuel oils and crankcase oils were especially toxic. (EIS-Katz)
W78-11017

TOXICOLOGICAL EFFECTS OF MERCURY ON A FRESHWATER FISH, ANABAS SCANDENS, CUV. & VA. AND THEIR ECOLOGICAL IMPLICATIONS,
Berhampur Univ., Crissa (India). Environmental Biology Lab.
A. K. Panigrahi, and B. N. Misra.
Environmental Pollution, Vol. 16, p 31-39, 1978. 6 fig, 23 ref.

Descriptors: *Mercury, Metals, *Freshwater fish, Bioassay, Toxicity, *Pathology, Fish behavior, Water pollution effects, Fish physiology, Biochemistry, Algae, Laboratory tests, Bioaccumulation, India, *Anabas, Hemoglobin, Red blood cell count, Protein content, Mercury accumulation.

Fish exposed to mercuric nitrate all died in concentrations greater than 5 mgl-1. However, at 3 mgl-1 they survived although they showed a variety of pathological and biochemical disorders. The main clinical symptoms such as inappetence and ataxia appeared after 5 days' exposure. After 3 weeks' exposure, blindness was noted in 29% of the fish and respiratory rate was considerably reduced. After 4 weeks a total of 71% had become blind. Partial recovery of respiratory rate occurred in all treated fish when they were transferred to fresh, mercury-free water. Considerable reductions in haemoglobin percentage, red blood cell (RBC) count, body weight and protein content of the treated fish were observed. The mean concentration of mercury in the liver of the fish exposed for a period of 45 days was as high as 3.0 plus or minus 0.16 micro g g-1 wet tissue and in the muscles 2.8 plus or minus 0.18 micro g g-1 wet tissue, while concentrations in untreated liver and muscle were 0.20 plus or minus 0.05 and 0.12 plus or minus 0.05 micro g g-1 wet tissue, respectively. The physiological and biochemical disorders were related to the concentrations of mercury in the tissue. Mercury accumulation in algae and Hydrilla plants was 0.76 plus or minus 0.022 and 0.83 plus or minus 0.035 micro g g-1 wet weight, respectively within a period of 45 days' exposure. (EIS-Katz)
W78-11018

EFFECTS OF HEPTACHLOR AND TOXAPHENE ON LABORATORY-REARED EMBRYOS AND FRY OF THE SHEEPSHEAD MINNOW,
Environmental Research Lab., Gulf Breeze, FL.
L. R. Goodman, D. J. Hansen, J. A. Couch, and J. Forester.
In: Proceedings of the Thirtieth Annual Conference, Southeastern Association of Fish and Wildlife Agencies, October 24-27, 1976, Jackson, Mississippi. p 192-202. 10 fig, 2 tab, 16 ref.

Descriptors: *Bioassay, *Toxicity, *Heptachlor, *Absorption, *Embryonic growth stage, Minnows, Fry, *Lethal limit, *Growth rates, Pathology, Hatching, *Fish behavior, Water pollution effects, Estuarine environment, Microscopy, Fish eggs, Laboratory tests, Chlorinated hydrocarbon pesticides, Halogenated pesticides, Fish reproduction, *Toxaphene, Bioconcentration, Cyprinodon variegatus, Sublethal effects.

Flow-through seawater bioassays of 28-days duration were conducted with the organochlorine pesticides heptachlor and toxaphene to determine their toxicity to and bioconcentration by embryos and fry of the sheepshead minnow (Cyprinodon variegatus). At technical heptachlor measured concentrations of 4.3, 3.5, 2.2, 2.0, and 1.2 micro gr/l (ppb), test animal survival was 1, 5, 61, 79, and 88% m respectively. At toxaphene measured concentrations of 2.5, 1.1, 0.6, 0.3, and 0.2 micro gr/lm test animal survival was 10, 85, 79, 88, and 80%, respectively. Average standard length of fry continuously exposed from fertilization to heptachlor concentrations of 4.3 and 3.5 was significantly reduced. Concentration factors (concentration in fish/measured concentration in water) for heptachlor averaged 3,600 and for trans-chlordane averaged 8,600. Heptachlor epoxide and cis-chlordane were also present in the fish. Concentration factors for toxaphene in fry averaged 9,800. Various histopathological characteristics not seen in control fish were observed in the liver, kidney, pancreas, and intestine of the few fish that survived the 4.3 and 3.5 micro gr/l of heptachlor. (EIS-Katz)

W78-11020

PRELIMINARY OBSERVATIONS ON THE PRODUCTIVITY OF PERIPHYTON ATTACHED TO FRESHWATER ARTIFICIAL TIRE REEF,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
E. D. Prince, R. J. Strange, and G. M. Simmons, Jr.
In: Proceedings of the Thirtieth Annual Conference, Southeastern Association of Fish and Wildlife Agencies, October 24-27, 1976. Jackson, Mississippi p 207-215 2 fig, 3 tab, 25 ref.

Descriptors: *Primary productivity, Productivity, *Phytoplankton, *Periphyton, *Diatoms, *Algae, *Chlorophyta, *Food chains, *Artificial substrates, *Fish food organisms, *Nutrients, *On-site investigations, Biological communities, Aquatic plants, Biomass, Dissolved oxygen, Equipment, Euphotic zone, *Artificial tire reefs, *Smith Mountain Lake(Virginia).

Primary productivity and nutrient concentrations were compared between the periphyton community on a freshwater artificial tire reef and the littoral phytoplankton in Smith Mountain Lake, Virginia, during the months of July, August, and September 1974. Primary productivity and nutrient concentrations of the periphyton community were several times greater than that of the littoral phytoplankton. The periphyton community was dominated by pennate diatoms and filamentous green algae. Productivity measurements of the reef periphyton were on the same order of magnitude as the highest periphyton production rates reported in the literature. High productivity of the tire reef periphyton supports the hypothesis that freshwater artificial reefs support increased densities of fish and invertebrates by enhancing the productivity of aquatic environments. (EIS-Katz)
W78-11021

SOME RESULTS OF INVESTIGATIONS OF THE CYCLE OF MATTER AND THE BIOLOGICAL SELF-PURIFICATION OF LAKES AND STREAMS,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
M. M. Kamshilov.
Hydrobiological Journal, Vol. 13, No. 1, p 1-8, 1977. 70 ref.

Descriptors: *Plant pigments, *Phytoplankton, *Biomass, *Self-purification, *Zooplankton, *Biodegradation, Algae, Aquatic bacteria, Organic compounds, Degradation(Decomposition), Pigments, Water purification, Pollutant abatement, Water quality, Eutrophication, Chlorophyll, Diatoms, Chlorophyta, Aquatic microorganisms, *Flagellata, *Volga River, Lemna.

Long-term investigations of the floristic composition of the water of the Volga indicate increase in its saprobicity. Studies of the composition of the photosynthetic pigments in the phytoplankton of different Volga basin reservoirs have enabled us to estimate their average content per unit of phytoplankton biomass and to determine the basic factors on which it is dependent. The role of the colorless Flagellata in the biotic cycle of reservoirs was elucidated. The process of breakdown of phenol under experimental and field conditions is used to illustrate the proposition that analysis of the biological factors involved in the breakdown of organic matter in the aquatic environment should be approached from biogeocoenological positions, and methods of biogeocoenology should be applied. (EIS-Katz)
W78-11022

SOME EFFECTS OF PAPER AND PULP MILL EFFLUENTS ON SOUTHERN LAKE SAIMAA,
Limnological Inst., Oosterzee (Netherlands).
H. de Haan, and I. Kettunen.
Aqua Fennica, p 41-51, 1976. 6 fig, 3 tab, 7 ref.

Descriptors: *Seasonal, *Pulp wastes, *Water quality, *Biochemical oxygen demand, *Water pollution effects, Limnology, Autumn, Winter, Organic matter, Industrial wastes, Lignins, Dissolved oxygen, Aquatic bacteria, Phenols, Surface waters, Pulp and paper industry, Lake Saimaa(Finland).

The effect of paper and pulp mill effluents on southern Lake Saimaa was investigated each fortnight for 9 months by performing ten different analyses on surface and hypolimnien samples from 11 sampling stations. The analyses included Chemical Oxygen Demand, Biological Oxygen Demand, dissolved organic carbon, oxygen saturation, colour, ultra violet absorption at 250 nm, lignin, phenolic substances and heterotrophic bacteria counts. The hydrology of the waste waters appeared to be strongly dependent on the season. In autumn the waste waters mixed with the lake water and flowed with the main surface current eastwards. In winter however the relatively warm waste waters did not mix with the cold lake water and flowed along the bottom, strongly polluting the hypolimnion of southern Lake Saimaa. Soon after the ice cover had disappeared the water was fully mixed again. The results of Sephadex gel filtration of polluted and natural water showed a relatively large amount of brown organic matter with a high molecular weight (MW greater than 10000) to be characteristic of polluted water. Natural water appeared to contain a relatively large amount of organic matter with a low molecular weight (MW less than or equal to 500). (EIS-Katz)
W78-11023

BENTHOS AROUND AN OUTFALL OF THE WERRIBEE SEWAGE-TREATMENT FARM, PORT PHILLIP BAY, VICTORIA,
Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group.
G. C. B. Poore, and J. D. Kudenov.
Australian Journal of Marine and Freshwater Research, Vol. 29, p 157-167, 1978. 1 fig, 6 tab, 18 ref.

Descriptors: *Benthic fauna, *Sewage treatment, Environmental effects, *Sewage effluents, *Intertidal areas, *Invertebrates, *Estuarine environment, Water chemistry, Bottom sediments, Salinity, Nutrients, Ammonia, Nitrogen compounds, Sewage disposal, Connate water, Distribution, Benthos, Mollusks, Crustaceans, *Australia, Werribee sewage-treatment farm, Port Phillip Bay.

A 2 square km area adjacent to the 145W outfall of the Werribee sewage-treatment farm was sampled for sediment, water chemistry and macrobenthos. Sediments nearshore were more sandy and more uniform than those offshore. Water salinity and nutrient concentrations (particularly ammonia) in overlying and interstitial water decreased rapidly with increasing distance from shore. The fauna was rich and contained several euryhaline and opportunistic species. Classification analysis revealed an offshore and a nearshore group of stations, and possibly a third group around the outfall. The distribution of common species were correlated with depth, sediment parameters or interstitial phosphate concentrations. The benthos of the 145W drain was distributed patchily but the station closest to the outfall (within 300 m) had high densities, high proportions of scavengers and deposit-feeders, high sediment organic fraction and high interstitial nutrient concentrations. The effect of the drain on the macrobenthos is exerted through particulate organic matter, dissolved nutrients and freshwater inputs. (EIS-Katz)
W78-11024

RESPIRATORY METABOLISM OF STRIPED BASS, MORONE SAXATILIS (WALBAUM), IN RELATION TO TEMPERATURE,
California Univ., Davis. Dept. of Animal Physiology; and California Univ., Davis. Inst. of Ecology.
R. L. Kruger, and R. W. Brocksen.
Journal of Experimental Marine Biology and Ecology, Vol 31, p. 55-66, 1978. 4 fig, 4 tab, 20 ref.

Descriptors: *Respiration, *Striped bass, *Metabolism, *Water temperature, *Fish behavior, Juvenile fish, Sea basses, Oxygen, Temperature, Behavior, Velocity, Swimming, Fish physiology, Environmental effects, Predation, Laboratory test, Morone.

The oxygen consumption of striped bass, Morone saxatilis (Walbaum), has been determined using tunnel-type flowing water respirometers. Standard metabolic rates were established and active metabolic rates were determined at three water velocities: approximately 0, 5 and 10 cm/sec and five temperatures, namely, 8, 12, 16, 20 and 24C. Using the difference between the standard and active metabolic rates at 10 cm/sec swimming velocity, a measure of the scope for activity over a limited range of velocities for striped bass was derived. The scope of activity was found to be very similar at water temperatures of 8, 12 and 16C, being 55, 44 and 45 mg 02/kg/h, respectively for a representative 40 g striped bass. At 20 and 24C, the scope of activity was 99 and 143 mg 02/kg/h, respectively. In terms of the potential for energy expenditure, the highest scope for activity was at 24C and the lowest at 12C. Extrapolations to higher swimming velocities were made from the literature. (EIS-Katz)
W78-11025

CHANGES IN FISHES WITH CULTURAL LAKE EUTROPHICATION (FISCHEREILICHE VERANDERUNGEN IN KULTURBEDINGT EUTROPHIERENDEN SEEN),
Staatliches Inst. fuer Seenforschung und Fischereiwesen, Langenargen (West Germany).
J. Hartmann.
Schweizterische Zeitschrift fur Hydrologie, Vol 39, No 2, p. 243-254, 1977. 2 fig, 1 tab, 66 ref.

Descriptors: *Succession, *Eutrophication, *Benthos, Environmental effects, Fish physiology, *Freshwater fish, Aquatic populations, Plankton, Phosphorus, Growth rates, Fish reproduction, Water pollution effects, Distribution, Primary productivity, Fish food organisms, Yellow fever, *Coregonidea, *Percidea, *Cyprinidae.

Mainly from the trends of fish yield, four stages of fish succession in European lakes under cultural eutrophication are described. Trends of transparency, phosphorus, weeds, benthos, and plankton are included. Supplementary interrelated effects of eutrophication on fish biology (growth, fat content, condition, distribution, reproduction, parasites, fish kills, introgression, feeding) have been collected from literature. The effects, mainly observed on planktiovores, are not specific for species or localities. (EIS-Katz)
W78-11026

PREDATOR-PREY INTERACTIONS OF FISHES UNDER THE INFLUENCE OF AMMONIA,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
D. M. Woltering, J. L. Hedtke, and L. J. Weber.
Transactions of the American Fisheries Society, Vol 107, No 3, p. 500-504, 1978. 2 fig, 1 tab, 16 ref.

Descriptors: *Bass, *Ammonia, *Fish behavior, *Predation, *Growth rates, *Fish food organisms, *Fish physiology, Laboratory tests, Feeding rates, Water pollution effects, Environmental effects, Nitrogen compounds, Behavior, Aquatic populations, Balance of nature, Mosquito fish, Micropterus, *Sublethal effects, Gambusia.

Food consumption and growth rates of a predator, the largemouth bass (Micropterus salmoides) and the behavior of both the predator and its prey, the mosquitofish (Gambusia affinis) were sensitive indices of sublethal effects of ammonia on predator-prey interactions. Prey consumption and growth rates of bass in control tests increased with increasing prey densities. Ammonia concentrations of 0.63 and 0.86 mg/liter substantially decreased prey consumption and growth of bass in test tanks stocked with densities of 30, 60 and 120 mosquitofish. At a given ammonia concentration, there were greater decreased in prey consumption and growth rates of bass at higher prey densities. This can be attributed in part to the bass being more sensitive than mosquitofish to ammonia and to the harassment of the predator by the prey which occurred at high ammonia concentrations and high prey concentrations. (EIS-Katz)
W78-11027

SEARCH FOR NITRIFYING AGENTS IN WATER AND SOILS AS SOURCES OF NITRATES IN SURFACE WATER,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5B.
W78-11063

PHENOL POISONING DUE TO CONTAMINATED DRINKING WATER,
Bureau of Epidemiology, Atlanta, GA. Cancer and Birth Defects Div.
E. L. Baker, P. J. Landrigan, P. E. Bertozzi, P. H. Field, and B. J. Basteyns.
Archives of Environmental Health, p 89-94, March/April, 1978. 3 fig, 2 tab, 12 ref.

Descriptors: *Accidents, *Water pollution, *Phenols, *Human diseases, Poisoning, Water wells, Wisconsin, Organic compounds, Pollutant identification.

Accidental spillage of 37,900 liters of 100% phenol (carbolic acid) in July, 1974 caused chemical contamination of wells in a rural area of southern Wisconsin. This resulted in an outbreak of human illness in several people living nearest the spill site. Analysis of water-testing data and knowlege of the physical properties of phenol (i.e. the chemical solidifies at ambient temperatures) support the prediction that those wells which now have high levels of phenol will continue to be contaminated for many years. Furthermore, these wells will be re-contaminated after every rain. It was noted that some of the variations in results of water testing related to differences in well depth and type of construction. (Purdin-NWWA)
W78-11075

EFFECT OF THERMAL STRESS AND TOTAL RESIDUAL CHLORINATION ON EARLY LIFE STAGES OF THE MUMMICHOG FUNDULUS HETEROCLITUS,
Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station.
D. P. Middaugh, J. M. Dean, R. G. Domey, and G. Floyd.
Marine Biology, Vol 46, No 1, 1978, p 1-8, 8 tab, 30 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, Powerplants, Chlorination, Fish, Life history studies, Growth stages, Embryos, Larvae.

Developing embryonic stages of Fundulus heteroclitus were found to be more resistant to the deleterious effects of temperature, total residual chlorination (TRC) and duration of exposure than 0-day and 7-day-old larvae. For the embryonic stages, temperature was the only statistically significant main variable. TRC concentration and duration of exposure had no significant effect. An inverse relationship was found between hatching success and test temperatures for the 1-2 cell and gastrula stages. The potentially detrimental effect of entrainment of eggs and larvae of an estuarine fish in coastal electric generating plants using chlorination was demonstrated. (Chilton-ORNL)
W78-11095

EFFECT OF TEMPERATURE ON ACTIVITY AND SOCIAL BEHAVIOR OF THE ADULT TAUTOG TAUTOGA ONITIS UNDER LABORATORY CONDITIONS.
National Marine Fisheries Service, Highlands, NJ. Sandy Hook Lab.
B. L. Olla, A. L. Studholme, A. J. Bejda, C. Samet, and A. D. Martin.
Marine Biology, Vol 45, No 4, 1978, p 369-378, 2 fig, 1 tab, 22 ref. ERDA No. E(49-7) 3045.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, Fish, Fish behavior, Temperature, Tautog.

During exposure to elevated temperature, activity of the adult Tautoga onitis was generally depressed. Feeding, aggression and interfish distance showed a decrease. Upon return to acclimation temperatures, activity, interfish distance and feeding returned to normal levels but aggression remained reduced. It was suggested that, under natural conditions tautog are subjected to temperature elevations of this level and are able to withstand and recover from these exposures. Both young and adult tautog tend to remain within their natural range and do not seek to avoid these temperatures. (Chilton-ORNL)
W78-11096

INFLUENCE OF TEMPERATURE ON THE REPRODUCTIVE POTENTIAL OF ONCHOLAIMUS OXYURIS (NEMATODA: ONCHOLAIMIDAE),
Ghent Rijksuniversiteit (Belgium). Dept. of Zoology.
C. Heip, N. Smol, and V. Absillis.
Marine Biology, Vol 45, No 3, 1978, p 255-260, 4 tab, 22 ref.

Descriptors: Environmental effects, *Thermal pollution, Temperature, Reproduction, Aquatic animals, Nematodes, *Water pollution effects.

The large predatory nematode, Oncholaimus oxyuris, has a long life cycle relative to its weight. The reproductive potential is low, and a yearly average of r (rate of natural increase) = 0.0104/day, corresponding with a doubling time of 67 days has been found. The generation time at the annual average temperature in the location of the test population is 232 days. It was concluded that the population inhabiting this shallow brackish-water pond produces only one generation annually and that, with continuous reproduction, the average annual temperature required to produce two generations would be 13.9C. (Chilton-ORNL)
W78-11097

THE LARVAL DEVELOPMENT OF THE ROCK CRAB, CANCER IRRORATUS SAY, 1817, UNDER LABORATORY CONDITIONS (DECAPODA BRACHYURA).
Rhode Island Univ., Kingston. Graduate School of Oceanography.
A. N. Sastry.
Crustaceana, Vol 32, No 2, 1977, p 155-168, 6 fig, 28 ref. EPA (R-800981).

Descriptors: Environmental effects, Temperature, *Salinity, *Crabs, Larval growth stage, Growth stages, Appendages.

A detailed description of each of the five zoeal stages and a megalopa stage which metamorphoses into the crab stage of C. irroratus are given. Eggs hatched at 10, 15, and 20C in 30% salinity released the first zoea which completed development to the first crab stage with a maximum survival rate at 15C in 30% salinity. Descriptions of functional appendages of each larval stage are given to be used as an aid in identifying the stages of development and differentiating them from larvae of other brachyuran crabs in plankton collections. (Chilton-ORNL)
W78-11098

AQUACULTURE OF THE GREEN MUSSEL, MYTILUS VIRIDIS LINNAEUS, IN MALAYSIA,
Universiti Sains malaysia, Penang. Pusat Pengajian Sains Kajihayat.
For primary bibliographic entry see Field 2L.
W78-11099

THE EFFECTS OF A SIMULATED REFINERY EFFLUENT ON THE GRASS SHRIMP, PALAEMONETES PUGIO,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
L. W. Hall, Jr., A. L. Buikema, Jr., and J. Cairns, Jr.
Archives of Environmental Contamination and Toxicology, Vol 7, 1978, p 23-35, 8 tab, 15 ref.

Descriptors: Environmental effects, *Water pollution effects, Thermal pollution, Temperature, *Shrimp, *Toxicity, Effluents, Salinity, Light intensity, Photoperiodism.

An arbitrary reference mixture (ARM) which contained chemicals in the approximate concentrations recommended by EPA for 1977 was used to simulate refinery effluent. The ARM components were 0.10 mg/l phenol, 0.17 mg/l sulfide, 0.25 mg/l chromium, 10 mg/l ammonia, 10 mg/l No. 2 fuel oil, and 20 mg/l kaolinite. Results showed that light intensity, photo-period, and salinity had no significant effect upon the toxicity of the ARM to grass shrimp but that temperature was the most important environmental variable affecting short term toxicity. Collection location, genera and species differences did not affect sensitivity to the ARM. Grass shrimp were more sensitive than pinfish. (Chilton-ORNL)
W78-11100

THE EFFECT OF TEMPERATURE ON REPRODUCTION OF CYCLOPS VERNALIS FISCHER (COPEPODA, CYCLOPOIDA),
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
G. W. Hunt, and A. Robertson.
Crustaceana, Vol 32, No 2, 1977, p 169-177, 1 fig, 3 tab, 17 ref. 18050 ELT.

Descriptors: Environmental effects, *Thermal pollution, Temperature, Reproduction, Copepods, Eggs, Hatching, Fecundity, Longevity, Cyclops vernalis Fischer.

The purpose of this study was to observe and compare the longevity, fecundity, egg development rate and egg viability for Cyclops vernalis at different temperatures. Duration of the adult stage of females was found to vary with temperature. The longest period that any individual female lived after her adult molt was 84 days at 14C and the shortest was 21 days at 31C. Every female observed produced at least one eggsac. Clutches varied in size from 3 to 102 eggs, with both extremes being produced at 21C. It was concluded that the factor directly determining clutch size was the female's body size. Data indicated that development rate of eggs increases linearly as temperature increases up to 26C. From 26 to 31C the rate of acceleration of the development rate appeared to slow down. It was concluded that hatching success of eggs was not affected by temperatures used in these experiments. (Chilton-ORNL)
W78-11101

SEASONAL CHANGES IN THE EFFECTS OF TEMPERATURE AND WATER FLOW RATE ON THE GROWTH OF JUVENILE PACIFIC OYSTERS, CRASSOSTREA GIGAS (THUNBERG),
Oregon State Univ., Newport. Dept. of Fisheries and Wildlife.
R. E. Malouf, and W. P. Breese.
Aquaculture, Vol 12, No 1, September 1977, p 1-13, 7 fig, 3 tab, 20 ref. NOAA 04-5-158-2.

Descriptors: Environmental effects, *Thermal pollution, Temperature, Oysters, Growth rates, Nuclear powerplants.

This study investigates the feasibility of utilizing the heated effluent from nuclear power plants for culturing oysters. Extreme seasonal changes in the growth rate of immature oysters were observed which were independent of temperature and appeared to be related to changes in the quantity of particulate organic material suspended in the water. Between November and March, growth was minimal and independent of temperature. During periods when food availability and water flow rate were low, growth was observed to be inversely related to temperature between 10 and 23C. It was suggested that maximum growth might be obtained at a temperature near 20C if other conditions are ideal and food availability high. (Chilton-ORNL)
W78-11102

THE SALINITY AND TEMPERATURE TOLERANCE AND THE GROWTH OF MACROBRACHIUM OHIONE (SMITH) 1874 REARED IN LABORATORY TANKS,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
K. Chung.
The Texas Journal of Science, Vol 28, No 1-4, March 1977, p 271-284, 7 fig, 2 tab, 39 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, Shrimp, Salinity, Temperature, Resistance, Growth rate, Mortality.

Laboratory experiments showed that differences in survival rates of shrimp in freshwater and at salinities of 2,4,6, or 10 ppt were not significantly different at 1% level. High mortality during molting occurred when late afternoon temperatures reached 31.5C and higher. Non-molting occurred when late afternoon temperatures reached 31.5C and higher. Non-molting animals were able to survive temperatures of 32C for several days. None survived at a peak temperature of 32.9C after molting. In growth studies, the calculated maximum body length, 96.79 mm, compared favorably with reports from the literature and it was concluded that under artificial conditions, one might expect the size of adult popultions to be similar to natural populations. (Chilton-ORNL)
W78-11103

THE EFFECTS OF THE MARSDEN 'A' THERMAL POWER STATION ON THE MARINE PLANKTON,
New Zealand Oceanographic Inst., Wellington.
J. M. Bradford, and D. A. Burns.
NZOI Records, Vol 3, No 9, April 1977, p 69-86, 7 plates, 6 fig, 4 tab, 22 ref.

Descriptors: Environmental effects, Powerplants, Cooling water, *Plankton, Populations, Mechanical damage.

Power station effects on plankton were determined by comparing samples taken across the effluent plume with samples from the intake area. Passage through the cooling system caused considerable mechanical damage to the plankton. In considerations of the whole area, this loss is probably not detectable because the plankton of the area are continually being replenished by the general flow of water and because damaged biological material discharged in the effluent forms the food of detrital or deposit feeding animals and is therefore not lost to the food chain. (Chilton-ORNL)
W78-11104

THERMAL SELECTION OF ALLOZYME POLYMORPHISMS IN BARNACLES,
Haifa Univ. (Israel). Dept. of Biology.
E. Nevo, T. Shimony, and M. Libni.
Nature, Vol 267, June 23, 1977, p 699-701, 2 tab, 21 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, Temperature, Powerplants, Cooling water, Aquatic animals, Adaptation, *Barnacles.

Barnacles were collected by immersing plates in the open Mediteranean seawater canals of the Haifa Electrical Plant Cooling System, where the temperature varies from 9 to 12C between the cooler inflowing and warmer outflowing canals. Number of barnacles per plate in the inflowing canals was about 2,400 compared with 510 per plate in the outflowing canals. Individuals varied in size from 336 cumm in the inflowing canals to 135 cumm in the outflowing canals. Mean heterozygosity for all 8 loci decreased from 0.110 in the cooler to 0.047 in warmer canal. Distinct statistically significant repetitive trends in alleli frequencies were found for chosen alleles in seven out of the eight loci. It was concluded that both allozymes and size are positively selected by natural selection as adaptation to warm environments. (Chilton-ORNL)
W78-11105

THE EFFECT OF TEMPERATURE ON ROUTINE METABOLISM IN TILAPIA RENDALLI BOULENGER,
Rhodesia Univ., Salisbury. Div. of Biological Sciences.
M. S. Caulton.
Journal of Fish Biology, Vol 11, 1977, p 549-553, 2 fig, 1 tab, 12 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, Fish, *Metabolism, Respiration, Oxygen requirements, Energy budget, *Tilapia rendalli.

The rate of oxygen consumption (expressed as mg 02 consumed per gram of fish per unit time) of Tilapia rendalli was determined over the temperature range of 17-40C. Between 17 and 28C, oxygen consumption increased in a perdictable normal logarithmic fashion which may be expected of most poikilotherms, showing a mean rate of increase of about 0.36 mg 02/d/C. From 28 to 37C, oxygen consumption deviated from the expected logarithmic increase and was suppressed so that the demand for oxygen at this tempature range was relatively stable with a mean rate increase of only 0.19 mg 02/g/C. From 37 to 40C, there was a rapid increase in oxygen consumption of about 1.8 mg 02/d/C. It was suggested that oxygen consumption between 28 and 37C represents a significant energy saving function which would be a valuable credit to the daily energy budget of these fish. Good correlations were found to exist between theoretical estimates of biomass change and actual measurements of biomass change. (Chilton-ORNL)
W78-11106

THE OCCURRENCE AND RELATIVE ABUNDANCE OF PLANKTONIC FISH LARVAE IN ANDERSON CREEK EMBAYMENT, KENTUCKY LAKE, KENTUCKY,
Murray State Univ., KY. Dept. of Biological Sciences.
W. L. Davis, and T. M. Freeze.
Transactions of the Kentucky Academy of Science, Vol 38, No 3-4, 1977, p 120-122, 1 tab, 9 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, Temperature, Populations, Fish, Plankton, Larvae, Distribution, *Kentucky Lake(KY).

99.6% of the total catch in this study were clupeids (mostly skipjack, gizzard shad and threadfin shad). The numbers of these fish taken in the tow net increased as the water temperature increased above 19C. Nonclupeid fishes generally represented by temperature increased above 19C. Nonclupeid fishes were generally represented by temperate basses (Morone sp) when the water temperature was below 17.0C and by crappies (Pomoxis spp) when the water temperature was between 19.0 and 22.0C. (Chilton-ORNL)
W78-11107

AN ANALYSIS OF SEASONAL DYNAMICS OF A MIXED POPULATION OF DAPHNIA, AND THE ASSOCIATED CLADOCERAN COMMUNITY,
Maryland Univ., College Park. Dept. of Zoology.
J. D. Allan.
Freshwater Biology, Vol 7, 1977, p 505-512, 7 fig, 1 tab, 16 ref.

Descriptors: Environmental effects, *Temperature, Zooplankton, *Daphnia, *Seasonal, Adaptation, Succession.

Results of this study showed rather precise seasonal separation of three cladocerans (Daphnia, Bosmina longirostris, and Ceriodaphnia quadrangula) implying differential adaptations to changing conditions in the lake. D. ambigua exhibited a spring peak in abundance followed by a decline which was coincident with a high occurrence of sexual reproduction, the appearance of D. parvula, and an increase in Ceriodaphnia quadrangula. Bosmina longirostris was abundant before and after the period of dominance by D. ambigua. It was concluded that temperature rather than species interactions was the more important environmental variable in controlling species succession. (Chilton-ORNL)
W78-11108

LARVAL GROWTH AND DEVELOPMENT OF ARGIA VIVIDA (ODONATA: COENAGRIONIDAE) IN WARM SULPHUR POOLS AT BANFF, ALBERTA,
Calgary Univ. (Alberta). Dept. of Biology.
G. Pritchard, and B. Pelchat.
The Canadian Entomologist, Vol 109, No 12, 1977, p 1563-1570, 6 fig, 4 tab, 13 ref.

Descriptors: Environmental effects, Temperature, Photoperiodism, Life history studies, Larvae, Larval growth stage, Aquatic insects.

The role of temperature and photoperiod in the regulation of the life-cycle of A. vivida was investigated. Larvae were collected from a variety of places in a warm spring system. Only the Z instar stage can be recognized with certainty but populations can be divided into size classes which appear to correspond well with the last nine larval instars. Field investigations showed that periods of rapid growth occur in fall and spring. Laboratory studies, in conjunction with field results, suggest that, of the physical factors directly controlling the rate of larval development in this species, temperature is the inmportant factor until the penultimate instar, exit from which is under photoperiod control. (Chilton-ORNL)
W78-11109

THE IMPORTANCE OF TEMPERATURE CONDITIONING TO THE RESPIRATION OF NATURAL PHYTOPLANKTON COMMUNITIES,
New Univ. of Ulster, Coleraine (Northern Ireland). Limnology Lab.
R. I. Jones.
British Phycology Journal, Vol 12, September 1977, p 277-285, 6 fig, 19 ref.

Descriptors: Environmental effects, *Thermal pollution, Seasonal, Spring, *Temperature, *Phytoplankton, *Respiration.

During the spring in which these observations were made, the temperature of the water in the bay rose by about 13C, but the rate of warming was erratic due to the shallowness and turbulence of the water mass. Phytoplankton in the bay were therefore subjected to considerable changes in temperature within short periods of time. Respiration rate was not constant but showed changes which could be related to temperature changes. This effect was more pronounced when expressed as per unit of chlorophyll a than when expressed as per unit of algal volume. (Chilton-ORNL)
W78-11110

SEASONAL SIZE CHANGES IN CERTAIN DIATOMS AND THEIR POSSIBLE SIGNIFICANCE,
Victoria Univ. of Manchester (England). Pollution Research Unit.
E. G. Bellinger.
British Phycology Journal, Vol 12, September 1977, p 233-239, 6 fig, 1 tab, 12 ref.

Descriptors: Environmental effects, *Thermal pollution, *Seasonal, Temperature, Growth rates, *Diatoms, Size.

Cell size changes in populations of Stephanodiscus astraea and Asterionella formosa were observed throughout the growing season. Population numbers underwent their maximum increase in the spring when water temperature rose from about 4 to 10C. Size restitution seemed to mainly occur during the late autumn and winter and not to any extent during the main growing seasons. These observations are of importance in interpretations of parameters such as cell Volume as used in biomass estimates, rates of nutrient absorption, and sinking rates. (Chilton-ORNL)
W78-11111

A MATHEMATICAL MODEL OF THE ACCUMULATION OF RADIONUCLIDES BY OYSTER (C. VIRGINICA) AQUACULTURED IN THE EFFLUENT OF A NUCLEAR POWER REACTOR TO INCLUDE MAJOR BIOLOGICAL PARAMETERS,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
For primary bibliographic entry see Field 5B.
W78-11112

THE RECENT HISTORY OF PRODUCTIVITY IN SELECTED BERKSHIRE LAKES,
Massachusetts Univ., Amherst. Dept. of Zoology.
S. D. Ludlam.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 037, Price codes: A04 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC Publication No. 90, September 1977. 66 p, 3 tab, 10 fig, 40 ref. OWRT A-077-MASS(2), 14-34-0001-7046.

Descriptors: *Chlorophyll, Sedimentation rates, *Trophic level, Degradation(Decomposition), Sediments, *Massachusetts, *Productivity, *Lake sediments, *Pigments, Eutrophication, *Berkshire Lakes(Mass), Lakes, Cape Cod Ponds(Mass), *Mesotrophy, *Pigment profiles, Oligotrophy.

Seven of the deepest Berkshire lakes were examined to determine their relative trophic type and the concentration of sedimentary pigments most recently deposited. Chlorophyll a and silica uptake in the euphotic zone were used as measures of a lake's trophic type. Fair relationships were observed between euphotic chlorophyll a and the concentration of sedimentary chlorophyll derivatives in the most surficial sediment, and between euphotic chlorophyll a and total sedimentary carotenoids. These relationships were apparently influenced by climate and the morphometry of the lake basins and watersheds. The recent history of productivity was derived for eight Berkshire lakes and two Cape Cod ponds using pigment profiles from sediment cores. Of the Berkshire lakes, five showed definite signs of recent cultural eutrophication. One showed signs of past eutrophication followed by a decline in productivity, and two showed either a very slight increase in productivity with time or no significant change. Of these lakes, one was eutrophic, six were mesotrophic and one was oligotrophic. Comparison of pigment profiles with other methods of predicting past levels of productivity indicated that it is both an accurate method in the Berkshire lakes and more easily interpreted than diatom profiles. Bacteriochlorophyll degradation products are also useful as an indicator of past anaerobic hypolimnetic conditions in Berkshire lakes. They are better indicators of this conditions than sediment laminae. (Idoine-Mass)
W78-11203

THE EFFECTS OF ELEVATED LEVELS OF SODIUM IN COMMUNITY DRINKING WATER ON BLOOD PRESSURE DISTRIBUTION PATTERNS,
Massachusetts Univ., Amherst. Div. of Public Health.
For primary bibliographic entry see Field 5G.
W78-11204

BENZIMIDAZOLE FUNGITOXICANTS IN VIRGINIA SOILS: MOVEMENT, DISAPPEARANCE, AND EFFECT ON MICROORGANISMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.
For primary bibliographic entry see Field 5B.
W78-11215

RECOVERY OF SANITARY-INDICATOR BACTERIA FROM STREAMS CONTAINING ACID MINE WATER,
West Virginia Univ., Morgantown. Water Research Inst.
For primary bibliographic entry see Field 5A.
W78-11217

PHYSICAL, CHEMICAL AND BIOLOGICAL EFFECTS OF DREDGING IN THE THAMES RIVER (CT) AND SPOIL DISPOSAL AT THE NEW LONDON (CT) DUMPING GROUND.
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
Naval Facilities Engineering Command, Environmental Assessment Report No. 2, April 1977, 346 p.

Descriptors: *Dredging, *Water pollution effects, Connecticut, *Outer Continental Shelf, *Ocean dumping, *Spoil disposal, Dredged material, Biological effects.

The impact of dredging operations on suspended material transport in the lower Thames River Estuary were confined to an area within 300 to 500 yards of the operating dredge and barge, produced an increase in total suspended load within the estuary that was small in comparison to that produced by typical aperiodic storm events, and caused no major alternations in mass transport within the estuary. The physical oceanography of the disposal area showed that turbidity was higher in bottom waters than near the surface and was not restricted to the vicinity of the spoil pile. Maximum transport was in the east/west direction with highest values occurring during the ebbtide. Studies on the effect of dredging and spoils deposition on fecal coliform counts at the disoposal site showed that spoil disposal did not increase densities in sediments and bottom waters of the disposal area. Scuba survey and underwater photography of disposal site indicated that troughs and mounds of newly dumped material provided relief to the normally flat bottom topography and were initially attractive to demersal fish and crustacea. No obvious turbidity was noted at the spoil-water interface during 1.5 knot currents. (Sinha-OEIS)
W78-11229

LABORATORY AND FIELD STUDIES ON THE LONG-TERM EFFECTS OF PETROLEUM HYDROCARBONS ON BENTHIC MARINE INVERTEBRATES,
Battelle Pacific Northwest Lab., Richland, WA.
J. W. Anderson, R. Riley, R. M. Bean, J. W. Blaylock, and S. L. Kiesser.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-770345-1, Report No. BNWL-SA-6169, March, 1977. Presented at Workshop on the Interagency Marine Research Program Associated with Energy Development, held at Newport, RI on March 1-3, 1977. 33 p, 5 fig, 6 tab, 15 ref. EPA - E(45-1):1830.

Descriptors: *Water pollution effects, *Benthos, *Oil pollution, *Bottom sediments, Aromatic compounds, Outer Continental Shelf, Petroleum hydrocarbons, U.S. Northwest.

The experiments have been useful in demonstrating the differences in the potential persistence of crude oil utilizing undisturbed fine-textured marine sediments under anaerobic laboratory conditions. Furthermore, these experiments have provided sets of samples of development of analytical techniques appropriate not only for use in conjunction with related biological studies of oil-contaminated sediments, but also to studies with related biological studies of oil-contaminated sediments, but also to studies involving the uptake and metabolism of oil by marine organisms. This paper presents data on the uptake of numerous petroleum hydrocarbons by three species present in contaminated sediment held for a long period (40 days) in the natural environment. The extent of hydrocarbon uptake by the two deposit-feeders is demonstrated in contrast to the lack of contamination in Protothaca, which is a filter-feeder. This is probably the most significant approach to determine uptake of hydrocarbons via ingested sediment particles, as all three species were surrounded by oiled substrate. These preliminary findings demonstrate that benthic deposit-feeders take up large molecular weight aromatic compounds from polluted sediment, and these are the hydrocarbons most harmful to marine organisms, as well as vertebrates including man. (Sinha - OEIS)
W78-11237

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME I: PROCESSING SYSTEMS SUMMARY.
Dames and Moore, Salt Lake City, UT.; and EIC Corp., Newton, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 913, Price codes: A08 in paper copy, A01 in microfiche. Joint Report to NOAA, Office of Marine Minerals, August 1977. 170 p, 9 fig, 9 tab, 10 ref. 6-35331.

Descriptors: *Water pollution effects, *Environmental effects, Mining, *Manganese nodules, Outer Continental Shelf, Nodules, Ocean mining.

Technological information pertenent to the processing of manganese nodules from the sea floor was prepared to help assess the effects of manganese nodules processing activities on land and marine environments. Potential methods, operations, and requirements for processing and handling mangaese nodules on land and at sea are dealt with including recovery of valuable metals,

transport of manganese-nodule ore and process wastes, treatment and disposal of wastes, material and energy balances and resource requirements. (Sinha - OEIS)
W78-11239

CHEMICAL AND BIOLOGICAL QUALITY OF LAKES FAITH, HOPE, AND CHARITY, AT MAITLAND, FLOIDA, WITH EMPHASIS ON THE EFFECTS OF STORM RUNOFF AND BULK PRECIPITATION, 1971-74,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-11259

NITROGEN REGIME OF SHALLOW EUTROPHIC LAKES ON THE CANADIAN PRAIRIES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
Progress in Water Technology, Vol 8, No 4/5, p 313-321, 1977. 5 fig, 2 tab, 18 ref.

Descriptors: *Eutrophication, *Lakes, *Nitrogen cycle, *Fish farming, *Fishkill, *Ammonia, *Erickson(Manitoba Canada), Shallow water, Dissolved organic nitrogen, Saline lakes, Pothole lakes, Phytoplankton, Algae, Dissolved oxygen, Oxygen depletion, Chlorophyll, Cyanophyta, Ice cover, Agricultural runoff.

Investigation in 1971-74 of the nitrogen cycle in shallow (1-5 m), land-locked, unstratified, eutrophic, moderately saline lakes of the Erickson area of southwestern Manitoba, Canada, showed that ammonia and dissolved organic nitrogen were the most abundant forms of nitrogen. The nitrogen regime was closely associated with oxygen concentration and phytoplankton production. Anoxic conditions resulting from ice cover or the sudden collapse of algal blooms coincided with release of ammonia back into solution in toxic concentrations of 2000-3000 micrograms/1. Ammonia showed a significant inverse relationship to dissolved oxygen and chlorophyll-a. The best correlation was between ammonia at the end of winter and maximum phytoplankton biomass the following summer. These 'pothole' lakes have no permanent inflow or outflow, and are supplied by surface runoff and groundwater seepage. The drainage area is primarily agricultural. Most of the lakes experience regular winterkill due to the ice cover and are thus suitable for summer fish farming, but some develop noxious summer algal blooms and experience high fish mortality during summerkill. Ammonia release can reach toxic levels during summerkill if oxygen depletion is only partial. At a total ammonia concentration of 2000 micrograms/1, pH 9.0, and water temperature of 22C, the toxic un-ionized ammonia concentration will be 568 micrograms/1, or 2.84 times the acceptable LC50. (Lynch-Wisconsin)
W78-11278

ESTIMATED RESPONSES OF LAKE ONTARIO PHYTOPLANKTON BIOMASS TO VARYING NUTRIENT LEVELS,
Manhattan Coll., Bronx, NY. Dept. of Environmental Engineering and Science.
R. V. Thomann, R. P. Winfield, and D. S. Szumski.
Journal of Great Lakes Research, Vol 3, No 1-2, p 123-131, October 1977. 8 fig, 3 tab, 10 ref. EPA R 800610.

Descriptors: *Lake Ontario, *Nutrients, *Phosphorus, *Phytoplankton, *Biomass, *Water pollution control, *Eutrophication, Great Lakes, Lakes, Algae, Model studies, Simulation analysis, Algal control, Nutrient removal, Canada, Nitrogen, Measurement, Analytical techniques, Water pollution sources, Municipal wastes, Industrial wastes, Limiting factors, Water pollution effects.

A simplified model of Lake Ontario phytoplankton dynamics was used to estimate the lake-wide biomass response to various levels of nutrient loading. Simulation analysis demonstrated the importance of the overall loss rates of nutrient, and indicated the open-lake phytoplankton biomass is not in equilibrium with the input nutrient load. For an assumed equilibrium condition, the simulations indicated that reduced load will reduce biomass. Simulation of the 'pastoral load', i.e., that existing prior to man's intense activity, showed that spring phytoplankton levels were 30-70% of present levels, depending on kinetic assumptions (optimistic, reasonable, pessimistic) resulted in a range from a decrease of 25% to an increase of 80% in peak phytoplankton over present levels. Over an implementation period of 10 years, a phosphorus load reduction of about 1-1.5 metric tons/day per year appears to be a sound objective to maintain or reduce phytoplankton levels. The principal sources of nutrients to Lake Ontario are: (1) the Niagara River, including input from Lake Erie; (2) other tributary inputs in the Lake Ontario basin; (3) direct discharges of municipal and industrial wastes; (4) local drainage to the lake; and (5) atmospheric inputs. (Lynch-Wisconsin)
W78-11279

MODEL OF PRIMARY PRODUCTION, INCLUDING CIRCULATION INFLUENCES, IN LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
D. C. L. Lam, and E. Halfon.
Applied Mathematical Modelling, Vol. 2, No. 1, p 30-40, March 1978. 15 fig, 5 tab, 27 ref.

Descriptors: *Lake Superior, *Circulation, *Model studies, *Primary productivity, *Hydrodynamics, Lakes, Great Lakes, Stratification, Winds, Waves(Water), Phosphorus, Nutrients, Plankton, Water temperature, Currents(Water), Oligotrophy, Ecology, Drag, Drag coefficients, Simulation analysis, Analytical techniques, Eutrophication.

A finite-difference hydrodynamic model developed by Simons was used to compute the flow regimes of Lake Superior in 1973. Results confirmed the generally counterclockwise circulation patterns observed during summer stratification. Preliminary results of applying a variable drag coefficient based on a wind-wave coupling model for a stormy period are presented. A two-compartment ecological model was used in which transformation from one compartment (soluble reactive phosphorus) into the other (particulate phosphorus) is controlled by a primary production submodel. Application showed that a physical model should always be included with the ecological model because the distribution of biological activity is influenced by current patterns, influenced in turn by temperature and nutrient distribution. The model constant, K sub s, identifies the concentration of soluble reactive phosphorus at which the photosynthesis rate is half of maximum production. The value of the constant is 0.78 mg/cu m, computed by observing that maximum production occurs at a soluble reactive phosphorus concentration of 0.98 mg/cu m. Reference data was collected during six cruises May-November 1973 at over 200 stations. Some 40 physical, chemical, and biological variables were sampled. (Lynch-Wisconsin)
W78-11280

SEASONAL AND HORIZONTAL DISTRIBUTIONS OF PLANKTONIC CRUSTACEA IN GEORGIAN BAY AND NORTH CHANNEL, 1974,
Waterloo Univ. (Ontario) Dept. of Biology.
J. C. H. Carter, and N. H. F. Watson.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 113-122, October 1977. 6 fig, 2 tab, 9 ref.

Descriptors: *Georgian Bay(Lake Huron Ontario Canada), *North Channel(Lake Huron Ontario Canada), *Crustaceans, *Zooplankton, *Distribution patterns, *Copepods, *Cladocerans, Canada, Ontario(Canada), Lake Huron, Seasonal, Horizontal distribution, Species composition, Bays, Water temperature, Cyclops bicuspidatus thomasi, Currents(Water), Eutrophication.

A high abundance of cladoceran zooplankton found in Georgian Bay and North Channel (Lake Huron, Ontario, Canada) was probably caused by warm surface waters accumulated there in late spring and early summer; copepod horizontal distribution, probably dependent on transport by water currents, showed no positive relationship to water temperature. Sampling was carried out April-December 1974 on seven synoptic cruises at 46 stations. One vertical haul was taken at each station from two m above the bottom to the surface with a conical plankton net of 40-cm mouth diameter and a No. 25 nylon mesh with 64-micrometer apertures. Abundance was quantified on a areal basis because the great majority of planktonic crustacea are found in the upper 25-30 m, and volumetric quantification would give misleading high figures for shallower stations. Eleven species of cladocerans and 12 of copepods were found; Cyclops bicuspidatus thomasi comprised over 50% of all specimens. Mean summer abundance of planktonic crustacea (61.8/sq cm) was slightly higher than in Lake Superior in 1968 (43/sq cm) but much lower than in other parts of Lake Huron during 1968 (167/sq cm). Planktonic crustacea may be related to total annual phosphorus loading. Each of the three major groups--cladocerans, calanoid copepods, and cyclopoid copepods--showed distinctive patterns of seasonal horizontal distribution, details of which are presented in the paper. (Lynch-Wisconsin)
W78-11282

FEEDING BY AN OMNIVOROUS PLANKTONIC COPEPOD AETIDEUS DIVERGENS BRADFORD,
Washington Univ., Seattle. Dept. of Oceanography.
S. B. Robertson, and B. W. Frost.
Journal of Experimental Marine Biology and Ecology, Vol. 29, No. 3, p 231-244, October 1977. 3 fig, 2 tab, 46 ref. NSF GA-25385 and DES 74-22640.

Descriptors: *Copepods, *Aetideus divergens, *Feeding rates, *Zooplankton, *Particle size, Diatoms, Phytoplankton, Artemia, Crustaceans, Larvae, Food webs, Omnivores, Trophic level, Calanoid copepods, Puget Sound(WA), Washington, Thalassiosira fluviatilis, Coscinodiscus angstii, Calanus pacificus, Euchaeta elongata, Model studies.

Adult females of the omnivorous calanoid copepod Aetideus divergens were used in laboratory experiments to study patterns of feeding on various sizes and concentrations of diatoms, and on freshly hatched nauplii of the crustacean Artemia. A. divergens fed most efficiently on the largest size of diatom and on Artemia nauplii, but was notably inefficient at feeding on small diatoms, even at very high concentrations. A. divergens differs in this respect from filter-feeding copepods such as calanus pacificus. A. divergens and its congeners usually occur at subsurface depths not far below the mixed layer and seem adapted for feeding on large particles, possibly large phytoplankton and fecal pellets. Seawater and copepods were obtained at a depth of about 230 m in central Puget Sound near Seattle, Washington. In diatom feeding experiments three sizes of Thalassiosira fluviatilis and Coscinodiscus angstii were used. One hundred female A. Divergens were placed in each of several four-liter beakers containing 3800 ml filtered seawater and specific concentrations of diatoms. Beakers were kept at 12C in continuous dim light. Several

models, including the Ivlev curve and Michaelis-Menten equations, were considered in analyzing feeding behavior of A. divergens. Swimming behavior of A. divergens is compared with that of two other Puget Sound copepod species, the filter-feeder C. pacificus, and the carnivore Euchaeta elongata. (Lynch-Wisconsin)
W78-11283

TRACE METAL CONCENTRATIONS AND PARTITIONING IN ZOOPLANKTON, NEUSTON, BENTHOS FROM THE SOUTH TEXAS OUTER CONTINENTAL SHELF,
Texas A and M Univ., College Station. Dept. of Oceanography.
A. Horowitz, and B. J. Presley.
Archives of Environmental Contamination and Toxicology, Vol. 5, No. 2, p 241-255, 1977. 1 fig, 2 tab, 27 ref.

Descriptors: *Gulf of Mexico, *Continental shelf, *Zooplankton, *Heavy metals, *Benthos, *Neuston, Trace elements, Sargassum, Food chains, Bioaccumulation, Partitioning, Fish, Shrimp, Squid, Sediments, Path of pollutants, Copepods, Ostracods, Larvacea, Baseline studies.

Biological samples of zooplankton, surface plankton, sargassum, and benthos obtained at 12 stations on the south Texas outer continental shelf were analyzed for copper, zinc, cadmium, lead, chromium, nickel, iron, and manganese to establish both baseline metal concentrations and partitioning among parts and organs of the individual organisms. Benthos samples were primarily squid, shrimp, and fish. Chemical analyses showed shrimp exoskeletons and the skin of squid and fish generally contained higher metal levels than the flesh, probably due to adsorption from seawater and/or an internal detoxification procedure employed by the organism. Squid 'pens' contained higher levels of copper, cadmium, znc, lead, and iron than skin or flesh, also probably the result of internal detoxification or as a means of storing necessary metabolites in the case of copper and zinc. Adsorption is not a factor as the pen is not directly exposed to seawater. A north-south directional increase in lead concentrations in organisms and an increase in cadmium from nearshore to offshore agrees with spatial distribution patterns in sediments. Statistical analysis of chemical and biological data indicates that relatively small changes in biological makeup of the sample can markedly affect concentrations of lead, cadmium, nickel, and zinc. Fish and shrimp contained some of the lowest metal levels of biota examined. All lead can be accounted for by copepods, ostracods, and larvacea. (Lynch-Wisconsin)
W78-11285

FINE STRUCTURE OF ENCYSTMENT OF THE QUADRIFLAGELLATE ALGA, POLYTOMELLA AGILIS,
Ottawa Univ. (Ontario). Dept. of Biology.
D. L. Brown, G. G. Leppard, and A. Massalski.
Protoplasma, Vol. 90, 1976, p 139-154. 17 fig, 28 ref.

Descriptors: *Polytomella agilis, *Plant morphology, Structure, *Encystment, *Cysts, *Algae, Electron microscopy, Quadriflagellates, Cytological studies, MEthodology, Cell walls, Chlorophyceae, Dessication.

Morphological changes accompanying encystment of the quadriflagellate alga Polytomella agilis, analyzed by using electron microscopy, are described. Subsequent redifferentiation of the swimming cells during excystment is discussed in a companion paper. In exponentially growing cultures P. agilis exists as a free-swimming, colorless quadriflagellate lacking a cell wall, which reproduces rapidly by binary fission. As the population enters the stationary growth phase (after about 40 hrs) increasing numbers of cells become thick-walled, immotile cysts resistant to dessication, which germinate if placed in fresh medium. during encystment--which takes about 20 hrs--the unicells lose their flagella, sink to the bottom, and form a thick, four-layered cell wall. Proliferation of rough endoplasmic reticulum and Golgi bodies is seen in early stages, followed by reduction in size or number of these organelles and of plastids in the maturing cyst. Microtubular structures de-differentiate and are not observed in later stages of encystment. Six stages are distinguished: (1) Flagella absent, cells rounded, prominent large starch grains. (2) Cells smaller and completely rounded, cytoplasm denser with many free ribosomes, nucleolus diffuse, plastid highly reticulate, appearance of very thin wall layer. (3) First discrete wall layer, large and compact nucleolus. (4) Second wall layer inside first, Golgi bodies more evident. (5) Third wall layer. (6) Final wall layer with invaginations. (See also W78-11287) (Lynch-Wisconsin)
W78-11286

FINE STRUCTURE OF EXCYSTMENT OF THE QUADRIFLAGELLATE ALGA, POLYTOMELLA AGILIS,
Ottawa Univ. (Ontario). Dept. of Biology.
D. L. Brown, A. Massalski, and G. G. Leppard.
Protoplasma, Vol. 90, 1976, p 155-171. 15 fig, 15 ref.

Descriptors: *Polytomella agilis, *Plant morphology, *Structure., *Excystment, *Cysts, *Algae, Electron microscopy, Quadriflagellates, Methodology, Cytological studies, Cell walls, Chlorophyceae, Flagella.

Excystment by the quadriflagellate alga Polytomella agilis was studied using electron microscopy. Encystment is described in a companion paper. The alga develops a four-layered cell wall during encystment, following a free-swimming exponential growth stage. In excystment, which takes 30-40 min, each germinating cyst releases a single, fully differentiated, flagellated swimming cell. A new method of purifying populations of mature cysts resulted in up to 90% excystment, compared with <2% in previous studies. Cysts were harvested from cultures after 7-10 days of growth. The medium was removed, and clumps of cysts and debris on the bottom broken up by vortex agitation. After cysts were removed by low-speed centrifugation, denser mature cysts pelleted. The pellet was suspended in fresh medium, again agitated and centrifuged, resuspended in fresh medium, and incubated at 25C. About 50% excysted in 3-7 hrs, and up to 90% in 18 hrs. During the first three hrs the cysts grow bigger (due apparently to water uptake), and a polarity is established in the cytoplasm. Release involves selective degradation of part of the cyst wall, followed by physical rupturing. Cytoplasmic organelles seen to de-differentiate during encystment are completely re-differentiated during excystment. The excystment stimulus appears to be replacemtn of the old conditioned medium with fresh medium, and is not dependent on nutrient replacement. (See also W78-11286) (Lynch-Wisconsin)
W78-11287

ELECTRON-OPAQUE MICROSCOPIC FIBRILS IN LAKES: THEIR DEMONSTRATION, THEIR BIOLOGICAL DERIVATION AND THEIR POTENTIAL SIGNIFICANCE IN THE REDISTRIBUTION OF CATIONS,
Canada Centre for Inland Waters, Burlington (Ontario).
G. G. Leppard, A. Massalski, and D. R. S. Lean.
Protoplasma, Vol. 92, 1977, p 289-309. 14 fig, 63 ref.

Descriptors: *Fibrils, *Lakes, *Cations, *Electron microscopy, *Algae, *Lake Ontario, Cytological studies, Ions, Nutrients, Dissolved organic carbon, Particulates, St. George Lake(Ontario Canada), Ontario(Canada), Canada, Bay of Quinte(Ontario Canada), Phytoplankton, anabaena, Microcystis aeruginosa, Scenedesums basiliensis, Navicula pelliculosa, Nitzschia kuetzingiana, Stigeoclonium.

An abundant, persistent, electron-opaque, fibrillar material of high surface-to-volume ratio was identified as an important component of the water of two lakes using electron microscopy. The behavior and contact relations of fibrils and aggregates suggest they play a role in contact cation exchange, a hypothesis bolstered by a composition of 20-30% uronic acid residues. Analyses of purified fibril preparations show physical characteristics appropriate to the principal component of a hypothetical organic carrier system for redistribution of bound, but biologically available, cations in lakes. The non-rigid fibrils (3-10 nm in diameter) were found on the surfaces of common lakes algae and microbes, free in the water column, and free on the lake bottom. Filtration experiments and microscopy indicate the fibrils are readily lost by cells without cell damage. Fibrils may form meshlike aggregates which can separate and reassociate, and which also adhere to cells and large suspended particles. Water and sediment samples taken from St. George Lake near Toronto, Ontario, Canada, were centrifuged to yield a heterogenous pellet of small and fine particles, and then prepared for transmission electron microscopy. Water samples from limnocorral no. 3 in the Bay of Quinte in northern Lake Ontario were also analyzed. Experiments were conducted with cultures of eight species of algae obtained from various sources. (Lynch-Wisconsin)
W78-11288

THE VERTICAL AND SEASONAL DISTRIBUTION OF CHLOROPHYLL IN LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO: IMPLICATIONS FOR PRIMARY PRODUCTION ESTIMATES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
E. J. Fee.
Limnology and Oceanography, Vol. 21, No. 6, p 767-783, November 1976. 12 fig, 32 ref.

Descriptors: *Primary productivity, *Fluorometry, *Phytoplankton, *Chlorophyll, *Methodology, *Distribution patterns, *Experimental Lake Area(Ontario Canada), Ontario(Canada), Canada, Lakes, Stratification, Fertilization, Nutrients, Eutrophication, Algae, Depth, Carbon radioisotopes, Measurement, Seasonal, Vertical distribution.

Use of an in-vivo flow-through fluorometry system in the Experimental Lakes Area of northwestern Ontario, Canada, revealed narrow bands of very high chlorophyll concentrations in the metalimnia or hypolimnia of all clear, stratified ELA lakes. A large error may therefore be associated with estimating primary production on the basis of samples taken at discrete depths, which can miss the narrow bands of high phytoplankton biomass. In addition in many lakes results supporting the classical theory of the generation of autumn phytoplankton blooms probably stem from sampling at discrete depths. In two experimentally fertilized lakes chlorophyll concentrations in the hypolimnion exceeded 300 micrograms/l while epilimnetic chlorophyll was only three micrograms/l. The hypolimnetic bloom represented the major response to enhanced nutrient loading. The peak was in or below the thermocline at depths where 2-3% of photosynthetically available surface irradiance penetrated; algae at the peak were actively growing flagellated colonial chrysophyceans. The autumn surface bloom was due to entrainment of this previously produced chlorophyll, not to growth caused by mixing in of hypolimnetic nutrients. Chlorophyll fluorescence as a function of depth sensitive photomultiplier, and a recorder. Using a rubber hose connected to a submersible pump, the

profile was obtained by hand-lowering the intake at one m/min. (Lynch-Wisconsin)
W78-11289

NUTRIENT DISTRIBUTION IN THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec) Marine Sciences Centre.
P. Greisman, and G. Ingram.
Journal of Fish Research Board of Canada, Vol. 34, No. 11, p 2117-2123, 1977. 8 fig, 11 ref.

Descriptors: St. Lawrence Estuary, *Nutrients, *Distribution patterns, *Tidal effects, *Nitrogen, *St. Lawrence River, Estuaries, Horizontal distribution, Rivers, Tides, Mixing, Nutrient flux, Nitrates, Nitrites, Saline water-freshwater interfaces.

The relative importance of freshwater and maritime nutrient sources to the St. Lawrence estuary was investigated. Data indicated only two major nutrient sources to the euphotic zone of the estuary, the St. Lawrence River and the intermediate layer of the Laurentian Channel. Assuming simple mixing, the distribution of surface nutrients along the estuary was calculated. Differences between these values and the observed ones may be attributable to consumption and to variability of the freshwater source and internal tide amplitude. Based on correlation of observed and predicted nutrient distribution, the suggestion by Steven (1974) of a 'nutrient pump' at the head of the Laurentian Channel is verified, but river-supplied nutrients are also important. The St. Lawrence system can be divided into four regimes: (1) Gulf of St. Lawrence seaward of Pointe des Monts; (2) the maritime estuary between Pointe des Monts and Tadoussac; (3) the middle estuary between Tadoussac and Ile aux Coudres; and (4) the fluvial St. Lawrence River. The latter, while nearly salt-free, experiences tidal effects to Lac St. Pierre. The Laurentian Channel, with depths exceeding 300 m, serves as a path for the intrusion of continental shelf and slope waters to its head near Tadoussac. Upstream of the maritime estuary the river rarely exceeds 50 m in depth. (Lynch-Wisconsin)
W78-11290

VERTICAL AND SEASONAL DISTRIBUTION OF CHLOROPHYLL A IN LAKE MICHIGAN,
Wisconsin Univ.-Milwaukee. Dept. of Zoology.
A. S. Brooks, and B. G. Torke.
Journal of Fish Research Board of Canada, Vol. 34, No. 12, p 2280-2287, 1977. 2 fig, 32 ref.

Descriptors: *Lake Michigan, *Chlorophyll, *Distribution patterns, *Eutrophication, *Food chains, *Seasonal, *Phytoplankton, Algae, Great Lakes, Lakes, Thermal stratification, Depth, Limnology, Vertical distribution, Species composition, Diatoms.

Observation of distribution patterns of chlorophyll-a at a deep offshore station in Lake Michigan March 1973 to December 1974, showed a deep chlorophyll-a maximum, a factor of importance in future investigations of food chains and eutrophication in the Great Lakes. Chlorophyll-a concentrations increased uniformly at all depths during spring, reaching 3-4 mg/cu m by late May. Thermal stratification was followed by development of a subthermocline chlorophyll peak between 10 and 30 m that reached 8.5 mg/cu m by late July. The major subthermocline peak collapsed in mid-August, but was followed by two lesser peaks at 10 and 30 m. Autumn mixing dispersed these peaks in the mixed layer, increasing epilimnetic chlorophyll at a time when integral chlorophyll levels were declining. At fall overturn chlorophyll was uniformly distributed at concentrations of about 1 mg/cu m, and remained at this level throughout the winter. Samples were collected from shipboard at a 140-m deep station on 45 cruises at about biweekly intervals. The presence of a deep chlorophyll maximum in Lake Michigan is a widespread phenomenon during periods of thermal stratification, judging from observations made in the northern and southern basins of the lake in July 1974. Data on chlorophyll-a and temperature related to depth and season are figured, and information on phytoplankton species composition is included. (Lynch-Wisconsin)
W78-11291

ALGAL CULTURE IN THE LIQUID PHASE OF ANIMAL SLURRY--EFFECT OF LIGHT AND TEMPERATURE UPON GROWTH AND PHOSPHORUS REMOVAL,
Queen's Univ. Belfast (Northern Ireland). Dept. of Agricultural and Food Chemistry.
For primary bibliographic entry see Field 5D.
W78-11292

AMMONIUM AND UREA UPTAKE BY SOME FRESHWATER ALGAE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
F. P. Healey.
Canadian Journal of Botany, Vol. 55, No. 1, p 61-69, 1977. 4 fig, 5 tab, 43 ref.

Descriptors: *Ammonium compounds, *Urea, *Phytoplankton, *Absorption, *Light, *Nitrogen, Algae, *Chlorophyta, *Cyanophyta, Darkness, Scenedesmus quadricauda, Pseudoanabaena catenata, Acetohydroxamic acid, Chelation, Eutrophication.

The influence of several factors on ammonium and urea uptake by three green and three blue-green algae was examined. Nitrogen deficiency increased the initial saturated rate of ammonium and urea uptake, with a generally greater increase in darkness than in the light. Nitrogen deficiency also increased the nitrogen debt. Two algae--the chlorophyte Scenedesmus quadricauda and the cyanophyte Pseudoanabaena catenata--were selected for more detailed study. Uptake of both ammonium and urea by the algae was found to be light-stimulated; uptake of urea was sensitive to an uncoupler (CCCP) but not to the urease inhibitor acetohydroxamic acid. Ammonium and urea uptake were similar in dependence on the presence of a chelator, but differed in pH dependence and in dependence on substrate concentration; ammonium uptake showed half-saturation values of 0.1-0.3 micrograms atom N/l, and urea uptake had values of 0.4-1.4 micrograms atom N/l. While ammonium depressed urea uptake and urea depressed ammonium uptake, the two substrates did not appear to compete for the same site. It is concluded that some internal mechanism governs the rate of uptake at one site depending on what is occurring at the other site. All algae were grown in modified medium fw-6/2 at 20C in aerated one-liter tubes lighted from the side by fluorescent tubes. (Lynch-Wisconsin)
W78-11293

FEEDING RATES OF PLANKTONIC COPEPODS FROM A TROPICAL SEA,
Australian Inst. of Marine Science, Townsville.
T. Ikeda.
Journal of Experimental Marine Biology and Ecology, Vol. 29, No. 3, p 263-277, October 1977. 5 fig, 2 tab, 17 ref.

Descriptors: *Copepods, *Zooplankton, *Feeding rates, *Over-hunting, *Marine microorganisms, Australia, Eucalanus subcrassus, Tortanus gracilis, Calanopia elliptica, Temora turbinata, Paracalanus aculeatus, Tropical regions, Oceans, Artemia, Larvae, Omnivores, Algae, Phytoplankton, Dunaliella salina, Skeletonema costata, Crustaceans.

In laboratory feeding experiments with five species of tropical planktonic copepods, the relation was measured between daily ration (Y, % body wt) and copepod body weight (X, micrograms dry wt) at 20C: log Y = 2.531-0.377 log X. Daily ration (% body wt) was 28-329%. Copepods studied, all omnivorous, were Eucalanus subcrassus, Tortanus gracilis, Calanopia elliptica, Temora turbinata, and Paracalanus aculeatus. Specimens were collected from inshore waters near Townsville, Queensland, Australia May-October 1976 with a 202-micrometer mesh net. Newly hatched nauplii of the crustacean Artemia were used as food for Eucalana, Tortanus, and Calanopia; Dunaliella salina was used for Temora; and Skeletonema costata was used for Paracalanus. The copepods fed well on the food. Seawater collected from the site was used as the medium, and temperature was maintained close to the in-situ range of 22-25C. Feeding rates were measured for each single individual through successive incubations until death, which occurred after between a few days and three weeks. Feeding rates generally varied day to day, but less so than the diurnal variation. An interesting phenomenon, here termed 'over-hunting', was observed with Tortanus and Calanopia, which killed but did not eat almost as many Artemia nauplii as they ate. Over-hunting may prove important in studies of production and recycling of material in marine pelagic ecosystems. (Lynch-Wisconsin)
W78-11294

INHIBITION OF PHOTOSYNTHESIS AND NITROGEN FIXATION IN ALGAE BY VOLATILE NITROGEN BASES,
Agricultural Experiment Station, Fort Collins, CO.
A. R. Mosier.
Journal of Environmental Quality, Vol. 7, No. 2, p 237-240, 1978. 4 fig, 2 tab, 20 ref.

Descriptors: *Nitrogen fixation, *Anabaena subcylindrica, *Chlorella ellipsoidea, *Ammonia, *Photosynthesis, *Amines, Aliphatic amines, Feed lots, Acetylene reduction, Nitrogen, Algae, Volatility, Feed lots, Water pollution sources.

Inhibitory effects of ammonia and amines on oxygen production by the green alga Chlorella ellipsoidea and the nitrogen-fixing blue-green alga Anabaena subcylindrica were studied. Objectives were to determine whether amines and ammonis affected: (1) oxygen production in the algae as in isolated plant chloroplasts, (2) the two algae differently, or (3) nitrogen fixation by A. subcylindrica. Aliphatic amines (1-5 carbons) and ammonia decreased C. ellipsoidea oxygen production by 50% at concentrations of 1.2-23.5 x 10 to the minys 9th power micrograms free amine N/cell and 160 x 10 to the minus 9th power micrograms free ammonia N/cell. Amine (1-6 carbons)concentrations of 3.0-248 x 10 to the minus 9th power micrograms free amine N/cell decreased A. subcylindrica oxygen production and nitrogen fixation 50%, as estimated by the acetylene reduction technique. Reduction of A. subcylindrica oxygen production by 50% required ammonia concentrations of 12-2510 times greater than any single amine concentration, and decrease of acetylene reduction by 50% required ammonia concentrations of 14-1220 times greater. The effect of the chemicals on C. ellipsoidea was reversible and depended on pH and free amine concentration. Algae were axenically grown in batch culture in flasks containing Knopp's solution adjusted to pH 7.2. (Lynch-Wisconsin)
W78-11295

SEASONAL VARIATIONS IN SALT-MARSH MACROALGAE PHOTOSYNTHESIS. II. FUCUS VESICULOSUS AND ULVA LACTUCA,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
B. H. Brinkhuis.
Marine Biology, Vol. 44, No. 2, p 177-186, 1977. 6 fig, 25 ref.

Descriptors: *Fucus vesiculosus, *Ulva lactuca, *Salt marshes, *Photosynthesis, *Flax Pond(NY), *Light intensity, Seasonal, Algae, Carbon radioisotopes, Chlorophyll, Biomass, Pigments, Solar radiation, Ascophyllum nodosum, Intertidal areas, New York.

A study of the role of natural irradiation patterns in determining seasonal photosynthetic variations in the macroalgae Fucus vesiculosus and Ulva lactuca collected at Flax Pond, New York, showed maximum photosynthesis occurred in spring and summer. Photosynthetic capacity, evaluated by carbon-14 uptake, was closely related to seasonal irradiation patterns and changes in field biomass in both species. Photosynthesis measured by dry weight was higher in U. lactuca, while photosynthesis by chlorophyll-a was equal in the two species. Photosynthetic capacity was inversely related to pigment content. Maximum chlorophyll-a concentrations occurred during winter. Frond profile studies with F. vesiculosus indicated that apices always exhibited greatest photosynthetic capacity. F, vesiculosus showed greater carbon-14 uptake in the ethananol-soluble fraction, while U. lactuca exhibited greater activity in ethanol-insoluble fractions. Intertidal specimens of F. vesiculosus were obtained from a saxicolous population on the northern edge of a marsh embankment at Flax Pond, on Long Island, 0.2 m above mean low water. Subtidal specimens of U. lactuca were collected from the rocky substratum in the marhs's inlet at -0.5 m below MLW. Specimens were collected March 1973-July 1974 at 4-6 wk intervals. Incubations were conducted at light intensities of 4.73, 6.37, 8.48, and 9.82 g cal/sq cm/hr. (Lynch-Wisconsin)
W78-11297

5D. Waste Treatment Processes

LIQUID AND WATERBORNE WASTES RESEARCH IN NEW ZEALAND 1976,
National Water and Soil Conservation Organization, Christchurch (New Zealand).
For primary bibliographic entry see Field 5B.
W78-10530

RUGGED SELF-PRIMING PUMPS.
For primary bibliographic entry see Field 8C.
W78-10548

SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE,
Alcorn State Univ., Lorman, MS.
H. E. Grier, G. C. Gupta, and S. C. Tiwari.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE4, p 551-556, August, 1977. 2 fig, 1 tab, 11 ref.

Descriptors: Ammonia, Nitrates, Nutrients, Suspended solids, *Waste water disposal, Waste water treatment, Effluents, *Salt removal(Wastes), *Swine wastes, Farm wastes.

Swine waste aerobic lagoon effluent was sprinkled overland and the runoff water was collected. Both the waste effluent and the runoff water were analyzed for nitrate, ammonia, chloride, suspended solids, BOD, and specific conductance. Removal efficiency of nitrate dropped from 62% to 32% on prolonged disposal of swine waste effluent, in six months. Data for suspended solids and specific conductance support these results for nitrate removal efficiency. Removal efficiencies for ammonia and chloride were higher and showed a very small decrease with time. BOD removal efficiency was 95% throughout the six-month period of the study. The system showed signs of 'overloading' for nitrate removal but not for BOD removal. (Skogerboe-Colorado State)
W78-10586

NEW JERSEY PLANT TO TURN SLUDGE INTO COMPOST.
Solid Wastes Management, Vol 21, No 5, p 12, May, 1978. 1 fig.

Descriptors: *Biodegradation, *Sludge treatment, *Aeration, *Sewage bacteria, *Humus, Wood wastes, Sewage sludge, Decomposing organic matter, Equipment, Design data, Municipal wastes.

The $2.1 million sludge composting plant in Camden, New Jersey, will reduce sludge treatment costs to $35/dry ton from the $109/wet ton cost associated with ocean disposal. The pilot plant was constructed with a design developed by the United States Department of Agriculture's Beltsville, Maryland, research facility. The sludge is mixed with wood chips in a 1:2 ratio by volume and deposited on a compost pad. The compost pad is underlined with a piping system to draw air through the sludge. The sludge and wood chip pile is covered by a layer of recycled wood chips or composted sludge. After three days, the sludge reaches a temperature of 160-170 F. The compost pile is dismantled after 21 days and allowed to cure for an additional 30 days. The compost is then separated from the wood chips, which are reused. The high composting temperature kills pathogenic bacteria; the pilot plant has a 15 ton/day sludge capacity. (Lisk-FIRL)
W78-10598

NEW CONCEPT CLAIMED FOR SEWAGE AERATION.
Journal of the Institution of Engineers (Australia), Vol. 50, No. 7, p 56, April, 1978.

Descriptors: *Aeration, *Turbines, *Submergence, *Pumps, *Aerated lagoons, Activated sludge, Oxidation lagoons, Sludge digestion, Biological treatment, Flotation, Equipment, Design data, Waste water treatment, Municipal wastes.

Pacific Pumps has begun distribution in Australia of submersible turbine aerators suitable for activated sludge, aerobic digestion, sludge oxidation lagoons, and flotation processes. The aerator turbine, with a Frogman submersible motor, does not rely on a fan or compressor. Waste water is drawn into the turbine through an intake at the base; the effluent is mixed with air drawn in through a tube. The high speed rotation of the turbine provides thorough mixing; air and waste water are discharged automatically. Units are manufactured with capacities ranging over 25 cu m/hr to 200 cu m/hr; motor sizes range over 1.5-11 kilowatts. Due to the high oxygen intake and absorption values achieved by the aerators, these units are reportedly suitable for high strength sewage and industrial wastes. (Lisk-FIRL)
W78-10609

OXYGEN INJECTION SYSTEM.
Effluent and Water Treatment Journal, Vol. 18, No. 6, p 289, June, 1978. 1 fig.

Descriptors: *Oxygenation, *Aeration, *Injection, *Dissolved oxygen, *Oxygen sag, Reaeration, Oxygenation, Activated sludge, Seasonal, Pumps, Nozzles, Equipment, Waste water treatment, Municipal wastes.

BOC Vitox oxygen injection systems have been installed as an alternative to plant expansion in several English waste water treatment plants where aerators were overloaded. The Vitox system, supplied with liquid oxygen in vacuum insulated containers, injects oxygen into activated sludge tanks when dissolved oxygen levels fall below a preset level. Oxygen is mixed with process liquor, pressurized to 2-3 bars in a venturi-type blender; the mixture is pumped to the oxygen deficient area. The bubble-bearing liquid is discharged through a high velocity expansion nozzle which shatters the oxygen bubbles to a readily dissolvable size as they are released with the liquid. The Vitox system promotes rapid mixing and 95% oxygen dissolution. One kg of BOD is removed for each kg of oxygen; oxygen may also be generated on-site rather than supplied in contained liquid form. Several Vitox systems already in use augment aerators during diurnal or seasonal peaks, reduce odor problems at plant inlets, and reoxygenate contaminanted rivers. (Lisk-FIRL)
W78-10612

EFFLUENT OIL COLLECTING VESSEL,
Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee).
S. Uchida, H. Takeshita, and S. Yamazaki.
United States Patent 4,100,072. Issued July 11, 1978. Official Gazette of the United States Patent Office, Vol. 972, No. 2, p 718, July, 1978. 1 fig.

Descriptors: *Oily water, *Oil wastes, *Patents, *Floats, *Pontoons, Separation techniques, Oil pollution, Hydraulic structures, Waste water treatment, Industrial wastes.

A patent has been issued for a floating pontoon vessel used to separate effluent oil from the surface of a body of water. The floating parallel hulls have an oil converging mechanism which collects oil and water at the bow of the vessel. The oil and water are directed towards the mechanism by a series of flexible guides and passed to a suction pipe located on one of the floats. A high pressure ejector, connected to a water source, directs a pressurized flow of water towards the effluent in the coverging mechanism; the suction pipe, with its open end at the water level, removes the oil from the effluent by means of an ejector. The effluent oil is transferred to a storage tank. (Lisk-FIRL)
W78-10618

THROUGH A GLASS DARKLY.
Effluent and Water Treatment Journal, Vol 18, No 6, p 295, June, 1978. 2 ref.

Descriptors: *Anion exchange, *Resins, *Ion transport, *Cation exchange, *Polymers, Fouling, Organic wastes, Inorganic compounds, Separation techniques, Porosity, Waste water treatment, Municipal wastes.

Fouling potentials and prevention methods are discussed for anion exchange resins. The presence of organics and a high organic-to-inorganic dissolved ion ratio in the influent can lead to fouling, breakthrough, high organic loading, and a high residual on the anion exchange resin. When waste water containing fulvic or humic acids with a high inorganic ion concentration is treated on a cation/anion exchange system, subsequent anion exchangers, especially in mixed beds, may be damaged. Anion exchangers with a high reversibility to organics and a large total available capacity will peform more efficiently and resist organic accumulations. Weak bases are preferred over strong bases for resistance to organics. Gels rather than macroreticular resins provide higher capacities. Mixed bed operations have shown the highest susceptibility to fouling by acid fixation of the organics. Matrix and macroporosity have improved weak and strong base resins; physical stability, bead integrity, bead shape, and hydraulic properties are considered the important parameters in macroporous resins. Backwash characteristics and organic reversibility by polymers are considered important features of anion exchange resins. (Lisk-FIRL)
W78-10656

A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM,
Instituto Venezolano de Investigaciones Centificas, Caracas. Lab. de Ingenieria Ambiental.
For primary bibliographic entry see Field 5G.
W78-10661

LABORATORY STUDIES ON OPTIMIZATION OF THE ACTIVATED SLUDGE PROCESS,
Schneider Engineers, Bridgeville, PA.
A. B. S. Alam, and D. I. Angelbeck.
Journal of the Water Pollution Control Federation, Vol. 50, No. 7, p 1786-1803, July 1978. 14 fig, 9 tab, 17 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Water pollution control, *Optimization, *Simulation analysis, Hydraulics, Rates, Mass balance equation, Data collections, Computer models, Operations research, Variational calculus.

A computer simulation of optimal control techniques for a laboratory-scale activated sludge system consisting of a complete-mix reactor and a clarifier has been demonostrated. The model included: two state variables--(a) dilution factor and (b) sludge wastage rate; and two disturbance variables--(a) influent microorganism level and (b) influent substrate level. The model consisted of the two basic equations derived through microbial solids and substrate mass balances in the aerator and the clarifier and a connecting equation defining the sludge settling character as a function of sludge volatile fraction and applied load factors. The linearized process performance defined by the deviations of state variables and the overall performance function were minimized using variational calculus techniques. The optimal solution of the linearized system equations related by the new connecting funtion generated the optimal control schedules of influence flow rate, sludge wastage rate, and sludge recycle rate. Measured system performance was compared with the computer-simulated predicted values; the theoretical system models were found to closely represent the operational system. The simulation demonstrated that substantial reduction in effluent quality variation caused by an influent substrate distrubance is possible by using optimal control strategies. (Bell-Cornell)
W78-10663

LIME/NA2CO3 TREATMENT IMPROVES SLUDGE DIGESTION,
Illinois State Univ., Normal. Coll. of Applied Science and Technology.
A. R. Jacobson.
Public Works, Vol. 109, No. 7, p 94, July, 1978.

Descriptors: *Sodium compounds, *Lime, *Anaerobic digestion, *Methane bacteria, *Methane, Alkalinity, Ammonia, Carbon dioxide, Sludge digestion, Waste water treatment, Sludge treatment, Municipal wastes.

Lime and sodium bicarbonate treatment of anaerobically digested sludge provides the optimum pH for methane-forming bacteria. A natural buffer system established by digesters is based on bicarbonate alkalinity from the reaction of ammonia and carbon dioxide to form ammonium bicarbonate. The optimum pH for growth of methane-producing bacteria is in the range of pH 7.0. Lime will adjust the pH of the digester to 6.3-6.5. Sodium bicarbonate further increases the pH to 7.0-7.4. When digester bicarbonate alkalinity falls below 2,500 mg/liter, a 1,500 lb/million gal sodium bicarbonate addition will increase the alkalinity by 180 mg/liter. Treatment with sodium bicarbonate in addition to lime prevents lime overdose or loalized pH variations. (Lisk-FIRL)
W78-10671

PURIFYING INDUSTRIAL EFFLUENTS AND ADSORPTION MATERIAL THEREFOR.
Ciba-Geigy, Basel (Switzerland).
British Patent No. 1,491,722. November 16, 1977. 12p, 19 claims, 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Ion exchange, *Patents, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Textiles, Color, Anions, Anion adsorption, Leather industry, Effluents, Polyamides, Polymethacrylics, Acrylic polymers, Amino polymers, Sulfite pulp, Asbestos, Ion exchange, Ion exchangers.

A process is provided for purifying industrial effluents, particularly for decoloring waste waters in the textile, paper, and leather industries. the process comprises bringing the aqueous effluent into contact with an adsorbent capable of removing anionic substances (e.g., dyes, optical brighteners) from the waste water. the adsorbent comprises a carrier which has been treated with a combination of a basic nitrogeneous polymer and a polyanionic polymer. For example, the carrier can comprise eual parts of asbestos and bleached sulfite pulp, treated first with a polyamidepolyamine (derived from linoleic acid/linolenic acid and triethylenetetramine) and then with polymethacrylic acid. (Lynch-IPC)
W78-10672

DEVELOPMENT OF AN EFFICIENT SAMPLING STRATEGY TO CHARACTERIZE DIGESTED SLUDGES,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Centre.
H. D. Monteith, and J. P. Stephenson.
Canadian Environmental Protection Service, Research Report No. 71, 141 p, 1978. 26 fig, 72 ref, 19 tab.

Descriptors: *Sludge, *Testing procedures, Water pollution sources, Wastes, Canada, Nutrients, Heavy metals, Physical properties, Data processing, Anaerobic digestion, Sludge digestion, Foreign countries, Sampling, Monitoring.

Anaerobically digested liquid sludges from five Ontario water pollution control plants were examined to identify the sources of constituent variability (nutrient, heavy metals, physical characteristics) by determining whether variations arose from sample handling and methods of analysis, from changes in composition with time, or from inherent sludge heterogeneity. Familiar methods of data reduction (graphic time sequences, probability plots averages, confidence limits, etc.) have been combined with more rigorous methods of data analysis (analysis of variance, time series analysis) to assist in data interpretation. The results are fundamental for establishing efficient sampling programs to monitor nutrient and undesirable contaminant discharges in sludges destined for disposal. (Witt-IPC)
W78-10673

HYDROGEN PEROXIDE ELIMINATES ODOR IN WASTEWATER TREATMENT PLANT.
Water and Sewage Works, Vol. 125, No. 7, p 27, July, 1978.

Descriptors: *Oxidation, *Odor, *Sulfides, *Gases, *Corrosion control, Air pollution, Sewerage, Treatment facilities, Low flow, Sewers, Pipelines, Pumping plants, Waste water treatment, Municipal wastes.

Hydrogen peroxide was injected into force mains, pumping stations, and wet wells to reduce sulfide odors and corrosion problems at the Manatee County, Florida, waste water treatment plant. Odors, especially prevalent during the summer months, were attributed to water temperatures up to 85C, a relatively flat sewer system layout, and low flow in sewers in certain areas. Paint on some houses near the plant was actually discolored by the hydrogen sulfide gas. Du Pont's Tysul WW hydrogen peroxide was injected by metering pumps into 12 sites located along the sewer system. The hydrogen peroxide was stored at the sites in 500 gal tanks. Chlorine injections of 100-200 ppm into lift station lines provided only temporary relief; permanganate and chemical injections were also ineffective. Hydrogen peroxide injection also eliminated corrosion problems: the cost of the deodorization system was an estimated $5/yr/residence. (Lisk-FIRL)
W78-10675

BLEACHERY EFFLUENT TREATMENT,
CIP Research Ltd., Hawksbury(Ontario).
F. M. A. Nicolle, and R. Shamash.
Canadian Forestry Service, Ottawa, Ontario K1A 0H3. Cooperative Pollution Abatement Research (CPAR) Project Report 187-3, Final Report to March 31, 1976, 28 p, 5 fig, 3 ref, 9 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Pulp wastes, Lime, Chemical precipitation, Salts, Calcium, Softwood, Color, Toxicity, Fish, Sludge disposal, Burning, Chemical oxygen demand, Hydrogen ion concentration, Kraft mills, Clarifiers.

A major obstacle in lime treatment of pulp mill bleachery effluents for color removal has been the poor settleability of the lime sludge. More rapid settling was achieved by a 3-stage process (mixing of chlorination/chlorine dioxide and first extraction stage effluents, addition of lime, and treatment with carbon dioxide to pH 7), but this process required 3 separate clarifiers. A simplification requiring only one clarifier has been discovered, based on the finding that lime settles rapidly if soluble Ca salts are present when the lime is added to the extraction-stage effluent. Soluble Ca salts can be obtained by dissolving a small amount of lime in the chlorination effluent prior to mixing with the extraction-stage effluent. A continuous operation in a pilot plant of 20 liter/hr capacity was found feasible, using effluents from CEDED-bleached softwood kraft pulps. This study confirmed that 80-85% of the color from total bleach plant effluent can be removed in a single stage of lime additions varying from 90 to 120 lb/air-dry ton of pulp (in presence of soluble Ca salts). At the same time, COD and total organic carbon are reduced 40%, and fish toxicity is improved from LC(50) of 37% to 50-100%. For the settling of treated effluent, a clarifier with an overlfow rate of 200 U.S. gal/day/sq ft (or 8.1 cu m/day/sq m) would be needed. It is suggested that the lime sludge be burned in the lime kiln (after thickening in a separate filter) or with the lime mud from the causticization. The lime makeup due to Ca lost in the effluent is about 20-30 lb or 10-15 kg/air-dry ton. (Brown-IPC)
W78-10676

QUALITY OF THERMOMECHANICAL PULPING EFFLUENTS,
MacMillan Bloedel Ltd., Powell River(British Columbia).
For primary bibliographic entry see Field 5B.
W78-10677

ORIGIN AND REMOVAL OF PRECIPITATED SUSPENDED SOLIDS IN BLEACHED KRAFT PULP MILL EFFLUENTS,
British Columbia Forest Products Ltd., Mackenzie.
A. Twa, and R. J. Reis.
Canadian Forestry Service, Ottawa, Ontario K1A OH3. Cooperative Pollution Abatement Research (CPAR) Project Report 371-2, Final report to September 30, 1976, 23 p, 3 fig, 5 ref, 1 tab.

Descriptors: *Pulp wastes, *Chemical precipitation, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Lignins, Biochemical oxygen demand, Biomass, Water pollution treatment, Suspended solids, Calcium, White water(Paper machines), Pulp washing, Countercurrent washing, Kraft mills, Biological treatment.

The installatin of an additional countercurrent brown stock asher (downstream from a diffusion washer and knotters but ahead of pulp screens) reduced unbleached white water losses from 55 to 12.4 lb/air-dry ton (as saltcake). the washer operated at 81% efficiency. After purging the high-washing-loss effluent from the biologial treatment basin, suspended solids (mainly calcium-lignin precipitates) dropped from 240 to 87 ppm (24 lb/air-dry ton, compared to a previous average of 74 lb.). Suspended solids generation is attributable largely to biomass, and 75% of suspended solids are settleable within 8 hr. In a mill trial with a 6-hr quiescent zone, at least 50% of these solids could be removed. Reduced washing losses decreased the 5-day BOD loading to the basin by 40%; as a result, the BOD reduction across the basin improved from 80% to 88%. Further benefits included chemical savings in nutrients, saltcake makeup, bleach consumption, and defoamer use. (Brown-IPC)
W78-10678

COMPACT EFFLUENT CLARIFICATION SYSTEM,
Canadian Forestry Service, Ottawa, Ontario K1A OH3. Cooperative Pollution Abatement Research (CPAR) Project Report 399-1, Final Report to March 31, 1976. 12 p, 3 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Wood wastes, Suspended solids, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Filtration, Filters, Sand, Aeration, Biological treatment, Separation techniques, Chemical precipitation, Oxidation, Woodroom effluents, Barking(Of wood), Effluents.

Two wire-wound filters for purification of barking effluents did not permit reproducible measurements to be made of filtration parameters. Although a combination of wire-wound and sand filters achieved temporary clarification of woodroom effluent, the continuous precipitation of solids due to oxidation made it impossible to evaluate the system. It is recommended that barking wastes be thoroughly oxidized (by extended aeration or biological treatment) prior to final removal of particulate solids. (Brown-IPC)
W78-10679

STUDY OF THE FEASIBILITY OF TREATMENT OF STRAW PAPER MILL EFFLUENTS (STUDIO DI FATTIBILITA SUI TRATTAMENTI DI EFFLUENTI DI CARTIERE A PAGLIA),
G. Nardini, L. Petarca, and M. Baudone.
Cellulosa e Carta, Vol 28, No 10, p 3-11, October, 1977. 6 fig, 16 ref, 5 tab. English Summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Flocculation, Dissolved solids, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Lime, Biological treatment, Laboratory tests, Activated sludge, Water reuse, Recycling, Pulp and paper industry, Phosphoric acid, Straw paper.

Experiments are reported concerning treatments for effluents from the pulping of straw with lime. Improvement in effluent quality, to a level permitting reuse in the manufacturing process, was achieved by flocculation of waste water solids with phosphoric acid. Laboratory biological treatment tests yielded the parameters necessary for dimensioning an activated sludge reactor. (Speckhard-IPC)
W78-10681

REGENERATION OF ACTIVATED SLUDGE IN BIOLOGICAL PURIFICATION OF EFFLUENTS FROM FERMENTATION PLANTS (IZUCHENIE REGENERATSII AKTIVNOGO ILA V USLOVIAKH BIOLOGICHESKOI OCHISTKI STOKOV GIDROLIZNYKH ZAVODOV),
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gidroliznoi Promyshlennosti Moscow (USSR).
T. V. Zharova, and T. G. Chernyatinskaya.
Gidroliznaya i Lesokhimicheskaya Promyshlennost', No. 8, p 5-7, 1977. 2 fig, 4 ref.

Descriptors: *Activated sludge, *Sludge regeneration, Chemical industry, Wastes, Waste treatment, Water pollution sources, Industrial wastes, Respiration, Aeration, Costs, Sludge, Biological treatment.

The biological purification process in aeration tanks includes a compulsory regeneration of activated sludge by air blowing. Different opinions concerning the effects of regeneration are discussed. To further study this problem, laboratory experiments were conducted in which the effects of active sludge regeneration on its respiration rate and the rate and extent of substrate utilization were investigated. The sludge used was obtained from aeration tanks in which extensive and partial purification had been conducted. Non-regenerated sludge from both types of tanks served as control. Aeration tended to decrease the respiration rate as well as the utilization of organic substrate. Thus, there is no justification for sludge regeneration, considering the additional cost of this process. (Stapinski-IPC)
W78-10683

IMPROVING METHODS FOR ELIMINATING INJURIOUS WASTES FROM WOOD-PROCESSING PLANTS (VERVOLLKOMMNUNG DER VERFAHREN ZUR BESEITIGUNG SCHAEDLICHER EMISSIONEN HOLZVERARBEITENDER BETRIEBE),
V. Biryukov, N. Paskov, M. Zamaraev, and V. Sokolov.
Holztechnologie, Vol 18, No 4, p 235-238, December, 1977. 2 tab. English summary.

Descriptors: *Waste water treatment, *Fiberboard mills, Conferences, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Europe, Water consumption(Except consumptive use), Effluents, Air pollution, Dusts, Filters, Water utilization, Sludge, Pollution abatement, Forest products industry.

This article summarizes the proceedings of a symposium of Comecon countries dealing with possibility for improving processes and methods for cleaning liquid effluents and gaseous emissions from wood-processing plants. Bulgaria, Hungary, East Germany, Poland, Romania, Czechoslovakia, and the Soviet Union are compared as to their use of water per ton of wet-process fiberboard and as to the composition of the effluent. The wet-process fiberboard industry is discussed separately, including the water cycle, the reduction of wood hydrolysis wastes, effluent purification, and sludge utilization. The other wood-based industries use much less water, but gaseous emissions are more of a problem. The precipitation of solid particle dusts by cyclones, filters and wet processes, and the removal of undesirable volatile constituents are discussed. (Ward-IPC)
W78-10684

ELECTROCHEMICAL DECOLORIZATION OF KRAFT MILL EFFLUENTS,
British Columbia Research Council, Vancouver.
K. Oehr.
Journal Water Pollution Control Federation, Vol 50, No 2, p 286-289, February, 1978. 6 fig, 1 illus, 9 ref.

Descriptors: *Bleaching wastes, *Pulp wastes, *Waste water treatment, *Electrolysis, *Color, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Anodes, Electric power, Pulp and paper industry, Organic compounds, Electrochemistry, Water purification.

Test solutions which contain mixtures of total kraft mill or caustic extraction effluent and sea water were recycled through Pepcon (Pacific Engineering and Production Co., Nevada) annular flow electrolytic cells. The removal of colored organic compounds was thought to occur by hypochlorite oxidation. The hypochlorite, along with chlorate and chlorine, were produced electrochemically from chloride ion. The decolorization efficiency increased as the anode current density decreased and as the free chloride content of the effluent was increased. Lead dioxide was preferable to graphite as an anode material. Temperature changes had no significant effect on decolorization efficiency. For a 1:1 caustic extraction or total kraft mill effluent and sea water mixture, the power requirement is about 10 kw-hr/1000 gal at about 80% color removal and 5.4 milliamperes/sq cm. (Swichtenberg-IPC)
W78-10685

DEVELOPMENT OF COLOR REMOVAL POTENTIAL IN ORGANISMS TREATING PULP AND PAPER WASTEWATER,
Biochemical Corp. of America, Salem, VA.
L. Davis, J. E. Blair, and C. W. Randall.
Journal Water Pollution Control Federation, Vol 50, No 2, p 382-386, February, 1978. 3 fig, 3 ref, 4 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Biological treatment, *Color, Bacteria, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Pulp wastes, Hydrogen ion concentration, Nutrients, Phosphorus compounds, Nitrogen compounds, Biodegradation, Microorganisms, Enzymes, Adsorption.

A series of experimental procedures, developed jointly by the Biochemical Corporation of America (Salem, Virginia) and the Virginia Polytechnic Institute and State University (Blacksburg), are designed to select, isolate, and possibly alter specific bacteria for degradation of color bodies in kraft bleach plant (CEDED) effluents. The effects of pH, organic nutrients (viz., P and N), additional salts, sterilization of effluent, and acclimation of inoculum are investigated. The results show that adsorption and enzymatic degradation play major roles in biological decolorization of kraft mill effluents. While color-destroying organisms can be selectrively grown in a controlled environment, it remains to be seen whether these somewhat specialized organisms can succeed in populating lagoons and other biological treatment systems in competition with organisms already adapted to the chemical and climatic environment. (Swichtenberg-IPC)
W78-10686

WATER RECOVERY AND EFFLUENT TREATMENT FOR THE PAPER INDUSTRY,
R. J. Kiff.
Paper, Vol 189, No 2, p 67-68, 70, January 23, 1978. 3 illus, 1 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *United Kingdom, Wastes, Industrial wastes, Pulp wastes, Sulfite liquors, Water pollution treatment, Water pollution sources, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Hydrogen ion concentration, Flotation, Biological treatment, Sedimentation.

Effluent assessment and treatability studies, the nature of effluents, and British treatment systems are discussed. Effluents from debarking, wood washing, groundwood production, and kraft, soda, sulfite, semichemical, and nonwood raw material

pulping are described. An analytical assessment program should include tests for BOD, COD, suspended solids, and pH. Sedimentation, flotation, and biological treatment are generally used for treating paper industry wastes. (DuVall-IPC)
W78-10687

PYROLYSIS OF INDUSTRIAL WASTES,
Greeley and Hansen, Chicago, IL.
For primary bibliographic entry see Field 5E.
W78-10689

BIOLOGICAL PURIFICATION OF DECOLORIZED KRAFT MILL EFFLUENTS (BIOLOGICZNE OCZYSZCZANIE ODBARWIONYCH SCIEKOW POSIARCZANOWYCH),
Instytut Celulozowo-Papierniczy, Lodz (Poland).
Z. Skwara, and C. Leszcynski.
Przeglad Papierniczy, Vol 33, No 9, p 317-321, September, 1977. 1 fig, 12 ref, 2 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Biological treatment, Color, Chemical oxygen demand, Biochemical oxygen demand, Lime, Carbon dioxide, Economics, Foaming, Black liquors, Aluminum, Sulfates, Chemical precipitation, Effluents, Foam, Aluminum sulfate, Coats.

A review of pertinent literature shows that decolorization of kraft mill effluents before, rather than after, biological purification is considered advantageous technically and economically. The effect of the activated sludge process on decolored effluents as compared to crude effluents was studied. Black liquor doluted to a COD of 1200 and a 4-day BOD of 1350 mg/liter, and having a color of about 320 mg Pt/liter, was purified biologically directly or after decoloration by treatment with aluminum sulfate or lime. Samples decolored with lime were treated either directly or subjected to preliminary saturation with carbon dioxide. Effluent decolored with sulfate or lime (with carbon dioxide saturation) showed about the same reduction of BOD as the crude effluent. An excess of lime (in the absence of carbon dioxide saturation) interfered with the process. The advantages of preliminary decoloration were better penetration of oxygen and low foaming tendency. The removal of 83-91% of the color makes the activated sludge process more economical. (Stapinski-IPC)
W78-10690

RECOVERY OF ALUMINUM SALTS FROM COAGULATION SEDIMENTS OF BEECH AND PINE BARKING EFFLUENTS (BADANIA NAD REGENERACJA SOLIGLINU Z OSADOW PO KOAGULACJI SCIEKOW Z KOROWALNI DREWNA BUKOWEGO I SOSNOWEGO),
Nicolas Copernicus Univ. of Torum (Poland). Inst. of Chemistry.
S. Kaminski, and M. Jankowska.
Przeglad Papierniczy, Vol 33, No 10, p 376-379, October, 1977. 3 fig, 9 ref, 5 tab.

Descriptors: *Aluminum, *Pulp wastes, *Chemical recovery, Coagulation, Waste water treatment, Wastes, Water pollution sources, Pulp and paper industry, Europe, Calcium hydroxide, Lime, Chemical precipitation, Moisture content, Hydrogen ion concentration, Chemical oxgygen demand, Suspended solids, Waste treatment, Foreign countries, Poland, Sodium hydroxide, Sulfuric acid, Woodroom effluents, Barking(Of wood), Effluents, Chemical recovery, Wood wastes.

Barking effluents from the Swiecie pulp and paper mill (Poland) were coagulated with aluminum sulfate. The freshly decanted sediments were treated with 0.1 molar NaOH, 0.022 molar calcium hydroxide, and 3, 0.6, and 0.15 molar sulfuric acid. Following 24 hr decantation and separation of the precipitates formed, determinations were made of the volume and moisture content of the precipitates and of the pH, COD, aluminum content, and volume of the solutions. The amounts of the recovery agents used were 100-400% of the stoichiometric amounts for NaOH and lime, and 25-250% for sulfuric acid. Recovery of aluminum by the alkaline method was low: a maximum of 36% for NaOH and 22% for lime at the highest doses of the reagents. The solutions obtained had a high COD and were difficult to clarify. Satisfactory results were obtained with sulfuric acid. The optimum pH for the recovery process was 2.5-3.2, corresponding to a sulfuric acid dose of 60-80% of the stoichiometric amount. The degree of aluminum recovery was over 60%, and the concentration of the solutions was 0.05%, as aluminum oxide. These solutions had good coagulating properties: when used for coagulation of fresh barking effluents, they gave a reduction of suspended solids and COD nearly the same as with the aluminum sulfate solution. (Stapinski-IPC)
W78-10691

NEW GRAVITY SCREEN MAKES OF WASTEPAPER PRACTICAL AT PAPER MILLS,
Albany International Co., Glens Falls, NY.
E. R. Woodard.
Pulp and Paper, Vol 52, No 3, p 93-95, March, 1978. 3 fig, 2 illus.

Descriptors: *Filters, *Water treatment, *Waste water treatment, *Pulp and paper industry, Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Screens, Equipment, *Water reuse, Recycling, Industrial water, White water(Paper machines), Filtration.

The AES 3600 gravity strainer, developed by Oy. Filter AB. (Finland), is used to treat water for use and reuse in the pulp and paper mill. The filter resembles a large vertical drum with effluent flowing up and over a weir and toward the center at about the top perimeter of the tank. The effluent flows through a distributor plate and a metal or plastic screen into a tank over which the filter is mounted. A rotating shower beneath the screen lifts rejects and floats them toward the center reject outlet. Applications include filtering water from paper machine vacuum pumps at Chesapeake Corp. (West Point, Virginia), treating process river water at Stevens and Thompson Paper Co. (Greenwich, New York), and filtering saveall white water at Georgia-Pacific Corp. in Crosett, Arkansas. (Swichtenberg-IPC)
W78-10692

ENVIRONMENTAL PROBLEM OF BLEACHERIES (BLEKERIETS MILJOVARDSPROBLEM),
IVL-Konsult A.B., Stockholm (Sweden).
H. Norrstrom.
Svensk Papperstidning, Vol 81, No 5, p 146-149, March 25, 1978.

Descriptors: *Bleaching wastes, *Sweden, Europe, Foreign countries, Water conservation, Recycling, Incineration, Biochemical oxygen demand, Chemical oxygen demand, Pulp and paper industry, Pulp wastes, Effluents, Water pollution sources, Wastes, Industrial wastes, Waste water treatment, Waste treatment.

Modified bleaching technologies, reduction of water consumption, effluent thickening, recycling, and combustion have improved environmental protection practices to such an extent in the past decade that the BOD/COD loading discharged by the Swedish pulp and paper industry has dropped below the 1920 level despite greatly multiplied pulp production. (Brown-IPC)
W78-10695

FILTER BED FLOOR TILES.
For primary bibliographic entry see Field 8F.
W78-10696

EFFECT OF THE CONSTRUCTION OF FLOTATION TRAP PRESSURE TANKS IN PURIFYING WASTE WATERS (VLIYANIE KONSTRUKTSII NAPORNOGO BAKA FLOTATSIONNOI LIVUSHKI NA EFFEKTIVNOST' OCHISTKI STOCHNYKH VOD),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost, Moscow (USSR).
V. A. Kopylov.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No 16, p 10-11, June, 1977. 2 fig, 1 tab.

Descriptors: *Flotation, *Waste water treatment, Equipment, *Pulp wastes, Waste treatment, Water pollution treatment, Froth flotation, Solubility, Gases, Water purification, Bubbles, Water quality control, Saturation, Mixing.

The quantity of bubbles evolved from a supersaturated solution, and hence the effectiveness of flotation purification of paper mill effluents, depends on the amount of gas dissolved. In agreement with Henry's law, at constant temperature the solubility of gas in a liquid is directly proportional to the partial pressure of gas over the solution. Waste water usually dissolves less gas than the amount specified by Henry's law. The intensity of agitation of the liquid with air in a pressure tank affects the final size of the bubbles and the dissolution rate. Various pressure tanks were used with height/diameter ratios of 2-7 and residence times of water in the tank from 3 to 8 min. With an increase in the ratio of tank height to diameter, the time to saturation of water with air decreased, because of more uniform distribution of air. For the minimal saturation time of 1 min this ratio was 5. Further increasing this ratio resulted in an increased rate of water rising, whereas the rising of bubbles decreased, thus reducing the intensity of mixing of water with air. (DuVall-IPC)
W78-10697

CHEMICAL CONCENTRATION BY SEQUENTIAL ACTIVATED CARBON ADSORPTION AND FRACTIONATION,
Flambeau Paper Co., Park Falls, WI.
K. W. Baierl.
United States Patent No. 4,071,398. January 31, 1978. 13 p, 12 claims. 4 fig.

Descriptors: *Pulp wastes, *Sulfite liquors, *Patents, *Waste water treatment, *Activated carbon, Wastes, Waste treatment, Water pollution sources, Water pollution treatment, Pulp and paper industry, Adsorption, Carbon, Costs, Steam, Equipment, Condensates, Chemical recovery.

A method is provided for recovering adsorbable chemicals from dilute process streams, partcularly for concentrating and recovering chemicals from waste condensates derived in kraft or sulfite pulping. For example, the process can be used to recover furfural, sulfur dioxide, and acetic acid from a stream of sulfite pulping waste condensate comprising condensed digester relief and blow gases and condensates from the evaporation of the spent sulfite liquor. The process involves concentrating the chemicals from the dilute waste stream by adsorption on an activated carbon column, then desorbing with an agent such as methanol to form a partially concentrated feed stream containing a higher concentration of the chemicals than the original stream, and subjecting the partially concentrated stream to fractional distillation to yield the desired chemicals in concentrated form (e.g., 90% by weight or better). By using two carbon columns alternately operated in adsorption and regeneration (desorption) modes, and by suitable recycling and holding steps, and by using a single fractionator to accomplish both intermediate and final concentration, it is possible to operate the system continuously using equipment normally used for batch operations. In addition to this saving in equipment cost, the steam consumption is relatively low, thus realizing further reductions in the overall cost of the system. (Lynch-IPC)
W78-10698

CLOSED PROCESS WATER LOOP IN NSSC CORRUGATING MEDIUM MANUFACTURE,
Green Bay Packaging Inc., WI.
G. O. Walraven, W. R. Nelson, P. E. DeRossi, and R. L. Wisneski.
U.S. Environmental Protection Agency, Environmental Protection Technology Series EPA-600/2-77-241, 94 p, December, 1977. 3 appendices, 22 fig, 4 illus, 3 ref, 1 tab. S-800520.

Descriptors: *Water conservation, *Pulp and paper industry, *Pulp wastes, *Recycling, *Corrugating medium mills, Water pollution sources, Wastes, Industrial wastes, Reverse osmosis, Membrane processes, Wisconsin, Operation and maintenance, Economics, Biochemical oxygen demand, Water pollution control, Spills, Closed systems, Sulfite pulp mills.

Over the past 5 years, the corrugating medium mill of Green Bay Packaging Inc. in Green Bay, Wisconsin, has been converted to an essentially closed process water system. The mill is a net consumer of water. This is due to the greater amount of water carried out of the system with the sheet compared to the lower water content entering the process system in raw materials. Many small dilute water streams are accepted into the process without upsetting the water balance. When extraneous water inputs do upset the system balance, the condition is correctable by removing water either by thermal evaporation or reverse osmosis. The reverse osmosis plant operating performance and economics are described. Although many reverse osmosis operating problems have been solved, flux rates are somewhat lower than had been predicted. Other system additions and revisions for process water entrapment, recycle, and surge protection are described. A monitoring system is in use for early spill detection and problem correction. Levels of BOD loss have been reduced from the 9,072 kg/day (20,000 lb/day) range of 1971 to less than 454 kg/day (1,000 lb/day) as a monthly average for 1975. The daily maximum of 1,814 kg (4,000 lb) has not been exceeded in any mill-operating day during 1975. (Witt-IPC)
W78-10699

EFFECTS OF CLARIFICATION PROCEDURES ON EFFLUENT DISCHARGE FEES (AUSWIRKUNGEN VON KLAERMASSNAHMEN AUF DIE HOEHE DER ABWASSERABGABE),
For primary bibliographic entry see Field 5G.
W78-10700

PROCESS FOR THE PURIFICATION OF WASTE WATER,
Standard Oil Co., Chicago, IL. (Assignee).
J. F. Grutsch, R. C. Mallatt, and B. F. Steely.
U.S. Patent No. 4,073,722, 11 p, 1 fig, 2 tab, 12 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 610, February 14, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Industrial wastes, Oil wastes, Filtration, Activated sludge, Oxygenation, Tertiary treatment.

An improved process for treating waste water including high and variable concentrations of BOD5 contaminants, COD contaminants, oil and grease, inert solids, ammonia, phenolics, and other contaminants which are relatively refractory is disclosed. The process is adapted to treat waste water from municipalities and also waste water from oil refineries and chemical complexes where the water from the refining of oil is mixed with waste water from chemical plants and waste water from combined municipal/industrial sources. The modifications in the intermediate and secondary treatments result in substantial improvement in effluent water quality. The intermediate treatment includes equalization and filration. Equalization is conducted in a basin having two, preferably three or four compartments. These compartments are mixed and arranged in series so that water flows from one compartment to the next succeeding compartment. Aeration thoroughly agitates and mixes the water with the result colloidal and suspended oils and solids are mechanically flocculated and accumulate on the water surface. These oily solids are removed by skimming. Water from intermediate treatment flows through a conventional activated sludge plant which has been modified in two important ways: the sludge-water mix flowing between stages of activated sludge process is aerated, and the sludge of different ages from different stages is recycled to one or more upstream stages. Dissolved oxygen maintains the sludge in the clarifier tank aerobic and ensures that the effluent water to the subsequent tertiary treatment includes at least three parts of dissolved oxygen per million parts of water. (Sinha-OEIS)
W78-10709

REMOVAL OF TRINITROTOLUENE FROM AQUEOUS MEDIA,
Polytechnic Inst. of New York, Brooklyn, NY. (Assignee).
Y. Okamoto, J. Y. Want, and E. J. Chou.
U.S. Patent No. 4,073,726, 4 p, 2 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 611, February 14, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, Chemical wastes, Separation techniques, Organic compounds, Chemical precipitation, Munitions and Explosives industry, *Trinitrotoluene(TNT).

A simple, safe and low coast method of removing TNT from waste water is provided. The method is based on the discovery that certain amino group contaning compounds alone or together with cationic compounds cause the formation of water-insoluble reaction products with TNT. The resulting precipitates can be readily and safely removed and the treated waste water can then be safely discharged or further treated to remove other pollutants, without hazard, by conventional methods. (Sinha-OEIS)
W78-10710

PROCESS FOR THE OXIDATION OF WASTE LIQUORS ARISING FROM THE MANUFACTURE OF PAPER PULP,
Groupement European Dela Cellulose, Paris (France). (Assignee).
Y. G. Garrigues.
U.S. Patent No. 4,073,727, 5 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 612, February 14, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, Pulp and paper industry, Oxidation, Equipment, Bubbles.

An oxidation process is described which is applicable to waste liquors (black liquors and white liquors) arising from the manufacture of paper pulp. The aqueous liquor contaning caustic soda and sodium sulphide are oxidized in a reservoir containing candles of a sintered material placed horizontally. Air for oxidation is introduced into the candles at about 90 deg C and oxidation is carried out at a temperature of from 70 deg to 90 deg C. The candles are made of sintered stainless steel with 3 to 5 micron pores. The air blown through these candles form very fine air bubbles of large specific surface area. (Sinha-OEIS)
W78-10711

ULTRAFILTRATION WATER COLLECTOR,
Systems Engineering and Corp., Stoughton, MA. (Assignee).
For primary bibliographic entry see Field 5F.
W78-10712

SODIUM HYPOCHLORITE TREATMENT FOR REMOVAL OF CYANURATE COMPOUNDS FROM AQUEOUS WASTE STREAMS,
FMC Corp., Philadelphia, PA. (Assignee).
R. H. Carlson.
U.S. Patent No. 4,075,094, 8 p, 2 fig, 5 ref; Official Gazette of the United State Patent Office, Vol. 967, No 3, p 1064, February 21, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, Chemical reactions, Chlorine, Oxidation, *Sodium hypochlorite.

The manufacture of sodium dichloroisocyanurate and trichloroisocyanuric acid is accompanied by the production of aqueous waste streams containing dissolved cyanurates, the pollution-free disposal of which presents a special problem. This invention provides a means for reducing the levels of cyanurate compounds present in the chlorinator waste stream to less than 15 ppm by reaction of the waste stream with sodium hypochlorite in either a batch or continuous process, and has particular application to the treatment of such waste streams that have been dechlorinated with hydrogen peroxide to reduce soluble cyanuric acid levels from 2% to 200-3,000 ppm. Further oxidization of such waste streams, containing as much as 3,000 ppm of cyanurate compounds with sodium hypochlorite can result in an effluent that meets zero nitrogen discharge requirements. The reaction rate is related to such variables as pH, temperature, initial concentration of cyanurate compounds and initial sodium hypochlorite concentration. Excess sodium hypochlorite can be subsequently destroyed by reaction with hydrogen peroxide. (Sinha-OEIS)
W78-10718

DRAINAGE AND SEWAGE PUMPS.
For primary bibliographic entry see Field 8C.
W78-10719

METHOD FOR TREATMENT OF DIGESTER SUPERNATANT AND OTHER STREAMS IN WASTEWATER TREATMENT FACILITIES,
M. D. Richard.
U.S. Patent No. 4,076,515, 8 p, 3 fig, 19 ref; Official Gazette of the United States Patent Office, Vol 967, No 4, p 1541, February 28, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Sludge treatment, Nitrogen, Ammonia, Separation techniques, Fertilizers.

Digester supenatants and/or liquors from sludge dewatering are reacted with an excess of an alkaline reagent having a stronger cation than the ammonoium ion and the reaction product is separated into a solution containing aqueous ammonia and solids. The aqueous ammonia derived from the separation stage is heated by free steam under a lowered pressure to free ammonia in gaseous form. The ammonia as a gas, or adsorbed in water, or adsorbed in an acid, or as an acid salt is then mixed with conventionally dried sludge to increase the nitrogen content of the sludge from approximately 1-2 percent to as high as 10 percent.
W78-10721

SUB-SERVICE SURVEYING.
For primary bibliographic entry see Field 7B.
W78-10723

MULTI-PART EXAMPLE OF SOLIDS/VOLATILES RELATIONSHIPS,
D. A. Lee.
Water and Sewage Works, Vol. 125, Reference Number, p 188, April, 1978. 1 tab.

Descriptors: *Mathematical models, *Analytical techniques, *Sludge treatment, *Dewatering,

*Drying, Volatility, Solid wastes, Evaporation, Model studies, Waste water, Activated sludge, Treatment, Moisture content, Fertilizers, Municipal wastes.

Mathematical models described the relationship between solids recovery and water removal in waste activated thickening, filtering, and drying processes. The models were used in estimating appropriate sizes for process equipment and feed rates and calculating associated cost factors. Equations were developed which interrelated volatile removal on the filter press, solid sludge discharge, feed rate, and associated parameters of food solids content and moisture content in the final sludge product. The solids/volatiles analysis was applied to a thickener with a feed rate of 20 tons/hr and a sludge solids content of 7.8% prior to pressure filtration dewatering and drying. After filtration, the sludge solids content was 68.8%; a final 1.5% moisture content after drying was desired to make the sludge suitable as a fertilizer. Results from these calculations were used to approximate the fuel requirements associated with sludge drying. (Lisk-FIRL)
W78-10724

CMS SYSTEM SAVES TIME AND MONEY.
Water and Wastes Engineering, Vol 15, No 5, p 76, May, 1978.

Descriptors: *Management, *Project planning, *Design criteria, *Treatment facilities, *Construction costs, Tertiary treatment, Bids, Pumping plants, Financial analysis, Inflation(Economic), Waste water treatment, Municipal wastes.

Construction management services supplied by CH2M Hill permitted a 16% savings and early completion of the Rock Creek sewage treatment plant, commissioned by the Unified Sewerage Agency of Washington County, Oregon. The plant, which provides primary, secondary, and tertiary treatment, was completed on a phased design and construction system. Construction contracts were divided into 50 separate packages; major equipment was ordered directly from the manufacturers. The project was divided into three phases: the raw sewage pumping plant, the primary treatment facilities, and the secondary-tertiary treatment facilities. Phased design and construction permitted earlier startup than would have been possible with conventional design-bid-construct systems. Phased design also permitted earlier equipment orders and deliveries; inflation associated with project construction costs was reduced because of the shorter and earlier construction time. Initial designs were developed in March, 1975; the entire tertiary operation was completed in November, 1977, 9 months ahead of schedule. (Lisk-FIRL)
W78-10725

TREATMENT OF LIQUIDS CONTAINING COMPLEXED HEAVY METALS AND COMPLEXING AGENTS,
Photocircuits Corp., Glen Cove, NY. (Assignee)
R. J. Zeblisky.
U.S. Patent No 4,076,618, 7 p, 8 ref; Official Gazette of the United States Patent Office, Vol 967, No 4, p 1569, February 28, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Heavy metals, Separation techniques, Ion exchange, Water reuse, Chemical reactions, *Metal processing industry, *Complexing agents.

Electroless metal deposition bath by-products such as alkai metal salts (sodium formate, sodium sulfate and the like) are separated from alkanolamine complexing agents and heavy metals complexed with such agents, in an electroless metal deposition bath, or bath effluent, by adjustment of the pH and extraction with an ion exchange medium. The extracted complexed heavy metals and complexing agents are removed from the exchange medium and returned to the electroless metal deposition operation. This results in a continuously operating electroless metal deposition operation. This results in a continuously operating electroless metal deposition bath from which by-products of the deposition process are removed, and from which heavy metals and complexing agents are not discharged as pollutants. Optionally, in batch-wise metal deposition operations, the extracted heavy metal and complexing agent can be recovered from the exchange medium and, instead of being returned directly to metal deposition, prepared as a concentrate for future use in other metalizing operations. In another embodiment, solutions of alkanolamine complexing agents and alkanolamine-complexed heavy metals, e.g. metal cleaning solutions, electroplating baths, etchant solutions, and the like, are treated by the same pH-adjustment and contact with an ion exchange medium to remove the complexed heavy metal and complexing agents from solution, thus preventing their discharge as pollutants and enabling reuse of these materials if desired. (Sinha-OEIS)
W78-10726

CHELATE OXIDATION OF HYDROGEN SULFIDE IN SOUR WATER,
Chelate Oxidation of Hydrogen Sulfide in Sour Water,
L. C. Hardison.
U.S. Patent No 4,076,621, 5 p, 1 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 967, no 4, p 1570-1571, February 28, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Anaerobic conditions, Hydrogen sulfide, Odor, Separation techniques, Chelation, Oxidation, *Sour water, *Chelated iron.

Hydrogen sulfide is generated under anaerobic process conditions in many industrial processes. Although this invention is used typically on waste water from refinery operation it is useful in the treatment of any sour water stream. A process is described for effecting combined stripping of hydrogen sulfide gas from sour water and conversion of both the evolved hydrogen sulfide and also the residual dissolved hydrogen sulfide to sulfur. An aqueous chelated iron solution is utilized as a catalyst or reagent to effect conversion of the hydrogen sulfide to sulfur. Contacting of the hydrogen sulfide-containing gas stream with the chelated iron solution (in which the iron is in the ferric state) effects oxidation of the hydrogen sulfide to elemental sulfur with concomitant reduction of the iron from the ferric state to the ferrous state. The solution is regenerated by aeration or the like to oxidize the iron to the ferric state. (Sinha-OEIS)
W78-10729

BAFFLE AND WASH TROUGH ASSEMBLY FOR GRANULAR-MEDIA FILTERS,
General Filter Co., Ames, IA. (Assignee)
For primary bibliographic entry see Field 5F.
W78-10732

HIGH STRENGTH CAST MODULES FOR SUPPORTING REVERSE OSMOSIS MEMBRANES.
Union Carbide Corp., New York. (Assignee)
For primary bibliographic entry see Field 3A.
W78-10733

EPA AMENDS SEWAGE PLANT FUNDING RULES.
For primary bibliographic entry see Field 5G.
W78-10739

JAPANESE GAS FROM SEWER SLUDGE.
Water and Waste Treatment, Vol 21, No 6, p 17, June, 1978.

Descriptors: *Turbines, *Sludge digestion, *Electric generators, *Electric power production, *Gases, Sewage sludge, Hydrogen sulfide, Generators, Equipment, Design data, Waste water treatment, Ultimate disposal, Municipal wastes.

An electric powerplant, developed by Ebara-Infilco of Tokyo, Japan, uses sewage sludge gas as its fuel source. The powerplant, reportedly capable of generating 170,000 kilowatts/1 mgd waste water, reclaims sludge gas in a high-efficiency sewage digestion chamber. Desulfurization and other methods remove hydrogen sulfide and oher impurities from sludge digestion gas which is then stored in a pressure tank. The digester gas is burned in an engine designed and supplied by Motoren-Werke Manheim A. G. of Munich, West Germany. Combustion of the gas in the engine turns a generator turbine which generates electricity. The powerplant is equipped with a waste gas burning boiler which supplies steam to the digestion chamber. The plant is reportedly capable of supplying enough electrical power to operate all sewage treatment equipment, including the air blowers and pumps, in addition to generating surplus power. (Lisk-FIRL)
W78-10741

VACUUM SEWER SYSTEM.
Australian Patent 493,453. Issued June 15, 1978. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 48, No. 21, p 1925, June, 1978.

Descriptors: *Pumps, *Circulation, *Aeration, *Patents, *Pumping plants, Equipment, Intakes, Design data, Mixing, Turbulence, Waste water treatment, Municipal wastes.

A patent has been issued for a sewage collection plant which operates with a vacuum. A vacuum is formed at the inlet to the sewage collection tank by a venturi ejector pump. A circulating pump operates the venturi ejector pump by circulating the collected waste water from the collection tank through the venturi pump. The waste water is partially treated as it circulates through the pump. As the contents of the collection tank are passed through the venturi ejector pump, the wastes are agitated, comminuted, and aerated. (Lisk-FIRL)
W78-10766

TREATMENT OF WASTE MATERIAL.
Australian Patent 493,562. Issued June 15, 1978. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 48, No. 21, p 1954, June, 1978.

Descriptors: *Solid wastes, *Separation techniques, *Cryogenics, *Patents, *Cooling, Compressibility, Physical properties, Coolants, Waste water treatment, Municipal wastes.

Commonwealth Industrial Gases Ltd. has received a patent for a solid waste treatment process using cryogenic conditioning. Solid waste in sewage entering the treatment plant is separated from the inflowing waste water. The separated solids are first compressed and then cooled by exposure to a cryogenic liquid or a cold vapor generated from the liquid. The low temperature solid wastes become brittle and are comminuted. (Lisk-FIRL)
W78-10771

WATER-INSOLUBLE BIO-POLYMER FLOCCULATING AGENT SPEN. - FROM ACTIVATED SLUDGE USING ETHYLENE-DIAMINE TETRA:ACETATE SODIUM

CHLORIDE, ISOPROPANOL AND POLYVALENT METAL IONS.
Soviet Patent SU-563-423. Issued October 20, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 21, p 5, July, 1978.

Descriptors: *Flocculation, *Activated sludge, *Polymers, *Patents, *Chemical precipitation, Centrifugation, Separation techniques, Magnesium, Calcium, Sodium chloride, Waste water treatment, Municipal wastes.

A method to prepare a water insoluble biopolymer flocculant from activated sludge has been patented. The activated sludge is initially centrifuged and extracted with a 2% disodium ethylenediaminetetraacetic acid solution for 4-5 hrs at 0-4C. The extracted residue is centrifuged for 20 min at 0-4C and treated with 2% NaCl in a volume of propanol or isopropanol equal to the sludge volume. The resulting biopolymer precipitate is redissolved in water and mixed with a magnesium or calcium ion-bearing aqueous solution. Polyvalent metal ions are added in the range of 0.05-0.125 mg/eq per mg of precipitate at 4-20C to yield a 30% biopolymer flocculant. The flocculating agent can accelerate clarification rates by a factor of 2-8. (Lisk-FIRL)
W78-10772

EFFLUENT PURIFICATION - BY CONTROLLING MICROBIAL CONCENTRATION AND FLOW IN THE AERATION TANK.
French Patent FR 2362-794. Issued April 28, 1978. Derwent French Patents Abstracts, Vol. A, No. 21, p 4, July, 1978.

Descriptors: *Microbial degradation, *Biological treatment, *Nutrient removal, *Patents, *Biomass, Carbon, Nitrogen, Phosphorus, Biochemical oxygen demand, Aeration basins, Waste water treatment, Municipal wastes.

Aeration basin retention time may be reduced and nutrient remova improved when a 3-25 ratio of total organic carbon treated/day to microbial concentration based on weight is maintained in the aeration basin. The weight of the microbial concentration comprises 20-200 percent of the total organic content of the aeration tank effluent. This patented technique eliminates removal of activated sludge for recycle and prevents microbial inactivation undr anaerobic conditions. The reduced microbial population of 50-400 ppm reduces the effluent residence time in the aeration tank to 1.5-6.0 hrs. The proliferation of active microorganisms improves nutrient removal; nitrogen is reduced by 70-90%, phosphorus by 50-70%, and BOD by 90-96%. (Lisk-FIRL)
W78-10789

SLUDGE DREDGER - FOR ELONGATED SETTLING TANKS ETC.
German Patent DS 2203-865. Issued May 24, 1978. Derwent German Patents Abstracts, Vol A, No 22, p 2, July, 1978.

Descriptors: *Settling basins, *Sludge treatment, *Patents, *Hydraulic equipment, *Dredging, Design data, Bridges, Traction, Sludge disposal, Sewage sludge, Equipment, Sanitary engineering, Waste water treatment, Municipal wastes.

A patent has been issued for a sludge scrapping apparatus to be used with elongated clarifiers. A sludge scraper bridge is equipped with the scraper blade, a loading device, and a blade lifting unit. The scraper blade pivots up and down within the tank. The loading device is vertically mobile and is equipped with a connection rod assembly containing the blade lifter. The lifter, provided with a traction and pressure drive system, removes the blade from the clarifier. The loading device, which becomes operational after the sludge blade is lifted from the tank, has a release force that counteracts the load force. The release force is activated by a spring or weight assembly which supplies slightly less force than that of the loading system. The lifter size required for removing the scraper blade determines the size of the sludge scraping apparatus. (Lisk-FIRL)
W78-10804

CENTRIFUGAL LIQUID/SLUDGE SEPARATOR - WITH AXIALLY ACTUATED VALVE FOR SUPPLEMENTARY OUTLETS.
Soviet Patent SU-566-509. Issued August 19, 1977. Derwent Soviet Inventions Illustrated, Vol A, No 23, p 8, July, 1978. 1 fig.

Descriptors: *Centrifugation, *Separation techniques, *Sewage sludge, *Channels, *Pistons, Patents, Design data, Equipment, Outlets, Rotors, Waste water treatment, Municipal wastes.

A patent has been issued for a centrifugal waste water/sewage sludge separator which automatically evacuates accumulated sludge without interrupting operation. The centrifuge is equipped with a rotor containing a piston; located along the walls of the rotor and piston are channels which operate as jets and rim outlets. Waste water is conveyed along the hollow rotor shaft to a separator having insert vanes. As the waste water is passed into the separator, sludge is drawn through the channels along the rotor and piston. Sludge accumulates on a deposit pad located beneath the separator inserts. When sufficient sludge accumulates to reach the inserts, the piston is automatically activated. The piston descends, forcing the sludge from the deposit pad through an outlet. (Lisk-FIRL)
W78-10805

PURIFYING WASTE WATER OF HIGH ORGANIC CONTENT - FIRST ACID ANAEROBIC, THEN AEROBIC, THEN ANEROBIC METHANE FERMENTATIONS.
French Patent FR 2364-184. Issued May 12, 1978. Derwent French Patents Abstracts, Vol A, No 23, p 4, July, 1978.

Descriptors: *Anaerobic digestion, *Aerobic conditions, *Organic wastes, *Patents, *Methane bacteria, Acid bacteria, Methane, Carbon dioxide, Biological treatment, Digestion, Inhibition, Neutralization, Waste water treatment, Municipal wastes.

A patented process reduces the organic content of waste water with combined anaerobic and aerobic digestion. The highly organic waste water is anaerobically digested in an acid medium which supports a microbial culture to convert contained oxygen to an organic acid mixture; fermentation occurs at a temperature of 20-50C over a residence time of 0.1-0.8 days/kg/cu m. The acidity of the waste water during anaerobic digestion inhibits methane fermentation. The waste water is then treated by aerobic fermentation for a residence period of 0.2-0.3 days/kg/cu m, followed by anaerobic methane digestion for 6-15 days. Neutralization with an alkali is not required because acid is converted to CO2 and H20 by the process. The treated effluent may be further aerobically digested after the anaerobic methane digestion stage. (Lisk-FIRL)
W78-10808

FOOD PROCESSING PLANT WASTE WATER PURIFICATION - BY ELECTRO-FLOTATION. USING TITANIUM ALLOY ELECTRODES FOLLOWED BY ELECTRO-COAGULATION STEP.
Soviet Patent SU-562-515. Issued August 9, 1977. Derwent Soviet Inventions Illustrated Vol. A, No. 21, p 2, July, 1978.

Descriptors: *Electrolysis, *Flotation, *Coagulation, *Titanium, *Patents, Electrodes, Food processing industry, Oily water, Steel, Foaming, Waste water treatment, Industrial wastes.

A patent has been issued for an electro-flotation and electro-coagulation process to remove oils, insoluble materials, soluble organics, and minerals from food processing wastes. The waste water is electro-flotated for 15 min between titanium alloy electrodes; the electrodes are 10 mm apart and operated at current densities of 10 milliamperes/sq cm. Surface foam is periodically skimmed during flotation. The waste water is then electro-coagulated for 10 min with No. 3 steel electrodes, spaced 40 mm apart; the anode current density is 25 milliamperes/sq cm. The surface foam-bearing electrolysis particles are then skimmed and discarded. Following electro-coagulation, the waste water is retreated by electro-flotation. When the process was applied to fish processing effluent, insoluble materials were reduced from 20 to 0.3 g/liter, oxidizable biochromate from 20 to 0.06 g/liter, and total fats from 12.0 to 0.02 g/liter; transparency was improved from 3.5 cm to 47 cm. (Lisk-FIRL)
W78-10820

LOW PH WASTE WATER FERROUS ION OXIDATION - USING IRON OXIDIZING BACTERIA ON ANTIACID POROUS GRANULES WITH AIR AGITATION, SETTLING, RECYCLING.
French Patent FR 2362-793. Issued April 28, 1978. Derwent French Patents Abstracts, Vol. A, No. 21, p 4, July, 1978.

Descriptors: *Oxidation, *Iron, *Mine water, *Mine wastes, *Patents, Acid mine water, Iron bacteria, Iron oxides, Chemical precipitation, Settling basins, Granules, Separation techniques, Waste water treatment, Industrial wastes.

A patent has been issued for a ferrous iron oxidation process which employs iron-utilizing bacteria suitable for treating acid mine effluents. An oxidation zone contains the acid resistant iron-utilizing bacteria supported on antacid porous granules. The ferrous iron in the waste water is oxidized within the aerobic zone and the resulting iron-bearing gas is utilized as an energy source. The waste water is transferred from the oxidation zone to a settling zone where the oxidized iron is precipitated from the solution. The granules supporting the bacteria are separated from the waste water and recycled to the oxidation zone. (Lisk-FIRL)
W78-10821

LIQUID WASTE TREATMENT APPARATUS.
United States Patent 4,082,662. Issued April 4, 1978. Official Gazette of the United States Patent Office, Vol. 969, No. 1, p 269, April, 1978.

Descriptors: *Organic wastes, *Aeration, *Patents, *Design criteria, *Equipment, Aerated lagoons, Shear, Shear strength, Shear stress, Pressure head, Waste water treatment, Municipal wastes.

A patent has been issued for a waste water pretreatment process employing aeration. The waste water is pumped horizontally through a nozzle with a reduced diameter into an aeration tank which has an equilateral, elongated cross section. The organic solids in the waste water are broken up by the shearing action of the influent as entrained as gas is released. Air is aspirated into the aeration chamber through the area around the influent nozzle and mixed with the liquid waste by the turbulent action in the aeration chamber. Further mixing of the air and waste water to release the entrained air and breakdown the organic solids is accomplished by passing the wastes into a mixing chamber with a large cross section maintained by ambient pressure. (Lisk-FIRL)
W78-10822

CENTRIFUGE FOR DRAINING OFF SEWAGE SLUDGE,
J. Steen.

United States Patent, 4,085,887. Issued April 25, 1978. Official Gazette of the United States Patent Office, Vol. 969, No. 4, p 1344, April, 1978. 1 fig.

Descriptors: *Centrifugation, *Sewage sludge, *Separation techniques, *Patents, *Dewatering, Centrifugal pumps, Design data, Equipment, Sludge treatment, Intakes, Outlets, Waste water treatment, Municipal wastes.

A centrifuge has been patented for removing sewage sludge and suspended solids from waste water. The centrifuge incorporates an inner rotary drum with a scraper mechanism; an outer rotary drum and scraper coaxially surround the inner drum. Sewage sludge is introduced through an inlet into the inner drum for preliminary separation. The outer drum for final separation has separate outlets for sewage sludge and liquid effluent at opposing ends. A passage in the inner drum, opposite from the waste water inlet, moves the waste water through the initial separating stage into the outer drum for final separation of the liquid fraction. (Lisk-FIRL)
W78-10823

BIOLOGICAL TREATMENT WASTEWATER, (OSVAIVAEM BIOLOGICHESKUYU OCHISTKU STOCHNYKH VOD),
Ziminskii Kanifol'no-Ekstraktsionnyi Zavod (USSR).
L. V. Urban.
Gidroliznaya i Lesokhimicheskaya Promyshlennost', No. 8, p 8, 1977. 1 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Wood extraction, Rosin, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Trickling filters, Biochemical oxygen demand, Effluents, Flow rates, Temperature, Hydrogen ion concentration, Chemical oxygen demand, Suspended solids, Chlorination, Foreign countries, Soviet Union(USSR), Chemical industry, Wood wastes, Filtration.

Until recently, the effluents of the Zimin rosin extraction plant (USSR) were treated only mechanically in sand traps and sedimentation tanks. The degree of purification was about 60-70%. In 1975 gravel trickling filters were installed. The surface of the trickling filters is 339 sq m, the 20-day BOD load 2.1 kg/sq m. The optimum conditions for the operation of the filters are an effluent flow rate of 1200-1500 cu m/day, a temperature of 20-30C, a BOD at the inlet of 250-300 mg oxygen/liter, and a pH of 6.5-8. The present reduction of BOD is 92%, 88% for COD, and 71% for suspended solids. The purified effluent is chlorinated prior to being discharged. (Stapinski-IPC)
W78-10911

LABORATORY STUDY OF CHEMICAL COAGULATION AS A MEANS OF TREATMENT FOR DREDGED MATERIAL,
University of Southern California, Los Angeles. Environmental Engineering Program.
Chun-Ching Wang, and K. Y. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A050 596, Price codes: A10 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technica Report D-77-39, Dec. 1977. 209 p, 58 fig, 32 tab, 90 ref, 2 append.

Descriptors: *Coagulation, *Sediments, *Suspended solids, *Waste water treatment, *Effluents, *Polymers, Laboratory tests, Waste disposal, *Dredged material, *Trace metals.

Extensive laboratory experiments were carried out to screen commercially available polymers and conventional coagulants, such as alum and ferric sulfate, for the removal of suspended particles. It has been found that these conventional coagulants are suitable for this use due to the large dosages (in the range of 30 to 40 ppm) and pH control that are required to achieve acceptable effluent quality. There is also the problem of carry-over of trace metals from these conventional coagulants. Furthermore, polymers affect pH to a minor extent, thereby eliminating the need for pH adjustment of the treated effluent. Among fifty types of polymers evaluated in this study, some high molecular weight cationic polymers (such as Betz 1160 and Hercofloc 815.3 and 849) and anionic polymers (such as Calgon WT-3000 and Betz 1120) were found to be very effective for the treatment of the resuspensions tested in the laboratory. Rapid removal of contaminants was observed immediately after flocculation. (WES)
W78-10957

PROCESS FOR SEWAGE TREATMENT WITH COUNTERCURRENT HEAT TRANSFER MEANS,
S. Beaumont.
United States Patent 4,094,773. Issued June 13, 1978. Official Gazette of the United States Patent Office, Vol. 971, No. 2, p 688-689, June, 1978. 1 fig.

Descriptors: *Heat treatment, *Sludge treatment, *Sewage treatment, *Thermophilic bacteria, *Patents, Water purification, Design criteria, Heat transfer, Heat exchangers, Waste water treatment, Municipal wastes.

A sewage digester which contains psychrophilic, mesophilic, and thermophilic zones and a sterilization stage with heat exchange has been patented. Sewage is introduced into a deep, narrow psychrophilic compartment and heated at 20-45C. This is accomplished by mesophilic sludge flowing transversely into the compartment from an adjoining mesophilic zone. The upward conversion currents formed by the mesophilic layer of sludge form stratified layer of psychrophilic sludge and supernatant. The supernatant is then introduced into the deep, narrow mesophilic zone where it is further digested at 35-55C by a thermophilic bacterial slime introduced from the adjacent thermophilic zone. The mesophilic supernatant flows into the thermophilic entrapment compartment where it is passed through a 50-100 micron filter. The filtered suspended solids are hydrolized at 45-70C and digested by the bacerial slime. The treated effluent is heated as it flows to a sterilization compartment containing a heat transfer surface and heating elements. The effluent is heated to above 75C and transferred to a storage compartment lying beneath the other compartments. Heat from the treated effluent is transferred sequentially to the sterilization, thermophilic, mesophilic, and psychrophilic compartments. (Lisk-FIRL)
W78-10965

METHOD AND APPARATUS FOR OXYGENATING AEROBICALLY DECOMPOSIBLE LIQUORS,
E. J. Smith.
United States Patent 4,094,774. Issued June 13, 1978. Official Gazette of the United States Patent Office, Vol. 971, No. 2, p 689, June, 1978. 1 fig.

Descriptors: *Aeration, *Oxygenation, *Heat exchangers, *Condensers, *Patents, Aerated lagoons, Conduits, Cooling, Design data, Equipment, Waste water treatment, Municipal wastes.

A patent has been issued for an oxygenation system to treat aerobically degradable waste water and sewage effluent. An oxygenation tank, separated into a gas head section and a receiving section, is equipped with an inlet to maintain a constant volume of raw effluent or mixed liquor in the tank. The gas head section is connected to a supply of cooled, high purity oxygen by a conduit containing heating elements. The waste water or liquor is transferred under pressure to the gas head section where it is oxygenated. The oxygen-bearing effluent then passes to the receiving tank located below the gas head section. The liquor is than passed through a channel located near the oxygen supply conduit and over heat exchanges. Dissolved oxygen is removed from the liquor and transferred back to the gas head section in a gaseous state. The cooled effluent is then returned to the gas head section for rearation. (Lisk-FIRL)
W78-10971

APPARATUS FOR USE IN WATER PURIFICATION PARTICULARLY SEWAGE TREATMENTS,
Filters International, Inc., Chicago, Il. (Assignee).
E. B. White, and M. N. Sharma.
United States Patent 4,100,070. Issued July 11, 1978. Official Gazette of the United States Patent Office, Vol. 972, No. 2, p 717, July 1978. 1 fig.

Descriptors: *Tertiary treatment, *Sewage treatment, *Filtration, *Activated carbon, *Patent, Adsorption, Aeration, Settling basins, Oxygen, Particle size, Valves, Design data, Equipment, Storage tanks, Waste water treatment, Municipal wastes.

A unit incorporating primary, secondary, and tertiary filtration/adsorption treatment of municipal sewage has been patented. The unit contains a primary aeration tank with a secondary settling zone. Secondary effluent is contained in a receiving tank connected by a conduit to an inlet at the base of the tertiary treatment unit. Tertiary treatment is accomplished by upflow filtration through a mixed bed of particles decreasing in size toward the upper layers. Filtration is followed by adsorption on an activated carbon bed located above the mixed bed filter. An oxygen-bearing gas, introduced under pressure at the base of the tertiary unit, aerates the effluent as it is forced upwards through the filtration/adsorption beds. An outlet at the top of the tertiary unit conveys excess renovated effluent to a storage tank and returns the remainder to the receiving tank. Valves, mounted in the conduits leading to and from the receiving and storage tanks, control the flow of effluent to the tertiary system. Effluents from the receiving and storage tanks are redirected through the tertiary system to regenerate the mixed bed and the activated carbon. (Lisk-FIRL).
W78-10973

METHOD AND APPARATUS FOR THE BIOLOGICAL CLEANSING OF WASTE WATER,
Maschinenfabrik Hellmut Geiger, Karlsruhe (West Germany). (Assignee).
L. Hartmann.
United States Patent 4,100,063. Issued July 11, 1978. Official Gazette of the United States Patent Office, Vol. 972, No. 2, p 715, July, 1978. 1 fig.

Descriptors: *Trickling filters, *Biological treatment, *Microbial degradation, *Patents, *Design data, Outlets, Spraying, Equipment, Waste water treatment, Municipal wastes.

A patented trickling filter unit maintains a preset level of municipal waste water sprayed into the apparatus for biological treatment. Waste water is sprayed through the top of the trickling filer housing over a biologial mass suspended on vertical supports; the biomass is located above the preset waste water level to prevent immersion. Outlets located between the vertical supports continuously remove a portion of the biomass as sludge. Below the sludge outlet is mounted a second discharge duct to remove the treated waste water. The water level in the unit is maintained between these two outlets. The treated effluent is continuously discharged from the system through the second discharge duct. (Lisk-FIRL)
W78-10978

ACTIVATED CARBON TREATMENT OF OXYGENATED WASTEWATER,
Union Carbide Corp., New York. (Assignee)

R. A. Conway, C. T. Lawson, and M. J. Stankewich, Jr.
United States Patent 4,080,287. Issued March 21, 1978. Official Gazette of the United States Patent Office, Vol 968, No 3, p 1092, March, 1978. 1 fig.

Descriptors: *Activated carbon, *Activated sludge, *Oxygenation, *Patents, Absorption, Biological treatment, Oxidation, Design data, Oxygen, Organic wastes, Biodegradation, Waste water treatment, Municipal wastes.

A patent has been issued for a waste water oxygenation process utilizing activated sludge and carbon. Effluent bearing biodegradable organics is introduced into an enclosed oxygenation zone and mixed with activated sludge and a feed gas containing 50% oxygen. Carbonaceous materials are biochemically oxidized, reducing the BOD of the oxygenated supernatant. Vent gas, containing 20-70% oxygen, is withdrawn from the tank; the oxygenated liquor is separated from the activated sludge and residual contaminants. A portion of the activated sludge is returned to the oxygenation zone; the effluent is passed upward through an activated carbon absorption zone where the depleted vent gas is added to provide a dissolved oxygen level of 2 ppm to maintain aerobic biological conditions within the activated carbon column. Residual organic contaminants in the effluent are absorbed or biologically oxidized within the activated carbon absorption zone. (Lisk-FIRL)
W78-10981

CENTRIFUGAL SEWAGE PUMP,
Kabushiki Kaisha Sogo Pump Seisakusho, (Osaka) Japan. (Assignee)
For primary bibliographic entry see Field 8C.
W78-10989

METHOD OF TRANSFORMING SLUDGE INTO ECOLOGICALLY ACCEPTABLE SOLID MATERIAL,
F. Manchak.
United States Patent 4,079,003. Issued March 14, 1978. Official Gazette of the United States Patent Office, Vol 968, No 2, p 654, March, 1978.

Descriptors: *Sludge treatment, *Patents, *Sewage bacteria, *Viruses, *Disinfection, Alkalinity, Chemical reactions, Thermal properties, Heat, Solubility, Waste water treatment, Design data, Municipal wastes.

A patent has been issued for a process to convert liquid sludge which contains bacteria, viruses, and toxic soluble compounds into a solid, friable, odorless material. The sludge is introduced into one end of an elongated tank at a specific rate; calcium oxide is introduced at another rate. The sludge reacts with the calcium oxide in an exothermic manner as the materials move toward one end of the tank. The exothermic reaction generates steam and forms a solid, friable, odorless sludge cake with a pH of 12. The alkaline conditions and the heat produced by the reaction inactivate the bacterial and viral organisms and transform the water soluble compounds into insoluble form. The steam is removed from the tank and the solids reaction product is withdrawn from the end of the tank. (Lisk-FIRL)
W78-10991

COMPOSITION AND METHOD FOR DISPERSING FLOCCULANT POLYMERS,
Chemed Corp., Cincinnati, OH. (Assignee)
B. C. Chambers.
United States Patent 4,089,831. Issued May 16, 1978. Official Gazette of the United States Patent Office, Vol 970, No 3, p 1039, May, 1978.

Descriptors: *Polymers, *Flocculation, *Dispersion, *Patents, *Separation techniques, Aqueous solutions, Coagulation, Design data, Solubility, Waste water treatment, Municipal wastes.

A process for dispersing high molecular weight flocculant polymers or copolymers to prevent agglomeration in waste water has been patented. The flocculant polymers or copolymers are mixed with a free flowing powdered inert material and water. The inert substance is added as 10-80% of the weight of the flocculant polymer; water is added to 0.10-20% of the weight. When the polymer solution, containing the inert powder, is introduced into water, the solubility of the flocculant is decreased. As the solution rate slows, the solids disperse and separate. Dispersion of the solids particles in the flocculant polymers prevents the agglomeration of the polymers or copolymers. (Lisk-FIRL)
W78-10992

METHOD FOR TREATING SEWAGE,
J. L. Ramer.
United States Patent 4,089,761. Issued May 16, 1978. Official Gazette of the United States Patent Office, Vol 970, No 3, p 1022, May, 1978. 1 fig.

Descriptors: *Biological treatment, *Electrolysis, *Aerobic bacteria, *Patents, *Oxygen, Hydrogen, Digestion, Sewage bacteria, Nutrient removal, Design data, Equipment, Ventilation, Waste water treatment, Municipal wastes.

A patent has been issued for a biological waste water treatment process in which oxygen and hydrogen are generated by electrolysis. Influent raw sewage is comminuted to an aqueous slurry and introduced into a digester containing aerobic bacteria. Oxygen for degradation of the sewage slurry by the aerobic bacteria is generated by electrolysis which simultaneously generates hydrogen. The digester is enclosed to prevent the escape of oxygen; hydrogen is maintained separate from the oxygen in the digester. The bacteria are sustained in the presence of oxygen while the hydrogen is vented from the waste water treatment unit. (Lisk-FIRL)
W78-10994

PROCESS FOR DEWATERING ORGANIC WASTE PRODUCT,
Orgonics, Inc., Slatersville, RI. (Assignee).
J. M. O' Donnell.
United States Patent 4,081,366. Issued March 28, 1978. Official Gazette of the United States Patent Office, Vol. 968, No. 4, p 1456, March, 1978.

Descriptors: *Sludge treatment, *Dewatering, *Ureas, *Patents, *Solubility, Organic compounds, Activated sludge, Organic wastes, Solid wastes design criteria, Waste water treatment, Municipal wastes, Filtration, Sewage sludge.

A dewatering process for treating sewage sludge in the presence of urea-formalydehyde has been patented. A urea-formaldehyde solution is reacted under alkaline pH to form water soluble, monomeric mono- and dimethylol ureas and excess urea. Waste activated sludge in an aqueous solution is reacted with the excess urea and water soluble, monomeric, methylol ureas at pH 7.0-9.0. An inorganic acid or acid salt is added to the mixture to lower the pH to 3.0-5.0 to condense the methylol ureas. The resulting water insoluble polyurea condensate has a molecular weight of < 800. The methylene bridged reaction product contains solid organic wastes and has linear, low molecular weitht properties. An alkali is added to the solution neutralization and the solid fraction is filtered from the solution. (Lisk-FIRL).
W78-10995

ADSORBENT FOR THE TREATMENT OF WASTE WATER,
Japan Exlan Co. Ltd., Osaka. (Assignee).
S. Takegami, T. Korenaga, and C. Yoshinaga.
United States Patent 4,081,403. Issued March 28, 1978. Official Gazette of the United States Patent Office, Vol. 968, No. 4, p 1468, March, 1978.

Descriptors: *Adsorption, *Activated sludge, *Patents, *Resins, *Granules, Formulation, Design data, Heating, Organic compounds, Waste water treatment, Municipal wastes.

A granular adsorption medium containing activated sludge and a condensate of a formaldehyde resin or dialdehyde compound has been patented. The absorbent is prepared with 100 dry weight parts activated sludge-treated organic wastes which are mixed with 5 weight parts of a water soluble condensate of either or both formaldehyde resin and dialdehyde compound. The dialdehyde compound is chosen from group containing glyoxal, malonidiadehyde, succindialdehyde, and phthaldialdehyde. The 100:5 ratio mixture is cured by heating at 60-200C and granulated. The medium is to be used for waste water treatment. (Lisk-FIRL)
W78-11019

ACTIVATED SLUDGE SYSTEM WITH STAGGERED PARTITION BASIN,
Air Products and Chemicals, Inc., Allentown, PA. (Assignee).
C. S. Block, M. S. Chen, O. J. Noichl, and S. Hong.
United States Patent 4,081,368. Issued March 28, 1978. Official Gazette of the United States Patent Office, Vol. 968, No. 4, p 1456-1457, March, 1978.

Descriptors: *Activated sludge, *Aeration, *Patents, *Flow system, *Oxygen demand, Aerated lagoons, Intakes, Outlets, Design data, Equipment, Waste water treatment, Municipal wastes.

An activated sludge tank with staggered partitions for moving mixed liquor through the aeration cycle in a serpentine manner has been patented. The staggered partitions project toward the center of the tanks' width and extend the entire depth of the waste water. Mixed liquor is introduced into the tank through an inlet and is aerated as it passes in a cross-sectional flowpath. The open flowpath is mantained adjacent to the liquid passes in a range of 30-80% of the tank's wetted cross section. Complete mixing of the liquid passes is prevented to maintain an unequal oxygen demand through the effluent. Backflow in maintained between and within the liquid passes; the mixing factor of each aerator is within the range of 20-450. (Lisk-FIRL)
W78-11050

METHODS FOR USE IN WATER PURIFICATION PARTICULARLY SEWAGE TREATMENTS,
Filters International Inc., Chicago, IL. (Assignee).
E. B. White, and M. N. Sharma.
United States Patent 4,081,365. Issued March 28, 1978. Official Gazette of the United States Patent Office, Vol. 968, No. 4, p 1455, March, 1978. 1 fig.

Descriptors: *Flocculation, *Oxidation, *Biological treatment, *Chemical precipitation, *Patents, Zeta potential, Aeration, Filtration, Adsorption, Separation techniques, Organic wastes, Suspended solids, Sewage, Waste water treatment, Municipal wastes.

A continuous, automatic waste water treatment process providing cyclical biochemical oxidation and flocculation-agglomeration of organic solids has been patented. Effluent containing more than 25 mg/liter BOD and suspended solids is introduced into an aeration chamber where the wastes are biochemically oxidized during periods of maximum sewage accumulation. During cycles of minimum sewage accumulation, following maximum accumulation periods, a preaerated flocculant is introduced into the chamber before the termination of biochemical oxidation to produce an instantaneous floc-agglomeration reaction in the sewage. The pH is maintained at a level suitable to the floc-agglomeration process; the zeta potential is stablized at -5 to +5 ZP. Effluent is removed

from the chamber during minimum accumulation periods and retreated with preaerated flocculant for further agglomeration of suspended solids which are then filtered from the effluent. Dissolved organic solids are removed from the filtered effluent by adsorption. (Lisk-FIRL)
W78-11056

ANALYSIS OF THE CONTROL AND PERFORMANCE OF ALGAL-WASTEWATER STABILIZATION PONDS,
Purdue Univ., Lafayette, IN. School of Mechanical Engineering.
F. P. Incropera.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 709, Price codes: A05 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 104. September 1978. 77 p, 36 fig, 59 ref. OWRT-A-42-IND(4).

Descriptors: *Oxidation lagoons, *Chorella, *Photosynthesis, *Heat exchangers, *Solar radiation, *Waste water treatment, Stabilization ponds, Sewage treatment, Heated water, Thermal power plants, Water cooling, Algae, Central U.S.

There has been considerable interest in recent years in controlling the thermal condition of shallow water bodies used to effect beneficial biological conversion processes. Waste heat from a power production process may be used as the energy source for this control, and specific applications include wastewater treatment and algal production. In this study mathematical models were developed to assess means of maintaining thermal control and assessing the impact on wastewater treatment and algal production. The thermal response and control of a shallow pond which uses waste heat in a closed cycle cooling system was considered. Calculations suggested a heat exchanger design involving a network of 30m long, 25mm OD pipes on 0.15m centers. The design provides a reasonable compromise between initial cost and performance and enables maintaining near-optimum pond temperatures throughout the year for climatic conditions typical of the midwest. Calculations based on a model of a completely mixed activated sludge wastewater treatment system revealed the benefits to be derived from operation at elevated temperatures. Effluent quality is improved for any increase in temperature from 10 to 30 deg. C. Calculations based on a model of algal growth at optimum temperatures predicted daily yields which are in agreement with maximum yields which have either been measured or inferred from field studies.
W78-11065

DISPOSAL AND UTILIZATION OF HYDRAULICALLY DREDGED LAKE SEDIMENTS IN LIMITED CONTAINMENT AREAS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W78-11067

BIOFILTER,
Enso-Gutzeit Osakeyhtio, Helsinki (Finland). (Assignee).
E. Tapola, M. Sten, and O. Koistinen.
United States Patent 4,086,167. Issued April 25, 1978. Official Gazette of the United States Patent Office, Vol 969, No 4, p 1433, April, 1978. 1 fig.

Descriptors: *Biological treatment, *Filtration, *Porous media, *Nutrient removal, *Patents, Bark, Wood wastes, Gravels, Drainage, Application equipment, Spraying, Microorganisms, Plastics, Linings, Aeration, Waste water treatment, Biodegradation, Design data, Municipal wastes.

A biological filter design incorporating beds of porous media lain in a cupshaped pit in the ground and a waste water spray distribution apparatus has been patented. The plastic fabric-lined pit is filled with a bottom layer of gas- and liquid-permeable gravel, followed by a bed on coniferous tree barking wastes extending above the top perimeter of the pit in a mound. The bark layer contains microorganisms and articles such as plastic, pine cones, tree limb sections, and tubular paper roll cores for maintaining the permeability of the filter bed and preventing compaction. The heap is covered with a roof equipped with a vertically mounted, rotating spray pipe for distribution of the waste water in a horizontal plane over the heap. The spray pipe contains a number of nozzles, each equipped with a deflector plate, and a feed tube supplying the waste water. Mounted within the gravel layer at the bottom of the pit is a radially extending pipe system which blows oxygen-bearing gas upward through the bark layer for aeration of the down flowing waste water. Below the aeration system, underdrains are embedded in the gravel for the collection and discharge of treated effluent. The roof is equipped with valves for exhausting the gas from the system. (Lisk-FIRL)
W78-11074

WATER TREATMENT: CONTAMINANTS.
Ground Water Age, Vol. 12, No. 12, p 45-47, August, 1978. 1 fig.

Descriptors: *Water pollution treatment, *Waste water treatment, *Water pollution effects, *Water pollution sources, *Microorganisms, *Chemicals, Filtration, Demineralization, Distillation, Chlorination, Coliforms, Well construction.

Various mineral and biological contaminants, their effects, sources, and treatment are described. Fluoride, nitrates, chlorides, sulfates, and carbon dioxide create problems such as mottled teeth, oxygen starvation in babies, bad taste, laxative effects, and corrosion. They can be removed by various filters and chemical treatment but the best solution is prevention in the form of proper well construction. The most serious potential water problem is biological contamination. The presence of certain pathogens such as bacteria, viruses, and cysts can cause serious or even fatal diseases. This type of contamination is due to location of wells near sources of pathogens, poor well construction, and construction of shallow wells. The best test for biological contaminants is the presence of coliform bacteria since it is found in animal or human feces and is easy to detect. This test should be performed at least once a year. A well should be chlorinated after it is drilled, and whenever there is a threat of contamination it should be chlorinated continually by means of a chemical feed pump. (Purdin-NWWA)
W78-11079

SLUDGE THICKENING APPARATUS,
Envirotech Corp., Menlo Park, CA. (Assignee).
E. M. Kelly.
United States Patent 4,082,671. Issued April 4, 1978, Official Gazette of the United States Patent Office, Vol 969, No 1, p 272, April, 1978. 1 fig.

Descriptors: *Sludge treatment, *Dewatering, *Patents, *Sewage sludge, *Design data, Equipment, Intakes, Outlets, Sludge disposal, Separation techniques, Waste water treatment, Municipal wastes.

A patent has been issued for an apparatus which thickens primary and secondary sewage sludge. An open top tank is equipped with a vertical, tubular upper inlet for the introduction of aerated secondary sludge into the thickener. Below the inlet, a second feedwell passes primary sludge into the tank below the secondary sludge. The upper inlet has a closed bottom and an open top, while the reverse is true for the lower, adjacent inlet. Mounted within the tank and extending radially from the upper feedwell is a circular partition which divides the tank into concentric portions. A liquid extraction apparatus mounted on the tank wall withdraws liquid from the outer ring of the tank to maintain a constant fluid level. Within the center ring area, floating solids on the surface of the confined liquid sludge are removed. A valve at the bottom of the tank collects and removes solids which settle from the liquid. (Lisk-FIRL)
W78-11083

TANK FOR AGITATION AND AERATION OF SEWAGES,
Biuro Projecktowo-Konstrulcyjne Centralnego Zwiazku Spoldzielni Mleczarskich, Warsaw (Poland). (Assignee).
R. Przybylowicz, and C. Zabierzewski.
United States Patent 4,080,292. Issued March 21, 1978. Official Gazette of the United States Patent Office, Vol 968, No 3, p 1094, March, 1978. 1 fig.

Descriptors: *Aerated lagoons, *Activated sludge, *Patents, *Turbidity, *Aeration, Equipment, Design data, Suspended solids, Waste water treatment, Sewage treatment, Municipal wastes.

A waste water aeration basin that provides both horizontal and vertical agitation has been patented. The basin consists of a rectangular tank equipped with turbine aerators which rotate around a vertical axis. The aerators are spaced around the interior of the tank, separated by vertical partitions. The partitions divide the aeration tank into two sections which are connected by adjacent ditches. The method of aeration uses a brush which rotates around a horizontal axis transversing the two ditches. Vertical and horizontal turbulence is generated by the aerators and brush in the waste water. The activated sludge in the treatment tank is thus maintained in suspension throughout the tank during aeration, ensuring even distribution of the microorganisms. (Lisk-FIRL)
W78-11093

METHOD FOR REMOVING PHOSPHATES FROM AQUEOUS SOLUTIONS,
Chemische Fabrik, Uetikon (Switzerland). (Assignee).
K. Klantschi, and A. Aregger.
United States Patent 4,080,290. Issued March 21, 1978. Official Gazette of the United States Patent Office, Vol 968, No 3, p 1093, March, 1978.

Descriptors: *Phosphorus, *Phosphates, *Patents, *Nutrient removal, *Absorption, Salts, Metals, Cations, Organic compounds, Organic acids, Waste water treatment, Municipal wastes.

A technique to selectively remove phosphorus from aqueous solutions and waste water has been patented. The phosphorus-bearing solution is initially contacted with a water insoluble complex of multivalent metal cations. The metal cations are complexed with organic ligands coordinated by treating the ligands with a salt solution of the multivalent metal cations. The organic ligand coordinated complex is then washed with water until the wash water no longer contains traces of the salt solution and has been neutralized. Phosphorus in the waste water or aqueous solution is absorbed onto the coordination complex of multivalent metal cations. (Lisk-FIRL)
W78-11094

APPARATUS FOR TREATING WASTE WATER OR SOLUTION,
Hitachi Ltd., Tokyo (Japan). (Assignee).
K. Kabara, T. Ogawa, S. Takahashi, S. Nishimura, and S. Kikawa.
United States Patent 4,080,289. Issued March 21, 1978. Official Gazette of the United States Patent Office, Vol. 968, No. 3, p 1093, March, 1978. 1 fig.

Descriptors: *Membrane processes, *Calcium, *Fluorides, *Patents, *Aluminum, Solubility, Design criteria, Equipment, Separation

techniques, Waste water treatment, Municipal wastes.

A membrane separation apparatus for removing calcium and fluoride from a waste water stream has been patented. The waste water bearing the fluoride and calcium is initially pretreated before introduction into the membrane separation apparatus. An additive containing aluminum ions is mixed with the waste water. The aluminum ions cause the formation of water soluble fluoride complexes. The pretreated waste water bearing the soluble fluoride complexes is introduced into the membrane separation apparatus where the waste is separated into two fractions. The membrane separates the pretreated waste water into a permeated liquid fraction and a concentrated liquid fraction. Means are provided in the apparatus for introducing of the waste water and the aluminum ion additive. (Lisk-FIRL)
W78-11124

WASTEWATER DISINFECTION IN CANADA, A BACKGROUND PAPER.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Economic and Technical Review Report No. EPS 3-WP-78-4, May 1978, 91 p, 172 ref, 7 tab, 3 append.

Descriptors: *Waste water(Pollution), *Waste water treatment, *Disinfection, *Chlorination, *Byproducts, Effects, Aquatic life, Water users, Environmental effects, Pathogenic bacteria, Costs, *Canada, *National policy(Canada).

In September 1976, at the request of the Deputy Minister, Department of the Environment, an interdepartmental working group was formed to review available data on disinfection practices in Canada and to establish a technical basis upon which a national policy on wastewater disinfection could be developed. One year later, in October 1977, the interdepartmental committee completed its technical review and drafted this document summarizing its findings. The report summarizes existing wastewater disinfection requirements throughout Canada, and in the United States and Europe. The effectiveness of chlorination in combatting the spread of waterborne disease is assessed, and the possible effects of residual chlorine and chlorination byproducts on man and aquatic species are discussed. Disinfection alternatives are reviewed with respect to their effectiveness in reducing pathogens, availability, relative costs, environmental impact and other practical considerations. Emphasis has been placed on the need to recognize the dual requirements for protection of both public health and the environment in formulating policies and criteria for wastewater disinfection. (WATDOC)
W78-11198

CULTURED DAPHNIDS AS A BIOLOGICAL WASTEWATER TREATMENT SYSTEM FOR OXIDATION POND EFFLUENT CLARIFICATION,
New York Cooperative Fishery Unit, Ithaca.
D. G. Heimbuch, S. Perretta, and J. G. Nickum.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 933, Price codes: A04 in paper copy, A01 in microfiche. Center for Environmental Research, Cornell University, Ithaca, N.Y., July 1978. 64 p, 20 fig, 17 tab, 49 ref, 1 append. OWRT A-065-NY(1), 14-34-0001-6033, 7067, 7068.

Descriptors: *Daphnids, Oxidation ponds, *Biological treatment, Algae removal, Water pollution, *Culture systems, *Waste water treatment.

The technical feasibility of culturing Daphnia magna in flowing water and their function as biological filters for removing algae from the effluent of simulated oxidation ponds was demonstrated. Greatest daily increases in daphnid population biomass in 5.5 liter culture vessels were observed in populations receiving flows of low algal concentration (3 mg/l) and high flow rate (240 ml/min). The maximum four day average increase for three replicate populations of that treatment was 136 mg (dry weight)/liter/day. Water leaving the culturing vessels of the 3 mg/l X 240 ml/min treatment had significantly lower concentrations of total nitrogen, total phosphorus, and volatile suspended solids than water entering the vessels; however, control vessels with no daphnid populations achieved similar reductions in total nitrogen and total phosphorus. Concentrations of volatile suspended solids were reduced significantly reduced significantly in vessels containing daphnids in comparison to control vessels. Concentrations of ammonia nitrogen and orthophosphate increased significantly in passing through culture vessels containing daphnid populations.
W78-11214

THE EFFECTS OF THE USE AND REGULATION OF SEPTIC TANK SYSTEMS UPON LAND USE IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional Planning.
For primary bibliographic entry see Field 5G.
W78-11216

AN EVALUATION OF THE APPLICATION OF A DUAL-FUNCTIONAL FILTER TO DEWATERING NEUTRALIZED ACID-MINE-WATER SLUDGE,
West Virginia Univ., Morgantown. Water Research Inst.
J. D. Henry, and C. H. A. Kuo.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-285 990, price codes: A04 in paper copy, A01 in microfiche. Information Report 10, (WRI-WVU-78-01), 1978. 55 p 15 fig, 5 tab, 22 ref, 1 append.

Descriptors: *Acid mine water, *Cost analysis, *Design criteria, *Filtering systems, *Filtration, *Mine water, *Sludge treatment, *Dewatering, Evaluation, *Filters, Mathematical model, Sludge, Treatment facilities, Waste treatment, Water pollution, Water quality, Waste water treatment, Decantation, Design procedure, *Dual-functional filters.

The dual-functional filter, a solid-liquid separation device employing both the mechanisms of filtration and settling or decantation, includes a filtration and dump cycle where settling occurs. A design equation for the filter was developed which facilitated data interpretation and assessment of the feasibility of the process. Alternatives for integrating the dual-functional filter with acid-mine-water-treatment processes were evaluated. Economic evaluation of the costs of a clarifier-filter sequence was used to determine the optimum. Extent of dewatering prior to filtration. The optimum interstage-slurry concentration between the clarifier and the dual-functional filter for the vase case is 0.6 wt-percent. The total treatment cost is 10.3 cents per 1000 gallons. Economic-sensitivity analyses illustrate the effect of changes in the fractional redispersion of the filter cake, cycle time, and hose life. The economics are labor controlled. The labor cost is approximately 70 percent of the total treatment cost for the vasic case.
W78-11218

SYMBIOTIC MEMBRANE SYSTEMS.
United States Patent 4,080,288. Issued March 21, 1978. Official Gazette of the United States Patent Office, Vol 968, No 3, p 1092-1093, March, 1978. 1 fig.

Descriptors: *Semipermeable membranes, *Membrane processes, *Patents, *Organic wastes, *Biological treatment, Biodegradation, Membranes, Nitrogen, Oxygen, Biomass, Waste water treatment.

A patent has been issued for a symbiotic membrne treatment system to remove liquid organic and inorganic waste from sewage effluent. Biological treatment of the waste water is enhanced by the presence of nitrogen and oxygen. Waste water introduced into the biomass in the reactor is maintained in an ambient atmosphere by the permeation of selected gases through a membrane which is located between the biomass and the gaseous phase in the reactor. The semipermeable membrane, which allows the ambient gases for biological treatment to reach the biomass, maintains contact between the gaseous phase and the biomass for a period of time adequate for biological degradation of the organic and inorganic wastes. The treated biomass is then removed from the reactor. (Lisk-FIRL)
W78-11223

APPARATUS FOR TREATING SEWAGE,
American Water Recycling Co., Apache Junction, AZ. (Assignee).
L. R. Adams.
United States Patent 4,070,292. Issued January 24, 1978. Official Gazette of the United States Patent Office, Vol 966, No 4, p 1494, January, 1978. 1 fig.

Descriptors: *Biological treatment, *Aeration, *Patents, *Design data, *Equipment, Baffles, Aerated lagoons, Settling basins, Disinfection, Waste water treatment, Municipal wastes.

An extended aeration system providing continuous waste water treatment has been patented. A treatment tank with a curved end was has a perforated transverse baffle which divides the tank into a primary chamber and a mixing chamber. The waste water is introduced into the primary chamber and a mixing chamber. The waste water is introduced into the primary chamber where it is aerated and pumped into the mixing chamber through the perforated baffle. The mixing chamber contains an inlet, an outlet, and an ejector mounted in a conduit for decanting liquid from the mixing chamber. The withdrawn liquid is discharged through the outlet towards the curved wall of the tank, establishing circular flow between the mixing tank and the primary tank. During the circular flow, the larger particles are retained within the primary tank where they are organically degraded. The clarified liquid from the mixing tank is removed by a separate pumping apparatus which transports the liquid to a storage tank for chemical disinfection. (Lisk-FIRL)
W78-11234

WASTE WATER TREATMENT WITH OXYGEN,
Chemetron Corp., Chicago, IL. (Assignee).
E. Abrams, and A. J. Masella.
United States Patent 4,069,147. Issued January 17, 1978. Official Gazette of the United States Patent Office, Vol 966, No 3, p 1114, January, 1978.

Descriptors: *Biological treatment, *Biochemical oxygen demand, *Activated sludge, *Patents, *Oxygenation, Microbial degradation, Oxygen demand, Oxygen, Design criteria, Waste water treatment, Municipal wastes.

A biological waste treatment process which effectively reduces the oxygen requirements during microbial degradation has been patented. Waste water with a high BOD concentration is mixed with a biologically active mass which metabolizes BOD. The BOD of the influent is reduced by the activated mass without the need for extensive oxygenation. The BOD-rich biological activated mass and liquid are clarified and separated into the BOD-rich mass and clarified liquid. A portion of the activated mass is discharged and the remainder is transferred to an oxygenation tank where it is contacted with a gas containing 30% oxygen by

volume. The oxygenation of the biological mass reactivates it before transfer back ro the initial waste water mixing tank. (Lisk-FIRL)
W78-11238

THE DEVELOPMENT OF AN INTEGRATED SYSTEM FOR WATER QUALITY MANAGEMENT PLANNING,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5G.
W78-11242

ALGAL CULTURE IN THE LIQUID PHASE OF ANIMAL SLURRY--EFFECT OF LIGHT AND TEMPERATURE UPON GROWTH AND PHOSPHORUS REMOVAL,
Queen's Univ. Belfast (Northern Ireland). Dept. of Agricultural and Food Chemistry.
M. K. Garrett, S. T. C. Weatherup, and M. D. B. Allen.
Environmental Pollution, Vol. 15, No. 2, p 141-154, February 1978. 4 fig, 3 tab, 7 ref.

Descriptors: *Nutrient removal, *Waste water treatment, *Slurries, *Chlorella vulgaris, *Light, *Temperature, Phosphorus, Plant growth, Nutrients, Equations, Regression analysis, Beneficial use, Recycling, Northern Ireland, Chlorophyta, Algae.

Effects of light and temperature on growth of the chlorophyte Chlorella vulgaris and phosphorus removal in the liquid phase of pig slurry were studied as part of a series of experiments on the use of micro-algae for waste treatment of animal slurry. Both light and temperature significantly affected all growth parameters and phosphorus removal except the lag phase of algal growth, which was unaffected by light. The most notable feature of the data was the complexity of effects of light and temperature interactions. Temperature was the major factor influencing both growth and phosphorus removal. Effects of light on phosphorus removal were greatest at low temperature, and temperature effects were greatest at low light. Equations relating growth and phosphorus removal to light and temperature, based on regression techniques, facilitated predictions of performance of the treatment system under local climatic conditions in Northern Ireland. Use of algae for waste treatment in the slurry is attractive because it combines recycling of nutrients, synthesis of single cell protein, and purification of a noxious byproduct. Cultures of C. vulgaris were grown in supernatant of pig slurry diluted 1:1 with distilled water in 1-liter Roux flasks. Cultures were continuously agitated by a current of water-saturated air. Fluorescent light was provided at intensities of 4.28, 15.34, 25.32, and 48.83 klux, and temperatures used were 5.5, 10, 15, and 19.5C. (Lynch-Wisconsin)
W78-11292

5E. Ultimate Disposal Of Wastes

TOTAL AND ORGANIC MERCURY IN BENTHIC ORGANISMS NEAR A MAJOR SUBMARINE WASTEWATER OUTFALL SYSTEM,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-10544

SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE,
Alcorn State Univ., Lorman, MS.
For primary bibliographic entry see Field 5D.
W78-10586

NEW JERSEY PLANT TO TURN SLUDGE INTO COMPOST.
For primary bibliographic entry see Field 5D.
W78-10598

MOTORISED VALVE SYSTEM FOR SLUDGE VESSEL.
Pipes and Pipelines International, vol. 23, No. 3, p 31, June 1978.

Descriptors: *Sludge disposal, *Valves, *Ultimate disposal, *Equipment, *Electrical equipment, Remote control, Control systems, Instrumentation, Ships, Transportation, Waste water disposal, Sewage sludge, Municipal wastes.

Rotork controls Ltd. of Bath, Avon, England, designed the centralized electric valve actuators installed on the sewage sludge disposal ship, MV Garroch Head. Four valve actuators were installed on the 254 mm butterfly valves which control the loading hoppers; 22 were connected to the 500 mm equalizing and discharge valves; and 8 were mounted on the 406 mm ballast flooding valves. The actuators provide centralized and individual push-button control of the sludge loading, discharging, and ballasting operations.The Ship was capable of loading 3,400 tons of sludge in one hour and discharging the cargo in about 8 min with the Rotork valve actuators. the actuators on the ballast flooding valves allowed easy trim adjustment and tuning. (Lisk-FIRL)
W78-10674

DUAL PURPOSE VEHICLE.
Water and Waste Treatment, Vol 21, No 6, p 25, June, 1978.

Descriptors: *Transportation, *Mechanical equipment, *Solid wastes, *Sewage, *Sewage disposal, Rural areas, Design data, Equipment, Storage tanks, Waste water disposal, Municipal wastes, Domestic wastes.

R. Bradley Municipal Vehicles Ltd. of Clay Cross, Derbyshire, England, has begun production of a modified BMV 5000 vehicle to collect both sewage and solid refuse. Designed especially for sewage and refuse collections in rural areas, the BMV dual purpose vehicle is a modified BMV 5000 refuse collection truck equipped with two 200 gal tanks constructed of alloy welded plates. The sewage tanks, bolted beneath the truck's body, have 18 inch diameter screwsealed filler caps; the tanks are drained by gravity through 6 inch diameter convoluted hose. The standard BMV refuse collection vehicle consists of a Dodge G11 chassis with a 10-ft wheelbase containing 13.5 cu yds body space with a 1 cu yd hopper. The hopper has a rammer blade and ripper teeth for refuse collection. The BMV dual purpose vehicle will eliminate the need for two separate weekly trips to rural areas for sewage and refuse collections. (Lisk-FIRL)
W78-10682

PYROLYSIS OF INDUSTRIAL WASTES,
Greeley and Hansen, Chicago, IL.
R. Srinivasaraghavan, T. E. Wilson, and M. J. Stark.
Proceedings of the 32nd Industrial Waste Conference, Purdue University, may 10-12, 1977, p 377-386. 1 fig, 19 ref, 10 tab.

Descriptors: *Sludge treatment, *Solid wastes, *Pyrolysis, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Sludge, Wood wastes, Animal wastes(Wildlife), Plastics, Rubber, Energy, Byproducts, Operation and maintenance, Waste disposal, Sludge disposal.

The pyrolysis process has been used experimentally to process various industrial solid wastes. In general, the solid wastes with high volatile organics and low moisture content are the most satisfactory for this process. Studies cited in the literature show that wood, plastic, rubber, and animal wastes can be pyrolyzed to derive significant quantities of energy. While no information is available on the pyrolysis of petroleum and food industry wastes, these wastes are amenable to this process. Results from large-scale sludge pyrolysis studies are summarized. It was found that a sludge with 24% cake solids with a heat value of 9,000 Btu/lb of dry solids and a volatile content of 75% can be pyrolyzed without a supplementary fuel requirement. The benefits and disadvantages of sludge pyrolysis are outlined, and the sensitivity of pyrolysis by-products to changes in operating parameters and the potential uses of pyrolysis by-products are considered. (Witt-IPC)
W78-10689

FIBER SLUDGE - AN INTERESTING RAW MATERIAL (FIBERSLAM - EN INTRESSANT RAVARA),
Svenska Traeforskningsinstitutet, Stockholm.
I. Fineman, K. Helge, and L. Soderhjelm.
Svensk Papperstidning, Vol 81, No 4, p 110-113, March 10, 1978. 1 illus, 11 ref, 3 tab. English summary.

Descriptors: *Sludge, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Solid wastes, Foreign countries, Europe, Sludge disposal, Costs, Waste disposal, Dewatering, Recycling, Soil amendments, Tiles, Economics, Transportation, Sweden, Fodder supplement, Building boards, Cement tiles, Panel boards, Bricks, Molded fiber articles.

Considerable amounts of fibrous sludge are generated yearly by the pulp and paper industry, amounting to about 180,000 tons oven-dry matter in Sweden, of which about 30% is reused. The disposal costs of the remainder average about $13/ton and the dewatering costs about $5 to $40/oven-dry ton. Recycling of the fibrous sludge in the mill is the most attractive alternative, especially for sludge low in fillers and pitch. Fodder supplement and soil amendments seem to be advantageous outlets for low-ash sludges. The construction industry offers possibilities for use of high-ash sludges. The construction industry offers possibilities for use of high-ash sludges in fiber building boards and cement tiles, and of pitch- and filler-rich sludges in cement tiles. Successful trials with fibrous sludge have produced panel boards, low-density bricks, and molded fiber articles. Economics of sludge reuse must be evaluated separately in each case, as they depend on dewatering and transport costs, and to some extent also on drying costs, as well as on proper cooperation between sludge producer and consumer. (Brown-IPC)
W78-10693

CONTINUOUS SLUDGE DEWATERING WITH THE TUBE FILTER PRESS (KONTINUIERLICHE SCHLAMMENTWAESSERUNG MIT DER SCHLAUCHFILTERPRESSE).
Wochenblatt fuer Papierfabrikation, Vol. 106, No. 2, p 73, January 31, 1978. 1 fig. 1 illus.

Descriptors: *Sludge treatment, *Dewatering, *Dewatering press, Equipment, Sludge, Operation and maintenance, Wastes, Solid wastes, Waste treatment, Water pollution sources.

The Safir tube filter press developed by Bruderhaus Maschinen GmbH, Reutlingen, Germany, presses the sludge between two screen conveyor belts, which overlap to form a tube, preventing sludge being squeezed out at the sides. The design and operation of the press are described and illustrated. (Ward-IPC)
W78-10701

SEWAGE COULD SPREAD HEALTH HAZARD.
New Scientist, Vol 78, No 1106, p 646, June, 1978.

Descriptors: *Application methods, *Sewage bacteria, *Sludge disposal, *Viruses, *Public health, Biological treatment, Sewage sludge, Pathogenic bacteria, Diseases, Soil amendments, Crop

response, Waste water treatment, Waste water disposal, Municipal wastes.

Potential public health hazards are identified for the land application of municipal waste water and sewage sludge containing bacteria, viruses, parasitic protozoa and helminths. The increased use of sewage-derived organic fertilizers and incorporation of land application techniques into EPA construction grant policies may increase the potential for introducing pathogens into the soil. Conventional secondary waste water treatment and chlorination may not destroy all of the pathogenic or infectious agents; techniques for analyzing viruses are selective and may not identify all types present. Viruses have been shown to be resistant to many environmental conditions; poliovirus has survived for up to 36 days on lettuce and radish crops spray irrigated with waste water. Laboratory tests on pathogen viability in waste water after treatment have often overestimated the removal efficiency of the processes. Further biological, chemical, or physical stabilization processes are recommended for primary effluent and aerobically or anaerobically digested effluent. Caution is advised in the consumption of raw vegetables harvested within 2-3 mos of spray irrigation with sewage effluent. (Lisk-FIRL)
W78-10728

HAZARDOUS WASTE DISPOSAL PROGRAM SEVENTH MONTHLY REPORT,
TRW Systems Group, Redondo Beach, CA.
For primary bibliographic entry see Field 5G.
W78-10760

WASTE WATER DISPOSAL AT FEDERAL INSTALLATIONS IN THE UNITED STATES, STATE OF CALIFORNIA.
Federal Water Pollution Control Administration, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 586, Price codes: A06 in paper copy, A01 in microfiche. January, 1968, 116 p.

Descriptors: *Administrative agencies, *Data collections, *Sewage treatment, *Interagency cooperation, *Water pollution control, Pollution abatement, Water pollution, Water quality control, Water treatment, Federal government, Surveys, Investigations, Environmental sanitation, Sanitary engineering, Sewage disposal, Water pollution sources, Documentation, Information exchange, Monitoring, Federal Water Pollution Control Act, Water policy, Administrative decisions, Regulation.

President Johnson's Executive Order 11288 required federal agencies and departments to provide leadership in the nationwide effort to improve water quality. Responsibility for the program was placed with the Federal Water Pollution Control Administration (FWPCA), which established guidelines for the prevention, control, and abatement of water pollution by federal activities. The guidelines provided for the FWPCA to review water pollution control features planned for new federal buildings, and advise the operating agency as to the systems' adequacy. As for existing facilities, the FWPCA was to provide consultation for developing plans to control pollution. Any plans for federal water resource development projects were required to be submitted to the FWPCA for recommendations, and to the Secretary fof the Interior for approval. In order to monitor progress being made in the federal pollution abatement program, the FWPCA conducted a study of wastewater disposal practices at federal installations, of which this survey of 99 federal facilities in California is a part. Information surveyed included type of discharge, present treatment, present status, and proposed action. Of the 99 facilities surveyed, 37 were found to have no known water pollution problems. (Malefatto-Florida)
W78-10767

WATER POLLUTION ABATEMENT PROGRAM: ASSESSMENT OF FEDERAL AND STATE ENFORCEMENT EFFORTS.
Comptroller General of the United States, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 287, Price codes: A04 in paper copy, A01 in microfiche. March 23, 1972. 61 p.

Descriptors: *Federal Water Pollution Control Act, *Water pollution control, *Pollution abatement, *Law enforcement, *Water quality control, Water pollution effect, State jurisdiction, Waste water(Pollution), Permits, Environmental control, Legislation, Waste treatment, Municipal water, Sewage treatment, Water quality, Project planning, Penalties(Legal), Regulation, Governmental interrelations, Industrial water.

The assessment and evaluation of state and federal actions taken to enforce water quality requirements are discussed in this report. Previously, both the states and federal government relied primarily on voluntary compliance with water quality requirements and few enforcement actions were initiated, resulting in limited pollution abatement success. Since 1970, state and federal programs have been improved and enforcement actions vigorously pursued. States showing the greatest success include those that set both final and interim planning and construction deadlines for corrective and remedial measures. Close working relationships between the states' pollution control agencies and attorney general offices, as well as effective systems for monitoring the progress of pollution abatement are also part of the successful states' programs. Drawbacks in current federal legislation, particularly the restriction permitting the Environmental Protection Agency to commence an abatement enforcement action only after the pollution has occurred, and the merits of pending and proposed legislation are also discussed. The proposed legislation would result in more timely and forceful federal enforcement actions. It would also minimize enforcement coordination and duplication problems between states and the federal government, coordinate similar permitting problems, and keep officials informed of the status of national pollution problems. (Easterbrook-Florida)
W78-10814

RESERVE MINING COMPANY V. HERBST (DESIGNATION OF ALTERNATE WASTE DISPOSAL SITE AS 'FEASIBLE AND PRUDENT').
For primary bibliographic entry see Field 6E.
W78-10904

IMPACT OF FLUID MUD DREDGED MATERIAL ON BENTHIC COMMUNITIES OF THE TIDAL JAMES RIVER, VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point. Div. of Biological Oceanography.
For primary bibliographic entry see Field 5C.
W78-10944

MODELING OF ECOLOGICAL SUCCESSION AND PRODUCTION IN ESTUARINE MARSHES,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2L.
W78-10945

THE FLORA OF DREDGED MATERIALS SITES IN NAVIGATION POOL 8 OF THE UPPER MISSISSIPPI RIVER,
Wisconsin Univ.-La Crosse.
S. R. Ziegler, and S. H. Sohmer.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A050 778, Price codes: A06 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-31, November 1977. 97 p, 4 fig, 12 tab, 29 ref, append.

Descriptors: *Mississippi River, Plant populations, Ecology, *Vegetation, Plant growth, *Dredged material, *Waste disposal sites, *Navigation Pool 8(Mississippi River), Flora, Wisconsin, Minnesota.

A survey of vegetation growing on dredged material in Navigation Pool 8 of the Upper Mississippi River was made to determine plant species. Twenty-three dredged material sites in Pool 8 were surveyed and more than 3000 specimens collected of 304 species representing 64 plant families. Correlation of site ages, elevations, and plant community associations was used to determine primary colonizers of the various dredged material habitats. Sporobolus cryptandius (Torr.) Gray, Triplasis purpurea (Walt.) Chapm., Cyperus schweinitzii Torr., and Cycloloma atriplicifolium (Spreng.) Coult. were found to be pioneer herbaceous species of dry exposed dredged material sites. Upland invasion by woody species did not occur readily, but after a lengthy period species such as Vitia riparia Michx., Toxicodendron rydbergii Greene, and Rubus occidentalis L. encroached from surrounding forests. (WES)
W78-10947

TRACE AND TOXIC METAL UPTAKE BY MARSH PLANTS AS AFFECTED BY EH, PH, AND SALINITY.
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5C.
W78-10949

A LABORATORY STUDY OF THE TURBIDITY GENERATION POTENTIAL OF SEDIMENTS TO BE DREDGED,
Abcor, Inc., Wilmington, MA. Walden Research Div.
For primary bibliographic entry see Field 2J.
W78-10951

COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME I: PRODUCTIVITY,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 5C.
W78-10952

COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME II: GROWTH DYNAMICS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 5C.
W78-10953

HABITAT DEVELOPMENT FIELD INVESTIGATIONS, WINDMILL POINT MARSH DEVELOPMENT SITE, JAMES RIVER, VIRGINIA; APPENDIX C: ENVIRONMENTAL IMPACTS OF MARSH DEVELOPMENT WITH DREDGED MATERIAL: ACUTE IMPACTS ON THE MACROBENTHIC COMMUNITY,
Virginia Inst. of Marine Science, Gloucester Point. Div. of Biological Oceanography.
For primary bibliographic entry see Field 5C.
W78-10954

PRIMARY PRODUCTIVITY OF MINOR MARSH PLANTS IN DELAWARE, GEORGIA, AND MAINE,
Georgia Univ., Brunswick. Marine Resources Extension Center.
For primary bibliographic entry see Field 5C.
W78-10956

LABORATORY STUDY OF CHEMICAL COAGULATION AS A MEANS OF TREATMENT FOR DREDGED MATERIAL,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5D.
W78-10957

AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX B: ROLE OF DISPOSAL OF PCB-CONTAMINATED SEDIMENT IN THE ACCUMULATION OF PCB'S BY MARINE ANIMALS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-10959

AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; APPENDIX E: DEMERSAL FISH AND DECAPOD SHELLFISH STUDIES,
National Marine Fisheries Service, Hammond, OR.
For primary bibliographic entry see Field 5C.
W78-10960

AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO, APPENDIX B: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF BOTTOM SEDIMENTATION,
Nalco Environmental Sciences, Northbrook, IL.
L. J. Danek.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-42, December 1977. 597 p, 259 fig, 214 tab, 41 ref, 23 append.

Descriptors: *Bottom sediments, Disposal, *On-site investigations, Lake Erie, Ohio, *Dredged material disposal, *Hydraulic regime, *Ashtabula River(Ohio), *Waste disposal sites, *Waste disposal.

An investigation of the hydraulic regime and physical nature of bottom sedimentation was conducted in Lake Erie near the Ashtabula Disposal Site. The field sampling phase of the program, conducted between June 1975 and September 1976, included detailed monitoring of physical parameters before, during and after disposal operations at the disposal sits and at reference stations. The various hydraulic, sedimentologic, and limnologic data gathered from the site and analyzed include bathymetry and subbottom profiles; current speed and direction, temperature, and transmissivity within the water column; wave characteristics; bottom sediment characteristics and distribution; water levels of Lake Erie, and flow rate and suspended sediment laod of the Ashtabula River. The study indicated that the dredged material disposal operation had little effect on the physical nature of the area. (WES).
W78-10961

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON; APPENDIX E: RELEASE AND DISTRIBUTION OF POLYCHLORINATED BIPHENYLS INDUCED BY OPEN-WATER DREDGE DISPOSAL ACTIVITIES,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-10962

BENTHOS AROUND AN OUTFALL OF THE WERRIBEE SEWAGE-TREATMENT FARM, PORT PHILLIP BAY, VICTORIA,
Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group.
For primary bibliographic entry see Field 5C.
W78-11024

DISPOSAL AND UTILIZATION OF HYDRAULICALLY DREDGED LAKE SEDIMENTS IN LIMITED CONTAINMENT AREAS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
J. E. Walsh, and S. M. Bemben.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 729, Price codes: A08 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC Pub. No. 92, Sept. 1977. 149 p, 8 tab, 45 fig, 25 photo, 88 ref. OWRT A-092-MASS(1), 14-34-0001-7046.

Descriptors: *Dredging, *Waste disposal, Environmental engineering, *Lake sediments, Feasibility, Sedimentation, Dewatering, Settling basins, Containment areas, Northeastern US.

This study investigates the feasibility of using various disposal techniques to maximize the potential of a given containment area in terms of the amount and rate of sediment application and of the ultimate utilization of the area. The state-of-the-art regarding the sedimentation and dewatering of dredged lake materials is defined; and the state-of-the-art regarding lake disposal technologies, hydraulically dredged lake materials disposal problems and legal restrictions are assessed. Laboratory and field tests provide grain size distribution, specific gravity, organic content, consolidation and shear strength data for materials from eleven lakes and seven containment areas located throughout the northeastern United States. Laboratory and field studies show that sedimentation is the primary solid/liquid separation process which takes place within a dredged material containment area. Laboratory containment area simulation tests, utilizing sedimentation columns, show that the establishment of downward seepage stresses can cause significant additional compressions of fine-grained organic materials; thus the bulking factor of a dredged material is not a unique characteristic, but rather, is largely a response to effective stress changes. Of the various supernatent treatment schemes investigated in this study, only chemical treatment followed by sedimentation has been established as practical, based on actual field use. Various drainage and evaporation enhancement techniques are examined. Crustal management and underdrainage appear to be the most promising techniques for the rapid improvement of the engineering properties of containment area materials. (Idoine-Mass)
W78-11067

PHYSICAL, CHEMICAL AND BIOLOGICAL EFFECTS OF DREDGING IN THE THAMES RIVER (CT) AND SPOIL DISPOSAL AT THE NEW LONDON (CT) DUMPING GROUND.
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-11229

WATER PROBLEMS IN THE RURAL ENVIRONMENT--ALTERNATIVE SOLUTIONS FOR WATER SUPPLY AND WASTEWATER DISPOSAL.
For primary bibliographic entry see Field 3F.
W78-11244

RESERVE MINING: AN EPIC BATTLE DRAWS TO A CLOSE.
For primary bibliographic entry see Field 5G.
W78-11248

CONVERT CITY SEWAGE TO FARM FERTILIZER.
For primary bibliographic entry see Field 5G.
W78-11281

OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES,
General Accounting Office, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11284

5F. Water Treatment and Quality Alteration

ELECTROSTATIC WATER TREATMENT,
Electrostatic Equipment Co., Kansas City, MO. (Assignee).
E. A. Means, and R. C. MeMahon.
U.S. Patent No. 4,073,712, 12 p, 7 fig, 21 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 607, February 14, 1978.

Descriptors: *Patents, *Water treatment, *Scaling, Electric fields, Water quality control, Suspended solids, Electrodes, Piping systems, Electrostatic treatment.

Many liquid clogging mechanisms, including water system scaling, involve the electrostatic relations between suspended particles, the carrier liquid and the walls of the piping network. Thus, an electrostatic field suitably impressed across a section of flowing water is believed to primarily affect not only the water, but mainly suspended, especially colloidal size, particles immersed in the water. The effect of the field will depend, upon the relationship of the natural electrostatic charge on such immersed particles to the electrostatic charge on the various surfaces of the treater and how the latter charge induces a response on the liquid contacting surfaces of the piping network. If relative conditions are proper, the particles will be urged by the field to remain in suspension or migrate toward a charged electrode isolated from the walls of the piping network, thus reducing the tendency to form flow restricting deposits. In this invention a pair of concentric cylindrical electrodes are mounted one within the other with a dielectrically isolated flow passage. The outer surface of the inner electrode and the inner surface of the outer electrode each have a layer of electrical insulation to limit current flow to and from the liquid, and a circuit is provided for continually applying D.C. potential to the electrodes. The dimensions of the inner and outer electrodes and the thickness of the insulation are determined, according to the parameters of the liquid system and the chemistry of the liquid, from a mathematical model of the treating device as the equivalent of three capacitors connected in series. (Sinha-OEIS)
W78-10708

ULTRAFILTRATION WATER COLLECTOR,
Systems Engineering and Corp., Stoughton, MA. (Assignee).
J. Shorr, and H. Fishman.
U.S. Patent No. 4,073,730, 7 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 612-613, February 14, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Filtration, Membranes, Filters, *Ultrafiltration.

The ultrafiltration process permits a very high level of water purification using simple mechanical means. In this process very thin plastic membranes having very tiny pores are used to remove from water all contaminants that have a particle size larger than the pore size. One important limitation on ultrafiltration systems is that the membranes must constantly be maintained in a wet condition because if they are allowed to dry they irreversibly consolidate the lose their permeability. According to this invention there is a box completely enclosing an ultrafiltration unit forming part of a larger water purification system. There are brackets for support of the unit and ports for the entrance and exit of wastewater conduits. A drain located a distance above the bottom

of the box permits a moist atmosphere to be maintained in the box during normal operations and a second drain located flush with the bottom of the box permits quick and effective isolation of a unit so that the system operation may be continued in the event of failure of the unit. (Sinha-OEIS)
W78-10712

HYDROPHILIC ACRYLIC POLYMERS AS MARINE FILTERS, ALGAE GROWTH CATALYSTS, AND BREEDING STIMULUS FOR FISH AND INVERTEBRATES,
Polymetrics International Inc., New York. (Assignee)
For primary bibliographic entry see Field 5G.
W78-10727

MICROBIOCIDAL MACRORETICULAR ION EXCHANGE RESINS, THEIR METHOD OF PREPARATION AND USE,
Rohm and Haas Co., Philadelphia, PA. (Assignee)
C. R. Costin.
U.S. Patent No 4,076,622, 6 p, 5 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 967, no 4, p 1571, February 28, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Ion exchange, *Anion exchange, *Resins, Microorganisms, Macroreticular anion exchange resins.

This invention relates to large pore macroreticular anion exchange resins containing a chemically or physically bound biocide or combinations and their method of preparation and use as microbiocidal compositions. These macroreticular compositions trap and also kill the microbes in contaminated water, whereas the smaller macroreticular resins or the gel resins do not trap these microbes. The anion exchange resins used in this invention possess large pores which contain a chemically or physically bound microbiocide. Both weak and strong base anion exchange resins can be utilized, however, strong base anion exchange resins are preferred. Among the preferred anion exchange moieties that can be utilized are quaternary ammonium, tertiary sulfonium, quaternary phosphonium, alkyl pyridinium and the like. (Sinha-OEIS)
W78-10730

BAFFLE AND WASH TROUGH ASSEMBLY FOR GRANULAR-MEDIA FILTERS,
General Filter Co., Ames, IA. (Assignee)
J. J. Scholten, and J. C. Young.
U.S. Patent No 4,076,625, 10 p, 12 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 967, No 4, p 1572, February 28, 1978.

Descriptors: *Patents, *Water treatment, *Waste water treatment, *Separation techniques, *Filtration, *Filters, Baffles, Granular-media filters, Backwashing.

Granular-media filters have been used extensively to remove suspended solids from water in water treatment plants. Such filters also are finding widespread application for removing suspended solids from wastewater streams which have had various degrees of pretreatment. In studying the performance characteristics of various trough and baffle configurations, it was discovered that downwardly moving eddy currents on the outside of the vertically-extending baffles can contribute significantly to media loss. In the preferred design, the baffles have outwardly convex portions, which curve downwardly and inwardly around the lower portion of the backwash trough. Concave inner surfaces of the baffles are opposed to the lower portion of the wash trough. The throats or narrowest cross-sections of the outflow channels are between the opposed curved portions of the baffles and the trough. The overall result is that media loss is reduced, particularly under conditions of high-turbulence backwashing. (Sinha-OEIS)
W78-10732

IMPROVED FEDERAL AND STATE PROGRAMS NEEDED TO INSURE THE PURITY AND SAFETY OF DRINKING WATER IN THE UNITED STATES.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10813

REMOVAL OF CHLOROFORM FROM DRINKING WATER,
Kentucky Water Resources Research Inst., Lexington.
J. S. Zogorski, G. D. Allgeier, and R. L. Mullins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 819, Price codes: A05 in paper copy, A01 in microfiche. Research Report NO. 111, June 1978. 86 p, 5 fig, 24 tab, 66 ref. OWRT-A-071-KY(1), 14-34-0001-7038 and 14-34-0001-8019.

Descriptors: *Water treatment, Water quality control, Activated carbon, Water purification, *Clorination, *Chloroform removal, Potable water, *Trihalomethanes removal.

The objective was to evaluate via laboratory experiments the technical feasibility of reducing trihalomethane levels in drinking water. Special attention was directed at the removal of chloroform since: (1) it is the only trihalomethane which has been shown to be carcinogenic in animal tests; and (2) this compound generally comprises the largest fraction of the total trihalomethane content of chlorinated waters in Kentucky. Trihalomethanes are present in municipal drinking waters due to the reaction of free chlorine with naturally occurring compounds collectively called 'precursors'. A variety of treatment processes and potential modifications (or additions) to existing treatment facilities were evaluated for precursor and trihalomethane removal. In-plant modifications which could be implemented at existing treatment facilities were evaluated initially since they require a minimal amount of capital expenditure and could be implemented within a short time. Unit treatment operations studied for precursor removal included: settling, alum-polymer coagulation, precipitive softening, ion-exchange softening, rapid sand filtration, adsorption with both powdered and granular activated carbon, and treatment with ozone and chlorine dioxide. Results from both field and laboratory studies indicate that water utilities can markedly reduce the level of trihalomethanes currently in drinking water. (Huffsey-Kentucky)
W78-11059

AN ALTERNATIVE METHOD OF IRON REMOVAL,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol 32, No 9, p 26-27, August, 1978. 2 fig.

Descriptors: *Iron, *Filtration, *Aeration, *Water treatment, Pumps, Backwashing.

A simple method for removing iron from water supplies is described. It involves aeration and filtration. The filter medium is a combination of sand or 'anthra-filt' and graded gravel. This system will be trouble-free if the following rules are followed: (1) A minimal but steady supply of fresh air must be provided. (2) Violent mixing of air and water is not necessary. (3) Fine screens or strainers should not be used. (4) A sufficient supply of water must be capable of backwashing the filter for at least 15 minutes. This system can be used with piston or jet pumps with slight modifications; however, the system works best with a submersible pump. (Purdin-NWWA)
W78-11073

WATER TREATMENT: CONTAMINANTS.
For primary bibliographic entry see Field 5D.
W78-11079

THE EFFECTS OF ELEVATED LEVELS OF SODIUM IN COMMUNITY DRINKING WATER ON BLOOD PRESSURE DISTRIBUTION PATTERNS,
Massachusetts Univ., Amherst. Div. of Public Health.
For primary bibliographic entry see Field 5G.
W78-11204

WATER TREATMENT FOR SMALL PUBLIC SUPPLIES,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
H. G. Folster, D. B. Wilson, G. Kramer, S. Hanson, and W. Boyle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 963, Price codes: A04 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 095, May 1978. 53 p, 20 fig, 13 tab, 21 ref, 2 append. OWRT T-0009(No. 7515(1), 14-34-0001-7515.

Descriptors: Potable water, *Domestic water, *Water treatment, *Membrane processes, *Electrodialysis, *Reverse osmosis, Desalination, Water supply, *Portable demonstration Unit, *New Mexico, Small communities, Safe Drinking Water Act.

Approximately 800 community-type public water supplies in New Mexico are initially affected by the regulations adopted by the U.S. Environmental Protection Agency under the Safe Drinking Water Act. The project described is primarily the selection, design, construction, and operating procedures for a portable demonstration water treatment system using reverse osmosis and electrodialysis to provide information to small New Mexico communities for improving their drinking water supplies to meet existing regulations. The project's specific objectives are to develop operating conditions and information for an engineering evaluation of reverse osmosis and electrodialysis and their secondary support processes, to develop specific cost data, to extend available water treatment technology in the area of single solute removal from drinking water containing a large number of ionic and dissolved species, to provide the necessary material for assimilation of this unit or comparable equipment into the educational activities of water supply and water treating, and to evaluate brine disposal methods in compliance with New Mexico groundwater regulations. Operating experiences at the selected communities will be documented as supplements to this report. (Stockton-N Mex St)
W78-11208

5G. Water Quality Control

IRRIGATION WATER SALT CONCENTRATION INFLUENCES ON SEDIMENT REMOVAL BY PONDS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
C. W. Robbins, and C. E. Brockway.
Soil Science Society of America Journal, Vol 42, No 3, p 478-481, May-June 1978. 2 fig, 2 tab, 12 ref.

Descriptors: *Sediment control, *Irrigation, *Salts, Ponds, Water treatment, Coagulation, Flocculation, Runoff, Sediments, On-site investigations, Laboratory tests, Irrigation water, Irrigation practices, Sedimentation, *Irrigation return flow.

Irrigation water salt concentration effects on sediment pond efficiency were investigated to demon-

strate the necessity of considering the salt concentration in the irrigation waters when designing sediment retention ponds. The influence of dissolved salt was determined by adding concentrated CaC12 solutions to three ponds and then measuring electrical conductivities and sediment concentrations at the pond outlets. Increasing the salt concentration increased the sediment removal efficiencies when the retention time in the pond exceeded 1 hour or the inflow sediment concentration exceeded 500 ppm for the three soils studied. Adding salt to laboratory soil sample suspensions increased the settling rates for the two soils studied. That data indicated that the salt concentration in irrigation water is an important factor in determining sediment pond size and retention time. Using pond design criteria obtained from sediment ponds receiving water of a given salt concentration to design ponds that will receive water with a different salt concentration should include adjustments for salt concentration differences. A simple laboratory test was suggested to predict which soils will respond to irrigation water salt concentration changes that are likely to result in sediment pond efficiency changes. (Sims-ISWS)
W78-10521

WATER QUALITY RESEARCH IN NEW ZEALAND 1976,
National Water and Soil Conservation Organization, Christchurch (New Zealand).
S. F. Davis.
Water and Soil Technical Publication No. 3, 28 p. (1977).

Descriptors: *Water quality, *Research and development, *Projects, Water chemistry, Water pollution, Pollutants, Foreign countries, Eutrophication, Biology, Foreign research, Water supply, Model studies, Classification, Sampling, Surveys, *New Zealand.

Research projects relating to water quality conducted by organizations in New Zealand during 1976 were listed. These projects were classified by subject and by organization. Addresses of contributions to this report were listed. Subjects used for classification of these research projects were: (1) development of methods for the examination, sampling, preservation and analysis of waters, (2) water quality investigations, and (3) water quality for specific uses. (Sims-ISWS)
W78-10531

ZOOTOXICOLOGICAL ESTIMATION OF WASTE ACCOMPANYING THE PRODUCTION OF PHOSPHATES (AQUATIC ENVIRONMENT), (IN POLISH),
For primary bibliographic entry see Field 5C.
W78-10562

A REVIEW OF THE RESTORATION OF STREAM GRAVEL FOR SPAWNING AND REARING OF SALMON SPECIES,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
W. C. Mih.
Fisheries, Vol 3(1), p 16-18, 1978. 3 fig, 12 ref.

Descriptors: *Salmon, Freshwater fish, *Fish reproduction, Methodology, On-site investigation, Fish conservation, Fish farming, Fish behavior, Sediments, Gravels, *Stream improvement, *Streambeds, Streams, *Stream restoration.

Hydraulic jet action and a suction system for the removal of fine materials in natural spawning streams appear to be the best methods of clearing spawning grounds efficiently and economically. A machine will be designed, constructed and field-tested to restore salmon streams. (EIS-Katz)
W78-10563

IMPLICATIONS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT,
Pennsylvania State Univ., University Park. Dept. of Forestry.
For primary bibliographic entry see Field 4C.
W78-10565

SOME PROPERTIES OF THE GEOMETRIC MEAN AND ITS USE IN WATER QUALITY STANDARDS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-10641

GROUND-WATER POLLUTION BY NITROGEN COMPOUNDS AT OLEAN, NEW YORK--PROGRESS REPORT, JUNE 1977,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-10649

REAL-TIME CONTROL OF WATER QUALITY AND QUANTITY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
M. B. Beck.
Research Memorandum RM-78-19, International Institute for Applied Systems Analysis, Laxenburg, Austria, April 1978. 22 p, 11 fig, 1 tab, 26 ref.

Descriptors: *Water quality control, *Estimating, *Forecasting, *Reach(Streams), *Discharge(Water), *Real time, River basins, Pollutants, Movement, Dispersion, Design, Least squares method, Algorithms, Equations, Mathematical models, Dissolved oxygen, Operations research, Recursive procedure, Surface storage, Fuzzy control.

Considered is the application of estimation, forecasting, and control techniques to the problem of combined real-time control of stream discharge and water quality in a river basin. A simple recursive estimation procedure is presented for the on-line estimation of pollutant movement and dispersion in a reach of river. Some important features of the linear multivariable control system design problem are then considered in the context of controlling downstream discharge and quality given an upstream effluent discharge and surface storage facility as input control variables. Because of the very basic difficulties of visualizing water quality regulation according to most conventional control engineering approaches, a final section offers a speculative examination of the possibilities for fuzzy control applications in operational river basin management. Questions which should be considered for the future, if and when real-time control becomes realistic and desirable, are stated. It is concluded that, in general, control engineering techniques of the forecasting and state estimation type are more likely to find their way into operational river basin management practice. (Bell-Cornell)
W78-10657

IMPROVING IRRIGATION RETURN FLOW QUALITY WITH A WATER RENTAL MARKET,
Colorado State Univ., Fort Collins. Dept. of Economics.
P. C. Huszar, and M. B. Sabey.
Water Resources Bulletin, Vol 14, No 4, p 978-987, August 1978. 3 fig, 1 tab, 5 ref.

Descriptors: *Irrigation, *Return flow, *Water quality, *Improvement, *Rental market, Water transfer, Water allocation(Policy), River systems, Effects, Costs, Water pollution, Conceptual model, Yakima Valley(Washington), Systems analysis.

Current policies for correcting the problem of irrigation return flow pollution tend to attack the symptoms of the problem rather than its cause. The present institutional arrangement for allocating irrigation water is seen as the source of the problem. This paper examines the water quality benefits of altering the institutional arrangement to allow for irrigation water transfers through a rental market. It is conceptualized that by creating a water rental market an opportunity cost would be associated with the use of irrigation water such that profit maximizing farmers would be induced to use water supplies more efficiently and rent the surplus to other irrigators, thus reducing return flow pollution. It is shown that a water rental market could improve water quality in the Yakima River in south central Washington by 31 percent as well as increase farm incomes and crop production. (Bell-Cornell)
W78-10658

A PARTITIONING PROCEDURE FOR WATER QUALITY MANAGEMENT MODELS,
Environmental Protection Agency, Cincinnati, OH.
L. A. Rossman, and F. T. Vanecek.
Water Resources Bulletin, Vol. 14, No. 4, p 842-855, August 1978. 2 fig, 2 tab, 25 ref.

Descriptors: *Water quality, *Management, *Economic efficiency, *Partitioning procedure, *Optimization, Thermal pollution, Decision making, Standards, Water temperature, River systems, Dissolved oxygen, Biochemical oxygen demand, Mathematical models, Systems analysis, Equations, Cooling levels, Stream response, Nonlinear programming, Gradient search procedure.

An improved computational procedure for solving water quality management models containing interacting pollutants and control policies is presented. The method is developed with respect to the specific problem of minimizing the costs of basin-wide thermal and organic pollution control to meet water quality standards. It views the problem in partitioned form where a master problem is sued to find cooling levels for thermal polluters while subproblems determine optimal organic pollutant reductions for fixed cooling levels. A gradient-based search procedure is used to solve the master problem. Computational results for several river systems are presented. Application of the method to other water quality management models is suggested. The application of this approach to complex water quality management models should improve computational efficiency and make the use of such models more attractive to basin planners. (Bell-Cornell)
W78-10660

A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM,
Instituto Venezolano de Investigaciones Centificas, Caracas. Lab. de Ingenieria Ambiental.
D. T. O'Laoghaire.
Water Resources Bulletin, Vol. 14, No. 4, p 809-826, August 1978. 1 fig, 4 tab, 34 ref.

Descriptors: *Water quality, *Management, *Project planning, *Water treatment, *Economic efficiency, *Optimization, *Capacity expansion, Operating rules, Treatment facilities, Waste water(Pollution), River basins, Constraints, Biochemical oxygen demand, Dissolved oxygen, Computer programs, Capital, Investment, Integer programming, Linear programming, Branch and bound algorithm, Computer models, Operations research, Cost minimization.

Described herein are a mathematical model, an algorithm, and a computer program that were specially developed to study the problem of a water quality management system undergoing a rapidly increasing environmental stress. The model output will determine the locations, sizes and the timing

of construction of new treatment plants plus an overall treatment plant operating policy so that environmental standards are maintained at a minimum cost. The model, as formulated, is a 0-1 mixed interger programming problem which is solved by decomposing it into a capital budgeting problem (solved by Little's branch and bound algorithm) and an operational policy problem (solved by linear programming). The coded algorithm in FORTRAN 10 has been tested with a semi-realistic example. Results are presented sitting that an initial solution was found in 1.20 minutes, while the optimal solution was encountered in 7.57 minutes on a DEC 10-1077 computer. (Bell-Cornell)
W78-10661

AN APPROXIMATE METHOD FOR SIZING DETENTION RESERVOIRS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-10662

EFFECTS OF CLARIFICATION PROCEDURES ON EFFLUENT DISCHARGE FEES (AUSWIRKUNGEN VON KLAERMASSNAHMEN AUF DIE HOEHE DER ABWASSERABGABE),
W. Brecht.
Wochenblatt fuer Papierfabrikation, Vol. 106, No. 1, p 9-18, January 15, 1978. 8 fig, 14 ref, 7 tab.

Descriptors: *Pollution taxes(Charges), *Germany, Taxes, Suspended solids, Chemical oxygen demand, Toxicity, Mercury, Cadmium, Effluents, Water quality standards, Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Europe, Foreign countries, Standards, Pulp wastes, Tax rates, Costs, Fish.

The German waste water tax is based on the volume of effluent discharged and on its nature. The formula for calculating 'harmfulness' takes into account total suspended solids, COD, toxicity to fish, and mercury and cadmium content. The formula is discussed, and the standards for testing effluents are tabulated. The tax will increase annually each year until 1986. There is no tax if there is no effluent (16 German paper mills operated with closed water circuits in 1974) or if the harmfulness is below the limits set. Calculations given show that reduction of harmfulness reduces the tax much more effectively than does partial reduction of the amount of effluent. When both the tax level and the cost of cleaning up the effluent are considered, calculations show that removal of more than about 88% of the total harmful impurities in the effluent is too expensive to balance the tax savings. The author does not expect any tax reduction. From 1973 to 1976, the German paper industry has reduced the volume of effluent by 85% and its COD by 30%. The corresponding figures for the pulp industry are 15 and 40%. (Ward-IPC)
W78-10700

BARRIER FOR WATER CARRIED POLLUTANTS,
P. Preus.
U.S. Patnet No. 4,073,143, 7 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 420, February 14, 1978.

Descriptors: *Patents, *Water pollution control, *Water quality control, *Oil pollution, Oil spills, Barriers, Floats, Containment, Oil booms, Oil slicks.

A barrier for containing and controlling water carried pollutants, for example, oil, is composed of a series of boom sections which are connectable in end to end relationship with each of the boom sections containing a flotation material; generally liquid impervious connectors for the ends of the boom sections; flexible draft members and associated separable connectors for maintaining the continuity of the boom; and means associated with the flexible draft members and the fluid impervious connectors between the boom section to reduce to a minimum separating stresses at the end of to end connections of the boom sections. (Sinha-OEIS)
W78-10703

SUCTION DEVICE FOR AN OIL SEPARATION TANK,
Bridgestone Tire Co. Ltd., Tokyo (Japan). (Assignee).
H. Kawakami, Y. Tsukagawa, and I. Nagaoka.
U.S. Patent No. 4,075,096, 4 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 1065, February 21, 1978.

Descriptors: *Patents, *Oil pollution, Oil spills, Water pollution treatment, *Water pollution control, Water quality cobntrol, Separation techniques, *Suction device.

A device for recovering floating matter from water surfaces is an improvement of a suction device for an oil separation tank. The tank is mounted on a floating body such as ships, etc. and closed at its upper part and opened at its lower part and includes a socket opened below water level for receiving an upward flow of floating oil which has been drawn into water. The improvement to the system comprises a suction inlet provided at the top of the oil separation tank, the suction inlet being connected through a conduit to a strainer, a liquid pump and a storage tank in succession. The liquid pump is driven by a motor which is electrically connected to an oil detector and an electromagnetic valve. The oil detector is provided in the upper part of the oil separation tank so as to control energization and deenergization of the motor in response to the presence and absence of oil in the oil separation tank. The electromagnetic valve is opened and closed in response to the energization and deenergization of the motor. (Sinha-OEIS)
W78-10720

AQUATIC HERBICIDES,
Nalco Chemical Co., Oak Brook, IL. (Assignee).
J. F. Vartiak, and G. E. Wortley.
U.S. Patent No. 4,076, 516, 4 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 967, No 4, p 1541, February 28, 1978.

Descriptors: *Patents, Water treatment, *Herbicides, *Aquatic weed control, Polymers, Submerged plants, *Water pollution control, High molecular weight.

Many species of undersirable aquatic vegetation may be contained or controlled by treating this vegetation with a variety of aquatic herbicides. These herbicides are often applied by spraying them beneath the water's surface. Many of these aquatic herbicides are applied in conjunction with weighting agents such as sugar or as water-in-oil emulsions which are formulated so that the emulsion slowly inverts in the water. The emulsion droplets, prior to inverting slowly sink to the bottom of the water where they become affixed to the plant or to the bottom of the body of water where their activity can be focused directly against the vegetation sought to be controlled. It has been found that aquatic herbicides may be improved in their activity by applying these herbicides under water to the vegetation to be controlled in the presence of a minor amount of a water-soluble vinyl addition polymer which has a molecular weight of at least 10,000. (Sinha-OEIS)
W78-10722

HYDROPHILIC ACRYLIC POLYMERS AS MARINE FILTERS, ALGAE GROWTH CATALYSTS, AND BREEDING STIMULUS FOR FISH AND INVERTEBRATES,
Polymetrics International Inc., New York. (Assignee)
K. A. Howery.
U.S. Patent No 4,076,619, 6 p, 2 ref; Official Gazette of the United States Patent Office, Vol 967, no 4, p 1570, February 28, 1978.

Descriptors: *Patents, *Water treatment, *Water pollution treatment, *Water quality control, Seawater, Absorption, *Polymers, Filtration, Algae, Marine life wastes, *Hydrophilic acrylic polymers.

A hydrophilic polymeric solution or pellets or other subdivided solid forms is provided to be applied as a coating to plastic fibrous materials or plastic matrix materials used as filters or dispensed in the form of pellets or other subdivided form used as a filtration medium. It accelerates removal of marine wastes and facilitates algae growth essential to the establishment and maintenance of hearty marine life in natural or synthetic sea water. The polymeric coatings and the pelletized forms of the acrylic polymer are both hydrophilic and hydrophobic. Hydrophilic in that the acrylic polymer will pass both water vapor and gases through both the coating and pellet forms of the polymer while simultaneously absorbing water and swelling the coating and pellets. Hydrophobic in that both the coating and pellets will absorb only a predetermined amount of water, i.e. up to 20% by volume depending upon the solids percentage of the original formulation. (Sinha-OEIS)
W78-10727

MICROBIOCIDAL MACRORETICULAR ION EXCHANGE RESINS, THEIR METHOD OF PREPARATION AND USE,
Rohm and Haas Co., Philadelphia, PA. (Assignee)
For primary bibliographic entry see Field 5F.
W78-10730

SELF-DEPLOYING BOOM,
Goodrich (B. F.) Co., Akron, OH. (Assignee)
P. J. Tolan.
U.S. Patent No 4,076,624, 6 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 967, no 4, p 1571-1572, February 28, 1978.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, *Water pollution control, *Oil pollution, Oil spills, Barriers, Monitoring, *Floating oil booms.

An effective practical means for controlling and confining oil spills on water to prevent their subsequent spread and damage is provided. It is particularly useful in areas where water traffic prevents the permanent type of installation because the known booms were deployed in such a manner that they interfered with the use of the channel waters. The oil monitoring and pollutant control apparatus of this invention comprises a flexible elongated body or boom being so folded that it can be retained in a body of water by a holding line that is secured to a boat or a dock. An oil monitoring device is mounted adjacent to the holding line so that upon detection of oil, the holding line is severed and the boom deployed. The ends of the boom are connected to mooring lines which in turn are connected to spaced mooring blocks to deploy the boom in a pre-determined attitude and locations for most effective use of containment of the pollutant material. (Sinha-OEIS)
W78-10731

MIXING EFFECTS DUE TO BOATING ACTIVITIES IN SHALLOW LAKES,
Florida Technological Univ., Orlando. Dept. of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 5B.
W78-10734

SALINITY MANAGEMENT OPTIONS FOR THE COLORADO RIVER, DAMAGE ESTIMATES AND CONTROL PROGRAM IMPACTS,
Utah Water Research Lab., Logan.
J. C. Andersen, A. P. Kleinman, F. B. Brown, J. R. Cannon, and R. C. d'Arge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 482, Price codes: A16 in paper copy, A01 in microfiche. Water Resources Planning Series Report P-78-003, June 1978. 344 p, 53 fig, 365 tab. 14 maps, 7 append. OWRT B-107-Utah(2), 14-31-0001-4168.

Descriptors: *Economic efficiency, *Resource allocation, Regional analysis, Water quality, *Salinity, River basins, *Agricultural damages, Water management(Applied), Estimating, Costs, *Alternative costs, Economic impact, Input-output analysis, *Colorado River.

Rivers draining arid basins increase in salinity content in the downstream area of the point where water users are often significantly damaged. The problem in some cases can be ameliorated by altering upstream water and land use practices. An economic trade-off exists between the cost of such upstream efforts and the downstream benefits achieved. This study sought to provide additional information to estimate (1) economic and (2) economic costs of salinity control measures by upstream water users. Damages were estimated for high salinity levels to provide guidelines to project future conditions. Control costs were estimated with a physical model developed to predict the response of soil, water, and crop factors. Input-output models were used to estimate indirect economic impacts.
W78-10735

EPA AMENDS SEWAGE PLANT FUNDING RULES.
Engineering News-Record, Vol. 200, No. 25, p 41, June, 1978.

Descriptors: *Grants, *Sewage treatment, *Treatment facilities, *Construction costs, *Financing, Administrative agencies, Government finance, Cost repayment, Regulation, Waste water treatment, Municipal wastes.

The EPA has amended construction grant regulations for municipal sewage treatment plants in an effort to improve grant application processing procedures and to update the regulations to conform with 1972 amendments to the Federal Water Pollution Control Act. Equipment procurement practices will be modified and awarded construction grants will be cross-referenced with waste water permits. Enforcement practices will be coordinated with grant mechanisms to monitor construction schedules. Equipment costing less than $200,000 will no longer require commercial code equipment liens for progress payments. Retroactive application based on inflationary increases prior to December 17, 1975, will be eliminated. New provisions have been established for integrating specific treatment facilities with regional water quality. Proposed compliance with facilities planning requirements by March 31, 1980, will eliminate grace periods. (Lisk-FIRL)
W78-10739

TABANIDS IN EXPERIMENTALLY FERTILIZED PLOTS ON A MASSACHUSETTS SALT MARSH,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
R. A. Meany, I. Valiela, and J. M. Teal.
The Journal of Applied Ecology, Vol 13, No 2, p 323-332, 1976. 4 fig, 1 tab, 19 ref.

Descriptors: *Aquatic insects, Marshes, Marsh plants, *Salt marshes, *Massachusetts, *Fertilizers, Sludge, *Sludge disposal, Phosphate, Ureas, Fertility, Fertilizers, *Phosphate fertilizers, *Urea fertilizers, *Tabanids, Larval tabanids, Tabanidae, Great Sippewissett Marsh, Buzzards Bay, Sewage sludge fertilizers.

The average larval densities for both Tabanus nigrovittatus and Chrysops fuliginosus found in control plots of 1972-73 and the 1974 plots are comparable to the maximum values for Tabanus nigrovittatus obtained elsewhere on the east coast of North America. Larval tabanid populations were drastically reduced in plots treated with a sewage sludge fertilizer but were unaffected by treatments with a phosphate and a urea fertilizers. (Katz-EIS)
W78-10748

BIOLOGICAL AND CHEMICAL SUCCESSION IN NAHAL SOREQ: A FREE-FLOWING WASTEWATER STREAM,
Hebrew Univ., Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5C.
W78-10754

REPORT OF THE PRESIDENT'S WATER POLLUTION CONTROL ADVISORY BOARD HELD AT HONOLULU, HAWAII ON JUNE 7-10, 1971.
President's Water Pollution Control Advisory Board Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 599, Price codes: A03 in paper copy, A01 in microfiche. August 16, 1971, 33 p.

Descriptors: *Hawaii, *Water pollution control, *Water pollution effects, *Governmental interrelations, Water pollution, Water quality, Water quality control, Pollutants, Monitoring, Municipal wastes, Industrial wastes, Sewage effluents, Sewage treatment, Water pollution sources, Regulation, Pollution abatement, Water policy, Administrative agencies, Inter-agency cooperation, Sugar crops.

In June of 1971, the President's Water Pollution Control Advisory Board met in Hawaii to review that state's water pollution problems. The three-day agenda included inspection tours of Hawaii and Oahu Islands, public hearings, and an executive session where findings were drafted. A controversial incident at the hearings was the resignation of the state's deputy attorney general, who claimed the Governor had decided not to enforce water pollution control laws against the sugar industry. The Advisory Board made a number of proposals. It recommended that a full time administrator and staff be appointed to handle water pollution control. It stated construction of a sewage treatment plant should be Honolulu's highest priority. Increased monitoring by the state in recreation areas was also recommended. The Board stated that more consideration should be given to the condition of the sea floor. Lack of progress by the sugar industry in controlling its pollution along with hearing testimony, were cited as reasons for close scrutiny by the Environmental Protection Agency (EPA) of current abatement proposals. The Board also suggested that the EPA seek compliance with abatement regulations through the courts, if necessary. (Malefatto-Florida)
W78-10755

OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN,
California Univ., Berkeley. Lawrence Berkeley Lab.
J. Young.
Available from National Technical Information Service, Springfield, Virginia 22161 as LBL-5317. June 1976, 10p.

Descriptors: *California, *Oil spills, *Oil pollution, *Navigable waters, Accidents, Pollution, Coasts, Streams, Federal government, Environment, Facilities, Pollution abatement, Planning, Environmental effects, Storage requirements, Storage, Electronic equipment, Pollutant identification, Laboratories, Laboratory equipment.

The policy priorities of the Lawrence Berkeley Laboratory, Berkeley, California, concerning oil and hazardous substance pollution of navigable waters and waterways are discussed in this document. The specific, localized procedures to be followed in case of a pollution accident/spill are delineated. The laboratory's initial priority is to prevent pollution through physical design and preplanning of facilities. The contingency plan assigns primary surveillance responsibility to the person handling or transporting the pollutants. Secondary surveillance is carried out by members of the Laboratory Protection Department. The primary concern in any accident/spill is to protect the environment. The nature of the pollutant, and the particular threat it poses to life, property and the environment determines the procedures taken upon the discovery of an accident/spill. In cases where the discoverer has insufficient expertise to correctly identify the corrective measures to be instituted, as procedure is outlined that is designed to notify competent civil authorities and to have responsible persons sent to the scene to evaluate the problem. In all cases, state and federal agencies and officials are to be notified as required. (Easterbrook-Florida).
W78-10757

HEARING INVOLVING 180-DAY NOTICE OF VIOLATION OF WATER QUALITY STANDARDS OF THE CITY OF FARGO, NORTH DAKOTA HELD IN FARGO, NORTH DAKOTA ON JULY 10, 1970.
Federal Water Quality Administration, Washington, DC.
Available from National Technical Information Service, Springfield, Virginia 22161 as PB-259 500. Price codes: A07, in paper copy, A01 Microfiche.

Descriptors: *North Dakota, *Adjudication procedure, *Water quality control, *Law enforcement, *Governmental interrelations, Administration, Water law, Legal aspects, Cost sharing, Administrative agencies, Administrative decisions, Regulation, Comprehensive planning, Federal Water Pollution Control Act, Abatement, Water pollution control, Water quality standards, Public health, Sewage treatment, Water pollution treatment.

The city of Fargo, North Dakota was found in violation of the Federal Water Pollution Control Act in 1970. It has discharged effluent into the Red River of the North. Accordingly, hearings were convened by the Federal Water Quality Administration (FWQA). Mayor Laskowitz related Fargo's history of water pollution control, and maintained that continuing federal financial assistance was imperative. FWQA presented a report which stated that during the winter Fargo's sewage treatment system was less efficient, resulting in increased water pollution. To overcome the problem, additional treatment facilities were recommended. A representative from the North Dakota Department of Health next testified that while Fargo had violated effluent standards, even if it had not, river standards would not have been met because of pollution from other sources. The hearing officer stated that he had recommended that abatement action be taken against these sources. Fargo's water and sewage commissioner assured the hearing officer that the city would have a workable plan ready by the expiration of the 180-day notice period. The officer suggested the plan be presented thirty days sooner and that FWQA be consulted for technical assistance.
W78-10758

WATER QUALITY COMPARISON STUDY, ESCAMBIA RIVER AND OTHER NORTHWEST FLORIDA STREAMS.
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.

For primary bibliographic entry see Field 5A.
W78-10759

HAZARDOUS WASTE DISPOSAL PROGRAM SEVENTH MONTHLY REPORT,
TRW Systems Group, Redondo Beach, CA.
M. Appel, J. L. Blumenthal, J. F. Clausen, D. F. Dal Porto, and J. R. Denson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 369, Price codes: A15 in paper copy, A01 in microfiche. August 10, 1972, 347 p.

Descriptors: *Solid wastes, *Radioactive wastes, *Planning, *Management, *Industrial wastes, Mercury, Classification, Poisons, Storage, Transportation, Materials, Effects, Chemicals, Treatment facilities, Regulation, Waste disposal, Waste identification.

This is part of a comprehensive Environmental Protection Agency report and plan required to lead to the creation of a system of national disposal sites for the storage and disposal of hazardous wastes which may endanger public health or welfare. The overall objective of the program is to define and evaluate the waste management techniques and policies currently utilized for a specified set of hazardous wastes. Waste management techniques to be evaluated include those for storage, handling, transport, neutralization, detoxification, reuse and disposal. Included in this document are: reports on various exhaust gas cleaning devices; descriptive reports on air correction equipment and systems; a treatment process report for radioactive waste detoxification processes; and profile reports on 19 radioactive and 32 chemical waste compounds, including mercury and mercury compounds. Also to be included in the overall program will be a description of possible new techniques for management of hazardous wastes, proof-of-principal experimentation to determine the effectiveness of techniques for which insufficient data is available for adequate evaluation, and planning of research programs necessary for developing procedures and processes for treating hazardous wastes for which adequate techniques do not now exist. (Easterbrook-Florida)
W78-10760

FEASIBILITY STUDY FOR DEVELOPMENT AND IMPLEMENTATION OF A MODEL STATE INFORMATION SYSTEM (M.S.I.S.) FOR EPA'S SAFE DRINKING WATER PROGRAM.
American Management Systems, Inc. Arlington, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 864, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-570/9-76-002-5, June 15, 1976, 114 p.

Descriptors: *Comprehensive planning, Computers, *Water quality standards, *Potable water, Abatement, Administrative agencies, *Computer programs, Cost-benefit analysis, Data processing, Domestic water, Project planning, Water treatment.

The Safe Drinking Water Act of 1974 greatly expands the Environmental Protection Agency's (EPA) responsibilities for monitoring the quality of drinking water in the United States. The Act enfolds all public water systems under the regulatory umbrella of EPA, but provides for a joint federal-state enforcement system for ensuring the quality of drinking water. A preliminary survey of selected states confirmed EPA's belief that a computer-based information system would be required by most states to effectively monitor the program. Rather than have individual states embark on separate paths toward computer system development, EPA decided to develop a Model State Information System (MSIS) to assist the states and regions in implementing the program. A vast majority of the states surveyed indicated a very strong preference for the decentralized MSIS. Individual states will undoubtedly wish to extend the use of the MSIS to suit their specific requirements. This tailoring is probably best accomplished in a decentralized system. The decentralized operation will not create a large demand on EPA for continuing system support, computer facilities, and the problems of managing a complex telecommunication system. (Jordan-Florida)
W78-10762

AUDIT GUIDE FOR FINAL STATE AUDITS UNDER THE CONSTRUCTION GRANT PROGRAM (FOR USE BY INDEPENDENT PUBLIC ACCOUNTANTS).
Environmental Protection Agency, Washington, D. C. Office of Audit.
For primary bibliographic entry see Field 6E.
W78-10763

WATER QUALITY STRATEGY PAPER. A STATEMENT OF POLICY FOR IMPLEMENTING THE REQUIREMENTS OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED AND CERTAIN REQUIREMENTS OF THE 1972 MARINE PROTECTION RESEARCH AND SANCTUARIES ACT.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 495, Price codes: A03 in paper copy, A01 in microfiche. August, 1975, 35 p.

Descriptors: *Water policy, *Federal Water Pollution Control Act, *Water pollution control, *Water quality control, *Waste treatment, Water law, Water quality, Water pollution, Legislation, Legal aspects, Federal government, Environmental control, Environment, Water quality standards, Grants, Monitoring, Planning, Projects, Control, Permits, Environmental effects.

The primary focus of this paper is to summarize the Environmental Protection Agency's (EPA) near-term and long-range water pollution control goals. The purpose is to aid agencies in the implementation of the Federal Water Pollution Control Act. (FWPCA) the EPA's 1976 goals include a follow-through on the issuing of permits and the awarding of construction grants. In addition, emphasis is placed on monitoring and enforcement priorities. The completin of basin plans and a major acceleration of the contruction grants program is also required. Two new priorities discussed include the areawide waste treatment management programs and a program which will address the problem of nonpoint sources of pollution. As part of phase II, the EPA will continue to decentralize water quality management responsibility to the states. Public participation will be solicited and environmental results will be examined. The program's major problem areas are discussed with the enumeration of priorities among program areas, priorities within those areas and regional priorities. The sequence of implementation of the FWPCA through 1983 is discussed, as is the current water quality and water strategy. (Quarles-Florida)
W78-10764

MINIMAL REQUIREMENTS FOR A WATER QUALITY ASSURANCE PROGRAM.
Environmental Protection Agency, Washington, DC. Monitoring and Data Support Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 807, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-440/9-75-010, 1976. 20 p.

Descriptors: *Governmental interrelationships, *Regulation, *State jurisdiction, *Water quality standards, *Water sampling, Administrative agencies, Baseline studies, Federal government, Law enforcement, Legal aspects, Planning, Sampling, State governments, Water law, Water policy, Water quality, Water quality control.

A well-planned water quality assurance program is essential to produce valid data. Quality assurance progra planning is becoming increasingly more important because a large number of laboratories are producing analyses with resulting data; the equipment and procedures used for these analyses are increasing in variety and complexity; and there is an increasing need to consolidate data bases. To ensure that minimum requirements are met, this document provides guidelines for planning, developing, and implementing a successful quality assurance program. In addition, it outlines a typical Memorandum of Understanding. This memorandum is an agreement between the Environmental Protection Agency Regional Office and the State on quality assurance procedues. Overall requirements for a water quality assurance program include: (1) determining cost/manpower ratios, (2) designating a quality assurance control coordinator, (3) assessing the present level of operation, (4) calibrating sampling equipment and flow measuring devices, (5) collecting and preserving samples, (6) recording, storing and retrieving data, and (7) establishing chain of custody of samples for legal requirements. Management should recognize that an effective quality assurance program can always be improved and that it requires constant attention. (Jordan-Florida)
W78-10765

WASTE WATER DISPOSAL AT FEDERAL INSTALLATIONS IN THE UNITED STATES, STATE OF CALIFORNIA.
Federal Water Pollution Control Administration, Washington, DC.
For primary bibliographic entry see Field 5E.
W78-10767

ACCOMPLISHMENT PLAN. REGION VIII. CHEYENNE RIVER BASIN AREA.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 254, Price codes: A03 in paper copy, A01 in microfiche. March, 1972, 26 p.

Descriptors: *Water quality, *River basins, *South Dakota, *Industrial waste water(Pollution), Radioactivity, Federal government, Water resources development, Water pollution treatment, Wastes, Recreation, Water quality control, Monitoring, Standards, Sediment control.

The Cheyenne River Basin was selected as a high priority area for pollution abatement and control programs because of significant pollution problems. Municipal and industrial discharges threatened the use of these waters as water supply sources and as recreational areas. Broad objectives of the accomplishment plan included quality improvement of the waters by elimination of some industrial sources and requirement of secondary municipal treatment, determination of the magnitude of toxic pollution from buried mill tailings along the rivers, determination of the mercury contamination of local fish, monitoring of radiation levels, and development of a plan to control basin-wide sediment and backend problems associated with agricultural, recreational, mining, and construction activities. Specific tasks for improving water quality were included in the accomplishment plan. Plans of accomplishment were also developed to deal with the various air and water quality objectives of the Environmental Protection Agency for this area. (Molloy-Florida)
W78-10769

DEVELOPING A WATER RESOURCE PLAN FOR SOUTH FLORIDA,
South Florida Water Management District, Tampa.
For primary bibliographic entry see Field 6B.

W78-10770

OUTER CONTINENTAL SHELF OIL AND GAS AND SULPHUR OPERATIONS.
Federal Register, Vol. 43, No. 19, p 3880-17, January 27, 1978.

Descriptors: *Environmental effects, *Oil industry, *On-site investigations, *Well regulations, *Continental Shelf, Exploration, Oil wells, Sites, Surveys, Coasts, Drilling, Legal aspects, Geologic investigations, Administration, Federal government, Regulation, Water law, Leases.

Existing procedures for submission of plans for exploration and development activities on the Outer Continental Shelf by oil and gas lessees are revised and more clearly defined by these regulations. Exploration plan: the basic requirement that no exploration activities such as geological and geophysical surveys to commence prior to submission and approval of the plan. Other changes provide for increased flexibility in final placement of wells, and require a lessee rather than the supervisor, to indicate which portions of a proposed exploration plan are believed to be exempt from disclosure under the Freedom of Information Act, before copies of the plan are transmitted to affected states. Only minor changes were made in the area of environmental report requirements. Introductory statements were redrafted to make it clear that the Environmental Report (Exploration) is not intended to be as detailed or comprehensive as the Environmental Report (Development and Production). The section on compliance with the National Environmental Policy Act was substantially reorganized to reflect the requirements of the Act. (Rule-Florida)
W78-10776

FEDERAL COMMON LAW OF NUISANCE IN INTRASTATE WATER POLLUTION DISPUTES.
For primary bibliographic entry see Field 6E.
W78-10784

CARELESS KEPONE,
Hofstra Univ., Hempstead, NY. Dept. of Chemistry.
F. S. Sterrett, and C. A. Boss.
Environment, Vol. 19, No. 2, p 30-37 (March 1977), 2 fig, 7 p.

Descriptors: *Kepone, *Insecticides, *Chemical industry, *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Water pollution effects, Organic pesticides, Fishkill, Toxins, Water pollution, Toxicity, Virginia, Maryland, Chemical degradation, Effluents, Air pollution, Environmental effects, Persistence, Entomology, Pesticide toxicity, Pesticide removal, Chemical wastes.

Kepone is a water soluble, deadly insecticided that has been released into the waters and atmosphere of coastal Virginia and Maryland by industrial negligence. It affects the neurological functioning of organisms, and test reveal its acts as a cumulative poison which will affect the environment long into the future. This article chronicles the Kepone disaster that developed from 1973 through 1975 in Hopewell, Virginia. As a result of improper management and disregard of safety procedures, Kepone dust was allowed to cover the floors, equipment, outside grounds and lunch areas of the plant. The surrounding air and water was also contaminated by the dust. In addition, Kepone entered the city's sewerage system, inhibiting normal bacterial action needed for sewage treatment. Untreated sewage was then discharged in the St. James River, polluting a large part of it. Because Kepone is extremely toxic to estuarine organisms, fishing in the St. James has now been banned. To prevent future chemical disasters officials must promulgate strict standards for toxics production. Management must assure greater responsibility for the safety of its employees and our environment. Clean-up problems and alternative insect controls are also discussed in this article. (Spector-Florida)
W78-10788

SHIPWRECKS, POLLUTION, AND THE LAW OF THE SEA,
Environmental Protection Agency, Washington, DC. Office of International Activities.
For primary bibliographic entry see Field 6E.
W78-10790

APPROACH TO POLLUTION CONTROL AND LEGISLATION IN THE USA.
Water Pollution Control Federation, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-10793

REGULATORY PROGRAMS FOR NONPOINT POLLUTION CONTROL: THE ROLE OF CONSERVATION DISTRICTS,
National Association of Conservation Districts, Washington, DC.
M. M. Garner.
Journal of Soil and Water Conservation, Vol. 32, No. 5, p 199-204 (September-October, 1977).

Descriptors: *Water quality control, *Federal Water Pollution Control Act, *Pollution abatement, *Water conservation, Water quality, State governments, Land use, Water resources, Erosion control, Sediment control, Irrigation water, Administration.

Conservation districts play major roles in state and areawide water quality management plans developed under Section 208 of the Federal Water Pollution Control Act (FWPCA). Conservation districts, which are usually local subdivisions of state governments, encompass most privately owned land in the nation. In the past, districts have developed programs to control land and water resources. They have been instrumental in the implementation of water quality management plans, particularly those sections related to nonpoint-source pollution, such as erosion and sediment control, animal waste management, and irrigation water management. District programs are normally conducted on a voluntary, cooperative basis. The author notes that the FWPCA Section 208 requirement of a regulatory program to control point and nonpoint sources of pollution have forced districts to re-evaluate the adequacy of a purely voluntary program. The pertinent FWPCA Section 208 provisions are discussed and examples of the current participation of five states are outlined. The need for stronger control programs is examined. Current and pending legislation that would accomplish this goal is cited. It is up to the water quality planners in each district to determine which authorities or combination thereof they will use to develop an adequate regulatory program. (Quarles-Florida)
W78-10797

SPECIFIC PROBLEM ANALYSIS. 1975 NATIONAL ASSESSMENT OF WATER AND RELATED LAND RESOURCES (MISSOURI REGION).
Missouri River Basin Commission, Omaha, NE.
For primary bibliographic entry see Field 6E.
W78-10798

WATER WARS OR STREAMS OF PARADISE: DO WE HAVE A CHOICE.
April 6, 1978, 18 p.

Descriptors: *Aquifers, *Florida, *Groundwater availability, *Water pollution control, Comprehensive planning, Drainage effects, Groundwater resources, Land use, Freshwater, Water pollution effects, Wetlands, Federal Water Pollution Control Act.

Florida's freshwater supplies and the ways in which they are affected by man's various activities are the focal point of this booklet, with special emphasis upon Northwest Florida and the Tallahassee area. Initially, the authors statistically explain the scarcity of available fresh water, the quantities of water required for the production of different goods and services, and the formation and location of Florida's major aquifers, including a hydrologic cycle chart. Also examined are the ways in which water quality is affected by sewage treatment, industrial wastes, advanced water treatment processes, storm water runoff, construction, and landfills. The authors explain the harmful effects of drainage, and the interrelationships between ditches, flood damage, pollution and changing levels of the water table. The ecological importance of wetlands is also stressed. State and federal environmental legislation is examined, with particular emphasis on sections 201 and 208 of the Federal Water Pollution Control Act as amended by Public Law 92-500. In conclusion, the authors stress the need for a comprehensive and effective land use policy to avoid a critical water shortage in Florida. A selected bibliography is included. (White-Florida)
W78-10799

ENVIRONMENTAL PROTECTION: MODEL ORDINANCES FOR USE BY LOCAL GOVERNMENTS.
Metropolitan Council of the Twin Cities Area, MN.
For primary bibliographic entry see Field 6E.
W78-10801

GONE WITH THE WATER--DRAINAGE RIGHTS AND STORM WATER MANAGEMENT IN PENNSYLVANIA,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 6E.
W78-10807

THE ECONOMIC IMPACT OF THE FEDERAL ENVIRONMENTAL PROGRAM: A REPORT TO THE SUBCOMMITTEE ON AGRICULTURE, ENVIRONMENTAL AND CONSUMER PROTECTION OF THE COMMITTEE ON APPROPRIATIONS OF THE HOUSE OF REPRESENTATIVES,
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 690, price codes: A07 in paper copy, A01 in microfiche. November, 1974. 114 p.

Descriptors: *Federal government, *Federal Water Pollution Control Act, *Pollution abatement, *Environmental control, *Economic impact, Air pollution, Economic justification, Economic prediction, Employment, Inflation(Economic), Legislation, Pesticides, Political constraints, Regulation, Administrative agencies, Social aspects, Thermal pollution, Water pollution control, Industries, Costs.

The House Subcommittee on Agriculture, Environmental and Consumer Protection was concerned with the role that the inflexibility of nationwide environmental standards may play in creating energy shortages, inflation and environmental laws and regulations, as well as those now being developed, in order to determine whether or not funds should be provided to implement these laws and regulations. The Environmental Protection Agency report assessed the economic and energy impact of standards and regulations regarding: (1) water effluent limitations; (2) new source performance standards for air pollution; (3) thermal limitations; (4) new vehicle emissions standards; and (5) ambient air quality standards. Although some economic inefficiency might result, a greater economic inefficiency was eliminated by the

uniform and equitable requirements placed on industry by nationwide standards. Determination of a use category by local governments often yielded a standard that was advantageous to industry and did not adequately protect the interests of affected residents. In fact, states would sometimes compete with another to attract industries by setting pollution standards which were advantageous to industry. (Jordan-Florida)
W78-10809

INTRODUCTION TO THE MODEL STATE INFORMATION SYSTEM (MSIS).
American Management Systems, Inc., Arlington, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 863, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-570/9-76-002-4 (June 15, 1976). 29 p.

Descriptors: *Computers, *Potable water, *Comprehensive planning, *Water quality, Abatement, Administrative agencies, Computer programs, Data processing, Domestic water, Freshwater, Water purification, Water quality standards.

The Model State Information System (MSIS) is a computer-based information system for use by individual states in managing the increased volume of water quality and related data that will be required to implement the recently promulgated National Interim Primary Drinking Water Regulations. While it is primarily designed for those states that do not currently have an automated system, it is also designed to provide enhanced capabilities to states with automated systems. States will have the option of selecting a base package of features, plus one or more optional features, depending on their volume of data and individual preferences. The MSIS will perform the following basic functions: (1) maintain inventory records of public water systems; (2) maintain records and provide detailed reports on violations of regulations; (3) maintain accurate records of regulatory requirements; and (4) provide compliance data to the Environmental Protection Agency in computer compatible form. The optional features of MSIS are: (1) recording of compliance schedules under variance and exemption agreements; (2) automatic scheduling of sanitation surveys; (3) recording of specific enforcement actions; and (4) listing of certified operators and automatic mailing. (Jordan-Florida)
W78-10810

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM, VOLUME II: EXHIBITS.
American Management Systems, Inc., Arlington, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 861, Price codes: A13 in paper copy, A01 in microfiche. Report EPA-570/9-76-002-2, June 15, 1976. 96 p.

Descriptors: Computers, *Potable water, *Comprehensive planning, *Water quality, Abatement, Administrative agencies, *Computer programs, Data processing, Domestic water, Safety, Water purification, Water quality standards.

The Model State Information System (MSIS) is a computer-based information system which can be utilized by individual states and Environmental Protection Agency regions to perform the minimum data management functions mandated by the 1974 Safe Drinking Water Act. The MSIS consists of eight subsystems: (1) public water supply inventory; (2) water quality compliance; (3) regulations; (4) federal reporting; (5) variances and exemptions; (6) enforcement actions; (7) sanitary surveys; and (8) operator and mailing. The MSIS uses standardized forms to record data, including forms for: (1) bacteriological contaminants regulation; (2) turbidity regulation; (3) variances and exemptions; (4) enforcement actions; (5) laboratory table input; (6) chemical analysis; (7) violation record; (8) public water system inventory; (9) bacteria population table; (10) lists of samples in violation of chemical and radiological standards; (11) regulations on chemical, turbidity and bacteriological contaminants; and (12) code tables for contaminants, analysis methods, violations and treatment methods. Hopefully, the MSIS will eliminate the need for states to set up their own data collection systems and yet provide the flexibility to cover each situation. (Jordan-Florida)
W78-10811

A REPORT TO CONGRESS ON WATER POLLUTION CONTROL MANPOWER DEVELOPMENT AND TRAINING ACTIVITIES.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 596, Price codes: A05 in paper copy, A01 in microfiche. December 31, 1973, 97 p.

Descriptors: *Federal Water Pollution Control Act, *Law enforcement, *Manpower, *Personnel management, Administrative agencies, Human resources, Labor, Planning, Procurement, Regulation, Water quality control, Water pollution control.

Implementation of the 1972 Amendments to the Federal Water Pollution Control Act indicates that a greater number of new personnel and additional numbers of better trained personnel must be available to federal, state and local sectors than originally estimated. Such increases are attributed to intensified waste treatment plant construction; more stringent water quality standards and effluent limitations; increased regional, state and local planning requirements; and the administration and enforcement of a permit program. The current supply of professional scientists and engineers qualified in water pollution control cannot fill the technical requirements of the field under present circumstances. A 1973 study indicates serious impairments caused by under-staffing and under-training of operation and maintenance personnel. More highly skilled technicians are needed in activated sludge techniques, digestion, process control, and instrumentation in order to meet secondary treatment standards required by the new legislation. The Environmental Protection Agency water training programs continue to satisfy the needs of various employer groups and their employees. However, increased skill and knowledge requirements of personnel at all levels of government, industry and education dictate an intensified technical training effort. (Jordan-Florida)
W78-10812

IMPROVED FEDERAL AND STATE PROGRAMS NEEDED TO INSURE THE PURITY AND SAFETY OF DRINKING WATER IN THE UNITED STATES.
Comptroller General of the United States, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 288, Price codes: A05 in paper copy, A01 in microfiche. November 15, 1973, 84 p.

Descriptors: *Potable water, *Public health, *Water treatment, *Water works, Administrative agencies, Freshwater, Recreation, Safety, Water quality, Water supply, Water utilization, Domestic water.

Much public and congressional concern has been expressed about the capability of water purification plants to adequately protect the public against biological and chemical pollutants in the water. Although the classical communicable waterborne diseases, such as typhoid, cholera, and dysentary, were generally brought under control by the 1930's, outbreaks of communicable disease from contaminated drinking water continue to occur. Local governments and utilities are responsible for constructing, operating, and maintaining water supply systems and for taking samples of water for analysis. Although the drinking water used by most people in the United States is considered safe, recent Environmental Protection Agency (EPA) studies showed that potentially dangerous water was being delivered to some consumers, particularly by small water supply systems serving populations of 5000 or less. It is recommended that EPA's administration of the interstate carrier water supply program should be improved by making sure that: (1) laboratories used to conduct bacteriological tests are certified every three years; (2) more frequent sanitary surveys of the supply systems are made; and (3) classifications of systems are revised promptly when deficiencies are found. (Jordan-Florida)
W78-10813

REGULATION FOR TANK VESSELS ENGAGED IN THE CARRIAGE OF OIL IN DOMESTIC TRADE.
Coast Guard, Washington, DC. Office of Merchant Safty.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 719, Price codes: A15 in paper copy, A01 in microfiche. Report CG-M-07-77, August 15, 1975. 315 p.

Descriptors: *Coast Guard regulations, *Oil pollution, *Oil wastes, *Water pollution control, Water pollution, Pollutants, Oil, Administrative decisions, Discharge measurement, Barges, Environmental control, Federal government, United States, Regulations, Water pollution sources, Oil spills, Ships, Environmental effects.

This statement assesses the environmental impact of proposed changes to the pollution regulations in Title 33, Code of Federal Regulations, by adding regulations governing the design and operation of certain United States tankships certified to carry oil in the United States domestic trade. The regulations contain stringent discharge standards for both new and existing tank vessels and require the practice of load-on-top or retention-on-board methods to curtail the discharge of oil into the marine environment. Segregated ballast is required on new tankships over 70,000 deadweight tons. The regulations also set requirements for cargo tank size limits and improved tank vessel subdivision and stability. This statement presents information on economic and safety impacts of the proposed regulations. Among the alternative measures discussed are segregated ballast requirements to smaller and existing vessels, a requirement of double bottoms or double sides, and improvement of vessel maneuvering and stopping ability. The statement also contains information on sources of pollution from tank vessels, as well as results of a study of alternatives for distribution of required segregated ballast to provide protective spaces against collision or grounding damage. (Quarles-Florida)
W78-10815

FOREIGN NAVIES AND ENVIRONMENTALISM,
Naval Academy, Annapolis, MD.
For primary bibliographic entry see Field 6E.
W78-10816

SALINITY MANAGEMENT ALTERNATIVES FOR OIL SHALE WATER SUPPLIES,
Colorado State Univ., Fort Collins. Dept. of Economics.
G. E. Radosevich, G. V. Skogerboe, D. B. McWhorter, and W. R. Walker.
Natural Resources Journal, Vol. 17, No. 3, p 461-475 (July, 1977).

Descriptors: *Colorado River Basin, *Oil shale, *Salinity, *Water quality control, Colorado River, Interstate rivers, Irrigation water, Management, Oil, Percolating water, Saine water intrusion, Energy.

Considerable attention has been given recently to the problem of salinity in the Colorado River. Increasing salinity concentrations are threatening the utility of water resources in the downstream areas of Arizona, California, and the Republic of Mexico. At the same time, the Upper Colorado River Basin, because of its vast reserves of oil shale and near-surface coal, is becoming one of the most important areas in the United States for energy development. However, energy development will also result in increased salinity levels in the Colorado River unless mitigating alternatives are employed. The principle problem regarding return flows from oil shale plants will occur as the result of processed shale waste disposal piles. Any water percolating through the waste piles will result in considerable salt pickup. Revegetation and proper irrigation will do much to alleviate surface and subsurface return flows. Other possibilities include desalinization or deep well injection. The basin-wide, non-degradation salinity policy for the lower stem of the Colorado River requires that each development, including oil shale mining, offset any salinity detriments by making improvements on-site or somewhere else in the Colorado River Basin. (Jordan-Florida)
W78-10825

PROBLEM IDENTIFICATION, LEGAL ASPECTS OF FLOOD CONTROL, ALTERNATIVE CONTROL MEASURES.
Pikes Peak Area Council of Governments, Colorado Springs, CO.
For primary bibliographic entry see Field 6E.
W78-10827

FOURTH CIRCUIT RULES EPA MAY ISSUE PRESUMPTIVELY VALID EFFLUENT LIMITATIONS UNDER SECTION 301 OF THE FWPCA.
For primary bibliographic entry see Field 6E.
W78-10828

CARTER ENVIRONMENTAL MESSAGE STRESSES ADMINISTRATION, ENFORCEMENT,
For primary bibliographic entry see Field 6E.
W78-10829

EPA CHARTS POLICY FOR DEADLINE ENFORCEMENT,
For primary bibliographic entry see Field 6E.
W78-10830

EFFLUENT CHARGES AS AN ALTERNATIVE TO REGULATIONS,
For primary bibliographic entry see Field 6E.
W78-10834

FLORIDA'S AREA OF CRITICAL STATE CONCERN: AN UPDATE,
Florida Bureau of Land and Water Management, Tallahassee. Div. of State Planning.
For primary bibliographic entry see Field 6E.
W78-10835

TROUBLE AHEAD FOR CLEAN WATER,
Natural Resources Defense Council, New York.
For primary bibliographic entry see Field 6E.
W78-10837

THE ROLE OF INTERSTATE COMMISSIONS IN GROUNDWATER PROTECTION--THE SUSQUEHANNA RIVER BASIN COMMISSION PERSPECTIVE,
Susquehanna River Basin Commission, Mechanicsburg, PA.
J. Hollowell.
Water and Sewage Works, Vol. 124, No. 9, p 102, 105 (September, 1977).

Descriptors: *River basin commissions, *Interstate rivers, *Interstate commissions, State governments, Rivers, Water pollution control, Water quality control, Waste water disposal, Maryland, Pennsylvania, New York.

The Susquehanna River Basin Commission was created as a unique institution to deal with the complex problems of regional planning for the protection of water quality. Through the Commission, the states of New York, Pennsylvania and Maryland, and the United States government formally recognized their joint interest and responsibility to provide for effective and economical coordination of water resources efforts and programs for the conservation, management and control of the water and related natural resources of the Susquehanna River Basin. The Commission has a 50-member staff including engineers, planners, an economist, a geologist and a biologist. Although any one of the participating governmental bodies may issue permits for river projects, they must not contravene the goals or policies of the comprehensive plan. There has been a growing number of applications to the Commission for permits to discharge wastewater into the ground. The Commission has procedures by which to review the actions of individual members, and though such procedures has evaluated the issuance of those permits. This article summarizes the findings and recommendations of the Commission. (Stump-Florida)
W78-10839

WATER ACT'S OIL SPILL NOTIFICATION RULE SURVIVES CONSTITUTIONAL CHALLENGES.
For primary bibliographic entry see Field 6E.
W78-10843

SURFACE MINING RECLAMATION AND ENFORCEMENT PROVISIONS.
Office of Surface Mining, Reclamation and Enforcement, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-10845

FEDERAL WATER POLLUTION CONTROL ACT ENFORCEMENT FROM THE DISCHARGER'S PERSPECTIVE: THE USES AND ABUSES OF DISCRETION,
Arnold and Porter, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-10846

OCEAN DUMPING REVISITED: NEW STATUTORY DEADLINE MAY NOT STOP SEA DISPOSAL OF SEWAGE SLUDGE.
Environmental Law Reporter, Vol 7, No 12, p 10226-10229 (December, 1977).

Descriptors: *Sludge disposal, *Oceans, *Sewage disposal, *Water pollution sources, Water pollution, Permits, Regulation, Coasts, Shores, Water law, Sewage sludge, Legislation.

In November, 1977, President Carter signed into law an amendment to the Marine Protection, Research and Sanctuaries Act that is aimed at banning the ocean dumping of municipal sewage sludge after December 31, 1981. The amendment bolsters an existing provision in the Environmental Protection Agency's (EPA) ocean dumping regulations which prohibits the issuance of interim permits for ocean sewage sludge dumping beyond that date. The EPA has made heavy use of interim permits, which represents its policy of allowing contaminant levels above the regulatory ceilings for a relatively short time in order to aid dumpers to gradually switch to alternative disposal methods. The EPA's progress in phasing out ocean dumping has been steady, but too slow for those congressmen from coastal states whose offshore waters were bearing the environmental burden of ocean dumping. The author criticizes this legislative dumping deadline on three counts: it contains a caveat which may destroy its effectiveness; it assumes that economically and technologically feasible alternative methods of sludge disposal can be implemented by 1981; and sewage sludge represents only a small part of the potentially harmful material dumped into the oceans each year. (Stump-Florida)
W78-10847

THE MOVE TO AMEND S404 OF FWPCA: HOUSE PASSES BILL LIMITING FEDERAL AUTHORITY OVER DREDGE-AND-FILL ACTIVITIES.
For primary bibliographic entry see Field 6E.
W78-10848

EPA AUTHORITY AND RESPONSIBILITY UNDER THE COASTAL ZONE MANAGEMENT ACT OF 1972,
Environmental Protection Agency, San Francisco, CA. Region IX.
For primary bibliographic entry see Field 6E.
W78-10851

THE NEW FEDERAL WATER POLLUTION CONTROL ACT AND ITS IMPACT ON NUCLEAR POWER PLANTS,
Consolidated Edison Co. of New York, Inc., New York.
J. P. Davis.
Nuclear Safety, Vol 15, No 3, p 262-73, May-June, 1974.

Descriptors: *Federal Water Pollution Control Act, *Federal jurisdiction, *Water pollution control, *Effluents, *Permits, Pollution abatement, Legislation, Water pollution, Administrative agencies, Nuclear power plants, Water pollution sources, Legal aspects, Water quality control, Thermal pollution, Electric power plants, Nuclear wastes, Water cooling.

The Federal Water Pollution Control Act Amendments of 1972 (FWPCA) created a comprehensive water pollution control system with a two step program for compliance with efficient limitations. Under this program, utilization of the 'best practicable control technology currently available' must be achieved by 1977 and effluent limitations reflecting the 'best available technology economically achievable' must be realized by 1983. This article summarizes the FWPCA giving special emphasis to provisions which affect nuclear power plants. For example, nuclear power plants must now meet seven effluent limitation standards, especially toxic discharge limits, to obtain discharge permits required for continued operation. In addition the Environmental Protection Agency (EPA) has been given the authority to regulate nuclear power plant discharge through its National Pollution Discharge Elimination System permit program. Nuclear power plants must meet the 1977 and 1983 standards unless they can show that the proposed limitations are more stringent than necessary to assure protection and propagation of a 'balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made. Lastly, the EPA has been given broad inspection and monitoring powers under the FWPCA. Severe civil and criminal penalties are prescribed for noncompliance. (Spector-Florida)
W78-10861

LIABILITY FOR MARITIME OIL POLLUTION: A COMPARISON OF THE MAINE COASTAL CONVEYANCE ACT WITH FEDERAL LIABILITY PROVISIONS.
For primary bibliographic entry see Field 6E.
W78-10863

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.
For primary bibliographic entry see Field 6E.
W78-10864

UNITED STATES V. VELSICOL CHEMICAL CORP. (POLLUTION OF NAVIGABLE RIVER RESULTING FROM DISCHARGE INTO CITY WASTE WATER COLLECTION SYSTEM).
For primary bibliographic entry see Field 6E.
W78-10869

REVIEW OF PROJECTS AFFECTING SOLE SOURCE AQUIFERS.
For primary bibliographic entry see Field 6E.
W78-10882

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD V. SUPERIOR COURT OF KERN COUNTY (AN EXCEPTION TO EXHAUSTION OF ADMINISTRATIVE REMEDIES DOCTRINE).
For primary bibliographic entry see Field 6E.
W78-10884

NATURAL RESOURCES DEFENSE COUNCIL, INCORPORATED V. COSTLE (WATER QUALITY CONTROL REQUIRED BY FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W78-10885

OIL POLLUTION PREVENTION.
For primary bibliographic entry see Field 6E.
W78-10889

WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 6E.
W78-10890

STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM.
For primary bibliographic entry see Field 6E.
W78-10891

ENVIRONMENTAL DEFENSE FUND, INCORPORATED V. EAST BAY MUNICIPAL UTILITY DISTRICT (UNSUCCESSFUL ACTION TO FORCE UTILITY DISTRICT TO RECLAIM WASTE WATER, RATHER THAN PURCHASE WATER FROM FEDERAL RECLAMATION BUREAU).
For primary bibliographic entry see Field 6E.
W78-10894

STATE EX REL ASHCROFT V. UNION ELECTRIC COMPANY (NORMAL ACTIVITIES OF POWER GENERATING PLANT NOT PROSCRIBED BY STATE STATUTES EVEN THOUGH THEY RESULT IN OXYGEN DEFICIENT WATER DISCHARGE).
For primary bibliographic entry see Field 6E.
W78-10895

NATIONAL INDEPENDENT MEAT PACKERS ASSOCIATION V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EFFLUENT REGULATIONS FOR MEAT PROCESSORS).
For primary bibliographic entry see Field 6E.
W78-10899

FORD MOTOR COMPANY V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (ADMINISTRATIVE GUIDELINES NECESSARY TO DENYING PERMITS).
For primary bibliographic entry see Field 6E.
W78-10900

BURGESS V. M/V TAMANO (OIL SPILL ACCIDENT CAUSED BY MISPLACED BUOY).
For primary bibliographic entry see Field 6E.
W78-10901

VILLANI V. BERLE (ACTION BY NEW YORK COMMISSIONER OF ENVIRONMENTAL CONSERVATION TO CLOSE SHELLFISH LANDS IN NEW YORK BAYS UPHELD).
For primary bibliographic entry see Field 6E.
W78-10903

RESERVE MINING COMPANY V. HERBST (DESIGNATION OF ALTERNATE WASTE DISPOSAL SITE AS 'FEASIBLE AND PRUDENT').
For primary bibliographic entry see Field 6E.
W78-10904

MOBIL OIL CORPORATION V. KELLEY (STATE JURISDICTION OVER WATER POLLUTION).
For primary bibliographic entry see Field 6E.
W78-10906

ENHANCEMENT OF RELEASES FROM A STRATIFIED IMPOUNDMENT BY LOCALIZED MIXING, OKATIBBEE LAKE, MISSISSIPPI,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
M. S. Dortch, and S. C. Wilhelms.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A051 794, Price codes: A02 in paper copy, A01 in microfiche. Miscellaneous Paper H-78-1, January 1978. 15 p, 1 tab, 2 pl.

Descriptors: *Stratification, *Stratified flow, *Mixing, *Impoundments, Water quality, *Okatibbee Lake(Miss), Mississippi, Lakes.

Tests were conducted at Okatibbee Lake, Mississippi, to evaluate the effectiveness of localized mixing for enhancing the quality of low-level, low-flow releases from a stratified impoundment. A low-energy mechanical pump (Garton pump) that consisted of a submerged ventilating fan driven by a 1.12-kw electric motor was positioned immediately upstream of and above the low-level intake. Epilimnion water was forced toward the lake bottom where it was mixed with hypolimnion water and then released through the fixed low-level flood control outlet. The quality of this water mixture was an improvement over the quality of the water released without the pump operating. It was estimated that the epilimnion water comprised about 50 percent of the total release. Use of a Garton pump to induce localized mixing upstream of a fixed low-level flood control outlet was demonstrated to be an effective and economical means of improving the quality of low-flow releases from a stratified reservoir. (WES)
W78-10950

OIL POLLUTION ON ISRAELI COASTS,
Oil Pollution South East Kent, Dover (England).
For primary bibliographic entry see Field 5B.
W78-10968

CATTLE, RAINFALL AND TSETSE IN AFRICA,
Oxford Univ. (England). Animal Ecology Research Group.
D. Bourn.
Journal of Arid Environments, 1978, Vol. 1, p 49-61. 3 tab, 6 fig, 26 ref.

Descriptors: *Animal diseases, *Epidemiology, *Vectors(Biological), *Insect control, *Tsetse, Pasture management, Africa, Carrying capacity, Environmental effects.

As population pressure has increased in Africa, the need to develop previously unexploited land has become critical. Tsetse (Glossina ssp) and the diseases it transmits are present on ten million Km2 of the continent and causes major constraints in the development of potentially valuable land. Tsetse control and eradication programs have, with the exception of Nigeria, Uganda, Rhodesia and S. Africa, met with only limited success. Ironically, the most dramatic implications of the tsetse programs have been from direct effects of control measures but rather from the resultant overexploitation and mismanagement of reclaimed land. In the higher rainfall areas, ecological damages tend to be the result of arable malpractice, while in the dry regions it is associated with mismanagement of livestock. This study determines the relationship between cattle distribution, rainfall, and tsetse infestation for Africa as a whole and Ethiopia in particular and compares it to the predicted optimum carrying capacity for large herivores. A linear relationship is found between cattle biomass and rainfall in tsetse-free countries in Africa while cattle biomass in countries and sub-provinces with heavy infestations is substantially lower than in tsetse-free areas. Even when tsetse is eradicated from higher rainfall areas, these same areas are often degraded through mismanagement and over-exploitation. (Tickes-Arizona).
W78-10975

REESTABLISHMENT OF WOODY PLANTS ON MINE SPOILS AND MANAGEMENT OF MINE WATER IMPOUNDMENTS: AN OVERVIEW OF FOREST SERVICE RESEARCH ON THE NORTHERN HIGH PLAINS,
Rocky Mountain Forest and Range Experiment Station, Rapid City, SD. Forest Research Lab.
A. J. Bjugstad.
In: The Reclamation of Disturbed Arid Lands, Robert A. Wright, ed. University of New Mexico Press, Albuquerque, 1978, p 3-12, 2 fig, 10 ref.

Descriptors: *Revegetation, *Mine wastes, *Mine water, *Land reclamation, *Soil reclamation, Land development, Land management, Coal mine wastes, Chemical wastes, Wildlife management, Drip irrigation, Mine drainage, Soil chemical properties, Soil physical properties, Great Plains, Wyoming, *Rocky Mountain Region.

This project was initiated by the Rocky Mountain Forest and Range experiment station with the purpose of developing techniques for revegetating mine spoils and associated waters to enhance the habitat for non-game birds, deer, small mammals and waterfowl. This particular study is concerned with the Williston and Powder River Basins of the Northern Great Plains Province in the Fort Union Formation. The climates, vegetation and land use of these two basins are variable and contain continental, temperate and semiarid regions depending upon average precipitation. This area, heavily mined for lignite and subbituminous coal and bentonite clay, is being studied to develop guidelines for the establishment or reestablishment of woody species adaptable to draws and upland sites. Research has shown that dryland techniques for the reestablishment of shrub and tree species has been moderately successful on bentonite and low-salt coal spoils with green ash having a survival rate of 44% followed by Rocky Mountain juniper and Russian Olive (24%) and

buffaloberry, Siberian peashrub, Ponderosa pine and American plum all at 7% or less. Other studies are being carried out on the use of drip irrigation, greenhouse-grown containerized planting stock, and various cultural treatments such as the use of straw, fiber mulches, fertilizer and overhead irrigation. A program to study the rehabilitation and management of impounded mine and water was begun in 1976 and is aimed at assessing how the quality of impounded water in strip mined areas relates to habitat of wildlife including aquatic organisms. Chemical and physical properties are being analyzed in an effort to develop a variety of beneficial uses for this water. (Tickes-Arizona)
W78-10982

RESTORATION OF PRODUCTIVITY TO DISTURBED LAND IN THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Mandan, ND. Northern Great Plains Research Center.
J. F. Power, F. M. Sandoval, and R. E. Ries.
In: The Reclamation of Disturbed Arid Lands, Robert A Wright, Ed. University of New Mexico Press, Albuquerque, 1978, p 33-49. 8 tab, 1 fig, 13 ref.

Descriptors: *Land reclamation, *Water reuse, Land development, Productivity, Coal mine wastes, Chemical wastes, Spoil banks, Mine water, Environmental factors, *Revegetation, *Great Plains, Recreation, Grazing, Root development, Wildlife habitats.

The increasing development of the Northern Great Plains coal fields has caused much concern in recent years over the resulting social, economic and environmental problems in this area. This paper is a review of current information on the potential for restoration of agricultural productivity to the area with special emphasis upon available natural resources and how they can be recombined for the most beneficial effect. The problem is essentially one of creating an environment on the surface mined lands that will be conducive to the efficient utilization of available water by productive vegetation. It is argued that all types of post mining land use - agricultural, grazing, wildlife, recreation, etc. - are dependent upon successful revegetation. The task, especially in the arid and semi-arid regions, is one of creating a plant rooting medium in which rainwater will be stored within the rooting zone. Effort must then be directed toward maintaining such conditions while extracting coal. Disruption of surface and groundwater regimes is inevitable although preliminary research indicates that favorable conditions can be restored by proper earth moving activities. More research is needed in this area as well as in the area of restored wildlife habitats and other ecological niches but future legislation and management practices must be based upon the natural sciences involved. (Tickes-Arizona)
W78-10983

ASSESSMENT OF WATER QUALITY IMPACTS OF A WESTERN COAL MINE,
Argonne National Lab., IL. Land Reclamation Program.
E. H. Dettmann, and R. D. Olsen.
In: The Reclamation of Disturbed Arid Lands, Robert A. Wright, ed. University of New Mexico Press, Albuquerque, 1978, p 53-67, 4 tab, 2 fig.

Descriptors: *Water quality, *Mine water, *Water pollution sources, Mine drainage, Water analysis, Water reclamation, Coal mine wastes, Nitrate nitrogen, Phosphates, *Wyoming, Ammonium compounds, Nitrogen compounds.

The potential impact of western states coal mining upon the resulting water supplies is determined by the mining technology used and the associated hydrolic, meteorologic, and geologic characteristics of the mine locality. To determine the effect of these factors upon water quality, a study was carried out in the vicinity of the Big Horn Mine in the northwestern part of the Powder River Basin, Wyoming, between 1975-1976. Water quality was monitored upstream and downstream of mine discharge points and included measurements of PH, specific conductance, alkalinity, chloride, fluoride, sulfate, nitrogen, phosphorus and 16 metals and trace elements. All samples for a given month were collected on the same day from the two perennial streams which traverse the mine site, Goose Creek, and the Tongue River. Although many parameters were measured, the results reported were confined to the highly soluble constituents and related parameters that do not readily enter into chemical or biological reactions. Large changes in stream water quality were found only in the upstream reaches of Goose Creek and Tongue River watersheds, an intensively farmed area. Trace elements concentrations were relatively low at all stream and mine discharge points while ammonium and nitrate concentrations were found to be elevated. Ammonium nitrate explosives may have caused the elevated reading and the authors suggest that a cumulative effect of this nitrogen loading could be hazardous. Only minor effects of salinity were detected. In general, the effect of the Big Horn mine on concentrations of the dissolved and highly soluble constituents in the Tongue River was found to be small and within the range of analytical precision and short term variation in ambient concentrations. This appears to be due to the large quantities of dilution water available in the Tongue River relative to mine discharges. (Tickes-Arizona)
W78-10984

POTENTIALS AND PREDICTIONS CONCERNING RECLAMATION OF SEMIARID MINED LANDS,
Montana Agricultural Experiment Station, Bozeman.
R. L. Hodder.
In: The Reclamation of Disturbed Arid Lands, Robert A. Wright, ed. University of New Mexico Press, Albuquerque, 1978, p 149-154.

Descriptors: *Land reclamation, *Soil management, *Coal mine wastes, Land management, Strip mine wastes, Chemical wastes, Spoil banks, Mine water, Mine drainage, Wildlife management, Range management, Environmental impact, Economic planning, Watershed management, Groundwater, Project planning, Forecasting.

Reclamation of mined areas in the semi-arid regions of the Western U.S. involves the analysis of multiple and interrelated site specific conditions. In describing the needs for careful preplanning investigations, this author reviews important subjects concerned either directly or indirectly with sustained reclamation efforts, including range and wildlife inventories, soil surveys, land use and grazing patterns, watershed and groundwater studies, archeological review, and overburden analysis. Core sampling, overburden analyses and three dimensional mapping are essential preplanning inventories in making realistic and reliable decisions. Other subjects considered by the author include surface water impoundments, aquifer potential and depth, and various cultural practices such as seedbed preparation and vegetation selection. It is maintained that reclamation must realistically and permanently fulfill a local economic need or it will be misused and of temporary existence. (Tickes-Arizona)
W78-10985

SOME APPLICATIONS OF HYDROLOGIC SIMULATION MODELS FOR DESIGN OF SURFACE MINE TOPOGRAPHY,
Agricultural Research Service, Fort Collins, CO.
R. E. Smith, and D. A. Woolhiser.
In: The Reclamation of Disturbed Arid Lands, Robert A. Wright, ed. University of New Mexico Press, Albuquerque, 1978, p 189-196. 3 fig, 8 ref.

Descriptors: *Hydrologic simulation, *Simulation analysis, Dynamic programming, System analysis, Experimental models, Computer models, Analytical techniques, Theoretical analysis, Surface water hydrology, Land reclamation, Surface erosion, Hydraulic erosion, Soil physical properties, Soil chemical properties, Land reclamation, Coal mine wastes, Mine wastes.

A brief discussion is presented of the potential utilization of hydrologic simulation models in studying surface water hydrology of reclaimed areas. It is contended that if models properly reflect processes and interactions in nature they can be used successfully to rank alternate reclamation treatments without the precise parameter values needed to predict the quantitative result of a particular treatment. An example is presented which illustrates the adequacy of a simulation model in constructing sequences of statistically representative precipitation for simulation and in comparing the hydraulic response of various possible topographic treatments; however, because reclamation problems often vary considerably from conditions for which the model has proven useful, there is a present need to establish a wider range of parameters for hydraulic erosion rates, physical relations between soil properties and erosion susceptibility and relations between density of cover and hydrologic effects. The greatest challenge for simulation modelling now lies in quantifying the dynamic changes and interrelations of erosion, vegetal establishment and surface hydraulics on reclaimed areas.
W78-10986

WATER QUALITY IMPACTS OF HARVESTING AND REGENERATION PRACTICES,
Southern Forest Experiment Station, Oxford, MS. Forest Hydrology Lab.
For primary bibliographic entry see Field 5B.
W78-10996

THE APPROACHING CRISIS IN THE REGISTRATION OF FISHERY CHEMICALS,
Fish and Wildlife Service, La Crosse, WI. Fish Control Lab.
F. P. Meyer, and R. A. Schnick.
In: Proceedings of the Thirtieth Annual Conference, Southeastern Association of Fish and Wildlife Agencies, October 24-27, 1976. Jackson, Mississippi. p 5-14, 3 tab, 14 ref.

Descriptors: *Water quality standards, *Fish management, *Fish control agents, *Pesticides, *Herbicides, *Piscicides, *Aquiculture, *Public health, Hazards, *Toxicity, *Lethal limit, *Laboratory tests, Fish populations, Productivity, Environmental effects, Pesticide residues, Analytical techniques, Wildlife, 2-4-D, Copper sulfate, Path of pollutants, *Therapeutic agents, Food and Drug Administration, *Fishery chemicals, Registration, *Sublethal effects.

Review of the status of chemicals used in fisheries indicates that many lack proper registrations. Regulations of the U.S. Environmental Protection Agency and U.S. Food and Drug Administration require that all existing registrations be reviewed and reregistered by October 1977. Adequate data to support reregistration are lacking for some of the most widely used chemicals. Applications of unregistered compounds are strictly prohibited under penalty of law. All phases of fishery management are directly affected. The loss of therapeutants, anesthetics, herbicides, and piscicides will be reflected in lower hatchery production, fish of poorer quality, and increased costs. Survival of fish that are in poor health when stocked will be reduced. Loss of the use of chemicals to reclaim or renovate lakes and streams will further reduce the success of stocking programs and increase management costs. Commercial producers may be unable to cope with disease and water quality problems. Researchers will be unable to maintain experimental animals in con-

sistently uniform health or to obtain high quality stock without significantly increased costs. (EIS-Katz)
W78-11008

PRELIMINARY OBSERVATIONS ON THE PRODUCTIVITY OF PERIPHYTON ATTACHED TO FRESHWATER ARTIFICIAL TIRE REEF,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
For primary bibliographic entry see Field 5C.
W78-11021

SOME RESULTS OF INVESTIGATIONS OF THE CYCLE OF MATTER AND THE BIOLOGICAL SELF-PURIFICATION OF LAKES AND STREAMS,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W78-11022

ASSESSING THE SOCIAL EFFECTS OF WATER QUALITY MANAGEMENT PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
G. E. Willeke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 710, Price codes: A05 in paper copy, A01 in microfiche. Report ERC 03-78, April 1978. 71 p, 6 fig, 3 tab, 14 ref, append. OWRT A-067-GA(1), 14-34-0001-6011.

Descriptors: *Social impact, *Economic impact, Equity, *Carrying capacity, Planning, Water quality control, Management, *City planning, *Methodology, *Cost analysis, *Subsidies, *Wastewater management, Urban development, Atlanta(Ga).

An assessment of social and economic effects of wastewater management plans in the Atlanta, Georgia metropolitan region was attempted. It was undertaken partly for development and testing of methodology and data base requirements, and partly for effect assessment per se. A ground-up community analysis was the initial methodological approach. It was not successful because issue salience shifted to the very visible issues of water supply shortly after the wastewater planning began. Delays in plan preparation and dissemination and the lack of an effective public participation program further hampered this approach. A macro-analysis, focusing on community development over time was adopted as the second approach. This analysis relied heavily upon map interpretation for the period of rapid growth, 1959-1975. Records on sewer and water line construction were too poor to be used without extensive work. Theoretical analysis centered on issues of cost incidence and subsidies provided by existing residents to new residents, and carrying capacity. The widely scattered development pattern of Dekalb County in the late 1960s and early 1970s suggests the consideration of service districts and rate structure revision to reduce the amount of subsidy provided by existing residents to new residents. The value of ad valorem taxes for paying sewer construction costs under certain conditions is also demonstrated. Carrying capacity is re-interpreted to make it useful in the context of urban development, where social, political, and economic decisions are very important relative to natural factors such as soils and water availability. Carrying capacity is multidimensional, dynamic, and socially defined. Information requirements for its use are discussed.
W78-11062

PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME I. SUMMARY REPORT AND VERIFICATION.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 901, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-179a, August 1977. 59 p, 5 fig, 2 tab, 6 ref.

Descriptors: Water quality, Return flow, Irrigation, Irrigation effects, Model studies, Salinity, Dissolved solids, Simulation analysis, Groundwater, Hydrology.

This volume outlines the purpose and scope of the return flow research and explains the capabilities of the conjunctive use model for predicting the mineral quality of irrigation return flow. The purpose of the research was to develop a conjunctive use model for predicting the mineral quality of irrigation return flow. The purpose of the research was to develop a conjunctive use model which would (1) predict the salinity contribution from new irrigation projects and (2) predict the change in return flow salinity that would result from operational changes on existing projects. The model describes the chemical quality in terms of eight ionic constituents and total dissolved solids. A nodal concept has been used to facilitate subdividing the project area along physical or hydrologic boundaries as desired. The study may be limited to 1 or as many as 20 nodes. (See W78-11089 thru W78-11092) (Skogerboe-Colorado State)
W78-11088

PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME II. VERNAL FIELD STUDY.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 902, Price codes: A08 in paper copy, A01 in microfiche. Publication No. EPA-600/2-77-179b, August, 1977. 106 p, 45 fig, 9 tab, 1 append.

Descriptors: Utah, Groundwater, Water quality, Irrigation, Irrigation water, Return flow, Crop production, Soil chemistry, Simulation analysis.

This volume details the field investigations conducted to develop and validate the 'Simulation Model of Conjunctive Use and Water Quality for a River System of Basin' as given in Volume III. The studies were conducted in Ashley Valley, near Vernal, Utah. The investigations included: the quantity and quality of groundwater, irrigation water, and return flows; crop inventory and consumptive use; soil chemistry; and hydrological units to define nodes. (See also W78-11088) (Skogerboe-Colorado State)
W78-11089

PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME III. SIMULATION MODEL OF CONJUNCTIVE USE AND WATER QUALITY FOR A RIVER SYSTEM OR BASIN, USER'S MANUAL.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 903, Price codes: A13 in paper copy, A01 in microfiche. Publication No. EPA-600/2-77-179c, August, 1977. 285 p, 43 fig, 18 tab, 1 append.

Descriptors: Computer programs, Simulation analysis, Model studies, Irrigation, Irrigation effects, Return flow, Water quality.

This volume documents the development of a digital computer coded simulation model to predict the effect of irrigation of agricultural lands on the resulting irrigation return flow quality. The model is capable of simulating conjunctive uses of water, however, validation for this purpose was not purpose was not performed. The model developed in this volume is much less rigorous than that presented in Volume V, however, it can be used to provide an assessment of water quality trends due to irrigation at much less cost than the detailed model. A user's manual is included. (See also W78-11088) (Skogerboe-Colorado State)
W78-11090

PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME IV. DATA ANALYSIS UTILITY PROGRAMS.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 904, Price codes: A11 in paper copy, A01 in microfiche. Publication No. EPA-600/2-77-179d, August, 1977. 222 p, 1 ref.

Descriptors: Return flow, Irrigation effects, Water quality, Computer programs, Model studies, Simulation analysis.

This volume contains a description of the data analysis subroutines developed to support the modeling effort described in Volume III. The subroutines were used to evaluate and condition data used in the conjunctive use model. The subroutines include (1) regression analysis, (2) Gaussian probability function, (3) Beta distribution, and (4) Pearson's incomplete gamma function. For each of these subroutines, a brief theory is given plus a program listing and sample problem. (See also W78-11088) (Skogerboe-Colorado State)
W78-11091

PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW, VOLUME V, DETAILED RETURN FLOW SALINITY AND NUTRIENT SIMULATION MODEL,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
M. J. Shaffer, R. W. Ribbens, and C. W. Huntley.
Available from the National Techical Information Service, Springfield, VA 22161 as PB-272 705, Price codes: A11 in paper copy, A01 in microfiche. Report EPA-600/2-77-179e, August 1977. 228 p, 30 fig, 17 tab, 24 ref, append. 1HB617, EPA-IAG-D4-0371.

Descriptors: *Mathematical models, Digital simulation, Scheduling, Irrigated land, Evapotranspiration, Agriculture, Water pollution, Water loss, *Water quality control, *Salinity, *Nutrients, *Irrigation return flow.

A return flow quality simulation model is described which models the plant-soil-aquifer system from the soil surface to a tile or open drain. Processes simulated include evapotranspiration, unsaturated and saturated water flow, solution-precipitation of slightly soluble salts, ion exchange, ion pairing, nitrogen transformations, crop uptake of nitrogen, and the movement and redistribution of salts and nutrients. The dynamic non-steady-state model predicts the concentrations of calcium, magnesium, sodium, ammonium, bicarbonate, carbonate, chloride, sulfate, N03-N, and Urea-N contained in soil, aquifer, and drain water. Concentrations of organic-N; exchangeable calcium, magnesium, sodium, and ammonium; and gypsum are predicted within the soil and aquifer materials. Users' manuals for each basic subprogram are included, and a sample problem illustrates the use of the model. Model output can serve as input to the conjunctive use model. Model output can serve as input to the conjunctive use model described in Volume III; serve as input to other models on a nodal or point source basis; or stand alone depending on the type and scope of the particular study. (See also W78-11088)
W78-11092

THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS AND MINING OPERATIONS: AN OIL AND GAS LAWYER'S VIEW,
Hanna and Morton, Los Angeles, CA.
E. S. Renwick.
Rocky Mountain Mineral Law Institute, Vol. 23, p 975-1012 (1977).

Descriptors: *Economic impact, *Oil industry, *Potable water, *Water quality standards, Regulation, Standards, Permits, Pollution abatement, Administrative agencies, Water pollution treatment, Federal government.

The Federal Safe Drinking Water Act (SDWA) authorizes the federal Environmental Protection Agency (EPA) to establish harmful contaminant level standards applicable to all public water systems. EPA is also authorized by the SDWA to establish a joint federal-state system to ensure compliance with the standrds, and to protect underground sources of drinking water. The author of this article agrees that no-one would question the desirability of safe drinking water, but he questions the necessity for the SDWA. Statistics show only 20 deaths from disease or poisoning were attributed to drinking water in the 10-year period from 1961-1970. These numbers are minute compared to many other hazards to which humans are subject. Problems which will be faced by oil and gas operators as a result of the SDWA are also identified and discussed. The author argues that the Environmental Protection Agency may not have the requisite authority to impose these new regulations on states with existing standards, and concludes that the best way to achieve SDWA goals is to develop adequate state regulations. (Stump-Florida)
W78-11153

THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS, AND MINING OPERATIONS: BITTERSWEET OR UNPALATABLE,
Saunders, Snyders, Ross and Dickerson, Denver, CO.
J. W. Sanderson.
Rocky Mountain Mineral Law Institute, Vol. 23, p 941-974 (1977).

Descriptors: *Oil industry, *Economic impact, *Water quality standards, *Potable water, Permits, Regulation, Standards, Water pollution treatment, Pollution abatement, Administrative agencies, Water pollution control, Mining.

The real effect on oil, gas and mining operations of the Federal Safe Drinking Water Act (SDWA) will not be known for several years. However, the SDWA has created a significant amount of alarm and generated voluminous amounts of public comments. The implementation of the 1972 Federal Water Pollution Control Act (FWPCA) Amendments has produced a relatively straightforward procedural program whereby National Pollutant Discharge Elimination System (NPDES) permits are issued for all point sources of pollution. While the FWPCA generally does not protect underground waters, legislative history indicates Congress' desire to have the Environmental Protection Agency's underground injection control (UIC) programs patterned after or incorporated into the NPDES program. This article examines the UIC proposals in great detail, and attempts to predict effects on oil, gas, and mining industries. Problems created by the new legislation--not the least of which is simply adapting to the new system--are identified and discussed. The need to identify and accumulate a greater amount of data, plus built-in procedural delays, will mean a longer period from project inception to completion. However, 'tapping' existing state resources of knowledge able employees should minimize all problems. (Stump-Florida)
W78-11154

WATER QUALITY MANAGEMENT PLANS AND THEIR IMPACT ON MINING OPERATIONS,
Burlington, White, Burke and Ipsen, Denver, CO.
H. W. Ipsen.
Rocky Mountain Mineral Law Institute, Vol. 23, p 551-594 (1977).

Descriptors: *Mine drainage, *Mine wastes, *Federal Water Pollution Control Act, *Water quality control, Mining, Water pollution sources, Water quality, Mine water, Legislation, Regulation, Pollution abatement, Comprehensive planning.

The probable effects of current governmental planning efforts designed to achieve Federal Water Pollution Control Act (FWPCA) goals are examined in this article. Regulatory features of water quality management plans and problems concerning the implementation and enforcement of these plans, specifically in the context of mining operations, are detailed. The controls developed in the governmental plans will to some degree regulate mining operations, and may go so far as to require the elimination of mining activities in various western states where serious water quality problems already exist. Pollution from surface and underground mines was a primary source of concern which led to the enactment of Section 208 of the FWPCA; however, the Environmental Protection Agency's interpretive guidelines support the view that the main regulatory thrust of Section 208 planning should be aimed at new sources rather than existing ones. The principle means of controlling mines and other sources under Section 208 will be the development of 'best management practices' to control nonpoint sources of pollution, and combining technological and economic considerations with water quality concerns. (Stump-Florida)
W78-11156

ENVIRONMENTAL LAW ISSUES IN THE DEVELOPMENT OF ENERGY RESOURCES,
Texas Tech Univ., Lubbock. School of Law.
For primary bibliographic entry see Field 6E.
W78-11160

THE DEEPWATER PORT ACT OF 1974: THE DEFINITION OF ADJACENT COASTAL STATES,
For primary bibliographic entry see Field 6E.
W78-11162

APPLICATION OF FEDERAL COMMON LAW OF PUBLIC NUISANCE TO INTRASTATE STREAM POLLUTION--COMMITTEE FOR CONSIDERATION OF JONES FALLS SEWAGE SYSTEM V. TRAIN,
For primary bibliographic entry see Field 6E.
W78-11173

FLORIDA SAFE DRINKING WATER ACT.
For primary bibliographic entry see Field 6E.
W78-11178

CONTROL, PREVENTION, AND ABATEMENT OF POLLUTION OF SURFACE WATERS.
For primary bibliographic entry see Field 6E.
W78-11182

STATE OF WASHINGTON V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (VALID EFFLUENT GUIDELINES NECESSARY FOR EPA AUTHORITY).
For primary bibliographic entry see Field 6E.
W78-11185

INLAND STEEL COMPANY V. ENVIRONMENTAL PROTECTION AGENCY (CURRENT PERMIT CAN INCLUDE CONDITION THAT SUBSEQUENTLY ADOPTED DISCHARGE STANDARDS WILL BE APPLICABLE TO DISCHARGER).
For primary bibliographic entry see Field 6E.
W78-11187

QUALITY OF IRRIGATION WATER AND SURFACE RETURN FLOWS FROM SELECTED AGRICULTURAL LANDS IN NEVADA DURING THE 1974 IRRIGATION SEASON,
Max C. Fleischmann Coll. of Agriculture, Reno, NV.
For primary bibliographic entry see Field 5B.
W78-11199

WASTEWATER MANAGEMENT PLANNING: SOURCES OF CONFLICT IN THE EVALUATION OF ALTERNATIVES,
Clark Univ., Worcester, Mass. Dept. of Environmental Affairs.
H. E. Schwarz, and B. M. Stern.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 001, Price codes: A06 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC, Pub. No. 91, December 1977. 104 p, 2 tab, 2 fig, 52 ref, 4 append. OWRT A-099-MASS(1), 14-34-0001-7046.

Descriptors: Planning, Project planning, *Alternative planning, Wastewater(Pollution), *Non-structural alternatives, Decision making, Social aspects, *Massachusetts, *Water pollution control, *Water quality standards, *Attitudes, Conflict resolution, *Wastewater management, 208 planning.

This study investigates one conflict in regional wastewater planning which received significant attention by laymen and professionals, the conflict between 'structural' and 'non-structural' solutions to wastewater problems. Interviews, questionnaires and secondary materials, e.g., reports, correspondence and policy papers were used to assess the problem in two study areas, the towns of Acton and Westminister. In addition to town officials and citizens, state and federal officials dealing with wastewater problems in general and the study areas in particular were interviewed, as were engineers and planners familiar with the problem. It was found: (1) that the conflict was rather between the traditional and centralized wastewater management alternatives, i.e., sewers and end-of-pipe treatment, and alternatives to that approach than between structural and non-structural measures; (2) that this conflict could exist within a town as well as between different levels of government; and (3) that the roots of conflict often lay in areas only indirectly related to wastewater management alternatives. (Lefferts-Mass)
W78-11202

THE EFFECTS OF ELEVATED LEVELS OF SODIUM IN COMMUNITY DRINKING WATER ON BLOOD PRESSURE DISTRIBUTION PATTERNS,
Massachusetts Univ., Amherst. Div. of Public Health.
E. J. Calabrese, and R. W. Tuthill.
Available from the National Technical Information Service, Springfield, VA 22161, Price codes: A03 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, Pub. No. 94, February 1978. 28 p, 3 tab, 1 fig, 77 ref, append. OWRT A-102-MASS(1), 14-34-0001-7046.

Descriptors: *Sodium, *Public health, Human diseases, *Potable water, Water quality standards, Epidemiology, Human pathology, *Distribution patterns, *Hypertension, Sodium standard, Drinking water standard, Road salt, *Massachusetts.

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High school sophomores residing in a community with elevated levels of sodium in the drinking water (108 mg/l) exhibited a marked upward shift in blood pressure distribution patterns for systolic and diastolic pressure when compared with students in an appropriately matched community with low sodium levels (8 mg/l). The females exhibited a blood pressure distribution pattern characteristic of persons 10 years older while for males the upshift was similar to that of a group approximately 2 years older. The data suggest that elevated levels of sodium in drinking water may exert an adverse effect on normal healthy persons. (Lefferts-Mass)
W78-11204

OIL SPILLS: THE POLICY OF PREVENTION AND THE STRATEGY OF RECOVERY,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
J. M. Conrad.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 931, Price codes: A05 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC Publication No. 93, October 1977. 88 p, 8 tab, 4 fig, 21 ref. OWRT A-087-MASS(1), 14-34-0001-6022.

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Statistical models, Planning, Nonstructural alternatives, *Stochastic processes, *Massachusetts, Water pollution control.

A model of offshore petroleum production is constructed which contains a stochastic spill process where the amount spilled in the current period is conditional upon previous period production and other distribution parameters. The role of liability rules within the stochastic spill model is examined and an optimal liability rule derived. Existing and proposed federal legislation as well as current international conventions are discussed and their efficacy as a policy for spill prevention is evaluated. It is concluded that liability rules alone are incapable of establishing a comprehensive policy of prevention, particularly when biological and amenity resources vary along a coastline. As such there is a definite need for regulation of petroleum traffic and for greater investment in the design and deployment of recovery systems. A model for the optimal location of recovery resources is developed and applied to coastal Massachusetts. Southern Cape Cod and the islands of Martha's Vineyard and Nantucket were found to be underprotected. (Lefferts-Mass)
W78-11205

WATER TREATMENT FOR SMALL PUBLIC SUPPLIES,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5F.
W78-11208

BENZIMIDAZOLE FUNGITOXICANTS IN VIRGINIA SOILS: MOVEMENT, DISAPPEARANCE, AND EFFECT ON MICROORGANISMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.
For primary bibliographic entry see Field 5B.
W78-11215

THE EFFECTS OF THE USE AND REGULATION OF SEPTIC TANK SYSTEMS UPON LAND USE IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional Planning.
J. H. Twichell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 007, Price codes: A05 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, Pub. No. 96, January 1978. 90 p, 4 fig, 14 tab, 32 ref, 3 append. OWRT A-103-MASS(1), 14-34-0001-7046.

Descriptors: *Septic tanks, Land development, Domestic wastes, *Land use, Non-structural alternatives, Urbanization, Zoning, *Massachusetts, Community development, Rural areas, Suburban areas, Pollution abatement, Water pollution control, Massachusetts Environmental Code, Urban-Growth Regulation, P.L. 92-500 Section 208.

This study explores some of the land use effects associated with the use of septic tank systems in Massachusetts. Documentation was achieved by mapping certain U.S. Census data, searching the literature, and interviewing people with knowledge of the subject. Attempting to preserve a sense of community character and protect the quality of 'rural' environment, some communities have strictly enforced the Massachusetts Environmental Code as a way to limit further residential and industrial development. However, the Code is not effective as a tool to guide the use of land. While its use may tend to limit the number of new homes that are built, the requirements for large lots also force each new home to use more land. At the same time, by encouraging single-family development, which demands many public services such as schools and hospitals, to the exclusion of other land uses, it can burden a community's tax structure. Furthermore, over-reliance upon the Code as a growth inhibitor without recognizing the limitations of septic systems and their requirements for maintenance, can force a community to later install expensive sewers should large numbers of systems begin to malfunction. (Lefferts-Mass)
W78-11216

RECOVERY OF SANITARY-INDICATOR BACTERIA FROM STREAMS CONTAINING ACID MINE WATER,
West Virginia Univ., Morgantown. Water Research Inst.
For primary bibliographic entry see Field 5A.
W78-11217

AQUACULTURE TECHNIQUES: WATER USE AND DISCHARGE QUALITY,
Idaho Univ., Moscow. Coll. of Fisheries, Wildlife and Range Sciences.
G. W. Klontz, I. R. Brock, and J. A. McNair.
Avaialable from National Technical Information Service, Springfield, VA 22161, as PB-285 956, price codes: A06 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, April 1978. 114p 7 fig, 22 tab, 5 append.

Descriptors: *Idaho, *Aquaculture, *Fish management, Water quality control, Water pollution, Fish, Fish farming, *Fish hatcheries, Fish handling facilities, Forecasting, Computer programs, *Growth rates.

The objectives were to develop and test methods of predicting waste product generation from aquaculture facilities. Factors involved in waste product generation were identified. Among the 40-plus factors having the capability of affecting production in an aquaculture facility, each factor interacted with one or more other fctors in a dependent or counterdependent manner. Factors chosen for testing were (1) feeding rate; (2) diet efficiency; (3) growth rate; (4) population density; (5) water replacement time; (6) oxygen consumption; (7) fish size; and (8) water temperature. Although there were other probable choices for consideration, these eight were chosen with the other fctors veing dependent functions. Significant results are : (1) The identificatin of factors not only involved with the generation of waste products from an aquaculture facility, but also having the potential of affecting the production of an aquaculture facility. (2) The development of a practical method for determining oxygen consumption of fish in varying controlled environmental conditions. (3) the development of a computerized program for fish growth in optimized loading conditions of population density and water replacement time. (4) The development of a method to predict more accurately the anticipated growth rate of a group of fish, which corrects the existing method. (5) The development of a method to predict the solids, both settleable and suspended, produced daily by a group of fish being held in know conditions.
W78-11219

A CRITICAL TECHNICAL REVIEW OF SIX ADDITIONAL HAZARD ASSESSMENT MODELS,
Enviro Control, Inc., Rockville, MD.
For primary bibliographic entry see Field 5B.
W78-11224

DETAILED BATHYMETRY OF SELECTED AREAS OF THE INNER CONTINENTAL SHELF OF THE VIRGINIAN SEA: SOUTHEASTERN VIRGINIA, VIRGINIA BEACH AND VACHAPREAGUE, VIRGINIA,
Virginia Inst., of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W78-11225

HYDROGRAPHY OF OREGON ESTUARIES PRIOR TO JUNE 1956,
Oregon State Coll., Corvallis. School of Science.
For primary bibliographic entry see Field 2L.
W78-11226

BRUNSWICK ESTUARY STUDY.
Georgia Dept. of Natural Resources Atlanta. Environmental Protection Div.
For primary bibliographic entry see Field 2L.
W78-11227

MARINE PASTURES: A BY-PRODUCT OF LARGE (100 MEGAWATT OR LARGER) FLOATING OCEAN THERMAL POWER PLANTS,
Lamont-Doherty Geological Observatory. Palisades, NY.
O. A. Roels.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-2581-2, Price codes: A11in paper copy, A01 in microfiche. Progress Report COO-2581-2, for the Period Feb. 1, 1976 to April 30, 1976, to U.S. Energy Research and Development Administration. 37 p. E(11-1)2581.

Descriptors: *Resources development, *Computer programs, *Powerplants, Baseline studies, Water quality, *Outer Continental Shelf, *Ocean thermal powerplants, *Floating powerplants, Chaetoceros, Tapes semidecussata.

Computer programs have been developed to define the temperature increase which would be needed to bring deep-ocean water into density equilibrium with surface water for locations were data are available. A series of continuous-flow studies on phytoplankton blooms resulting from mixtures of deep and surface water in 2000-liter concrete culturing vessels ('reactors') has been completed. Preliminary results indicate that in approximately half of these mixtures (those dominated by various species of Chaetoceros) blooms reached peak productivity within three days and could be maintained on continuous flow for an average of 40 days at one volume turnover per day. Almost complete uptake of dissolved inorganic nitrogen under these conditions has been obtained. A quantitative determination of nutrient utilization and flow through a combined primary and secondary trophic level system has been

completed. This study utilized the clam Tapes semidecussata, fed from phytoplankton grown in deep and surface water. Preliminary results indicate that for 140 g of animals in a 4-liter tray, fed at a rate of 1 ml/sec, over 45 fathoms of the dissolved inorganic nutrients in the deep and surface water mixture are converted into Tapes meat-nitrogen. (Sinha-OEIS)
W78-11228

EXCHANGE OF MANGANESE, IRON, COPPER, AND ZINC BETWEEN DISSOLVED AND PARTICULATE FORMS IN THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-11230

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOLUME IX, THE COMPUTER PROGRAM,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 5B.
W78-11231

SOCIOECONOMIC IMPACTS OF OUTER CONTINENTAL SHELF OIL AND GAS DEVELOPMENT-A BIBLIOGRAPHY,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 6G.
W78-11232

INTERIM HIERARCHICAL REGIONAL CLASSIFICATION SCHEME FOR COASTAL ECOSYSTEMS OF THE UNITED STATES AND ITS TERRITORIES,
Fish and Wildlife Service Fort Collins, CO.
For primary bibliographic entry see Field 2L.
W78-11233

A CASE HISTORY OF PORT MANSFIELD CHANNEL, TEXAS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-11235

LABORATORY INVESTIGATION OF TIDAL INLETS ON SANDY COASTS,
California Univ. Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 8B.
W78-11236

PROBLEMS IN ATTEMPTING TO TRANSLATE STATUTORY STANDARDS INTO EMISSION LIMITATIONS UNDER AIR AND WATER POLLUTION CONTROL LEGISLATION,
Yeshiva Univ., New York. School of Law.
J. L. F. Silver.
Villanova Law Review, Vol. 22, No. 6, p 1122-1170 (October, 1977).

Descriptors: *Water Quality Act, *Federal Water Pollution Control Act, *Regulation, *Water pollution control, Effluents, Water pollution treatment, Legislation, Legal aspects, Water law, Water quality control, Standards.

In an effort to understand why many pollution control efforts appear unsuccessful, this article explores various statutory standards' implementation problems. The author also suggests reforms which could result in a better environmental quality. Attention is focused on the coast of these environmental quality reforms, so that the nation may decide if it is willing to pay the necessary price. In the author's view, the 1972 amendments to the 1965 Water Quality Act. In conjunction with the present Federal Water Pollution Control Act, are the most important pieces of legislation now affecting water quality regulation in the United States. For the first time under any water pollution legislation, direct control over effluent limitations is centralized in the federal government with the limitations to be developed on the basis of plant categories (for example, petroleum refineries, rubber processing, textile mills, etc.). The establishment of these effluent limitations is to be based primarily on the pragmatic consideration of what can be done, relegating the standards that should be achieved to a secondary, albeit important, position. (Stump-Florida)
W78-11240

SUMMARY, NEW HAMPSHIRE WATER QUALITY STANDARDS.
New Hampshire Water Supply and Pollution Control Commission, Concord.
July, 1977, 13 p, 1 fig, 1 tab.

Descriptors: *Federal Water Pollution Control Act, *Water quality control, *Water quality standards, *New Hampshire, Water policy, Water utilization, Surface waters, Water permits, Water management(Applied), Standards, Water resources, Management.

This official state document is an updated and condensed version of the 1971 publication entitled 'State of New Hampshire Water Quality Standards Summary'. It is a periodic review of the state's water quality standards mandated by the 1972 Federal Water Pollution Control Act Amendments. Definitions of water use classifications, which are divided into three water quality levels, are included. These levels are determinations of ultimately desired water uses, rather than statements of current water quality. A map illustrating the classification of surface waters is also included. The criteria for determining water quality are explained and a table presents the parameters and associated standards currently used in New Hampshire for water quality assessment. The antidegradation policy of the state Water Supply and Pollution Control Commission is also explained; definitions of pertinent terms are included. State policy is aimed at protecting waters which are currently of high quality, and prohibits any uses which would become injurious to existing uses. For a more detailed treatment of any included information, the Water Supply and Pollution Control Commission should be consulted. (Stump-Florida)
W78-11241

THE DEVELOPMENT OF AN INTEGRATED SYSTEM FOR WATER QUALITY MANAGEMENT PLANNING,
Connecticut Univ., Storrs.
J. E. Sarsenski.
Available from University Microfilms International, Ann Arbor, MI 48106; Order No. 7806147. PhD Thesis, 1978, 229 p.

Descriptors: *Model studies, *Water quality control, *Water utilization, *Land use, *Treatment facilities, Mathematical models, Sewerage, Interceptor sewers, Population, Land management, Planning, Waste water treatment, City planning.

Integrated models were designed to incorporate population and land use patterns, water quality criteria, waste treatment systems, and associated costs into water quality management system design. An epicenter model plotted as an ogee curve described the population density patterns and residential, commercial, and industrial land use relationships. The GENERATE model calculated waste water flows associated with the land use patterns. Residential flow was based on population density and per capita flow; commercial flow was dependent upon acreage and per acre flow coefficients; and industrial flow was taken from standard published data. A sewer model developed alternative interceptor designs which considered maximum waste loads and water quality standards. The results of the sewer model were incorporated into a treatment planning and cost model which calculated the land area requirements and associated costs of various treatment configurations. By varying the water quality parameters, the tradeoffs of specific water usages and treatment system costs were assessed. Planning tools to evaluate interrelationships between the various areas of water quality management were considered limited by the lack of an adequate data base. (FIRL-Lisk)
W78-11242

INTERIOR'S FAILURE TO COMPLY WITH NEPA BLOCKS ATLANTIC OCS OIL LEASING.
For primary bibliographic entry see Field 6E.
W78-11246

RESERVE MINING: AN EPIC BATTLE DRAWS TO A CLOSE.
Environmental Science and Technology, Vol. 11, No. 10, p 948-950 (October, 1977).

Descriptors: *Minnesota, *Waste disposal, *Industrial wastes, *Lake Superior, Water pollution sources, Water quality, Social impact, Judicial decisions, Economic justification, Project feasibility, Silicates, Impoundments.

The Reserve Mining Company has discharged silica waste tailings into Lake Superior since 1955. This poses a health problem since the tailings contain asbestiform fibers. These fibers are carcinogenic when inhaled. Their effects when ingested as a result of their presence in the drinking water of several cities is not yet known. The Mining Company has fought legal battles with environmentalists, and state and federal agencies since 1971. Problems concerning the economic feasibility of permit requirements and the economic impact of loosing the company's 3000 jobs have complicated what would have otherwise been a more simple case of environmental standards violations. As the legal battles were drawing to a close, the Company had been ordered to take immediate steps to curb its air pollution. Discharge of the tailings into Lake Superior will be allowed until 1980, pending the Company's completion of an on-land disposal basin. The tailings basin is to be operated as a closed system, monitored by routine air and water monitoring programs. Tailings particles are to be submerged under water, and all exposed tailings are to be vegetated. (Baumbach-Florida)
W78-11248

GUIDELINES FOR PREPARATION OF WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 444, Price codes: A04 in paper copy, A01 in microfiche. September , 1974 , 67 p.

Descriptors: *Federal Water Pollution Control Act, *Water quality control, *Comprehensive planning, *Water management(Applied), *River basin development, Legislation, Water pollution control, Water quality standards, Water policy, River basin commissions, Water pollution effects, Administration, Management, Planning, Coordination, River basins, Administrative agencies, Governmental interrelations, Federal government, State governments.

Section 303(e) of the Federal Water Pollution Control Act Amendments of 1972 provide for the establishment and implementation of 'basin plans', in order for states to coordinate their water quality decisions on a river basin scale. The Environmental Protection Agency (EPA) has established guidelines for the preparation of basin plans which are presented in this report. The pur-

pose of the plans is to identify and implement measures to correct a river basin's water quality problems. To accomplish this, basin planning must reflect the objectives of facilities planning and waste treatment management planning for the area in which they are located. However, as opposed to these plans, the basin plan is designed to be a dynamic management tool, rather than a static compilation of data and material. Basin plans should include the following elements: (1) a ranking of significant dischargers; (2) a schedule of compliance; (3) an assessment of municipal needs; (4) a determination of maximum daily pollutant loads; (5) load allocations and effluent limitations; (6) an assessment of nonpoint sources of pollution; (7) residual waste controls; (8) proposed revisions of water quality standards; 89) planning relationships; (10) monitoring and surveillance programs; and (11) interstate and intergovernmental cooperation. The level of detail for each of these elements should be agreed upon by the particular state and the EPA. (Malefatto-Florida)
W78-11249

CONSERVATION DISTRICTS AND 208 WATER QUALITY MANAGEMENT, NON-POINT SOUCE IDENTIFICATION AND ASSESSMENT; SELECTION OF BEST MANAGEMENT PRACTICES; MANAGEMENT AGENCIES; REGULATORY PROGRAMS,
National Association of Conservation Districts, Washington, DC.
W. B. Davey.
Available from the National Technical Information Service, as PB-274 411, Price codes: A16 in paper copy, A01 in microfiche. Report to Environmental Protection Agency, Water Planning division, Washington, DC. Publication WH-544, (June 1977), 175 p, 6 fig, 18 tab.

Descriptors: *Water conservation, *Water quality control, *Water quality control, *Water quality standards, *Pollution abatement, Federal Water Pollution Control Act, Regulation, Water pollution sources, Water pollution control, Salts, Comprehensive planning, Wastes, Water districts.

This publication shows the potential conservation district involvement in the preparation and implementation of state and areawide water quality management plans developed pursuant to Section 208 of the 1972 Federal Water Pollution Control Act Amendments. The publication emphasizes the non-point pollution source aspects of erosion and sediment control, animal waste management (organics), and irrigation water management (salts), but other information is included concerning the preparation of management plans which the federal Environmental Protection Agency indicates should be directed to meet two principal mandates of the Act: (1) the determination of effluent limitations needed to meet areawide management programs to implement abatement measures for all pollutant sources (Section 208). The information in this publication describes conservation district capabilities and their potential participation in water quality management planning and implementation. In states where plans are relatively well advanced, with work complete or underway beyond the scope of this document, no 'back up' or 'redirection' should be implied or construed. The suggestions in this publication often reflect experiences of planning agencies or conservation districts in such areas. (Beamer-Florida)
W78-11251

NITRATE-NITROGEN REMOVAL FROM SOIL PROFILES BY ALFALFA,
Southwestern Great Plains Research Center, Bushland, TX.
For primary bibliographic entry see Field 5B.
W78-11277

CONVERT CITY SEWAGE TO FARM FERTILIZER.
Wallaces Farmer, V. 102, No. 17, p 181, Sept. 10, 1977.

Descriptors: *Sewage sludge, Fertilizers, Heavy metals, Crop response, *Water pollution control, *Land application, Disease organisms, *Groundwater pollution, Runoff control, Composting.

Converting municipal sewage sludge to fertilizer to help dispose of this waste hasn't progressed as some people felt it would. One of the largest obstacles has been the heavy metal components of sewage which are dangerous to both plants and animals. Disease threat from the sludge has been another hazard. However, tests conducted by Edward Clapp of the USDA Agricultural Research Service, have indicated fertilization by such sludge is quite promising. Annual application of 4.5 tons of sludge per acre resulted in yields of 108 bu. of corn per acre, and 4.3 tons of reed canarygrass per acre. Control areas receiving conventional fertilizer yielded 102 bu. of corn per acre and 3.4 tons of reed canarygrass. Analyses revealed no difference in the heavy metal content of the corn grain or leaf tissue from sludge areas as a conventionally fertilized plot. Concentration of heavy metals in soil water was not increased by sludge application, and analysis of surface and groundwater showed no movement of potentially polluting materials out of the watershed. Results seem to indicate that this type of sludge may be used safely for agricultural purposes if the land is properly terraced for runoff control. Scientists are also developing composts for utilizing sewage sludge. Such compost would foster water retention, help prevent leaching of nutrients, and would raise the potassium level of the soil. (Merryman-East Central)
W78-11281

OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES,
General Accounting Office, Washington, DC.
E. B. Staats.
General Accounting Office Report 76-101, June 14, 1976, 40 p.

Descriptors: *Waste disposa, Recycling, Confinement pens, Livestock, Technology, Economics, Farm wastes, *Land disposal, Pyrolysis, Ammonia synthesis gas, Feedlots.

EPA's animal waste research program has been concentrated on the land application of the manure both as fertilizer and as a means of disposal. Although EPA has recognized the existence of various potential alternatives to land application, it has expended only minimal effort in developing these alternatives through small grants for laboratory research. An EPA official responsible for the Animal Feedlot Waste Research Program told us (the General Accounting Office) that EPA funded projects for ammonia synthesis gas production and production of useful products through pyrolysis were both at a stage where pilot plants have become necessary to test on a larger scale the results achieved in the laboratory. However, EPA officials said that EPA does not plan to proceed further with these methods. As discussed in chapter 2, our review identified several confinement operations, particularly holding pens for several meat packing plants which, because of their location in an urban area, were unable to dispose of accumulated manure to farmers for use as fertilizer. For these operations and for the large feedlots which may have disposal problems when operating at full capacity (currently operating nationally at about 50 percent) the various experimental technologies for manure use represent potential methods of solving the disposal problem. We believe that more research effort should be directed toward bringing such technologies to a commercially acceptable level of development including the determination of economic feasibility of the various alternatives. Of particular importance is the development and acceptability of those technologies, such as ammonia synthesis, which have shown promise in the laboratory but must now be tested on a larger scale to prove their practical commercial value. The General Accounting Office recommends that the Administrators of the Environmental Protection Agency and the Energy Research and Development Administration and the Secretary, Department of Agriculture enter into a joint agreement delineating responsibilities for the disposal and utilization of animal manure and provide for adequate coordination of activities. This agreement should provide assurance that innovative research projects, such as those discussed in this report, will be given adequate consideration for development to a stage where the economic and technical viability of the technology can be determined. (East Central)
W78-11284

ENGINEER EXPLAINS NEW WASTE RUNOFF SYSTEM.
Feedstuffs, V. 49, No. 16, p 15, April 18, 1977. 1 fig.

Descriptors: *Feedlots, *Agricultural runoff, *Water pollution control, Separation techniques, Costs, Biological treatment, Labor, Settling, Serpentine grassed waterway.

University of Nebraska agricultural engineer E. A. Alson reported on a new method of draining feedlots to comply with pollution standards at a meeting of the Mid-Central branch of the American Society of Agricultural Engineers held in St. Joseph, Missouri. The new system uses the serpentine or switch-back design with a grassed waterway to handle runoff from open lots. The runoff is passed through 2 wire screen debris traps to collect solids. The liquid then passes to a holding pond where it can be drained through the switchback system at periodic intervals. The solids load on the system is reduced by mechanical scraping of the lots. The system promises to be less costly to construct and will require less labor to operate than systems that require pumping or haulind liquids to the fields. (Merryman-East Central)
W78-11296

PROJECTS IN PROGRESS. SOME FEEDLOT INS AND OUTS,
Utah Agricultural Experiment Station, Logan.
L. M. Cox.
Utah Science, V. 38, No. 3, p 91-92, Sept., 1977.

Descriptors: *Water pollution sources, Utah, *Feedlots, *Agricultural runoff, Computer models, Overland flow.

Dennis George and Dan Filip (Utah Water Research Laboratory) in conjunction with William Grenney and James Reynolds, have just completed the first year of research designed to determine if small feedlots clustering in river basins are polluting local streams. After simultaneously monitoring a network of small streams that drains into the Little Bear River and several feedlots in a different part of the Little Bear River Basin, the team (which includes graduate student Steve Wieneke and a number of well qualified technicians), is ready to start inserting data into a computer model of the limited network of streams. Later the Basin's entire stream system will be modelled. These models should facilitate valid projections of future water pollution events, and should be readily applicable to comparable river basins. The models will also indicate the pollution-processing capabilities of specific streams in wet, dry, and normal years. An accompanying study is to be conducted in Cache Valley in which a minimum of 2 feedlots will be used as test sites for a 'greenbelt' or overland-flow approach to treating livestock wastes. In each case, the animals will be fed in an area removed from the stream and the

animals will have no direct access to the water. Grass will be established between the area where the animals are to be held and the stream. This grass should effectively pre-filter any potential stream pollutants. (Merryman-East Central)
W78-11298

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

POLICY ANALYSIS THROUGH CARRYING CAPACITY,
Ottawa Univ. (Ontario). Dept of Geography and Regional Planning.
P. F. Ricci.
Journal of Environmental Management, Vol 6, No 1, p 85-97, January 1978. 5 fig, 22 ref.

Descriptors: *Environmental control, *Carrying capacity, *Policy analysis, Decision making, Control theory, Operational definition, Qualitative analysis, Canada, Freshwater, Water budget, Population dynamics, Simulation analysis, Ecology, Anthropology, Natural environment, Human environment, Management, Mathematical models, Equations, Systems analysis.

Traditional views of carrying capacity are found to be conceptually appealing and transferable to policy-analysis if the asymptotic implication of the phrase is understood. To overcome the inherent rigidity of the phrase, it is suggested that the concept be operationalized, without recourse to a definition, as a heuristic model for policy analysis. The objective of the operational definition is to provide prescriptive applicability in which carrying capacity, although loosening the precision inherent to its scientific nature, maintains the accuracy necessary to policy analysis. In reviewing the concept, examples are used, including the fresh water water budget of Canada and problems of population dynamics. The approach suggested to operationalize the concept is based on control theory, as a possible approach to enhance the qualitative understanding of the cause-and-effect of a policy. (Bell-Cornell)
W78-10651

A COMPREHENSIVE METHODOLOGY FOR ASSESSING ENVIRONMENTAL IMPACT,
British Columbia Univ., Vancouver. Dept of Soil Science.
For primary bibliographic entry see Field 6G.
W78-10652

ECONOMICS OF MULTIPLE-USE FORESTRY,
Victoria Univ. (British Columbia).
For primary bibliographic entry see Field 6B.
W78-10654

LARGE-SCALE PLANNING PROJECTS: THE TENNESSEE VALLEY AUTHORITY AND THE BRATSK-ILIMSK COMPLEX,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6B.
W78-10655

METHODOLOGY AND EMPIRICAL ESTIMATES OF THE RESPONSE FUNCTION OF SORGHUM TO IRRIGATION AND SOIL MOISTURE,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soil and Water.
For primary bibliographic entry see Field 3F.
W78-10659

A PARTITIONING PROCEDURE FOR WATER QUALITY MANAGEMENT MODELS,
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 5G.
W78-10660

A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM,
Instituto Venezolano de Investigaciones Centificas, Caracas. Lab. de Ingenieria Ambiental.
For primary bibliographic entry see Field 5G.
W78-10661

AN APPROXIMATE METHOD FOR SIZING DETENTION RESERVOIRS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-10662

FINAL REPORT, ENVIRONMENTAL IMPACT MODEL DEVELOPMENT FOR NAVAL OPERATIONS,
Naval Weapons Center, China Lake, CA. Public Works Dept.
For primary bibliographic entry see Field 6G.
W78-10667

MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEM ANALYSIS - APPLICATION TO MEDIUM SIZE COMMUNITIES: URBAN STORM-DRAINAGE SYSTEMS PLANNING,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
S. A. Dendrou, J. J. Talavage, and J. W. Delleur.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 698, Price codes: A08 in paper copy, A01 in microfiche. Technical Report No. 101, May 1978. 155 p, 35 fig, 10 tab, 6 append. OWRT-B-083-IND(4).

Descriptors: *Urban drainage, *City planning, *Methodology, Urban runoff, *Storm runoff, Land use, *Urbanization, *Model studies, *Urban growth, Growth rates(Population), *Storm-drainage model, STORM, LANDSTORM, LANDUSE, URBDRAIN.

The relationship between urban growth and the storm drainage problem is analysed. A multilevel coordinated approach is used in a simulation-based optimization scheme that determines, at the planning level of details, the storm water system best suited for given trend of urban growth. Similar models dealing with water supply and sanitary sewer problems would allow for a global analysis of relationships between urban growth and water resources. The simulation phase of the storm drainage planning model is provided by the module LANDSTORM, which is a combination of (1) the land use forecasting model LANDUSE (presented in Purdue University Water Resources Research Center Technical Report No. 100 (See W78-07781), (2) a modified version of the urban hydrologic model STORM developed by the U.S. Corps of Engineers and (3) their interface. An urban agglomeration is understood to be partitioned in several drainage basins. For each urban growth scenario of LANDUSE, STORM produces a corresponding performance of the local basin storm drainage system. The requirements of the subbasins composing the urban agglomeration are then 'coordinated' in the model URBDRAIN to produce a globally optimal storm water system for a given growth pattern.
W78-11058

MATHEMATICAL MODELING OF A SOCIOLOGICAL AND HYDROLOGIC DECISION SYSTEM,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
W. H. Andrews, J. P. Riley, and M. B. Masteller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 803, Price codes: A09 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Logan. Water Resources Planning Series Report P-78-004, June 1978. 184 p, 44 fig, 28 tab, 8 append. ISSR Research Monograph No. 7. OWRT C-5177(4207)(1), 14-31-0001-3712 and 9053.

Descriptors: Sociological decisions, Hydrologic aspects, Urbanized areas, *Model studies, *Decision making, *Mathematical models, Conceptual models, Planning, *Flood control, Regression analysis, *Simulation analysis, Social aspects, Systems approach, Land use, Evaluation.

The general goal was to develop a functional model of the sociological and related hydrologic elements in flood control decision-making. Conceptual system models were developed for the hydrologic system and for the sociological system. The sociological variables were identified as they related to the steps in the process of the model. Following the conceptual decision process model the social elements of the model were calibrated from data obtained from field studies and mathematical equations were developed and tested. Finally simulations of the process were run. After adjustments were made the model was found to function. Several methodological factors were devised to make the model more realistic and operable. These were: (1) distortion factors, (2) importance factors, (3) acceptance functions, (4) expansion effect, and (5) threshold levels. These concepts permit the model to adjust to changes in social behavior related to the social structure of the decision process. The system provides for the function of social values as they relate to the social structures and the hydrologic components.
W78-11061

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, VOLUME 8,
Office of Water Research and Technology, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 914, Price codes: A17 in paper copy, A01 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 78-201, May 1978. 388 p. Edited by Daniel P. Loucks, Cornell University, Ithaca, New York.

Descriptors: *Systems analysis, *Bibliographies, *Water resources systems, *Optimization, *Simulation analysis, Operations research, Abstracts, *Alternative planning, *Management, Evaluation.

This is an annotated bibliography of 399 selected publications issued in 1975 and 1976 pertaining to the application of systems analysis techniques for defining and evaluating alternative solutions to water resource problems. The first two volumes of this bibliography, having the same title, were published by the Cornell University Water Resources and Marine Sciences Center, Ithaca, New York (Publication 25, August 1969; Publication 35, June 1971). (See W71-09465 and W70-00506). The third, fourth, fifth, sixth, and seventh volumes were published by the Water Resources Scientific Information Center in December 1972, December 1973, July 1974, September 1975, and November 1976, respectively. (See also W77-03967; W76-01517; W74-11574; W74-05401; and W73-07428). Both subject and author indexes are provided. Descriptors are listed with each abstract. The abstracted material emphasizes the application of optimization and simulation techniques for assisting in the planning and management of water resource systems.

W78-11207

6B. Evaluation Process

A SURVEY OF POTENTIAL METHODS FOR RESOURCE RECOVERY FROM BLACK WATER OF THE UPPER GREEN RIVER BASIN,
Wyoming Univ., Laramie. Dept. of Mineral Engineering; and Wyoming Univ., Laramie. Graduate School.
For primary bibliographic entry see Field 3E.
W78-10534

FRESHWATER ARTIFICIAL REEFS: BIOLOGY AND ECONOMICS,
Virginia Cooperative Fishery Research Unit.
E. D. Prince, and O. E. Maughan.
Fisheries, Vol. 3(1), 1978, p 5-9, 1 tab, 3 fig, 24 ref.

Descriptors: *Lakes, Ponds, *Reefs, *Recreation, Recreation demand, Recreation facilities, *Freshwater fish, *Sport fish, Sport fishing, Fish attractants, Fish behavior, Fish establishment, Fish harvest, Fish management, Economics, *Artificial reefs.

Artificial reefs, either in freshwater or saltwater areas, are used to stimulate recreational fishing when lack of underwater structures has been identified as a potentially limiting factor for fishery. The productivity of artificial reefs has been demonstrated. Research and practical experience indicates that artificial reefs used in structure-deficient lacustrine environments are a biologically and economically viable fisheries management tool. (EIS-Katz)
W78-10554

POLICY ANALYSIS THROUGH CARRYING CAPACITY,
Ottawa Univ. (Ontario). Dept of Geography and Regional Planning.
For primary bibliographic entry see Field 6A.
W78-10651

ECONOMICS OF MULTIPLE-USE FORESTRY,
Victoria Univ. (British Columbia).
G. R. Walter.
Journal of Environmental Management, Vol 5, No 4, p 345-356, October 1977. 3 fig, 11 ref.

Descriptors: *Economics, *Forestry, *Resources, *Evaluation, *Watersheds(Basins), *Multiple use, Management, Institutions, Demand, Supply, Linear programming, Optimization, Constraints, Opportunity costs, Benefit maximization, Market failure, Systems analysis.

The forest produces a number of goods and services for which there exists a strong demand. Unlike the vast array of goods produced by the economy, private market mechanisms have failed to solve the allocation problem with regard to multiple-use services. Among the reasons underlying this failure are: historical precedence, common property problems, joint products, and lack of clear liability rules. In addressing the problem, three levels of multiple use should be identified: regional, forest, and micro-land use. Watershed management is the level at which the professional forester is most involved. A small river watershed may be managed to meet a number of needs: water, timber, forage, and recreation. The simple analytics of multiple-use watershed management are often considered in terms of production possibilities curves. The demand for forest services can be dichotomized into specific and generalized demand, while supply is a matter of opportunity costs. What ever the pattern of demand, multiple-use valuation is as much a matter of institutional form as economic method. Among the methods which may be used within a given institutional framework are dollar value reference points, opportunity costs, shadow prices, linear programming, interagency bargaining, and artificial markets. (Bell-Cornell)
W78-10654

LARGE-SCALE PLANNING PROJECTS: THE TENNESSEE VALLEY AUTHORITY AND THE BRATSK-ILIMSK COMPLEX,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
H. Knop.
In: IIASA Conference '76, 10-13 May, 1976, Volume 1, p 187-202. International Institute for Applied Systems Analysis, Austria, 1976. 10 fig, 2 ref.

Descriptors: *Comprehensive planning, *Projects, *Tennessee Valley Authority, *Systems analysis, *Regional analysis, *Decision making, Water resources, Socio-economic systems, Management, Mathematical models, Simulation analysis, Optimization, Soviet Union, Agriculture, Industrial development.

The IIASA project on Planning and Management of Large Organizations had as its objective the systems analysis of decision-making processes in socio-economic systems. The Large Organizations group focused on case studies of large-scale planning projects embracing the interaction of socio-economic systems and their management. The first stage of research asked: How is systems analysis used as a tool of management. To answer, methodological experience in planning was drawn from, in particular, two case studies: (1) The Tennessee Valley Authority in the United States (TVA); and (2) the Bratsk-Ilimsk Territorial Production complex in the Soviet Union (BITPC). These case studies are discussed in terms of project goals, achievements, their advantages and drawbacks, and the decision-making processes and modeling techniques utilized. Two more questions were asked: (1) Who decides, and (2) How are decisions substantiated. Three aspects of the balances, models, and model systems used by the TVA and BITPC are considered: the mathematical type of models and their stage of development, sophistication, and complexity; the economic categories described in the balances and models; and the degree of comprehensiveness of models related to the national economy or its sectors. Main TVA goals were flood control, development of navigation systems, and modernization of agriculture; principal BITPC goals included the development of water-power generation by using the inexhaustible water supply in eastern Siberia. Comparisons are drawn between the two projects, and potential case studies for the future are mentioned. (Bell-Cornell)
W78-10655

IMPROVING IRRIGATION RETURN FLOW QUALITY WITH A WATER RENTAL MARKET,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-10658

SALINITY MANAGEMENT OPTIONS FOR THE COLORADO RIVER, DAMAGE ESTIMATES AND CONTROL PROGRAM IMPACTS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W78-10735

DEVELOPING A WATER RESOURCE PLAN FOR SOUTH FLORIDA,
South Florida Water Management District, Tampa.
P. B. Rhoads.
Florida Environmental and Urban Issues, Vol. 5, No. 4, p 11-15 (April 1978).

Descriptors: *Florida, *Planning, *Water resources development, *Environmental effects, Water resources, Water supply, Mathematical models, Land use, Coordination, Population, Management, Aquifer management.

The Florida Water Resources Act of 1972 difines the state's commitment to water resource planning and provides the basis planning goals. The author discusses the planning strategy of the South Florida Water Management District (SFWMD) for the development of a water resource plan for South Florida. The strategy required a unique approach due to the substantial water management system already in existence, substantial prior planning conducted by the Army Corps of Engineers, and water resources and supply plans previously authorized by Congress. Central to the SFWMD's planning strategy are commitment to: utilization of mathematical models to manage complex water resources systems; coordination of water resource and land use planning; utilization of local government projections of population and land use trends; and consideration of environmental consequences as part of the decision making process. Summarized are specific alternatives for providing additional water supplies evaluated in the SFWMD Draft Water Use and Supply Development Plan, including: water conservation and regulations; wellfield development and aquifer management; backpumping lower east coast canals; increased Lake Okeechobee storage; and advanced alternatives. The author concludes with a discussion of the SFWMD public participation program and future directions. (Hoofman-Florida)
W78-10770

REVIEW OF EXISTING STATE LAND USE REGULATION IN FLORIDA--AN OVERVIEW,
Florida Law Revision Council, Tallahassee. Office of Statutory Revision.
For primary bibliographic entry see Field 6E.
W78-10802

INSTITUTIONAL ARRANGEMENTS FOR EFFECTIVE GROUNDWATER MANAGEMENT TO HALT LAND SUBSIDENCE,
Texas A and M Univ., College Station. Dept. of Animal Science.
For primary bibliographic entry see Field 4B.
W78-11057

MATHEMATICAL MODELING OF A SOCIOLOGICAL AND HYDROLOGIC DECISION SYSTEM,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6A.
W78-11061

ASSESSING THE SOCIAL EFFECTS OF WATER QUALITY MANAGEMENT PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5G.
W78-11062

THE PUBLIC INTEREST IN WATER RIGHTS ADMINISTRATION,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6E.
W78-11155

POLICY AND PROGRAM ANALYSIS OF AN OPEN LAND APPROACH TO FLOOD PLAIN MANAGEMENT,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 6F.
W78-11201

WASTEWATER MANAGEMENT PLANNING: SOURCES OF CONFLICT IN THE EVALUATION OF ALTERNATIVES,
Clark Univ., Worcester, Mass. Dept. of Environmental Affairs.
For primary bibliographic entry see Field 5G.
W78-11202

OIL SPILLS: THE POLICY OF PREVENTION AND THE STRATEGY OF RECOVERY,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 5G.
W78-11205

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, VOLUME 8,
Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 6A.
W78-11207

THE IMPACT OF ENERGY RESOURCE DEVELOPMENT ON WATER RESOURCE ALLOCATIONS,
Utah Water Research Lab., Logan.
J. E. Keith, K. S. Turna, S. Padunchai, and R. Narayanan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 135, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Planning Series, Report P-78-005, June 1978. 95 p, 6 fig, 58 tab, append. OWRT B-131-UTAH(1), 14-34-0001-6125.

Descriptors: *Linear programming, *Energy development, *Water allocation, *Agricultural requirements, *Utah, Water requirements, Model studies, Irrigation water, Competing uses, Projections, Future planning, *Economic impact, *Colorado River Basin(Utah).

A linear programming model of the agricultural and energy sectors of Utah was used to examine the economically efficient allocation of water between agriculture and energy. Data were collected for agricultural returns, costs, and water requirements; energy returns, costs, and water requirements; and water supply costs. Results indicate that if large scale energy development occurs in the Colorado River Basin in Utah, most of irrigated agriculture will be eliminated, given Utah's consumptive use constraint under the Upper Colorado River Compact. On the other hand, for two more 'probable' levels of energy development, including the Energy Research and Development Administration's projections for the year 2000, only minor reductions in irrigated acreages would be expected. Under conditions of severe, prolonged drought, energy demands would consume almost all the water currently used in agriculture, given either of the 'probable' scenarios.
W78-11211

SOME POLITICAL-INSTITUTIONAL FACTORS AFFECTING EFFORTS TO CONSERVE WATER IN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W78-11212

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

LIABILITY FOR MARITIME OIL POLLUTION: A COMPARISON OF THE MAINE COASTAL CONVEYANCE ACT WITH FEDERAL LIABILITY PROVISIONS.
For primary bibliographic entry see Field 6E.
W78-10863

ASSESSING THE SOCIAL EFFECTS OF WATER QUALITY MANAGEMENT PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5G.
W78-11062

THE TWO-TIERED MARKET IN WESTERN WATER,
New Mexico Univ., Albuquerque. School of Law.
For primary bibliographic entry see Field 6E.
W78-11157

6D. Water Demand

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--SOURIS-RED-RAINY REGION,
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10636

THE IMPACT OF WATER RIGHTS AND LEGAL INSTITUTIONS ON LAND AND WATER USE IN 2000,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
W. A. Colette, E. O. Heady, and K. J. Nicol.
CARD Report 70, November, 1976. 85 p.

Descriptors: *Economic prediction, *Forecasting, *Rural sociology, *Water allocation(Policy), Agriculture, Community development, Competing uses, Econometrics, Land use, Planning, Probability, Legal aspects, Rural areas, Social aspects, Statistical methods, Water distribution(Applied), Water law, Water policy, Water pollution, Water rights, Water utilization.

There has been increased pressure for a reallocation of water and a review of the system of water rights in the United States. The economy has shifted from an agricultural orientation through an industrial phase and now is becoming service oriented. However, it is not clear that the best interests of society would be served by the elimination of existing water rights and priorities just because proponents of urban growth wish to obtain control of the water resources and divert them to urban and domestic uses. A national policy that eliminates water rights and reallocates existing agricultural water supplies in terms of marginal value productivities would affect the agricultural land use pattern in the United States. It would also cause increased utilization of dryland for crops and decreased use of irrigated land for crops, resulting in a net increase in the amount of land planted to crops. A main effect of the abolition of water rights on agricultural land would be an increase in the dominance of the north central region in American agriculture. In addition, such a policy would decrease the flexibility of American agriculture. (Jordan-Florida)
W78-10803

FEDERAL RECLAMATION AND WATER RIGHTS IN NEVADA,
California State Univ., San Diego. Dept. of History.
For primary bibliographic entry see Field 6E.
W78-10974

AN EXAMINATION OF FREQUENCY OF PARTICIPATION IN WATER-BASED ACTIVITIES BY RECREATION CONSUMERS IN INDIANA,
Purdue University, Lafayette, IN. Dept. of Forestry and Natual Resources.
J. T. O'Leary, and G. Pate.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 822, Price codes: A02 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center, Technical Report 114. Aug. 1978. 18 p, 4 tab, 17 ref. OWRT A-051-IND(1).

Descriptors: *Recreation, *Recreation demand, *Social participation, Social aspects, Recreation facilities, *Indiana, *Socio-economic aspects, *Social aggregates, Social action.

The water-based activity involvement of participants at state and federal and local and private facilities identified by using participation rate groups is examined. No differences between participant groups within activities based on socio-economic characteristics were found. However, groups of highly active individuals were identified at both types of properties. It is suggested that social action system variables be added to traditional social aggregate variables to assist the understanding of leisure involvement.
W78-11066

ALLOCATION OF RIGHTS TO WATER: PREFERENCES, PRIORITIES AND THE ROLE OF THE MARKET,
Florida State Univ., Tallahassee. School of Law.
For primary bibliographic entry see Field 6E.
W78-11159

6E. Water Law and Institutions

WATER RIGHT ABANDONMENT.
Wyoming Gen. Laws secs 41-47.1 (1976 Supp.).

Descriptors: *Wyoming, *Reservoirs, *Beneficial use, *Prior appropriation, *Water allocation(Policy), Appropriation, Irrigation water, Legal aspects, Legislation, Prescriptive rights, Regulated flow, Unappropriated water, Water law, Water rights, Water storage, Water utilization, Remedies, Regulation, Administration, Administrative agencies, State governments.

Where the holder of an appropriation of water from a surface, underground or reservoir water source fails, either intentionally or unintentionally, to use the water for the beneficial purposes for which it was appropriated during any five successive years, he is considered as having abandoned the wter right and shall forfeit all water rights and appurtenant privileges. The state engineer may initiate forfeiture proceedings against the appropriator with the state board of control, to determine the validity of the unused right. The holder of an appropriation from which water or a portion thereof has not yet been beneficially used for the purpose for which appropriated, may apply to the board of control for an extension of time not to exceed five years. In the application, the holder shall demonstrate the exercise of due diligence toward the utilization of the appropriation, and that notwithstanding the exercise of due diligence, reasonable cause exists for nonuse. Reasonable cause includes, but is not limited to delay due to: court and administrative proceedings; requirements of state and federal statutes; and any other causes beyond the control of the holder of the appropriation. (Jordan-Florida)
W78-10501

INFORMATION EXCHANGE ON COMPUTER PROGRAMS (EXCHANGE D'INFORMATION DES PROGRAMMES D'ORDINATEURS),
International Inst. for Hydraulic and Environmental Engineering, Del Delft (Netherlands); and Waterloopkundig Lab., Delft (Netherlands).
For primary bibliographic entry see Field 7C.
W78-10664

REPORT OF THE PRESIDENT'S WATER POLLUTION CONTROL ADVISORY BOARD HELD AT HONOLULU, HAWAII ON JUNE 7-10, 1971.
President's Water Pollution Control Advisory Board Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10755

PUBLIC ACCESS TO THE GREAT LAKES. A POLICY STUDY/1976,
Wisconsin Coastal Management Program, Madison.
M. T. Newman.
Available from National Technical Information Service, Springfield, Virginia 22161 as PB-263 935, Price codes: A04 in Paper, A01 in Microfiche.

Descriptors: *Wisconsin, *Great Lakes, *Public access, *State governments, *Water policy, Cities, Commercial fishing, Great Lakes region, Governmental interrelations, Lake Michigan, Land use, Local governments, Navigation, Planning, Political restraints, Recreation, State jurisdiction, Water law, Water resources, Urban area.

The concept of public access has been defined as a way or a means of getting to and using the Great Lakes. The access question encompasses visual, legal, social and economic access, the barriers that inhibit them and the tools that are available to enhance them. Under the Wisconsin trust doctrine, the state holds title to the beds of navigable lakes in trust for all of the citizens. Public access to the Great Lakes serves the recreational, commercial and navigational users of Wisconsin waters. Four future choices for public access are discussed in this article. The first is to maintain the status quo. The second is to allow maximum access even though this may entail environmental costs to society. The third choice is to allow minimum access which would limit recreational use of Wisconsin waters. The fourth alternative is a combination of increasing some types of access such as, ramp access and decreasing or maintaining the present level of others such as shore and harbor access. This recombination of access directions is the actual future ckoice implemented by most communities and state policy makers since it can be made to serve particular needs of each situation. (Jordan-Florida).
W78-10756

OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 5G.
W78-10757

HEARING INVOLVING 180-DAY NOTICE OF VIOLATION OF WATER QUALITY STANDARDS OF THE CITY OF FARGO, NORTH DAKOTA HELD IN FARGO, NORTH DAKOTA ON JULY 10, 1970.
Federal Water Quality Administration, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10758

HAZARDOUS WASTE DISPOSAL PROGRAM SEVENTH MONTHLY REPORT,
TRW Systems Group, Redondo Beach, CA.
For primary bibliographic entry see Field 5G.
W78-10760

AUDIT GUIDE FOR FINAL STATE AUDITS UNDER THE CONSTRUCTION GRANT PROGRAM (FOR USE BY INDEPENDENT PUBLIC ACCOUNTANTS).
Environmental Protection Agency, Washington, D. C. Office of Audit.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 375, Price codes: A07 in paper copy, A01 in microfiche. April, 1973, 48 p.

Descriptors: *Federal Water Pollution Control Act, *Administrative agencies, *Project post-evaluation, *Construction costs, *Cost analysis, Federal government, Regulation, Administrative costs, Comprehensive planning, Economics, Management, Budgeting, Economic justification, Estimated costs, Financing, Capital costs, Cost allocation, Administration, Federa project policy, Water Quality Act, Sewage treatment.

State and municipal agencies are eligible for sewage treatment plant construction grants from the federal government under the Federal Water Pollution Control Act. Responsibility for the grant program lies with the Environmental Protection Agency (EPA). The EPA has established auditing procedures, set forth in this guide for the use of independent public accounts employed to conduct final site audits of grantees' facilities. The purpose of the audits is to determine grant costs. Also, the auditor ascertains whether: the grantee has compiled with grant provisions; funds were properly spent and accounted for; facilities are maintained and managed properly; and management of the construction grant program can be improved. Auditors must pay special attention to unallowable costs, including: site costs; interests; damage awards; bonus payments; cost overruns; normal government costs; costs prior to acceptance of the grant (except certain pre-engineering costs); and costs after expiration of the grant. Audit reports follow a basic format. The opening paragraph identifies the grant and period audited. An opinion statement, preferably unqualified, presents the financial data and audit results. Compliance reviews, financial reviews, and background information comprise the remainder of the report. (Malefatto-Florida)
W78-10763

WATER QUALITY STRATEGY PAPER. A STATEMENT OF POLICY FOR IMPLEMENTING THE REQUIREMENTS OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED AND CERTAIN REQUIREMENTS OF THE 1972 MARINE PROTECTION RESEARCH AND SANCTUARIES ACT.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10764

MINIMAL REQUIREMENTS FOR A WATER QUALITY ASSURANCE PROGRAM.
Environmental Protection Agency, Washington, DC. Monitoring and Data Support Div.
For primary bibliographic entry see Field 5G.
W78-10765

WASTE WATER DISPOSAL AT FEDERAL INSTALLATIONS IN THE UNITED STATES, STATE OF CALIFORNIA.
Federal Water Pollution Control Administration, Washington, DC.
For primary bibliographic entry see Field 5E.
W78-10767

SOME LEGAL ASPECTS OF CATFISH AND CRAWFISH FARMING IN LOUISIANA: A CASE STUDY,
Louisiana State Univ., Baton Rouge. Center for Agricultural Sciences and Rural Development.
E. Williams, F. S. Craig, and J. W. Avault.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 787, Price codes: A02 in paper copy, A01 in microfiche. Bulletin No. 689, LSU-R-76-003, December, 1975. 18 p.

Descriptors: *Fish farming, *Aquiculture, *Legislation, Fish handling facilities, Farm ponds, Agriculture, Fish harvest, Legal aspects, Fish, Catfishes, Freshwater fish, State government, Federal governments, Regulation, Permits, Water rights, Water law, Fisheries, Farms.

Raising catfish and crawfish has become an integral part of agriculture in Louisiana. However, Louisiana's laws pertaining to fish farming are confused. Many recent enactment conflict with laws passed before fishing farming became an important industry. To raise domesticated fish for commercial markets, a farmer must first obtain a license from the state Wildlife and Fisheries Commission. The farmer should then construct ponds or reservoirs for raising fish on private property. Ponds located within the basins of a continuously flowing river, bayou, or other stream are not subject to private ownership and use. Fish raised in such ponds are not considered 'domesticated.' Although there are no specific state laws regulating the construction of ponds, the fish farmers must comply with all relevant local ordinances. Water for the ponds may be obtained from streams or wells. In choosing a species suitable for raising, the farmer must be aware of the various restrictions imposed by law. For example, freshwater game fish may not be sold. All drainage of fish ponds into state streams must meet federal and state water quality standards. Guidelines for harvesting, processing and marketing of fish are also set forth. (Malefatto-Florida)
W78-10768

ACCOMPLISHMENT PLAN. REGION VIII. CHEYENNE RIVER BASIN AREA.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W78-10769

DEVELOPING A WATER RESOURCE PLAN FOR SOUTH FLORIDA,
South Florida Water Management District, Tampa.
For primary bibliographic entry see Field 6B.
W78-10770

THE DUTIES AND RIGHTS OF OPERATORS OF WATER RETENTION STRUCTURES,
Connecticut Univ., Storrs. School of Law.
C. Davis.
Nebraska Law Review, Vol. 57, No. 2, p 319-32, 1978.

Descriptors: *Alteration of flow, *Natural Flow Doctrine, *Reasonable use, *Riparian rights, Adjacent land owners, Flow control, Riparian land, Riparian waters, Water law, Water rights, Negligence.

Eastern, or riparian, water law has traditionally and primarily been concerned with the allocation of a short supply of water. In allocation cases, courts have tried to reconcile the property theory of natural flow and the tort theory of reasonable use. However, there are cases in which the natural flow increased due to heavy runoffs, and downstream owners sued the upstream operator of a water retention structure alleging that its negligent operation, and not its failure, caused excess waters to overflow their lands. If natural flow plays a significant role in fixing minimum flows to allocate short supplies, then the natural flow of a stream, including freshlets and occasional heavy runoff, should play a role in fixing a permissible maximum flow. The reasonable duty of an operator might be to cut the crest, or distribute the higher flow over a longer period, but courts should take care not to demand that the crest be cut and higher than normal releases not be made at other times. The standard for water structure management should be that of other professionals in the area. (Jordan-Florida)
W78-10773

MODEL ORDINANCE FOR STORM DRAINAGE SYSTEMS AND IMPROVEMENTS.
Central Midlands Regional Planning Council, Columbia, SC.
March 28, 1974, 9 p.

Descriptors: *South Carolina, *Drainage systems, *Flood control, *Local government, Cities, Drainage engineering, Drainage practices, Flood protection, Storm drains, Surface runoff, Urban drainage, Storm runoff.

It is the intent of this model ordinance to protect the general health, safety and damages of flooding from the various drainage areas of Columbia, South Carolina and adjacent county lands. All subdivisions of land and all developments or improvements of any character which affect drainage should be subject to the provisions of the ordinance. The stated purposes for adopting such an ordinance include: (1) ensure adequate drainage improvements; (2) develop uniform standards for pipe and channel dimensions; 83) promulgate consistant design standards; (4) define financial responsibility for improvements for the developer and local governments; and (5) ensure clean and sanitary drainage channels. The improvement of primary drainage channels shall be the long-range responsibility of the city or county, and the improvement of secondary drainage areas shall be the responsibility of the developer. However, all primary drainage channels which are located within or immediately adjacent to an improvement, development, or subdivision shall be protected and improved by the developer. The city or county shall reserve the right to require improvements for flood control. (Jordan-Florida)
W78-10774

LOW-TIDE ELEVATIONS AND STRAIGHT BASELINES,
Cambridge Univ. (England). School of Law.
G. Marston.
The British Yearbook of International Law, Vol. 46, 1972-73, p 405-23, 1975.

Descriptors: *Law of the sea, *International law, *Conferences, *Boundary disputes, Governments, Low water mark, High water mark, Prescriptive rights, Water law, Jurisdiction, Treaties, Water zoning, Sites, International waters, Tidal waters, Water level fluctuations, Tides, Judicial decisions, Coasts.

Article 4 of the 1958 Geneva Convention on the Territorial Sea and the Contiguous Zone defines internal waters as those waters over which a coastal state possesses the fullest possible legal measure of control. Where the coastline of a state is jagged, or where there exist a fringe group of islands, Article 4 permits the use of the method of straight baselines joining appropriate points in drawing the baseline from which the breadth of the territorial sea is measured. Conflicts of interest arise between coastal states wishing to extend their internal waters by drawing baselines in their favor and other states protecting their shipping interests and passage rights. The Anglo-Norwegian Fisheries Case, 1949-51, is just one example of these conflicts. Paragraph 3 of Article 4, rgarding low-tide, is another source of conflict. Legal problems regarding the interpretation of this paragraph such as does it apply to nonparties, are there exceptions to the rule, and are there restrictions regarding permanent structures on low tide elevations, will require close attention at the third United Nations Conference on the Law of the Sea. (Curtis-Florida)
W78-10775

OUTER CONTINENTAL SHELF OIL AND GAS AND SULPHUR OPERATIONS.
For primary bibliographic entry see Field 5G.
W78-10776

DETERMINING PRIORITY OF FEDERAL RESERVED RIGHTS,
D. L. Hutchinson.
University of Colorado Law Review, Vol. 48, No. 4, p 547-573 (Summer. 1977).

Descriptors: *Federal-state water rights conflicts, *Reservation doctrine, *Water policy, *Prior appropriation, Legal aspects, Colorado, Nevada, Water law, Riparian rights, Public laws, Federal reservations, Water rights, Water allocation(Policy), Governmental interrelations, State governments, Watercourses(Legal aspects), Beneficial use, Diversion, Preferences(Water rights), Methodology, Judicial decisions.

When the federal government withdraws land from the public domain and reserves it for a federal purpose, by implication, appurtenant water then unappropriated is also reserved. Reserved water rights vest on the date of reservation and are superior to the rights of future appropriators. The author explores possible meanings for the phrases 'unappropriated waters' and 'future appropriators' in relation to determination of reserved rights priorities. The author also discusses the appropriation doctrine which provides for acquisition of water rights by diverting water from a water-course and putting it to a beneficial use. Colorado's mandate system is compared with Nevada's permit system. Three alternative methods for determining priority for federal reserved rights are analyzed in terms of workability, coordination with state appropriation systems, and advantages or disadvantages to state, private, and federal interests. The author recommends that state systems should be adopted in their entirety to eliminate specified difficulties in state water rights administration. Most problems arise when the date of creation of the reservation is compared with the date of appropriation by a competing appropriator, or when seniority is provided only to state interests which are 'choate' as of the date of reservation. (Hoofman-Florida)
W78-10777

DEFERENCE TO STATE COURTS IN THE ADJUDICATION OF RESERVED WATER RIGHTS,
Holland and Hart, Denver, CO.
C. M. Elliot, and K. Balcomb.
Denver Law Journal, Vol. 53, No. 4, p 643-662 (1976). 1 fig.

Descriptors: *Federal-state water rights conflict, *Reservation doctrine, *State jurisdiction, *Federal jurisdiction, Colorado, Jurisdiction, Judicial decisions, Legal review, Water rights, Federal reservations, Public lands, Prior appropriation, Legislation, Colorado River Basin, Rivers, Riparian rights, Water law, Indian reservations, United States.

When the federal government withdraws land from the public domain and reserves it for a federal purpose, by implication appurtenant water then unappropriated is also reserved. Reserved water rights vest on the date of reservation and are superior to the rights of future appropriators. The author discusses judicial treatment of the implied reservation doctrine and the question of whether federal or state courts should adjudicate federal-state water rights conflicts. Based on the McCarran Amendments' waiver of federal sovereign immunity, the Supreme Court has held that Colorado state courts may adjudicate appropriative rights, riparian rights, and reserved rights. In Akin v. United States (Akin), an action was brought in federal court by the United States for certain Indian tribes to determine federal water rights in the Colorado River Basin tributaries. Meanwhile, the United States was joined in an overlapping state adjudication. The Supreme Court upheld dismissal of the federal court case based on 'wise judicial administration' rather than abstention. After examining the pros and cons outlined in the Akin decision, the author concludes that state adjudication of local water rights has substantial advantages. (Hoofman-Florida)
W78-10778

COASTAL CONFLICTS AND THE COURTS,
E. A. Wilman.
Resources, No. 57, p 17-18 (January-March, 1978).

Descriptors: *Federal-state water rights conflicts, *Coasts, *Management, *Governmental interrelations, Judicial decisions, Federal jurisdiction, State jurisdiction, Coordination, Land management, Washington, California, Comprehensive planning, Water law, Water resources development, Water resources, Continental Shelf, Natural resources, Oil, Leases, Regulation, Grants.

Federal and state conflicts over coastal management are illustrated by three current Supreme Court cases. Ray v. Atlantic Richfield Company addresses the issue of whether Washington state's tanker law is preempted by the federal Port and Waterways Safety Act, County of Suffolk v. Secretary of the Interior concerns whether a Department of the Interior Environmental Impact Statement, regarding a Baltimore Canyon Outer Continental Shelf (OSC) oil and gas lease sale, fully complied with National Environmental Policy Act requirements. The third case questions federal approval of California's Coastal Plan. The author outlines development impacts on coastal environments which prompted federal and state legislation. The Coastal Zone Management Act (CZMA) of 1972, which set up a framework for coastal resources management, provides federal incentives and grants for development of state coastal management programs. The CZMA Amendments of 1976 concern development of coastal and OCS energy resources and establish a Coastal Energy Impact Program to mitigate adverse impacts. State coastal regulation and management frameworks are criticized for inadequate assessment and distribution of benefits and costs. As an alternative to licensing, the use of transferable development rights is recommended. Present and future issues concerning conflicting state and federal interests are also discussed. (Hoofman-Florida)
W78-10779

FLORIDA REGIONAL COASTAL ZONE STUDIES: EXISTING LEGAL AUTHORITIES.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Coastal Zone Planning.
Available from Bureau of Coastal Zone Planning, 2562 Executive Center Circle East, Montgomery Building, Tallahassee, Florida 32301. July, 1977. 20 p, 2 tab.

Descriptors: *Florida, *Coast, *Land management, *Regions, *Local governments, Managements, Governmental interrelations, Management, State governments, Zoning, Regulation, Administration, Grants, Land use, Administrative agencies, Planning, Environmental effects.

An analysis of existing North Central Florida coastal zone management is presented in this booklet. Critical elements representing the core of sound coastal zone management are listed. An inventory of existing local and regional agencies and a breakdown of their primary and secondary responsibilities is presented. Also identified are the general levels of government involved in decision making processes concerning: (1) upland land use; (2) submerged land use; and (3) use of marine waters. The critical coastal zone elements posing the greatest potential for agency conflict are identified. Other areas of concern include: (1) fragmentation of the responsibilities and jurisdictions concerning coastal zone management due to the number of federal, state, and local agencies involved; (2) growth in management duties without a corresponding increase in technical and monetary resources; and (3) lack of coordination between existing agencies. In conclusion, a number of recommendations are made to help facilitate local government compliance with Florida's Local

Government Comprehensive Planning Act of 1975 and the state coastal zone management plan. (Hoofman-Florida)
W78-10780

CONFLICTS BETWEEN PRIVATE APPROPRIATORS OF STREAM FLOWS AND USERS OF GROUND WATER IN NEBRASKA,
W. E. Holland.
Creighton Law Review, Vol. 10, No. 4, p 592-612, June, 1977.

Descriptors: *Nebraska, *Prior appropriation, *Reasonable use, *Relative rights, Legal aspects, Water rights, Appropriation, Surface-groundwater relationships, Prescriptive rights, Groundwater, Streamflow, Preferences(Water rights), Priorities, Water policy, Condemnation, Condemnation value.

Nebraska water law is split into two inconsistent systems. Groundwater is allocated by 'reasonableness' of the use in relation to the needs of all users; stream flow for irrigation purposes is allocated by priority of use in time. Incompatibility of rules and policies between the two systems leaves open questions as to how Nebraska courts will resolve conflicts between groundwater users and 'appropriators' of stream flow. Further open questions exist as to the prescriptive rights between parties under the differing systems. In order to maintain predictability of 'owners', the author favors priority of stream flow appropriation rights over the ground water 'reasonable use' system. He proposes legislation making ground water appropriations subject to any prior appropriation, whether surface or groundwater. To the extent that a groundwater use proves more efficient than a conflicting use of stream flow, however, the author suggests that groundwater users should be able to acquire the surface rights. This could be achieved either through a market transaction or through a state agency empowered to decide on the relative efficiency of conflicting uses and condemn the less efficient. (Baumbach-Florida)
W78-10781

LAND SUBSIDENCE: MENACE TO THE TEXAS GULF COAST,
Harris-Galveston Coastal Subsidence District, Houston, TX.
J. E. DeBerry.
Water and Sewage Works, Vol. 124, No. 5, p 54-56, May, 1977, 2 fig, 1 tab.

Descriptors: *Land subsidence, *Aquifer, *Texas, *Subsurface waters, Inundation, Water allocation(Policy), Artesian wells, Elevation, Sands, Soil structure, Soil pressure, Porosity, Tidal effects, Water demand, Water law, Ground water, Geological survey, Artesian aquifers.

In order to meet increasing industrial and domestic demands large volumes of water are being pumped from Texas underground water supplies. This pumpage has resulted in subsidence of land along the Gulf Coast. Many Texas residents have experienced property loss as a result of inundation. Subsidence is the loss of land surface elevation. It relates to the structure of the soils, primarily clays and sands. The pumpage of large volumes of water from the aquifer sands make it impossible for the aquifer to function properly for the water is drawn out faster than it can be returned. As a result the artesian pressure and the water level in the aquifer drops. Without the artesian pressure necessary to keep the pore water in the clay soils, the weight of the soil itself causes the pore water to be squeezed out, resulting in the loss of surface elevation. To help solve the problem, the 64th Texas Legislature passed House Bill 552 which created a special two county district, the Harris-Galveston Coastal Subsidence District. This district regulates the withdrawal of groundwater within its boundaries. A table with figures helps illustrates the problem. (Curtis-Florida)
W78-10782

LAW OF THE SEA: THE SCOPE OF THE THIRD-PARTY, COMPULSORY PROCEDURES FOR SETTLEMENT OF DISPUTES,
United Nations, New York. Office of Legal Affairs.
A. D. Adede.
American Journal of International Law, Vol. 71, p 305-11, April, 1977.

Descriptors: *Adjudicating procedure, *International law, *Law of the sea, *Treaties, *United Nations, Coasts, Continental margin, Decision making, Economics, Foreign countries, Governments, Resources, International waters, Legal aspects, Military aspects, Management, Oceans, Water law, Exploitation.

Disputes relating to the exercise by a coastal State of sovereign rights, exclusive rights, or exclusive jurisdiction are subject to the procedure specified under the Law of the Sea Convention. It is believed that the establishment of the meaning of the crucial terms used in the Convention and their correct application will greatly assist negotations on this important aspect of the Convention. The term 'sovereignty' is used to denote the usual broad and complete powers of a coastal state which are exercised over its territorial sea. The term 'sovereign rights' is used to denote a restriction on the coastal state's competence to those powers which are specifically related to the exploitation and management of resources in general. The term 'exclusive rights' is used to denote the rights reserved to the coastal states, within the exclusive economic zone, such as the establishment and use of artificial islands, installations and structures. The term 'jurisdiction' is used to denote the extent of the coastal states' rights within the exclusive economic zone with regard to the preservation of the marine environment. Despite the above definitions, it is difficult to classify all issues into neat categories for the purposes of third-party settlement. (Jordan-Florida)
W78-10783

FEDERAL COMMON LAW OF NUISANCE IN INTRASTATE WATER POLLUTION DISPUTES.
Washington University Law Quarterly, Vol. 1977, No. 1, p 164-77, Winter 1977.

Descriptors: *Interstate, *Common law, *Federal Water Pollution Control Act, *Water pollution control, Federal government, Judicial decisions, Abatement, Water pollution, Sewage, Federal jurisdiction, Waste water(Pollution), Legislation, Water law, Legal aspects, Pollution abatement.

In Committee for the Consideration of Jones Falls Sewage System v. Train, the Fourth Circuit evaded an opportunity to clarify the availability of federal common law nuisance actions to abate interstate water pollution. In that case, city and state officials had complied with the requirements of the Federal Water Pollution Control Act Amendments of 1972 (FWPCCA of 1972). As a result, no claim under the statute was available to the commission which sought to enjoin a Baltimore sewage [illegible] its customers to its system. [illegible], which neglected to allege the plaintiff's [illegible] had an interstate effect, based its request for an injunction on an asserted federal common law right. The court held that private citizens have no federal common law right to enjoin intrastate pollution. However, the court left unanswered the question of whether federal common law actions to abate interstate water pollution not enjoinable under the FWPCCA of 1972 are possible. The recent history of federal common law actions to abate water pollution is discussed. The author also analyzes the FWPCCA of 1972, as well as several federal common law nuisance cases. (Howard-Florida)
W78-10784

AN ANALYSIS OF THE SCOPE OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT ON THE GARRISON DIVISION UNIT PROJECT: APPLYING A TOTALITY OF CIRCUMSTANCES TEST,
For primary bibliographic entry see Field 6G.
W78-10785

WHAT ARE THE METES AND BOUNDS OF A WAVE.,
Oregon State Univ., Corvallis. Dept. of Anthropology.
C. L. Smith.
Ocean Development and International Law Journal, Vol. 4, No. 4, p 369-79, 1977.

Descriptors: *Resource allocation, *Governmental interrelations, *Boundaries(Property), Water pollution control, *Boundary disputes, Coasts, Ownership of beds, International waters, Boundary processes, Regional economics, Ecological distribution, Ecosystems, Fish management, Fish migration, Water resources, Water properties, Water quality, Water pollution, Social impact, Political aspects.

Seaward extension of national boundaries will involve application of land based boundary concepts to the oceans. This poses problems since resources, ecological boundaries, and pollutants do not respect political jurisdictions. Additionally, it is argued that extension of national boundaries may lock up ocean resources for the coastal nations. International bargaining and negotiations will be necessary in order to delineate the distribution of resources which cross boundaries and accrue primarily in coastal regions. Similar negotiations will be needed to define environmental responsibilities. The author notes a potential for increased neighbor-to-neighbor conflict as new boundaries are worked out, and as institutions to manage fish pollutants and other resources that do not correspond with national boundaries are initiated. However, he predicts a potential of better relations between distant-water fishing nations and coastal states will be possible with extensions of jurisdiction, since the rights of each can be clarified. He concludes that the nature of oceanic hydrologic systems and water masses will, in the long run, make the world a closer community as the residues of one nation becomes the resources and diseconomies of another. (Baumbach-Florida)
W78-10786

THE VIRGINIA COAST RESERVE: ACQUISITION STRATEGIES FOR COASTAL ZONE PRESERVATION,
Nature Conservancy, Arlington, VA.
For primary bibliographic entry see Field 6F.
W78-10787

SHIPWRECKS, POLLUTION, AND THE LAW OF THE SEA,
Environmental Protection Agency, Washington, DC. Office of International Activities.
R. J. McManus, and J. Schneider.
National Parks & Conservation Magazine, Vol. 51, No. 6, p 10-15 (June, 1977).

Descriptors: [illegible] *Oceans, *International [illegible], [illegible] ships, Coasts, Structural design, Pollutants, International waters, Oil spills, Compensation.

The recent spate of oil tanker casualties reinforces the author's belief that there is still no effective international law to protect the seas against such disasters. Some experts predict the biological death of the oceans within out lifetime if the present trends continue. Several man-made processes contribute to ocean degradation. These include the destruction of natural ground cover by coastal development, the addition of toxic materials to the oceans, and deliberate discharges from ships. Several methods used in controlling operating

discharges are explained in the article including the loadson-top technique and structural modification to vessels. the implementation of discharge standards is praised where present and called for where absent. The details of the treaty arising out of the Inter-Governmental maritime consultative Organization's Conference on marine Pollution are discussed along with possible interpretations. Certain proposals of the united States that would go beyond the international treaty are examined. One area of deficiency in the international arena cited and discussed is that of liability and compensation for oil pollution damage. The authors note that advancements made at the United Nations Conference on the Law of the Sea appear to be negligible. (Quarls-Florida)
W78-10790

GOOD TIMES FOR SOIL AND WATER CONSERVATION,
Library of Congress, Washington, DC. Congressional Research Service.
K. A. Cook.
Journal of Soil and Water Conservation, Vol. 33, No. 2, p 96-97 (March-April, 1978).

Descriptors: *Soil conservation, *Legislation, Land use, *Water conservation, Water resources, Erosion, Federal government, State governments, Data collections, Irrigation, Erosion control, Agriculture.

In an effort to revitalize federal efforts to conserve America's Soil and water resources, Congress passed the Soil and Water Resources Conservation Act of 1977 (WRCA). The new Legislation was several years in the making with a similar act being vetoed by President Ford in 1976. The author examines the development of the WRCA, the reasons for its implementation, the provisions of the new law and its effect. Drought, erosion, and the food crisis of 1974-1975 brought United States agricultural policy under close public scrutiny. The WRCA sqarely faced the need for new federal conservation programs. The author includes a detailed examination of the history of the bill in Congress and various objectives that were made. The WRCA has three major components that give it real potential to provide information on agricultural resources. The first section provides for the collection and synthesis of data for a continuing appraisal of the resource base. The second section forms the National Soil and Water Conservation program which will administer soil and water conservation efforts of the Department of Agriculture. The final component requires appraisal reports, policy statements, and recommendations for new legislation. The author notes that it is still too early to judge what effect the new law will have. (Quarles-Florida)
W78-10791

PLANNING AND SELECTING SITES FOR WATER STORAGE FACILITIES,
G. L. Groat.
Water and Sewage Works, Vol. 124, No. 9, p 111-116 (September, 1977). 8 fig.

Descriptors: *Reservoir design, *Storage tanks, *Reservoir sites, *Aesthetics, Water storage, Decision making, Cost-benefit analysis, Project planning, Design data, Engineering, Evaluation, Structural design.

Water storage facility planning has had to respond to increased citizen interest in neighborhood aesthetics. A 'Water Storage Guide' was recently developed to help provide guidelines and procedures for the evaluation and selection of water storage sites and designs. Several communities have adopted the guide as official policy. The guide delineates a six-step planning process; (1) environmental survey; (2) site and multiple use selection; (3) site and facility matching; (4) impact and cost evaluation; (5) impact cost tradeoffs; and (6) minimizing unavoidable impacts. the guide also includes engineering guidelines, design and multiple use proposals, and specific suggestions for working with the community to insure an uninterrupted and non-controversial water storage constructin program. The community acceptance section suggests that decision makers seek citizen participation. The guide suggests that engineering, economic and environmental factors considered in the selection of the preferred alternative be documented. The Water Storage Guide also includes useful graphs, maps and matrixes for use in analyzing land use sensitivity, aesthetic implications, and other impacts such as television interference. Use of the Guide has resulted in site and design combinations that are compatible with and complement the surrounding environment. (Baumbach-Florida)
W78-10792

APPROACH TO POLLUTION CONTROL AND LEGISLATION IN THE USA,
Water Pollution Control Federation, Washington, DC.
V. G. Wagner.
Water Pollution Control, Vol. 76, No. 3, p 277-279 (1977).

Descriptors: *Water pollution control, *Federal Water Pollution Control Act, Waste water treatment, *Environmental effects, Economic justification, Water quality control, Legislation, Cost-benefit analysis, Waste treatment, Industrial wastes, Municipal wastes, Regulation.

Even into the early 1900's the abatement of water pollution was treated as a private matter between the pollutor and the person claiming damage from the pollution. State law on pollution abatement evolved slowly and as late as 1940 few states had enforceable pollution laws. Following World War II and into the early 1960's, state control flourished and interstate compacts came into existence. In 1948, with the passing of the Federal Water Pollution Control Act (FWPCA), the federal government became dominant in the water pollution control effort. This leadership was expanded by the federal grant-in-aid program to municipal governments for the construction of publicly owned wastewater-treatment facilities. The federal role was further expanded with the FWPCA Amendments of 1972. The FWPCA Amendments require treatment of discharge water with the best practicable technology by 1977, and best available technology by 1983. The FWPCA Amendments set a 'zero pollutant discharge' goal. However, the author predicts this approach to pollution control will become less stringent, reflecting the high cost of such treatment in capital, maintenance costs, and high energy consumption. (Baumbach-Florida)
W78-10793

DEVELOPMENTS IN GROUNDWATER LAW,
Arizona Univ., Tucson. School of Law.
R. E. Clark, and A. Arguedas, Jr.
Nebraska Law Review, Vol. 57, No. 2, p 283-294 (1978).

Descriptors: *Groundwater, *Legislation, *Judicial decisions, *Water management(Applied), Groundwater mining, Groundwater availability, Water supply, Water quality control, Regulation, Planning, Water reuse, Water allocation(Policy).

In 1973, the National Water Commission emphasized the need for comprehensive state water legislation which would: integrate the management of surface water and groundwater; increase regulation of well drilling and groundwater 'mining'; and eliminate legal obstacles to the transfer of groundwater rights from one user to another. Because water law primarily is state property law, the most significant changes must therefore come from comprehensive changes in state laws. This commentary seeks to outline some of the more important recent state legislative and judicial actions in this area. The examples outlines show an increasing awareness of the law's need to respond to surface-groundwater interrelationships as affecting users' rights. There is growing awareness of the need for more specific criteria for choosing between competing water demands. And there is growing recognition of the importance of reclamation and reuse within water management programs. The author suggests that these constructive judicial and legislative efforts should be examined and improved wherever possible. In many states these growing recognitions could be incorporated into comprehensive water management legislation that would meet the essential requirements outlined in the National Water Commission Report and also anticipate future interstate and international problems. (Baumbach-Florida)
W78-10794

WHO HAS CONTROL OVER RECLAMATION PROJECT WATER,
W. Wieking.
In: Western Water, p 5-8 (May-June, 1978). Available from Western Water Education Foundation, 1107 9th Street, Suite 618, Sacramento, California, 95814.

Descriptors: *California, *Water rights, *Federal-state water rights conflicts, *Reclamation, Dams, Water allocation(Policy), Permits, Water utilization, Federal Reclamation Law, Impoundments, Impounded waters, Reclamation states.

California v. United States, currently under consideration by the United States Supreme Court, is further evidence of the continuing importance of the water issue in California. The case revolves around the question of whether California has the authority to impose conditions on the development and use of water derived from reclamation projects. The author explores the origins and developments of the controversy which arose out of the construction of the New Melones Dam. The California State Water Resources Control Board (WRCB) decided in 1973 that sufficient unappropriated water was available. However, when approving the United States' permit to appropriate water for the dam project, the WRCB established numerous conditions on the use and impoundment of that water. The United States claimed that under the Reclamation Act a state has no authority to set such conditions. The author considers the effect of the Reclamation Act and the reasons for the New Melones Dam project. The rationale of the California WRCB is set forth along with the legal arguments of both parties. The author expects the case will set precedent for the other sixteen reclamation states. (Quarles-Florida)
W78-10795

CHANGING RECLAMATION LAW TO MEET THE TIMES,
W. Wieking.
In: Western Water, p 9-12 (May-June, 1978). Available from Western Water Education Foundation, 1107 9th Street, Suite 618, Sacramento, California, 95814.

Descriptors: *Reclamation, *Federal Reclamation Law, *Irrigation water, *Reclaimed water, California, Federal government, Federal project policy, Reclamation states, Agriculture, Regulation, Irrigated land, Legislation.

Farmers in reclamation states who depend on reclamation projects for their irrigation water are in an uproar following the issuance of the Secretary of Interior's newly proposed regulation for acreage limitation. The regulation was issued in response to a federal district court's order. The issuance of these proposals resulted in congressional hearings and a number of Senate bills which would modify reclamation law. The Secretary's proposed changes call for: (1) a limit of 160 acres

owned or leased by each family member; (2) purchase of excess lands shall be chosen by lottery but a family relationsip with the seller results in preference; (3) all purchasers must live within fifty miles of the land; (4) the sale must occur within five years; and (5) the sale price shall be established by the Secretary of the Interior. The author examines these proposals in detail and also discusses alternative proposals contained in various congressional bills. All of the bills call for some form of revision of reclamation law. Each is examined individually. It is unclear at this point whether one of these bills will be adopted or whether a compromise solution will appear. (Quarles-Florida)
W78-10796

REGULATORY PROGRAMS FOR NONPOINT POLLUTION CONTROL: THE ROLE OF CONSERVATION DISTRICTS,
National Association of Conservation Districts, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10797

SPECIFIC PROBLEM ANALYSIS. 1975 NATIONAL ASSESSMENT OF WATER AND RELATED LAND RESOURCES (MISSOURI REGION).
Missouri River Basin Commission, Omaha, NE.
August, 1977, 16 p.

Descriptors: *Regional analysis, *Water resources, *Water management(Applied), Missouri River, *Assessments, Cost-sharing, Water users, Irrigation, Erosion control, Conservation, Alternative water use, Water supply, Surface-groundwater relationships, Energy, Water rights, Groundwater, Surface waters, Recreation demand, Water quality, Municipal water.

The principal agency for coordination of federal, state, interstate, and local plans for water and related land resources development in the area served by the Missouri River and its tributaries is the Missouri River Basin Commission (MRBC). This article summarizes the work of the MRBC during the 1975 National Assessment of Water and Related Land Resources. The objectives of the assessment were to identify existing and emerging needs and problems, relate these to the adequacy of resources to meet requirements and goals of the people for conservation, development, use and management, and identify complex problems requiring detailed planning. Maps and tables are included in discussion of water resources development, Indian water, alternative uses of water, water supply, cost-sharing, water related recreation needs, erosion, navigation requirements, flooding, water quality, and other topics of concern to the region. The discussions indicate needs, problems and trends in these areas of water resources and serve as background for the Commission's list of recommendations which basically call for further studies and accelerated federal funding to further the cooperative efforts of the Commission. (Spector-Florida)
W78-10798

SUMMARY GUIDE TO FLORIDA'S WATER RIGHTS,
Spessard L. Holland Law Center, Gainesville, FL.
J. B. Wadley.
Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida Circular 412, (1977), 24 p.

Descriptors: *Florida, *Public rights, *Riparian rights, *Water rights, Groundwater, Legislation, Navigable waters, Non-navigable waters, Pollution abatement, Regulation, Surface waters, Permits.

Summarized in this booklet are the legal aspects of acquisition and preservation of water rights and the substantive content of those rights in Florida. The booklet is intended to inform farmers and other landowners about the general characteristics of Forida's water law. The introduction outlines the nature of the right to use water in Florida and the way in which this right has been affected by the Florida Water Resources Act of 1972 (FWRA). The nature and extent of riparian rights are examined along with a discussion of natural navigable and non-navigable waterbodies. Rights of the general public to use such waterbodies are explained and contrasted with those of riparian landowners. The author discusses a landowner's rights with regard to groundwater and diffused surface water, and examines the permitting procedures mandated by the FWRA. A summary of the regulatory function of various governmental agencies involving pollution control, water management, and dredging and filling is provided along with the mailing addresses of those agencies. Explanations of Acreas of Critical State Concern and Endangered Lands are also presented. (White-Florida)
W78-10800

ENVIRONMENTAL PROTECTION: MODEL ORDINANCES FOR USE BY LOCAL GOVERNMENTS.
Metropolitan Council of the Twin Cities Area, MN.
March, 1977, 80 p.

Descriptors: *Minnesota, *City planning, *Environmental effects, *Local government, Cities, Environmental control, Land use, Mining, Natural resources, Planning, Water resources development, Zoning.

In 1974, the Minnesota Legislature directed the Metropolitan Council to develop model ordinances for the protection of natural resources in the Twin Cities Metropolitan Area. The intent of the legislation was to encourage local units of government to adopt and enforce sound policies regulating the subdivision, use and development of the limited land and water resources of the Metropolitan Area. The model ordinance offers three approaches: (1) a comprehensive site planning ordinance; (2) a series of over-lay district ordinances, each directed to the protection of a specific resource; and (3) a conservation district ordinance. A Mineral Extraction Ordinance is directed to minimizing the impact of such activity where it is occurring. The Council has also prepared a model ordinance to create a district zoned for agricultural land use. A reasonable balance must be achieved in the Metropolitan Area among natural resources protection, urban development and the need to provide adequate housing. Local governments are free to choose those model ordinances which apply in their jurisdictions and to vary the standards and requirements to best suit the local situation. (Jordan-Florida)
W78-10801

REVIEW OF EXISTING STATE LAND USE REGULATION IN FLORIDA--AN OVERVIEW,
Florida Law Revision Council, Tallahassee. Office of Statutory Revision.
F. W. Baggett, and D. Guthrie.
February, 1975. 75 p.

Descriptors: *Legislation, *Administration, *Land management, *Comprehensive planning, *Flordia, Water management(Applied), Natural resources, Land use, Land management, Management, Environmental control, Administrative agencies, Permits, Water law, Water resources planning, Regulation, Law enforcement.

Existing Florida laws regulating land use are reviewed as to purpose, scope, administration, statutory limitations, and enforcement. The Environmental Protection Act of 1971 provides for actions against violators of air, water, and natural resource laws. Injunctive relief may be obtained except instances where a person or an agency charged with a violation is acting in compliance with a currently valid permit. The Environmental Land and Water Management Act provides that Florida must establish land and water management policies to facilitate growth and development decisions. The act covers areas of critical state concern and developments of regional impact. It is administered by the Florida Land and Water Adjudicatory Commission, which consists of the governor and the cabinet. The Florida Environmental Reorganization Act centralizes responsibility for environmental management and authorizes decision-making authority to the district level. Activities of the Department of Environmental Regulation and Department of Natural Resources are coordinated. Also reviewed are Chapter 23, State Comprehensive Planning; Chapter 160, Regional Planning Councils; Chapter 177, Maps and Plats; Chapter 253, Internal Improvement Trust Fund; Chapter 75-204, New Communities Act of 1975; and Chapter 75-257, Local Government Comprehensive Planning Act. (Rule-Florida)
W78-10802

THE IMPACT OF WATER RIGHTS AND LEGAL INSTITUTIONS ON LAND AND WATER USE IN 2000,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 6D.
W78-10803

PROPERTY RIGHTS TO GEOTHERMAL RESOURCES (PART ONE),
California Univ., Berkeley. School of Law.
S. Sato, and T. D. Crocker.
Ecology Law Quarterly, Vol 6, No 2, p 250-321 (1977).

Descriptors: *California, *Electric power, *Geothermal studies, *Land tenure, *Thermal power, Electricity, Energy conversion, Energy gradient, Geology, Geophysics, Heat, Public rights, Public utilities, Real property, Steam, Thermal powerplants, Thermal properties, Thermal water, Legislation, Common law.

Geothermal energy is being exploited currently only in areas where fluid is present in hot rock formations beneath the surface of the earth. There has been much speculation as to whether the allocation of geothermal resources should be governed by a property regime applicable to water or other resources. A critical issue is whether rights to geothermal resources are retained by the state and federal governments under the express mineral reservations required by the various statutes governing the patenting of land. Some landowners have argued that geothermal resources are 'water' and therefore are not covered by the reservations. However, the unique characteristic of geothermal resources--heat energy--should preclude its classification as 'water.' In addition, the common law doctrine that surface ownership carries with it the absolute ownership of all that lies beneath the land should not be applied to geothermal resources. This doctrine has been rejected in other areas, notably the control of percolating groundwater and airspace, in favor of a rule which protects only justified expectations surface related uses. (Jordan-Florida)
W78-10806

GONE WITH THE WATER--DRAINAGE RIGHTS AND STORM WATER MANAGEMENT IN PENNSYLVANIA,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
R. T. Weston.
Villanova Law Review, Vol 22, No 5, p 901-82 (1976-1977).

Descriptors: *Pennsylvania, *Drainage, *Storm water, *Management, *Planning, Flood control, Storms, Natural flow, Municipal water, Water resources, State governments, Damages, Watershed management, Land use, Structures, Diversion, Reasonable use.

The purpose of this article is to explore the interrelated issues of drainage rights, storm water and flood control programs and flood plain management in Pennsylvania. Noting that drainage law and storm water management are matters of public as well as private concern, the article concludes that: (1) a more integrated approach buttressed by clearly enunciated public policies and laws is essential; (2) prior planning is a prerequisite to any rational storm water management program; storm water mangement policy should conserve natural drainage characteristics as part of an economically efficient and equitable program; (3) for any solution to be successful, intermunicipal conflicts must be resolved and storm water problems must be addressed on a watershed-wide basis; (4) drainage rules should retain essential flexibility while providing sufficient certainty to guide private and public development decisions; (5) storm water management should be sensitive to and compatible with the attainment of other water resource and environmental objectives; and (6) storm water management considerations should be an integral aspects of land use planning and development programs. In addition, the author feels that future storm water management programs must be capable of administration and implementation through realistic manpower and budgetary resources. (Easterbrook-Florida)
W78-10807

THE ECONOMIC IMPACT OF THE FEDERAL ENVIRONMENTAL PROGRAM: A REPORT TO THE SUBCOMMITTEE ON AGRICULTURE, ENVIRONMENTAL AND CONSUMER PROTECTION OF THE COMMITTEE ON APPROPRIATIONS OF THE HOUSE OF REPRESENTATIVES,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10809

A REPORT TO CONGRESS ON WATER POLLUTION CONTROL MANPOWER DEVELOPMENT AND TRAINING ACTIVITIES.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-10812

IMPROVED FEDERAL AND STATE PROGRAMS NEEDED TO INSURE THE PURITY AND SAFETY OF DRINKING WATER IN THE UNITED STATES.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-10813

WATER POLLUTION ABATEMENT PROGRAM: ASSESSMENT OF FEDERAL AND STATE ENFORCEMENT EFFORTS.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5E.
W78-10814

REGULATION FOR TANK VESSELS ENGAGED IN THE CARRIAGE OF OIL IN DOMESTIC TRADE.
Coast Guard, Washington, DC. Office of Merchant Safty.
For primary bibliographic entry see Field 5G.
W78-10815

FOREIGN NAVIES AND ENVIRONMENTALISM,
Naval Academy, Annapolis, MD.
R. M. Paone.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 904, Price codes: A04 in paper copy, A01 in microfiche. Prepared for the Office of Support Technology, Naval Material Command, Wash., D.C. as Report USNA-EPRD-25, June, 1976. 45 p.

Descriptors: *Foreign countries, *Legislation, *Military aspects, *Water pollution control, Abatement, Economics, Foreign projects, Foreign research, Foreign waters, Industry, Institutional constraints, Water policy.

The environmental legislation of 15 nations from Latin America, Asia, North America and Europe was studied and placed into a perspective related to the environmental policies of the military of those nations. The study concludes that this environmental legislation has not been as effective as purported. There are several reasons for this situation: (1) lack of implementation measures; (2) insufficient punitive measures; (3) fear of cost of enforcing the environmental laws; (4) greater desire to support industrailization; and (5) inability to perceive pollution abatement as a long term value. These factors, when added to the contemporary character of the national legislation, leads to the conclusion that the effectiveness of the legislation is questionable. Most navies are environmentally minded, although combat readiness, at times involving pollution, is the highest priority. Where a navy has its own Research and Development section, there is a closer interaction between government policy and research and development on the environment. All of the foreign navies have the right to seek exemption from environmental restrictions deemed detrimental to the combat capability of the navy. (Jordan-Florida)
W78-10816

THE INTERNATIONAL LAW OF SCIENTIFIC RESEARCH IN THE OCEANS,
Harvard Law School, Cambridge, MA.
R. R. Baxter.
Georgia Journal of International and Comparative Law. Vol. 6, No. 1, p 27-39 (1976).

Descriptors: *International waters, *Law of the sea, *Research and development, *Continental shelf, Oceans, Fisheries, United Nations, Treaties, Internal water, Conferences, Jurisdiction, International law.

Freedom of scientific research of oceans is a major concern of both the United States and the Soviet Union. The author examines the existing legal regime governing scientific research in the seas, noting it will continue to govern if the United Nations Conference on the Law of the Sea (LSC) fails to draw up new treaties. Under present law, scientific research in territorial seas and internal waters is forbidden without permission of the coastal state. In the high seas, there are no restrictions on scientific research in the water column; beyond the limits of the continental shelf; or in the seabed or subsoil. Two polar extremes are discernable at the LSC. As to areas within the economic zone, including the continental shelf, the seabed and subsoil, one view is that research be governed by a consent regime. Such a regime could be managed under the jurisdiction of a coastal state or an international authority. The other faction favors full freedom of scientific research on the continental shelf, seabed and subsoil subject to certain conditions such as notification and sharing of results. All agree that consent is necessary for research in territorial seas and internal water. (Quarles-Florida)
W78-10824

SALINITY MANAGEMENT ALTERNATIVES FOR OIL SHALE WATER SUPPLIES,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-10825

THE LAW OF THE SEA: A TEST OF INTERNATIONAL COOPERATION,
Department of State, Washington, DC.
H. Kissinger.
Department of State Bulletin, Vol 74, No 1922, p 533-542 (April 26, 1976).

Descriptors: *International water, *Law of the Sea, *Treaties, *International law, Foreign trade, Political aspects, Economics, Administration, Planning, Foreign countries, Research and development, Jurisdiction.

The Secretary of State outlines United States proposals for the Law of the Sea (LOS) Treaty. The United States was ready to agree to coastal state control of scientific research directly related to the exploration and exploitation of the resources of the economic zone, but insisted that other marine scientific research not be hampered. To promote the fair settlement of disputes involving interpretation of the LOS treaty, the U.S. proposed the establishment of an impartial dispute-settlement mechanism whose findings would be binding upon all signatory states. An International Seabed Resource Authority (ISRA) was proposed to supervise exploration and development of deep seabeds. It was asserted that the ISRA should include: (1) a Council representing the economic concerns of all affected states; (2) a Tribunal to adjudicate powers of the ISRA under the LOS Treaty; and (3) an Assembly of all member states to give policy guidance. To insure nondiscriminatory access to seabed mining sites, the United States proposed that the ISRA should supervise a system of revenue sharing from mining activities for the use of the international community. International institutions could use revenue to assist countries to adjust and diversify and to improve their competitiveness. (Baumbach-Florida)
W78-10826

PROBLEM IDENTIFICATION, LEGAL ASPECTS OF FLOOD CONTROL, ALTERNATIVE CONTROL MEASURES.
Pikes Peak Area Council of Governments, Colorado Springs, CO.
(January, 1976). 92p.

Descriptors: *Colorado, *Flood control, *Runoff, *Drainage effects, Erosion control, Drainage practices, Urban drainage, Design standards, Coordination, Water management(Applied), Flood plains, Design criteria.

This 1976 report is a result of input from agencies and firms familiar with storm water runoff and associated drainage problems found in the study area near Colorado Springs, Colorado. Each agency and firm was asked to submit a list of 10 problems relating to storm drainage and non-point source pollution, ranking them from most to least frequent. The findings of the survey are presented as general problem classifications with selected comments that are representative of the general problem area. Most frequently mentioned problems were: (1) problems related to erosion and sediment control; (2) problems related to increased runoff, urbanization and development activities; and (3) problems with uniform design criteria and coordination between city and county agencies. The report also includes pertinent state laws, federal laws, drainage laws, and flood plain regulations. An extensive section analyzing alternative control measures contains suggestions for erosion and sediment control and treatment, abatement and disposal of urban runoff. The report is premised on the belief that drainage criteria and design standards must be continually reviewed and

revised to reflect advances in engineering technology. (StumpoFlorida)
W78-10827

FOURTH CIRCUIT RULES EPA MAY ISSUE PRESUMPTIVELY VALID EFFLUENT LIMITATIONS UNDER SECTION 301 OF THE FWPCA.
Environmental Law Reporter, Vol. 6, No. 5, p 10103-10105 (May, 1976).

Descriptors: *Effluents, *Federal Water Pollution Control Act, *Judicial decisions, *Discharge measurement, Regulation, Administrative agencies, Permits, Industrial wastes, Management, Water quality control, Water pollution sources, Legal aspects.

In 1976, the Fourth Circuit Court of Appeals joined the Third and Seventh Circuits in ruling that the Environmental Protection Agency (EPA) has authority to establish single-number effluent limitations under Section 301 of the Federal Water Pollution Control Act. The ruling continues the judicial momentum for this view, but also further confuses the related question of the form and effect those limitations should have and leaves uncertain the possibility of achieving uniform national discharge standards within each category of industrial polluters. National uniformity of standards was viewed as crucial to the administration and enforcement of the Act; however, the regulatory scheme of the Act is ambiguous and no one has explicit authority to establish effluent limitations. Thus, the judicial decisions giving that power to the EPA are important to the implementation of the Act. The Fourth Circuit approved the reasoning of the other two circuits that the EPA was a reasonable and unobjectionable agency to administer the Act; however the power of the EPA as to particular industrial categories was seen as less than adequate by the court, which noted the need for ultimate Congressional or Supreme Court clarification. (Stump-Florida)
W78-10828

CARTER ENVIRONMENTAL MESSAGE STRESSES ADMINISTRATION, ENFORCEMENT,
P. S. Ward.
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1572-1575 (July, 1977).

Descriptors: *Federal government, Programs, *Water policy, *Federal Water Pollution Control Act, Administrative agencies, Adoption of practices, Dredging, Environmental control, Law enforcement, Pollutants, Pollution abatement, Water pollution control, Water pollution sources, Water resources, Wetlands, Decision making.

On May 23, 1977, President Carter delivered an environmental message to Congress. Included were several new legislative initiatives and commitments to submit future legislation, five executive orders, and a variety of policy statements and directives to federal agencies. The President focused attention on three areas of the water pollution program under the Federal Water Pollution Control Act as amended. These were the construction grants program, the 208 program, and the need for further amendments dealing with enforcement. The Environmental Protection Agency was instructed to give highest priority to the development of the 1983 best available technology standards for toxic industrial pollutants and to setting toxic standards under the Safe Water Drinking Act. Carter also issued executive orders initiating a comprehensive review of water resources policy and mandating a cessation of federal support of development in floodplains and wetlands. He supported regulation of dredge spoil disposal in wetlands and requested funding for the purchase of waterfowl habitats. The message also urged the streamlining of the Environmental Impact Statement process, development of legislation to consolidate various environmental grants programs, and review of environmental coordination legislation to reduce overlapping and conflicting requirements. (White-Florida)
W78-10829

EPA CHARTS POLICY FOR DEADLINE ENFORCEMENT,
P. J. Piecuch.
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1569-1571 (July, 1977).

Descriptors: *Industrial wastes, *Municipal wastes, *Water pollution control, *Federal Water Pollution Control Act, Environmental control, Industries, Penalties(Legal), Pollution abatement, Priorities, Waste water(Pollution), Waste water treatment, Administrative agencies.

Industrial and municipal dischargers that were not in compliance with the water pollution abatement requirements before the July 1, 1977 Federal Water Pollution Control Act deadline face enforcement action from the Environmental Protection Agency (EPA). The author outlines the procedural scope of enforcing the secondary treatment and best practicable technology requirements for municipalities and industries respectively. Regional EPA administrators have been instructed to maintain close coordination with their respective state agencies in order to achieve consistency in filing noncompliance suits and other enforcement actions. The complex EPA enforcement policy regarding industrial dischargers involves the application of a three-pronged strategy. Major dischargers, as classified by the EPA, will be assigned highest priority. Enforcement action will initially concentrate on schedule violations rather than effluent violations. Enforcement priorities will be ranked within the schedule violation category on the basis of potential impact on human health, bad faith efforts toward compliance, and impact of existing discharges. For industrial dischargers, the EPA has established enumerated criteria which, if met, would extend the compliance deadline. EPA's enforcement strategy and priorities for municipal dischargers are also discussed. (White-Florida)
W78-10830

CURRENT STATUS OF THE WASHINGTON COASTAL ZONE MANAGEMENT PROGRAM AMENDMENT,
Washington State Dept. of Ecology, Olympia. Shoreline Div.
D. R. Mack.
In: Shorelines Management '77 Performance and Prospects, Conference Proceedings, September 22-23, 1977, University of Washington, Seattle, Sea Grant Program, Division of Marine Resources, p 148-152.

Descriptors: *Washington, *Coastal plains, *Environmental effects, *Land management, *Coasts, Management, Regulation, Administrative agencies, Legislation, Federal government, Economic impact, Oil, Land use, Municipal water, Solid wastes, Transportation, Governmental interrelations, Water quality, State governments, Zoning, Administrative decisions.

The state of Washington is seeking to amend its federally approved coastal zone management program. The amendment procedures are constantly evolving as new issues arise. The process involves a high level of public participation. This summary reflects the current status of the amendment and traces its history. The amendment requires the same review and approval procedures as the initial program. This includes public hearings, federal agency review and compliance with the National Environmental Policy Act. Further requirements include: (1) a formal request for an amendment; (2) a description of the change; (3) justification showing that the proposal complies with federal regulations; (4) evidence of public notice; and (5) analysis of environmental impacts. The proposed amendment calls for deletion of a policy statement favoring the siting of a single, major crude petroleum transfer facility in Washington's coastal zone. The amendment would allow the state to keep all options open and allow a more thorough analysis of the issue. The article contains a short discussion of the analysis of the environmental impact of the amendment. A decision on the amendment should be available in June of 1978. (Quarles-Florida)
W78-10831

EMERGING PATTERNS OF DECISIONS (THE APPLICATION OF POLICY IN THE ADMINISTRATION OF THE SHORELINE MANAGEMENT ACT IN WASHINGTON),
Shorelines Hearings Board, Lacey, WA.
C. Smith.
In: Shorelines Management '77 Performance and Prospects, Conference Proceedings, September 22-23, 1977, University of Washington, Seattle, Sea Grant Program, Division of Marine Resources, p 111-118.

Descriptors: *Permits, *Washington, *Land management, *Land development, *Shores, Legislation, Regulation, State governments, Local governments, Water pollution control, Beaches, Shore protection, Coasts, Public access, Aesthetics, Landfills, Decision making, Judicial decisions, Administration, Water policy.

The Shoreline Management Act (SMA) is important to those who develop or regulate development of Washington's shorelines. The main regulatory device employed by the SMA has proven to be the substantial development permit. By examining some cases where local decisions on permit applications have been appealed to the Shorelines Hearing Board (SHB), the author analyzes the application of the policies and procedures of the SMA. The history of the SHB is examined as well as its jurisdiction under the SMA. The procedures required for requests for review by the SHB are set forth along with the actions that the SHB may take. The conduct of the formal hearings, the standard of review required, the content of orders issued by the SHB, and appeals procedure from the SHB's orders are explained. The SHB's primary responsibility, in applying the SMA, is to evaluate a substantial development proposal in terms of the policies and procedures of the SMA. To illustrate the process, the author analyzes some typical SHB decisions involving fills, aesthetics and public access. (Quarles-Florida)
W78-10832

INTERGOVERNMENTAL CONFLICT IN LAND USE PLANNING: THE CALIFORNIA COASTAL ZONE CONSERVATION COMMISSION V. THE LOCAL REDEVELOPMENT AGENCIES,
A. M. Kirlin.
Beverly Hills Bar Journal, Vol. 11, No. 3, p 20-29 (May-June, 1977).

Descriptors: *California, *Coasts, *Area redevelopment, *Inter-agency cooperation, *Permits, Land development, Project planning, Governmental interrelations, Future planning(Projected), Land use, Planning, Administrative agencies, State governments, Legal aspects, Land management, Legislation, Local governments, Regional planning, Comprehensive planning, Judicial decisions, Common law.

In 1972, California enacted the California Coastal Zone Initiative. The objective of the Initiative was the protection and restoration of coastal zone resources. This article analyzes the political and legal basis for the ensuing conflict between the local redevelopment agencies with existing projects and the newly established coastal commissions. Local agencies had to choose between applying for permits under the new law or seeking exemption under the theory of vested rights. Controversy arose over exemption and permit requests because different results were reached at

the local and state levels. The controversy climaxed in 1973 when the California supreme court held that exemptions based on vested rights did not extend to redevelopment activities undertaken by private developers. The court also viewed redevelopment projects as a series of smaller enterprises each requiring a separate exemption or permit request. The author makes the following recommendations to resolve the tension between the state and local interests: (1) that all activities, public and private, taken pursuant to a redevelopment plan be classified as a single project and (2) that a project plan be considered as a whole for initial permit purposes. (Malmad-Florida)
W78-10833

EFFLUENT CHARGES AS AN ALTERNATIVE TO REGULATIONS,
S. J. Hadeed.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 534-36, April, 1977.

Descriptors: *Pollution taxes(Charges), *Water pollution control, *Regulation, *Pollution abatement, Water pollution sources, Water law, Environmental control, Cost-benefit theory, Costs, Taxes, Waste water disposal, Effluents, Law enforcement, Industrial plants, Industrial wastes, Water pollution, Penalties(Legal).

The Water Act, the regulatory approach to pollution control, has encouraged many industrial point sources polluters to reduce their pollutant levels to within the limits specified by effluent guidelines. However, a significant number of dischargers have failed in their attempts to comply with the provisions of the Water Act. To remedy this situation a proposed amendment, designed to supplement the regulatory approach by adopting a system of effluent taxes, was recently submitted to Congress by the Environmental Protection Agency. The amendment would add a new section entitled 'Non-Compliance Fee' to the Water Act. This amendment would authorize the imposition of a penalty upon noncomplying point sources. Opponents of the effluent tax system believe that the problem of determining pollution levels, assessing equitable fines, and distributing higher costs to the consumer will hinder the system's effectiveness. Advocates of the new fee claim that it will improve the efficiency of existing enforcement methods as well as foster compliance with the Water Act by making investment in pollution control facilities at least as financially attractive to industries as noncompliance. In addition, the amendment will end the inequitable result of permitting non-complying sources to gain competitive advantage over sources which have complied. (Curtis-Florida)
W78-10834

FLORIDA'S AREA OF CRITICAL STATE CONCERN: AN UPDATE,
Florida Bureau of Land and Water Management, Tallahassee. Div. of State Planning.
S. Fox.
Florida Environmental and Urban Issues, Vol. 5, No. 4, p 6-10 (April, 1978).

Descriptors: *Florida, *Environmental control, *Land management, *Water resources development, Legislation, Regulation, Land use, Regional development, Watershed management, Recharge, Wetlands, Planning.

Florida's Environmental Land and Water Management Act of 1972 (FLWMA) authorizes the designation of Areas of Critical State Concern (ACSC) and the review of developments of regional impact. The process, criteria, and consequences of designation of an ACSC are outlined. Once an ACSC has been designated, affected local governments have six months in which to submit acceptable land development regulations. Florida's first ACSC was the Big Cypress Swamp, a part of the Everglades National Park watershed. The state has attempted to reverse the water loss there caused by land speculators and farmers who dug canals to produce more dry land. The second ACSC was the Green Swamp, a major recharge area for the Floridan Aquifer. The Green Swamp's wetlands are the headwaters for five rivers. The third ACSC designated was the Florida Keys which now have the most comprehensive and complex regulations. The ACSC program and a new alternative resource management and planning program developed for the Appalachicola River Basin are analyzed. The author notes that the ACSC portion of the FLWMA has been declared unconstitutional by a lower court. The decision is being reviewed by the state Supreme Court. (Hoofman-Florida)
W78-10835

THE SETTLEMENT OF DISPUTES AND THE LAW OF THE SEA,
Pittsburgh Univ., PA.
D. S. Cheever.
Marine Policy Reports, Sea Grant College Program, College of Marine Studies, University of Delaware, Vol. 1, No. 5, (February, 1978). 4 p.

Descriptors: *United Nations, *Conferences, *Law of the Sea, *International law, Negotiations, International waters, Treaties, Regulation, Beds under water, Continental shelf, Natural resources, Exploitation.

One result of the Third United Nations Conference on the Law of the Sea (Conference) was the outlining of procedures for dispute settlement specified in the informal Composite Negotiating Text (ICNT). Most governments attending agree that a blinding dispute settlement procedure is indispensible for any comprehensive ocean treaty or regulatory regime. The author traces the historical development of binding dispute procedures and changes in the political-legal regime of freedom of the high seas. Conflicting interests and issues concerning jurisdiction over marine and seabed resources, pollution control, transit passage, and the 200-mile exclusive zone are discussed. To handle ocean resource exploitation disputes, the ICNT provides for a Sea Bed Dispute Chamber as part of a Law of the Sea Tribunal (LST) having jurisdiction over disputes arising between specified parties. The author details the procedures and composition of the LST and discusses three alternative forums for settling disputes: (1) the International Court of Justice; (2) traditional arbitration; and (3) appointment of experts to special arbitral tribunals. The author also discusses the scope and limits of the ICNT dispute settlement system which is particularly limited in the management of coastal zone fisheries. (Hoofman-Florida)
W78-10836

TROUBLE AHEAD FOR CLEAN WATER,
Natural Resources Defense Council, New York.
M. Reisner.
NRDC Newsletter, Vol. 6, Issue 4, p 7-10 (July-August, 1977).

Descriptors: *Federal Water Pollution Control Act, *Water pollution control, *Water pollution sources, *Hudson River, Water pollution effects, Pollution abatement, Effluents, Navigable waters, Toxins, Permits, Administrative agenc

The Natural Resources Defense Council's Project on Clean Water (Project) was established shortly after passage of the Federal Water Pollution Control Act of 1972 (FWPCA). To illustrate the alleged failure of the federal water pollution control effort, the author traces the path of the Hudson River from its tributary sources to where it empties into the Atlantic Ocean. Sources and types of pollutants which enter the river are identified and related to specific provisions of the FWPCA designed to remedy or ameliorate the problem. Sewage entering the river could be treated through implementation of the sewage treatment construction program. Other sections of the FWPCA were written to: (1) restrict the dumping of dredged or fill material into navigable waters; (2) control runoff of organic nutrients, chemical poisons, and sediments from the land; and (3) regulate toxic and hazardous pollutants. FWPCA sections concerning implementation of pollution control technology, state and federal permits system, and enforcement are also identified. Focusing on the problems of toxic pollutants, saving wetlands, enforcement and runoff, the author discusses the interaction of the legislative and litigation efforts of the Project governmental agencies, and private industry. The author advocates vigorous citizen efforts to prevent weakening of the FWPCA. (Hoofman-Florida)
W78-10837

EVOLUTION IN THE BRITISH INSTITUTIONAL FRAMEWORK FOR WATER MANAGEMENT,
Victoria Univ. (British Columbia). Dept. of Geography.
W. R. D. Sewell, and L. R. Barr.
Natural Resources Journal, University of New Mexico, School of Law, Vol. 17, No. 3, p 395-413 (July, 1977).

Descriptors: *Droughts, *Water resources development, *Foreign countries, *Management, Rationing(Water), Water shortage, Regulation, Administration, Planning, Alternative water use, Groundwater resources, Research and development.

The authors note that crisis often plays an important role in stimulating change in resources management institutions. They analyze the role of the British drought in the summer of 1976 as an impetus to change. The major features of British water resource protection were institutionalized under the 1963 Water Resources Act and the 1973 Water Act. Relatively sweeping reforms were accomplished with the 1963 Act, specifically by the establishment of a Water Resources Board. Through encouragement and facilitation of research and long-range planning, and coordination of major water management agencies, the Board was to provide a national perspective in water management. Although that Board was abolished by the 1973 Act, its functions are essentially carried on by the National Water Council. Deficiencies, such as too large a number of independent water management units, were remedied by the 1973 Act. The 1976 drought put pressure on policy-makers to initiate further changes. It led to a revival of interest in major reservoir and water diversion schemes, as well as consideration of alternatives such as recycling, groundwater development and rationing. (Stump-Florida)
W78-10838

THE ROLE OF INTERSTATE COMMISSIONS IN GROUNDWATER PROTECTION--THE SUSQUEHANNA RIVER BASIN COMMISSION PERSPECTIVE,
Susquehanna River Basin Commission, Mechanicsburg, PA.
For primary bibliographic entry see Field 5G.
W78-10839

SURFACE WATER: TEXAS GULF COAST ALTERNATIVE TO SUBSIDENCE,
Harris-Galveston Coastal Subsidence District, Houston, TX.
J. E. DeBarry.
Water and Sewage Works, Vol 124, No 7, p 52-53 (July, 1977).

Descriptors: *Water management(Applied), *Surface-groundwater relationships, *Subsidence, *Texas, Groundwater availability, Groundwater basins, Water resources development, Water supply, Water wells, Permits, Regulation, Groundwater resources.

An acceleration of subsidence, the loss of land surface elevation, due to concentrated groundwater pumping prompted the creation in May, 1975, of the Harris-Galveston Coastal Subsidence District. The two-county special district was created for the purpose of regulating groundwater pumping and promoting the use of surface water in order to end subsidence. This article reviews the progress of the district in its first two years. One of the district's main regulatory functions is the issuance of well permits. In considering permit applications, the district first determines whether or not there is an available source of surface water. With the Trinity, San Jacinto and Brazos River systems as the primary sources of surface water in the area, a total of 1195 MGD is available, which is considered adequate to meet the area's rapidly growing water demands well into the next century. In testimony given at a public hearing on the district's progress, a United States Geological Survey indicated that significant increases in groundwater levels were recorded in areas where significant conversion to surface water rise had taken place. Thus, the outlook for this two-county area is positive. (Stump-Florida)
W78-10840

KLEPPE CONDITIONALLY DECLARES NEW RIVER A SCENIC RIVER.
Environmental Law Reporter, Vol 6, No 4, p 10077-10080 (April, 1976).

Descriptors: *Wild River Act, *North Carolina, *Pumped storage, *Hydroelectric project licensing, Hydroelectric plants, Hydroelectric power, Water supply, Water storage, Federal Water Pollution Control Act, Federal Power Act, Drawdown, Permits.

In the first administrative design of this kind, Secretary of the Interior Thomas Kleppe granted the request of the state of North Carolina to include the New River among those designated 'wild and scenic rivers'. North Carolina's action was an attempt to prohibit construction of a large pumped-storage hydroelectric facility, called the Blue Ridge Project, by the Appalachian Power Company under a license granted by the Federal Power Commission. The Wild and Scenic Rivers Act prohibits such construction on those rivers included in the national wild and scenic river system. However, the designation was granted conditionally; if the FPC licensing of the Blue Ridge Project survives pending judicial review in the District of Columbia Circuit Court, that license will take precedence, and the construction will be allowed. This article discusses North Carolina's allegations that the real motivation behind the Blue Ridge Project is to augment streamflow for water quality control, which is in violation of the Federal Water Pollution Control Act, and identifies several factors the Court should consider in balancing the interests that favor flooding the river and those that favor preserving it. (Stump-Florida)
W78-10841

CALIFORNIA ISSUES STRONG COASTAL PLAN.
Environmental Law Reporter, Vol 6, No 4, p 10083-10086 (April, 1976).

Descriptors: *California, *Water resources, *[illegible]ning, *Regional development, Comprehensive planning, Legislation, Management, Beaches, Recreation, Coasts, Urban land use, Zoning.

The 1976 California legislature had the task of debating the proposed California Coastal Plan. The author of this article felt that the outcome would have a major impact on not only the California coast, but also on the national destiny of other comprehensive resource management plans. In response to the increasing population growth and density near the California coasts, the plan proposed quality development of the coastal area, integrating the preservation, enhancement and restoration of natural and man-made coastal resources. Additionally the plan recommended granting priority to public and coastal-dependent resource uses over private and non-coastal dependent uses. This article discusses specific plan provisions for energy and transportation, beach access and recreation, marine environment, and land environment and development. The California legislature had to consider several implementing bills, none of which adopted the Coastal Plan verbatim. This plan was one of the most comprehensive land use plans then developed in the United States, and was not without its detractors. With its twin objectives of protection of natural resources and quality development, the author concludes the plan's adoption or rejection will influence other innovative plans like it. (Stump-Florida)
W78-10842

WATER ACT'S OIL SPILL NOTIFICATION RULE SURVIVES CONSTITUTIONAL CHALLENGES.
Environmental Law Reporter, Vol 6, No 1, p 10011-10014 (January, 1976).

Descriptors: *Law enforcement, *Federal Water Pollution Control Act, *Oil spills, *Penalties(Legal), Oil pollution, Disasters, Water pollution, Regulation, Water law, Water pollution sources, Judicial decisions, Water quality control.

The fact that neither ecosystems nor pollutants respect state lines substantially explains the growing role of the federal government in pollution control. Although there have been serious challenges to the authority of the Environmental Protection Agency to administer some pollution control programs, implementation of the far-reaching Federal Water Pollution Control Act Amendments of 1972 has not been the subject of many attacks. However, some objections have been made to the statute's strict oil spill enforcement scheme, particularly one of its self-reporting requirements. To satisfy this requirement, and to insure prompt clean up, whoever spills harmful quantities of oil or other hazardous substances must immediately notify authorities of that fact. Both failure to notify and failure to do so promptly are criminal offenses. Although an Act provision prohibits the use of information contained in the required notification in a criminal prosecution of the individual responsible for the spill, many litigants have complained that the requirement violates their privilege against self-incrimination. This article analogizes this requirement to the vehicular hit-and-run self-reporting rule and predicts that it will be able to withstand strict constitutional scrutiny if challenged. (Stump-Florida)
W78-10843

FEDERAL PARTICIPATION IN SHORE, HURRICANE, AND TIDAL AND LAKE FLOOD PROTECTION.
Department of the Army, Washington, DC.
Federal Register, Vol 43, No 14, p 3048-3052 (January 20, 1978).

Descriptors: *Shores, *Flood protection, *Water policy, *Administrative agencies, Flood control, Hurricanes, Lakes, Beach erosion, Federal government, Shore protection, Planning, Cost sharing.

This proposed regulation prescribes the policies to be used by the Army Corps of Engineers (COE) in recommending and providing measures for shore, hurricane, and tidal and lake flood protection. COE beach control is authorized by identified federal acts providing for: cooperative studies with city, county, and state agencies; federal aid for construction of improvements and protection of publicly owned shores, and for privately owned shores where the public benefits; and federal funding of construction, studies, and reimbursement of work done by local interests. Federal acts authorizing hurricane, tidal and lake flood protection, and related legislative authorizations are summarized. Eligibility criteria for COE participation are discussed in terms of geographic area, beach erosion, shore categories, public use, public shores with limitations, and improvements for recreation. The impact on COE participation of user fees, public parking, access, and beach use by private organizations is discussed. COE responsibilities in serving federal interests are identified for various phases of project development, such as: studies; construction; maintenance; periodic nourishment; and working for other federal agencies. Plan formulation and evaluation criteria are listed. Federal cost sharing and local cooperation requirements are outlined. (Hoofman-Florida)
W78-10844

SURFACE MINING RECLAMATION AND ENFORCEMENT PROVISIONS.
Office of Surface Mining, Reclamation and Enforcement, Washington, DC.
Federal Register, Vol 43, No 39, p 8090-8093 (February 27, 1978).

Descriptors: *Coal mine wastes, *Design criteria, *Water pollution control, *Mining, Environmental engineering, Regulation, Administrative agencies, Settling basins, Diversion structures, Surface runoff, Water quality control, Effluents.

Pursuant to the Surface Mining Control and Reclamation Act of 1972, the Secretary of the Interior has published initial environmental protection regulations applicable to all coal-mining operations on lands regulated by the states until the state has an approved regulatory program. These interim rules modify the initial regulations by amending the design criteria for sedimentation ponds and temporary diversion structures for surface coal-mining operations. The filing deadlines for submission of schedules for reconstruction of existing sedimentation ponds and related pre-existing nonconforming structures are extended. These rules resulted from consideration of state, industry, and public interest representatives' comments; and from Interior Department and Environmental Protection Agency observation of mining operations. Primary technical literature is listed. These rules delete the minimum requirement that sedimentation ponds provide one square foot for each fifty gallons of inflow but do require consideration of sedimentation pond surface area in pond design to achieve effluent limitations. These rules clarify sediment storage volume requirements and require sedimentation pond design to provide a 24-hour detention time for runoff unless a lower detention time is approved. These rules also modify the requirements governing temporary diversion structures and distinguish small depressions. (Hoofman-Florida)
W78-10845

FEDERAL WATER POLLUTION CONTROL ACT ENFORCEMENT FROM THE DISCHARGER'S PERSPECTIVE: THE USES AND ABUSES OF DISCRETION,
Arnold and Porter, Washington, DC.
N. F. Tennille, Jr.
Environmental Law Reporter, Vol 7, No 12, p 50091-99, December, 1977.

Descriptors: *Permits, *Administrative agencies, *Federal Water Pollution Control Act, *Water pollution control, *Administrative decisions, Discharge(Water), Legal aspects, Legislation, Regulation, Waste disposal, Environmental effects, Decision-making, Pollution abatement, Water quality control, Supervisory control(Power), Water pollution sources, Water law.

A central issue in the evaluation of federal and state environmental regulatory mechanisms is the degree of discretion which should be vested in the regulatory authorities to set and enforce environmental standards. Under the Federal Water Pollu-

tion Control Act (FWPCA), the Environmental Protection Agency (EPA) and the states have broad power to regulate pollution discharges. The FWPCA provides the Administrator of the EPA only general guidelines for setting standards, writing permits, and enforcing permits. Courts typically defer to the administrator when his actions are challenged, creating an obstacle to dischargers who question standards or permit requirements. Additionally, the states have considerable discretion in setting substantive effluent standards which will be enforced against the discharger. Such state standards are integrated with federal standards at the permit-writing stage. The National Pollutant Discharge Elimination System (NPDES) permitting process is also subject to vast regulatory discretion. Since NPDES permits are issued on a regional level, this can result in uneven permit requirements for different areas of the country. The author concludes that a consistent but flexible enforcement policy must be developed and provided to the EPA by Congress. (Rule-Florida)
W78-10846

OCEAN DUMPING REVISITED: NEW STATUTORY DEADLINE MAY NOT STOP SEA DISPOSAL OF SEWAGE SLUDGE.
For primary bibliographic entry see Field 5G.
W78-10847

THE MOVE TO AMEND S404 OF FWPCA: HOUSE PASSES BILL LIMITING FEDERAL AUTHORITY OVER DREDGE-AND-FILL ACTIVITIES.
Environmental Law Reporter, Vol 7, No 5, p 10082-10084 (May, 1977).

Descriptors: *Federal Water Pollution Control Act, *Rivers and Harbors Act, *Navigable waters, *Dredging, Legislation, Permits, Water resources development, Governmental interrelations, Navigable rivers, Wetlands, Water pollution control, Water pollution sources.

In an effort to restrict regulatory power over dredge-and-fill activities, the House of Representatives passed a bill in April, 1977, which narrows the broad definition of 'navigable waters' set forth in Section 502(7) of the Federal Water Pollution Control Act. The House bill, H.R. 3199, renewed several funding authorizations under the Act, but is also designed to limit federal dredge-and-fill jurisdiction under Section 404 of the Act. This bill would remove as much as 98 percent of the nation's stream miles and 80 percent of its wetland areas from federal control. The bill consequently would open loopholes in the Act, removing the permit requirement for pollutant discharge into non-commercially navigable waters or adjacent wetlands. The bill may also foster inadequate state regulatory efforts because it breaches the basic assumptions of the interrelated character of water systems. Thus, it may also serve to open the way for comparable limitations on the scope of federal jurisdiction over point-source discharges and consequently cut out the heart of the national water pollution control problem. (Stump-Florida)
W78-10848

AN EXAMINATION OF THE LAW OF WATER BOUNDARIES AND ACCRETIONS IN MANITOBA,
Tallin Knitjansson, Winneipeg (Manitoba).
B. N. Johannson.
Manitoba Law Journal, Vol 8, No 1, p 403-416 (1977).

Descriptors: *Ownership of beds, *Canada, *Accretion(Legal aspects), *Riparian rights, Water law, Banks, Navigable waters, Recreation, Tidal waters, High water mark, Nonnavigable waters, Lakes.

The increased pressure on availability of land, especially for recreational use, naturally raises the value of waterfront property and underscores the need for a uniform method of determining property boundaries. This article is an analysis of the methods used in Manitoba. The Canadian laws are distinguished from English common law, with a major difference being the standards for determining boundaries in nontidal waters. Manitoba law differentiates between navigable and non-navigable non-tidal waters. The boundary of lands bordering navigable non-tidal waters is rebuttably presumed to extend only to the ordinary high water mark, while on non-navigable non-tidal waters it is rebuttably presumed to extend to the middle of the stream. However, the statutory law of Manitoba does not clearly follow these presumptions, creating a conflict between standards for boundary determination which has not yet been resolved. The article also deals with the additional problems of accretion, dereliction and determining boundaries on newly deposited or removed lands. The doctrine of accretion in Manitoba applies to tidal and non-tidal, navigable and non-navigable rivers, and also to the sea. (Stump-Florida)
W78-10849

THE PUBLIC TRUST DOCTRINE AND OWNERSHIP OF FLORDA'S NAVIGABLE LAKES,
D. L. Malloy.
University of Florida Law Review, Vol 29, No 4, p 730-751 (Summer, 1977).

Descriptors: *Florida, *Lake beds, *Ownership of beds, *Competing uses, Recreation, Inland waterways, Navigable waters, Non-navigable waters, Riparian rights, Public access, Water resources development, Legislation.

Florida adheres to the common law public trust doctrine which requires that the state holds legal title to the beds of navigable lakes while the public owns the beneficial title. The continuing controversy over the management and control of the lakes has been intensified by economic development, new environmental concerns and increasingly crowded conditions. In response to these pressures, Florida courts have relied on three theories to exempt land from the public trust for purposes of private development. These are: the apparent intent of certain legislation; equitable and legal estoppel; and application of the Marketable Record Title Act to quiet title in favor of private claimants. In the most recent case considering these questions, Odom v. Deltona Corporation, the Florida Supreme Court used all three arguments to avoid the application of the public trust doctrine to inland waters, but did not rely on any one, perhaps in a recognition of each individual argument's weaknesses and a belief that the whole is greater than the sum of its parts. This commentary also considers alternative means to protect the public interest in trust lands. (Stump-Florida)
W78-10850

EPA AUTHORITY AND RESPONSIBILITY UNDER THE COASTAL ZONE MANAGEMENT ACT OF 1972,
Environmental Protection Agency, San Francisco, CA. Region IX.
D. R. Andrews.
Natural Resources Lawyer, Vol 10, No 2, p 249-255 (1977).

Descriptors: *Coasts, *Land management, *Water management(Applied), *Federal Water Pollution Control Act, Water control, Water quality, Water quality control, Water quality standards, Water policy, Regulation, Legislation, Water resources, Water resources development, Local governments, State governments, Federal government.

The 1972 Coastal Zone Management Act (CZMA) is a unique federal land use law. It is a pioneering effort in collaborative planning among the federal government, the states, and local communities for use of the land. All thirty coastal states and three of the four territories are participating in the voluntary program established by the law. The goal of the program is to encourage the states to balance needs and make deliberate choices among myriad claims on coastal resources. The basic role of the Environmental Protection Agency (EPA) under the CZMA is to participate in the development of management plans and to insist that the Secretary of Commerce not approve a management plan unless the EPA's views have been 'adequately considered' by the state. One of the EPA's major responsibilities is to issue permits for acitivities which affect the coastal zone. However, permits are to be issued only if the activity is consistent with approved state management plan. Since, the water quality control requirements of the Federal Water Pollution Control Act are the primary control mechanisms in the coastal zones, these standards may not be altered by the states under the CZMA planning authority. (Stump-Florida)
W78-10851

AN OVERVIEW OF CHANGES OCCURRING IN THE LAW OF THE SEA--IMPLICATIONS FOR FEDERAL-STATE RELATIONS,
Krueger, Nossaman and Marsh, Los Angeles, CA.
R. B. Krueger.
Natural Resources Lawyer, Vol 10, No 2, p 225-235 (1977).

Descriptors: *Law of the sea, *Oceans, *Submerged Lands Act, *Federal-state water rights conflicts, International law, Coasts, Inland waterways, Continental shelf, Harbors, Treaties, International waters, Governmental interrelations.

Recent changes in federal law that have given coastal states jurisdiction over federal activities and land involve adjustments in the organic structure created by the Submerged Lands Act of 1953. Specifically, under the Deepwater Ports Act of 1974 the Secretary of Transportation is not permitted to issue a license for the construction of a deepwater port unless the governor(s) of the adjacent state of states approves. Also, through the Outer Continental Shelf Lands Act, advisory liason has been established between the federal government and the coastal states. The indirect influence of the states through the political process has been significant and influential. Moreover, legislation was introduced in 1977 which would increase the role of the states in federal offshore oil development. The author also reviews the work of the United Nations since 1967 on the whole spectrum of law of the sea issues and concludes that it is likely that any new international ocean treaties will be incorporated into our domestic law and will profoundly influence the relationships between the federal and state governments. (Stump-Florida)
W78-10852

THE CONTINUING OCEAN DEBATE,
J. C. Fine.
Sea Frontiers, Vol. 22, No. 2, p. 77-85 (March-April, 1976). 1 fig.

Descriptors: *Conferences, *Law of the sea, *Oceans, *United Nations, Coasts, International law, Jurisdiction, Natural resources, Navigation, Ownership of beds, Political aspects, Regulation.

Nations participating in the third international Law of the Sea Conference in Caracas, Venezuela were unable to agree on the substance of a treaty governing proprietary rights in the world's oceans. The author examines the major issues in controversy and explores the various options available to Conference participants. The basic issues are whether the oceans' resources should belong to any nation with sufficiently advanced technology to obtain them; whether coastal states can extend their boundaries and jurisdiction into the seas at will, thereby excluding oceanic resources from

non-coastal states; and whether ocean resources should be shared under an international agreement. The author examines the variety of positions taken by Conference delegates with respect to territorial seas and straits, the 200-mile economic zone, fisheries, international seabeds, marine pollution, and scientific research. Reasons are cited for the continued impasse on controlling deep-seabed mining, dumping, and other forms of marine pollution. The author concludes with the observation that a binding international agreement on the uses of the oceans is essential to the preservation of a productive and healthy oceanic environment. (White-Florida)
W78-10853

CASES ON LAW OF THE SEA, VOLUME I,
K. R. Simmonds.
(Cases on Law of the Sea, Volume I) Oceana Publications, Dobbs Ferry, N.Y., 1976, 470 p.

Descriptors: *Law of the sea, *International law, *Ships, *Judicial decisions, Legal aspects, Navigation, Oceans, Transportation, International waters, Law enforcement, Penalties(Legal), Legal review.

A representative sampling of maritime cases from 1800 to 1860 is presented in this volume. The cases included are drawn from established law reports, but are often scattered and hard to find. They are presented in chronological order. Most of the cases are either English or American, although some decisions from other maritime nations are included. Preceding each case is an introduction by the editor which refers the reader to related cases. The introduction also lists the case in a particular subject division. The subject divisions used are: (1) Terrirorial Sea; (2) Archipelagoes; (3) Bays and Gulfs; (4) Islands; (5) Straits; (6) Fishery Rights; (7) Fishery Limits; (8) Contiguous Zone; (9) High Seas; and (10) Ships. Cases were selected for inclusion based on the following criteria: (1) the intrinsic importance of the decision; (2) whether the case was a turning point in the evolution of a doctrine or line of authority; or (3) whether the case had great influence on subsequent decisions. The year 1800 was chosen as the starting point for the series because a resurgence in Anglo-American admiralty law began then. (Malefatto-Florida)
W78-10854

CASES ON LAW OF THE SEA, VOLUME II,
K. R. Simmonds.
(Cases on Law of the Sea, Volume II) Oceana Publications, Dobbs Ferry, N.Y., 1976, 432 p.

Descriptors: *Law of the sea, *International law, *Ships, *Judicial decisions, Legal aspects, Navigation, Oceans, Transportation, International waters, Law enforcement, Penalties(Legal), Legal review.

A representative sampling of maritime cases from 1861 to 1890 is presented in Volume II. of a series of casebooks dealing with the law of the sea. Cases were chosen for inclusion in this volume based upon their intrinsic importance to the evolving maritime doctrines of the era. The cases reported continue to reflect the uncertainty of this period concerning the nature and character of the jurisdiction exercised by coastal states over territorial seas, gulfs, and bays. Problems relating to concurrent jurisdiction between the coastal states and the flag state and the exemptions from local jurisdiction are examined. The cases illustrate the emergence of such major new areas of controversy as the function and extent of sovereign jurisdictional communities as they applied to foreign-owned public or commercial vessels. The distinctions drawn between piratical acts and belligerent or insurgent activities are also discussed. Each case is preceded by a short introduction by the author and is categorized in one of ten subject divisions. (Malefatto-florida)
W78-10855

REVIEW OF PROJECTS AFFECTING THE EDWARDS UNDERGROUND RESERVOIR, A DESIGNATED SOLE SOURCE AQUIFER IN THE SAN ANTONIO, TEXAS AREA.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol. 42, No. 189, p. 51574-79, September 29, 1977.

Descriptors: *Aquifers, *Project planning, *Government finance, *Water supply development, *Water quality control, Groundwater, Water sources, Reservoirs, Aquifer management, Administration, Planning, Project purposes, Project benefits, Projects, Competing uses, Alternative planning, Grants, Loans, Aquatic environment, Water quality, Water policy, Water supply.

The Edward's Underground Reservoir Texas area, had been designated a 'sole or principal source aquifer' under the Safe Drinking Water Act. The Act provided that 'no commitment of federal financial assistance shall be made to a project which the Administrator determines may contaminate an aquifer...so as to create a significant hazard to public health.' On April 26, 1976, the Environmental Protection Agency (EPA) held a public hearing in San Antonio, Texas, to hear the views of interested persons on the interim guidelines for project review. Several of the comments resulted in changes in the interim regulations including: an expanded definition of 'significant hazard to public health'; the deletion of the work 'major' from 'major projects' to fulfill the EPA intent to review any federally aided project; the clarification of 'commitment' to mean a 'written' agreement; and the simplification of petition information requirements. The EPA also concluded that several comments were adequately covered by the interim regulations. These comments questioned: appeal procedures; notice for public review; EPA reliance on state control; consideration of public benefit; and, the procedure for resubmittal of redesigned projects. (Kastner-Florida)
W78-10856

DELIMITATION OF MARINE AND SUBMARINE AREAS: THE GULF OF VENEZUELA,
Clemson Univ., SC. Dept. of Political Science.
M. J. Martz.
Lawyer of the Americas, Vol. 8, No. 2, p. 301-317 (June, 1977).

Descriptors: *Law of the Sea, *Continental shelf, *South America, *Boundary disputes, Treaties, Ownership of beds, Oil, Natural resources, Exploitation, International waters, Political aspects, International law.

There has been an ongoing border dispute between Venezuela and Colombia since the early 1800's. In recent years the dispute has centered on marine and submarine areas of the Gulf of Venezuela. The major reason for dispute is the presence of petroleum and other minerals in the Gulf. Venezuela notes that prior to 1833 the entire Gulf was surrounded by its territory and that Colombia paid little attention to the area until the 1960's when oil exploitation became feasible. Colombia maintains that the Gulf should be divided by equidistant lines with the adjacent state controlling the territorial sea and continental shelf closest to its coast. The 1958 Geneva Convention on the Continental Shelf endorsed this method of delimitation. Venezuela contends that the corving coast along the Gulf would dispropotionately favor Colombia, and relies upon the 1969 North Sea Cases decided by the International Court of Justice to support their view. The court in those cases rejected the use of one method of delimitation in all circumstances, and held that the standard should guarantee an equitable outcome. Current negotiations have not been successful in arriving at a mutually acceptable solution, despite cordial relations between the two nations. (Malefatto-Florida)
W78-10857

NEBRASKA WELL-INTERFERENCE PROBLEMS--A PROPOSAL,
P. D. Hietbrink.
Nebraska Law Review, Vol. 56, No. 3, p. 565-598 (1977).

Descriptors: *Well regulations, *Nebraska, *Water rights, *Water levels, Legislation, Water wells, Groundwater, Equitable apportionment, Water level fluctuations, Groundwater availability, Overlying proprietor, Competing uses.

As use of Nebraska's groundwater resources increases, so do instances of well-interference among adjoining users. Although a variety of statutes pertaining to groundwater have been enacted, none provide a complete or expedient solution to well-interference. Nebraska common law regarding groundwater modifies the so-called 'American rule,' and holds that a landowner may use the water beneath his land as long as the use is reasonable. But, in cases of water shortage, the water is apportioned equally. Since well-interference can occur as a result of reasonable uses, the problem is still unsettled. What is proposed instead is the adoption of a draft made by the authors of the Restatement of Torts. The proposed rule would not hold a beneficial user liable unless 'the withdrawal of water causes unreasonable harm through lowering the water table or reducing artesian pressure.' An important difference between the rules is that under the latter a reasonable use, even if causing harm to another's well, is permitted. The proposed rule provides a remedy to the harmed water user. The author concludes that the remedy would also be reasonable under the circumstances. (Malefatto-Florida)
W78-10858

COASTAL ZONE IMPACTS OF OFFSHORE OIL AND GAS DEVELOPMENT: AN ACCOMMODATION THROUGH THE CALIFORNIA COASTAL ACT OF 1976,
A. E. Yudes, Jr.
Pacific Law Journal, Vol. 8, No. 2, p. 783-809 (July, 1977).

Descriptors: *California, *Comprehensive planning, *Coasts, *Governmental interrelations, Pacific Coast region, Legislation, Oil industry, Exploitation, Leases, Continental shelf, Natural resources, Administrative agencies.

The federal Coastal Zone Management Act of 1972 (CZMA) is designed to encourage states to establish management plans for coastal areas. Yet the federally controlled program to lease outer continental shelf oil and gas tracts conflicts with the requirement that federal activities affecting coastal areas be consistent with state-developed plans. The conflict is evident in California which in 1976 passed its own Coastal Act requiring orderly coastal development. While California is responsible for coastal planning, under current leasing procedures it can only react to decisions made by federal agencies. It does not participate in the program until preparation of the environmental impact statement, after tracts are selected for leasing. California claims it must participate in the initial stages of the leasing program in order to develop effective coastal plans. Congress provided support for the California position in 1976 by amending the CZMA and specifically designating outer continental shelf leasing as as activity affecting the coastal zone. Federal agencies still maintain a narrow view of the CZMA, denying states participation in the leasing program. the author concludes that state participation should be allowed to ensure efficient and orderly development of offshore resources. (Malefatto-Florida)
W78-10859

THE UNITED STATES SUPREME COURT AND ARTICLE VII OF THE 1958 CONVENTION ON THE TERRITORIAL SEA AND CONTIGUOUS ZONE,
K. L. Walz.

University of San Francisco Law Review, Vol 2, p 1-51 (Fall, 1976).

Descriptors: *Boundary processes, *Baseline studies, *International waters, *Bays, Jurisdiction, International commissions, Coasts, Legal aspects, International law, Judicial decisions.

The 1958 Convention on the Territorial Sea and Contiguous Zone establishes the criteria for determining the baselines which form the landward edge of the territorial sea of a coastal state. Baselines are important because all subsequent international sea zones are determined by reference to these baselines. Article VII of the Convention establishes certain geographical requirements for an indentation to be recognized as a bay. The United States Supreme Court, in interpreting the provisions of Article VII, has clarified its position with respect to several issues left open by the Convention. In particular, the Court has dealt at length with the calculation of the diameter of a bay for the semicircle test and the measurement of the water area of a bay under that same test. The Supreme Court has not yet undertaken any detailed analysis of the geographical requirements for a bay. However, the many ambiguities of Article VII and the wide variety of geographical configurations of coastlines assure that these provisions will be the subject of controversy for many years. (Jordan-Florida)
W78-10860

THE NEW FEDERAL WATER POLLUTION CONTROL ACT AND ITS IMPACT ON NUCLEAR POWER PLANTS,
Consolidated Edison Co. of New York, Inc., New York.
For primary bibliographic entry see Field 5G.
W78-10861

COMMONWEALTH V. STEPHENS: THE TAKING DOCTRINE AT WORK IN ENVIRONMENTAL LAND USE PLANNING,
H. Hopson.
Kentucky Law Journal, Vol 65, No 3, p 729-47, 1977.

Descriptors: *Water management(Applied), *Land use, *Judicial decisions, *Kentucky, *River regulation, Future planning(Projected), Supervisory control(Power), Legal review, Legislation, Water law, Environmental control, State governments, Public rights, Wild River Act, Regulation, Land development, Compensation.

In Commonwealth v. Stephens, the Kentucky Supreme Court held that the application of the land use regulations prescribed by the 1977 Kentucky Wild Rivers Act constituted a taking of property without just compensation. These regulations were designed to prohibit residential and commercial development in designated wilderness areas. In reaching its decision, the Kentucky court relied on the United States Supreme Court decision in Pennsylvania Coal Co. v. Mahon. The author argues that the Stephens' opinion illustrates the potential of judicial application of the taking doctrine to impede effective environmental land use regulation. The author reviews the various forms of river protection legislation found in other states and discusses the methods used to implement land use controls under this legislation. The author also considers whether the application of the Mahon 'diminution of value' test is appropriate in determining whether the legislation is a valid exercise of police power. The history and evolution of the Kentucky Wild Rivers Act is detailed and the impact of the Stephens' opinion on future environmental land use regulation is considered. The author concludes that the court must not let its interest in preserving freedom of land use interfere with the public interest.
W78-10862

LIABILITY FOR MARITIME OIL POLLUTION: A COMPARISON OF THE MAINE COASTAL CONVEYANCE ACT WITH FEDERAL LIABILITY PROVISIONS.
Maine Law Review, Vol 29, No 1, p 47-72, 1977.

Descriptors: *Oil spills, *Oil pollution, *Federal jurisdiction, *State jurisdiction, *Maine, Damages, Coasts, Pollutants, Penalties(Legal), Water quality, Ships, Water pollution, Legal aspects, Oil, Property values, Real property, Recreation, Natural resources, Water Quality Act, Federal-state water rights conflicts.

Potential conflicts created by oil pollution problems and the federal and state statutes attempting to regulate this area are evaluated in this article. The Maine Coastal Conveyance of Oil Act, one of the most comprehensive state oil pollution control statutes, is critically compared with the Federal Water Quality Improvement Act of 1970 and the Federal Limited Liability Act. Emphasis is placed on the differing liability aspects of the three laws and the problems created by the federal statutes' constitutional power base and the state statutes' reliance on state police powers. A minority of states follow the federal statutes and impose limited liability for cleanup cost, except in cases of wilful negligence or misconduct. The majority of states (including Maine) have enacted their own laws. These states impose total liability on the polluter for all costs reasonably incurred in the removal of unlawfully discharged oil. Liability may also extend to reimbursing the state for restoration costs of the damaged areas and to compensating private individuals for damage to real and personal property. The alternative approaches taken in the Maine statute are also compared and contrasted with the federal statutes. (Easterbrook-Florida)
W78-10863

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.
Title 40, Code of Federal Regulations, Part 1510, Sections 1510.1-1510.54, July 1, 1977.

Descriptors: *Federal Water Pollution Control Act, *Adoption of practices, *Comprehensive planning, *Oil pollution, *Regulation, Future planning(Projected), Administrative agencies, Project planning, Water policy, Federal government, Water law, Oil spills, Water pollution, Water pollution sources, Oily water, Water pollution treatment, Costs, Cost sharing.

The National Oil and Hazardous Substances Pollution Contingency Plan, developed in compliance with the amended Federal Water Pollution Control Act, provides for a pattern of integrated response by departments and agencies of the federal government, in coordination with the states, to minimize damage to the environment from oil and hazardous substance discharges. The plan is effective for navigable waters of the United States, adjoining shorelines, and high seas where a threat to United States waters, shoreface, or shelf-bottom exists, and is applicable to all federal agencies. Provisions in the plan include: (1) procurement of equipment and supplies, (2) designation of a strike and emergency task force, (3) a system of surveillance to insure the earliest possible notice of discharges of oil and hazardous substances, (4) a national center to provide coordination in carrying out the plan, (5) procedures and techniques to identify, contain, disperse and remove oil and hazardous substances, (6) identification of any chemicals and dispersants that may be used in carrying out the plan, and (7) a system of reimbursement for states which incur costs in the removal of discharges. (Rule-Florida)
W78-10864

STATE COMMISSIONERS OF LAND OFFICE V. SEELKE (CHANGE IN RIVER CHANNEL BY AVULSION WORKS NO CHANGE IN BOUNDARIES BETWEEN RIPARIAN OWNERS).
Okl. App., 568 P.2d, p 650-654 (1977).

Descriptors: *Oklahoma, *Accretion(Legal aspects), *Avulsion, *Boundaries(Property), Boundary disputes, Adjacent land owners, River beds, Riparian rights, Flooding, Water law, Judicial decisions, Land tenure, Legal aspects, Rivers, Real property, Remedies, Rivers, Channels, Riparian land.

Plaintiff-owned portions of a tract of land on the west side of the Cimarron River's 1873 channel and defendant-owned lots on the east. Plaintiff filed an action in ejectment alleging that the river channel had gradually moved to the west past the defendants' land. The defendants argued that the channel changed due flood, avulsion rather than accretion, therefore no change in ownership occurred. The plaintiff's evidence showed that in 1954 the river's location coincided with an 1873 tract survey and that a flood in 1957 caused the river to change its course. The appellate court affirmed a decision for the defendants and summarized Oklahoma's legal tests for accretion which changes legal boundaries and avulsion which does not change former boundaries. Accretion occurs when a river channel change is gradual and imperceptible, as distinguished from easily perceived, rapid or violent changes incident to floods, storms, or channel breakthroughs known as avulsion. The court noted that a presumption of accretion does not apply where the evidence shows avulsion, and that the party asserting title by accretion has the burden of proof. (Hoofman-Florida)
W78-10865

STATE EX REL. COX V. HIBBARD (STATE ENVIRONMENTAL REGULATION NOT PREEMPTED BY FEDERAL MINING LAWS).
31 Or. App. 269, 570 P.2d 1190-95 (1977).

Descriptors: *Oregon, *Federal-state water rights conflicts, *Permits, *Mining, Regulation, Federal jurisdiction, State jurisdiction, Water law, Streambeds, Environmental control, Real property, Legislation, Jurisdiction, Federal government, Legal aspects, Judicial decisions, Law enforcement, State governments, Placer mining, Streams, Mineral industry.

Plaintiff state successfully brought an action to enjoin defendants from removing more than 50 cubic yards of materials per year from Foust Creek without obtaining a permit pursuant to Oregon's Fill and Removal law; and for a decree requiring restoration of the creek to its original condition. Defendants, owners of Gold Dust placer unpatented mining claims, appealed, claiming: (1) federal preemption based on federal mining laws, the Property and Supremacy clauses of the U.S. Constitution, and the Admission Act; (2) impairment of contract; (3) each of state agency jurisdiction; and (4) inverse condemnation and unconstitutional 'taking' in violation of the Fifth and Fourteenth Amendments. Assuming federal proprietal interest as distinguished from exclusive, concurrent, or partial federal legislative jurisdiction, the Oregon Appeals Court noted federal policy favoring state environmental regulation, and held: that federal mining laws were not intended to preempt state regulation and recognized states rights to impose additional nonconflicting requirements. In addition the court found that there was no impairment of contract or of rights arising out of federal and state mining and water laws; that the state agency had jurisdiction; and that defendants' inverse condemnation and 'taking' objective were untenable. (Hoofman-Florida)
W78-10866

ENVIRONMENTAL DEFENSE FUND, INC. V. HOFFMAN (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT CHALLENGED).
566 F.2d, p 1060-1073 (1977).

Descriptors: *Environmental effects, *Environmental control, *Channeling, *Engineers' estimates, *Cost-benefit analysis, Channels, Channel improvement, Environment, Water quality, Stream flow, Environmental engineering, Drainage engineering, Irrigation engineering, Floodways, Migration, Migratory birds, Water quality standards.

Plaintiff environmental groups sought a determination that a final revised environmental impact statement (EIS) filed by the Army Corps of Engineers in conjunction with the Cache River-Bayou DeView Channelization Project, did not comply with the National Environmental Policy Act (NEPA). The trial court had concluded that the EIS was adequate, and had vacated its previously issued injunction restraining-project construction. Affirming the trial court decision, the Eighth Circuit Court of Appeals stated that: (1) discussion of remote and highly speculative environmental impacts is not required within an EIS, (2) discussion of project impacts on Arkansas was quality was not required because Arkansas law exempts channeled streams from state water quality standards, and (3) discussion of a leveed floodway with bypass alternative was not necessary since the EIS did discuss two similar alternatives. The court further found that the EIS adequately discussed the cumulative effects on migratory water fowl and plans to mitigate wildlife losses, and that the balance of cost-benefits formulated by the Corps of Engineers in the EIS was not arbitrary and capricious and gave sufficient weight to environmental factors. (Baumbach-Florida)
W78-10867

AMOCO OIL COMPANY V. STATE HIGHWAY DEPARTMENT (RIPARIAN OWNER'S LAND EXTENDS TO CENTER/THREAD OF NON-NAVIGABLE STREAM).
262 N.W.2d, 726 (1978).

Descriptors: *North Dakota, *Non-navigable waters, *Riparian land, *Eminent domain, *Ownership of beds, Condemnation, State governments, Diversion, Properties, Property values, Water law, Streams, Compensation, Banks, Land reclamation, Legal aspects, Judicial decisions.

Plaintiff corporate property owner initially owned several lots adjacent to a non-navigable North Dakota river. The river was later diverted and its bed filled, making the plaintiff's land totally landlocked. The lots were subsequently condemned by the defendant State Highway Department, and the plaintiff contested the amount paid for the lots, claiming specifically that it should also be compensated for the newly created land lying between the original center/thread of the non-navigable river and its old bank. The court ruled that each riparian owner's land does extend to the center/thread of a non-navigable stream and ordered the defendant to pay the plaintiff and additional $53,000 together with interest, costs, disbursements and attorney's fees for the land in question. In so ruling, the court rejected the defendant's claim that the use of the word 'bank' as a reference word in the legal description of the plaintiff's land, in lieu of the word 'river', manifested and evidenced a specific and clear intent to restrict the conveyance to the land not originally covered by water. (Easterbrook-Florida)
W78-10868

UNITED STATES V. VELSICOL CHEMICAL CORP. (POLLUTION OF NAVIGABLE RIVER RESULTING FROM DISCHARGE INTO CITY WASTE WATER COLLECTION SYSTEM).
438 F. Supp. 945-50 (W.D. Tenn. 1976).

Descriptors: *Federal Water Pollution Control Act, *Navigable rivers, *Chemical wastes, *Waste water(Pollution), Water pollution sources, Tennessee, Pollution abatement, Chemicals, Pollutants, Waste water disposal, Cities, Insecticides, Chemical industry, Sewers, Permits, Water pollution, Navigable waters, Discharge(Water).

Defendant chemical corporation discharged pollutants into the Memphis, Tennessee, city waste water collection system, which discharged into the Mississippi River. The government brought suit against the corporation as an alleged discharger of pollutants into the Mississippi River. The defendant sought to have the suit dismissed, but the court denied the motion and granted summary judgment to the government. Noting that the defendant's discharge through conveyances owned by another party (the city system) did not remove the defendant's actions from the broad and remedial scope of the Federal Water Pollution Control Act, the court found that the defendant's discharge into the river through the city system satisfied the statutory requirements of discharging into water of the United States. In granting the plaintiff summary judgment, the court found: (1) the defendant to be a person within the meaning of the Act; (2) that the defendant did discharge a pollutant into navigable waters; (3) that the defendant's discharge was through a point source; and (4) that in so acting the defendant was in violation of its National Pollutant Discharge Elimination System permit. Consequently, the court ruled the defendant's actions were subject to civil penalties provided for by the Act. (Easterbrook-Florida)
W78-10869

MELVILLE V. SALT LAKE COUNTY (DEFINING PERCOLATING WATER FOR THE PURPOSE OF APPROPRIATION).
570 P.2d 687-89 (Utah 1977).

Descriptors: *Utah, *Domestic waters, *Percolating water, *Preferences(Water rights), Beneficial use, Building codes, Consumptive use, Judicial decisions, Legal aspects, Potable water, Prior appropriation, Reasonable use, Water allocation(Policy), Water distribution(Applied), Water law, Public health, Water utilization, Zoning.

Plaintiff landowners were denied building permits on the ground that they did not have an adequate supply of culinary water. The plaintiffs appealed, alleging that they had a generous supply of percolating water which they contended belonged to the owners of the land on which it was found. Although the spring, which was the source of the alleged percolating water, arose on property owned by one of the plaintiffs and could not be traced onto the land of others, the Utah Supreme Court held that the waters were not percolating because the waters did not beneficially affect the land. Accordingly, the waters were subject to appropriation under state law. The plaintiffs were required to prove some right to use it. Although the plaintiffs alleged that they possessed a contract which gave them the necessary right to use the water, the lower court found that the terms of the contract did not comply with the county's requirement that 400 gallons per unit per day to be available. The Utah Supreme Court affirmed this ruling. (Jordan-Florida)
W78-10870

WATER AND RELATED LAND RESOURCES PLANS.
Minn. Stat. sec 105.403 (1976).

Descriptors: *Minnesota, *Legislation, *Water allocation(Policy), *Stream improvement, Aquatic weeds, Drainage systems, Administrative agencies, Flood plains, Lakes, Land management, Local governments, Silting, Soil erosion, Natural resources, Waste disposal, Water levels, Water supply development, Water treatment, Water utilization, Wetlands.

The commissioner of natural resources, in cooperation with other governmental agencies, shall prepare a statewide water and related land resources plan for presentation to the legislature by November 15, 1975. This plan shall relate each of the programs of the department to the programs of the other agencies. The plan shall include, but not be limited to, provisions for the following: (1) regulation of land development and improvement by abutting owners of the beds, banks and shores of lakes, streams, watercourses, and marshes in order to preserve them for beneficial use; (2) regulation of improvements on and prevention of encroachments in the flood plains of the state; (3) reclamation of wet and overflowed lands; (4) repair and improvement of previously established public drainage systems; (5) preservation of wetlands; (6) management of game and fish resources; (7) alteration of stream channels for conveyance of surface waters, navigation, and any other public purpose; (8) regulation of the flow of streams and lake water levels; (9) maintenance of water supply; (10) sanitation, public health and regulation of waste disposal; (11) prevention of soil erosion; and (12) regulation of uses of water surfaces. (Jordan-Florida)
W78-10871

SEDIMENT CONTROL.
Md. Code Ann. secs 8-1101, 8-1105.1 (1974), as amended (Supp. 1976).

Descriptors: *Maryland, *Coastal engineering, *Legislation, *Shore protection, *Sediment control, Atlantic coastal plain, Beach erosion, Coastal structures, Coasts, Erosion, Erosion control, Land development, Natural resources, State governments, Water rights, Watersheds, Beaches, Watershed management.

Because the Maryland General Assembly has determined that the lands and waters comprising the watersheds of the State are great natural resources, criteria and procedures to implement soil and erosion control have been adopted by the Assembly. The Beach Erosion Control District has been created for the purpose of maintaining the Atlantic Coast beaches of the State. Any land clearing, construction activity, or the construction or placement of permanent structures within the District is prohibited. However, prohibition does not apply to any project approved by the District and the appropriate soil conservation district specifically for storm control, beach erosion and sediment control. If the building would constitute a taking of a property right under the Constitutions of the United States or Maryland, the property taken may be purchased. The District consists of that land bordered on the north by the Maryland-Delaware state line, on the east by the Atlantic Ocean, on the south by the Maryland-Virginia state line, and on the west by a line which coincides with the existing natural dune on Assateague Island and the Ocean City building limit line. (Jordan-Florida)
W78-10872

WATER COMMISSIONERS - DETERMINATION OF JOINT RIGHTS.
Mont. Rev. Code sections 89-1001 thru 89-1024 (1947), as amended, (Supp. 1975).

Descriptors: *Montana, *Legislation, *Prior appropriation, *Water allocation(Policy), *Water utilization, Adjudication procedure, Administration, Consumptive use, Irrigation water, Legal aspects, Legal review, Permits, Preferences(Water rights), Regulated flow, State governments, Water distribution(Applied), Water law, Water rights.

Whenever the rights of persons to use the waters of any stream, ditch, watercourse or other source of supply have been determined by a decree of a court of competent jurisdiction, the judge may, in his discretion, appoint a water commissioner. The water commissioner has the duty to admeasure and distribute the stored and supplemental waters to the users thereof as their interests may appear. The commissioner also has the authority to main-

tain and repair the water systems, to enter upon ditches and adjust headgates, and to arrest any and all persons interfering with the distributions made by him. At the time of his appointment, the court shall fix his compensation, and the owners and users of the distributed water shall pay their proportionate share of such fees and compensation. If a water user is dissatisfied with the method of distribution, he may file a written complaint with the court. Water users must maintain their own headgates and measuring devices. The judge may empower the commissioner to maintain the water systems at the expense of the owners. (Jordan-Florida)
W78-10873

ARROYO FLOOD CONTROL ACT (CREATION AND POWER OF FLOOD CONTROL AUTHORITY).
New Mexico Statutes Annotated sections 75-36-1 thru 22 (1968).

Descriptors: *Water districts, *Arroyos, *New Mexico, *Flood control, *Water management(Applied), Flood protection, Water control, Water contracts, Regulation, Damages, Taxes, Tax rates, Tariff, Water law, Contract administration, Political aspects, State governments, Water, Water policy, Flood damage, Flood data, Floods, Flood water.

New Mexico has enacted the Arroyo Flood Control Act, thereby creating the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA). The Act authorizes, empowers, and directs the AMAFCA to acquire, equip, maintain, and operate a flood control system for the benefit of the authority and inhabitants of the affected region. The Act not only sets out the geographical boundaries of the AMAFCA, but also establishes a board of directors with broad regulatory powers. The board is authorized to establish internal operating procedures and AMAFCA bylaws as well as make and pass resolutions and orders on behalf of the AMAFCA. In addition, the board exercises substantive powers necessary to the eventual creation of a flood control system. This includes the power to acquire, improve, equip, maintain and operate any project for the control of flood and storm waters located within the AMAFCA. Projects which have their sources outside the AMAFCA but flow into it also fall under the board's jurisdiction. Furthermore, the board is entitled to exercise the right of eminent domain, within or without the AMAFCA. Broad contractual, taxing, and regulatory powers which enable the AMAFCA to achieve its goals are also detailed. (Spector-Florida)
W78-10874

DIRECT FLOW WATER RIGHTS.
Wyo. Sess. Laws, Chapter 203, section 41-29.1 (1973).

Descriptors: *Wyoming, *Water storage, *Water rights, *Streamflow, *Legislation, Regulated flow, Regulation, Surface waters, Streams, Water, Water law, State governments, Water utilization, Water users, Water demand, Administrative agencies.

The holder of valid right to the direct use of the natural unstored flow of any surface stream of the state may store such flow, provided that no other Wyoming appropriator is injured by the storage. Prior to commencement of the storage, the holder of the right must submit a written request to the state engineer and obtain the approval of the state board of control. The state engineer is authorized to prescribe such regulations as are necessary to effectively administer the provision of this act. (Quarles-Florida)
W78-10875

TRANSFER OF WATER RIGHT.
Wyo. Sess. Laws, Chapter 170, section 41-4.1 (1973).

Descriptors: *Wyoming, *Legislation, *State governments, *Water rights, *Water utilization, Water, Water law, Water users, Return flow, Regulated flow, Water control, Water distribution(Applied), Water management(Applied), Water policy, Appropriation, Consumptive use, Compensation.

An owner of a water right must file a petition when he wishes to change a right to another use, or from the place of use under the existing right to a new place of use. The petition should give all pertinent facts regarding the present use and the proposed change, or, if a change of use is requested, all relevant information about the present place of use and the proposed place of use. A public hearing may be required by the board with the petitioner paying for and furnishing a transcript to the board. The change is to be granted, provided that the quantity of water transferred by the granting of the petition does not exceed the amount of water historically diverted under the existing use, nor exceed the historic rate of diversion under the existing use. In addition, the petition must not increase the historic amount of water consumptively used under the existing use, decrease the historic amount of return flow, or injure other existing lawful appropriations. The question of compensation, when at issue, shall be submitted to the proper district court for determination. (Quarles-Florida)
W78-10876

EXCHANGES OF WATER.
Wyo. Sess. Laws, Chapter 160, section 41-5 (1973).

Descriptors: *Wyoming, *Water delivery, *Water rights, *Water users, *Water conveyance, Water utilization, Water demand, Water storage, Surface water availability, Groundwater resources, Groundwater availability, Storage, Water conservation, Reservoirs, Surface waters, Groundwater, Water law, Legislation, Legal aspects, State governments, Appropriation.

Any appropriator owning a valid water right in the use of ground, surface, or reservoir water of the state may petition the state engineer to allow an exchange and the use of stored, direct flow, or groundwater from another source. The petition should be submitted in cases where the source of the appropriation is sometimes insufficient to fully satisfy such appropriation, or better conservation and utilization of the state's water may be accomplished, or the appropriator cannot economically convey appropriable water to its point of use. The state wishes to encourage exchanges, but an exchange order will not be issued if it would adversely affect other appropriators, or if in the opinion of the state engineer, the exchange would be too difficult to administer, or would be adverse to public interest. No exchange is allowed unless a sufficient amount of make-up water is introduced to replace the water withdrawn under the exchange. The state engineer may take consumptive use and transmission losses into consideration in determining the sufficiency of the make-up water. State water administration officials are to enforce the performance of each exchange. (Quarles-Florida)
W78-10877

STATE OF NEW HAMPSHIRE V. MCCARTHY (LANDOWNER'S RIGHT TO FILL TIDAL LAND).
379 A.2d, p 1251-1253 (New Hampshire, 1977).

Descriptors: *New Hampshire, *State governments, *Tidal marshes, *Vegetation, Marshes, Wetlands, Tidal waters, High watermark, Tides, Intertidal areas, Banks, Bogs, Peat, Elevation, Sea level, Salt marshes, Beds, Plant groupings, Legislation, Legal aspects, Water law.

The State filed a petition seeking to compel the defendants to remove certain fill alleged to have been placed by them in violation of a state statute. The matter was referred to a Master who ruled in favor of the State. The section of the statute in question included two types of land; submerged land and land bordering tidal water subject to tidal action whose surface is below a certain elevation and upon which grow specified vegetation. The Master acted upon the basis that there were three types of land included in the statute. The supreme court found that the Master had misconstrued the statute. The court held that the land was not submerged or flowed by the mean high tide and, though the land bordered tidal water subject to tidal action and was at an elevation not exceeding three-and-one-half feet above the mean high tide, none of the vegetation specified by the statute was capable of growing there. Since the land did not fit all the requirements of the second type of land covered by the statute, the defendant's land was not subject to the regulation. (Beamer-Florida)
W78-10878

MAKRANSKY V. MILLER (RIPARIAN RIGHTS OF LANDOWNERS TO ADJACENT DOCK).
398 N.Y.S.2d, p 575-576 (1977).

Descriptors: *New York, *Riparian rights, *Docks, *Bulkhead line, *Easements, Legal aspects, Water rights, Water law, Coastal structures, Piers, Reasonable use, Land tenure, Boats, Boating.

In a consolidation action to enjoin the appellant-respondents from interfering with the mooring of boats, the supreme court of New York entered a judgement fixing the rights of the parties. Both parties cross-appealed from the judgement. The appellate court held that the record established that the use of the south and north side of the dock was an existing one at the time of the severance of ownership and was necessary for the reasonable use of the upland property conveyed to the respondent-appellants. The court found that they had an implied easement to moor their boats on such tides. Nevertheless, as held by the trial court, due consideration of appellant-respondents' riparian rights requires that respondent-appellants should not use the first twenty feet thereof, as measured from the bulkhead. The relief afforded by the trial court of an easement to respondent-appellants to enter upon appellant-respondents' land for repair of the dock was found to be both unnecessary and unwarranted. (Beamer-Florida)
W78-10879

ALASKA PUBLIC EASEMENT DEFENSE FUND V. ANDRUS (SECRETARY OF INTERIOR'S AUTHORITY TO RESERVE EASEMENTS UPON LANDS PATENTED UNDER THE ALASKA NATIVE CLAIMS SETTLEMENT ACT).
435 F. Supp., p 664-681 (D. Alaska, 1977).

Descriptors: *Alaska, *Easements, *Land use, *Waterways, Shores recreation, Rivers, Public lands, Treaties, Public access, Transportation, Utilities, Docks, Indian reservations, Navigable waters, Mineral industry, Pipelines, Legislation, Environment, Federal-state water rights conflicts, Administrative decisions.

In consolidated cases, plaintiffs sought to challenge action by defendant Secretary of the Interior who reserved easements upon lands patented under the Alaska Native Claims Settlement Act. Defendant issued several orders, one of which authorized a reservation to the United States of a continuous shoreline easement along the coastline of Alaska. He also ordered the State Director, Bureau of Land Management, to reserve public easements to the United States in all conveyances

nder the Act for transportation of energy fuel and atural resources. The specific location of these asements were to be determined at an indefinite uture date. Plaintiffs contended that the Secretary xceeded his authority. The United States District Court, Alaska, held that: (1) the Secretary was not ound to choose from easements recommended by he land use planning commission; (2) the Secretay is bound in his choices by specific criteria in the ct; (3) reservation of a continuous shoreline asement without showing of necessity was void; 4) riverbank easements which reserved far more han necessary for mere access to public lands ere not valid; and (5) easements for transportaion of natural resources must be specifically ocated. (Quarles-Florida)
V78-10880

IERRA CLUB V. CAVANAUGH REQUIREMENT OF ENVIRONMENTAL IMPACT STATEMENTS FOR CONSTRUCTION OF RURAL WATER SYSTEMS).
47 F. Supp. 427-433 (S.D.S.D., 1978).

Descriptors: *South Dakota, *Rural areas, Environmental effects, *Water supply, Construction, Legal aspects, Administrative agencies, Administrative decisions, Agriculture, Water quality, Judicial decisions, Water shortage.

Plaintiff, a non-profit California corporation, brought an action pursuant to the National Environmental Policy Act seeking to enjoin further construction of and hook-up to two rural water systems until an environmental impact statement was prepared on each project. The facts surrounding the two systems were sufficiently distinct to merit separate consideration by the court. Both defendant water systems are funded by the Farmers Home Administration (FHA) and are intended to serve rural residents and bulk users which consist of municipalities. Plaintiff contended the systems would create widespread environmental consequences such as water shortages, urban sprawl, and reduced water quality. One defendant contended the suit was improper because the plaintiff's members waited too long to initiate it. The District Court accepted the defendants' contention after finding an inexcusable delay by the plaintiff in asserting the claim which resulted in undue prejudice to the defendant. As for the other water system, the court concluded that the environmental impacts of the construction would not significantly affect the quality of the human environment. Therefore it was reasonable for the FHA to determine that an environmental impact statement was not required. (Quarles-Florida)
W78-10881

EVIEW OF PROJECTS AFFECTING SOLE OURCE AQUIFERS.
Title 40, Code of Federal Regulations, Part 149, ections 149.1-149.11 (July 1, 1977).

Descriptors: *Public health, *Texas, Underground storage, *Water pollution sources, Administrative agencies, Aquifer management, Aquifer systems, Groundwater recharge, Project planning, Water supply, Projects, Regulations.

The Regional Administrator of the Environmental Protection Agency may review any project which e considers may potentially lead to contamination f the Edwards Underground Reservoir, near San ntonio, Texas, through its recharge zone so as to reate a significant hazard to public health. In etermining whether to review the project, the Administrator shall consider whether the project is: 1) located within the recharge area, or (2) of a nature that could cause contamination. The Administrator shall give notice to the originating federal gency in writing, and to the public, of any decision to review a project. Where there is significant ublic interest, the Administrator may hold a ublic hearing with respect to the project to be eviewed. As soon as possible after public comment and the submission of information from the originating federal agency, the Administrator shall review the project. After publication of a decision that a proposed project may contaminate the reservoir through its recharge zone thus creating a significant hazard to public health, no commitment for federal financial assistance may be entered into for such a project. (Jordan-Florida)
W78-10882

TWIN LAKES RESERVOIR, ETC. V. CITY OF ASPEN (PRIOR APPROPRIATORS CHANGE OF NATURE OF USE OF WATER RIGHTS).
568 P. 2d 45-50 (Colo. 1977).

Descriptors: *Water rights, *Colorado, *Prior appropriation, *Use rates, Appropriation, Priorities, Judicial decisions, Water allocation(Policy), Water utilization, Competing uses, Water distribution(Applied), Reservoir operation.

The company-appellee had filed an application for change of nature of use of water rights from direct flow and storage for irrigation purposes to direct flow and storage for irrigation, domestic, commercial, industrial, municipal, and all beneficial purposes. Six municipalities, which sought to use water derived from company systems in their municipal systems, owned 65% of the company. The water court initially permitted the use change with stipulations. The decision was appealed by city and county commissioners, and water and sanitation district officials. Affirming the water court's decree, the appellate court held that: (1) appellants and others holding junior priorities would not be injured because more water from the company's 'Independence Pass Transmountain Diversion System' (IPTDS), would be lost to Colorado without the change in use; (2) municipalities using IPTDS water would be subject to the same limitations on use as the company; and (3) evidence sufficiently supported the conclusion of the water court that volumetric limitations operating annually and on a ten year average constituted a reduction from the contemplated draft of the original appropriation and therefore the change in use was not improper. (Baumbach-Florida)
W78-10883

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD V. SUPERIOR COURT OF KERN COUNTY (AN EXCEPTION TO EXHAUSTION OF ADMINISTRATIVE REMEDIES DOCTRINE).
142 Cal. Rptr. 821-825 (Ct. App. 1977).

Descriptors: *California, *Administrative decisions, *Drainage programs, *Judicial decisions, Administrative agencies, Decision making, Legal aspects, Regulations, Drainage systems, Permits, Environmental effects, Legal review.

In the trial court, a county was seeking an injunction based on the appellant Regional Water Quality Control (Board's alleged failure to observe the California Environmental quality) Act (CEQA) in prescribing waste discharge requirements for a water drainage project. The appellant filed this action seeking to restrain the appellee trial court from proceeding with the county's injunction action. At issue was whether the trial court had jurisdiction to hear the case since it was alleged that the county had not exhausted all its administrative remedies. The appellate court held that the trial court had jurisdiction. Firstly, judicial review of an administrative action is not barred when sought by one who is not a party to that administrative action. Here the county was not a party to the administrative action, but had sought an injunction against it in the public interest as provided by the CEQA. Secondly, the exhaustion of administrative remedies will also be excused when the aggrieved party can state assuredly what the agency decision will be. Here an appeal to the state board from the waste discharge requirements of appellant board would have been futile. (Baumbach-Florida)
W78-10884

NATURAL RESOURCES DEFENSE COUNCIL, INCORPORATED V. COSTLE (WATER QUALITY CONTROL REQUIRED BY FEDERAL WATER POLLUTION CONTROL ACT).
564 F. 2d 573-583 (D.C.Cir. 1977).

Descriptors: *Federal Water Pollution Control Act, *Regulation, *Waste treatment, *Water pollution control, Administrative agencies, Agriculture, Channels, Cities, Federal government, Inland waterways, Law enforcement, Legislation, Planning, Silviculture, Pollution abatement, Water law, Water pollution, Water pollution sources, Water quality, Water quality control.

The National Resources Defense Council brought an action in district court seeking (1) a declaratory judgement construing Section 208 of the Federal Water Pollution Control Act (FWPCA), and (2) an order directing the Environmental Protection Agency (EPA) to promulgate regulations consistent with the plaintiff's interpretation of the FWPCA. The lower court held for plaintiff and the EPA appealed. Section 208 directs the EPA to publish guidelines for the identification of those areas having substantial water control problems. However, the EPA contended that Section 208 did not require the same level of planning in every area of the state. If the EPA's original interpretation of the statute was correct, 95% of the country's area would not be subject to Section 208 planning because the area had not been designated as having water quality control problems. The appellate court affirmed the lower court's decision finding that Section 208 sets up a comprehensive scheme for the elimination of water pollution in all areas of a state, both urban-industrial and agricultural areas. The court felt that it is unreasonable to believe Congress intended to exempt from this scheme 95% of the state's areas. (Jordan-Florida)
W78-10885

COUNTY OF SUFFOLK V. SECRETARY OF THE INTERIOR (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT).
562 F. 2d 1368-1391 (2d Cir. 1977).

Descriptors: *Exploration, *Leases, *Environmental effects, *Environmental control, Water resources development, Projects, Industrial production, Offshore platforms, Land management, Governmental interrelations, Cost-benefit analysis, Energy, Pipelines, Inter-agency cooperation, Oil industry, Natural gas, Oil, Exploitation, Economies of scale.

Plaintiffs, concerned towns, counties and the Natural Resources Defense Council, brought suit to challenge an environmental impact statement (EIS) prepared by defendant Secretary of the Interior. The EIS related to a proposal to accelerate leasing of the federally owned Outer Continental Shelf to private industry for energy exploration and development. The lower court ruled that the EIS was inadequate, and voided leases made by the Secretary and intervenor defendants appealed. In reversing and vacating the injunction, the appellate court held that the EIS was not inadequate under the National Environmental Policies Act (NEPA). The court stated that the multistage prpject is environmentally divisible, and that some phases of the project could not feasibly be covered within this early stage EIS. Therefore, failure to thoroughly assess the environmental consequences of the later stage of transporting the energy did not render this EIS fatally defective. Rather, the NEPA sufficiency requirements for an EIS are met if the EIS: (1) has set forth responsible opposing scientific views, (2) has factually-based conclusions, (3) was compiled in objective good faith, and (4) would permit a decisionmaker to fully consider and balance ascertainable environmental factors. (Baumbach-Florida)
W78-10886

CHUDZINSKI V. CITY OF SYLVANIA (LIABILITY FOR DAMAGE CAUSED BY INCREASE AND ACCELERATION OF SURFACE WATER FLOW).
372 N.E. 2d 611-616 (Ohio Ct. App. 1976).

Descriptors: *Ohio, *Flood damage, *Surface drainage, *Reasonable use, Damages, Outlets, Outlet works, Pipes, Surface waters, Overflow, Cities, Flow rates, Legal aspects, Judicial decisions, Ditches, Water law.

Plaintiff landowners brought an action for damages against defendants, municipality and private corporation, for loss of property due to flooding caused by their action. Defendant/corporation constructed a shipping center and was required by the defendant/municipality to increase the size of the inlet to a watercourse which traversed plaintiff's property. The result was an increase and acceleration in the flow of surface water into the watercourse. This caused periodic flooding of plaintiff's land which rendered a portion of it useless. Citing V.S. Supreme Court decisions, defendant/municipality argued that the capacity-of-the-stream rule should be applied. This rule allows increase and acceleration of watercourse flow to the extent of bank capacity. Noting the confusion surrounding the capacity rule, the appellate court held that the reasonable use rule should be adopted. Under the reasonable use rule, the possession of land only incurs liability when his interference with the flow of surface water is unreasonable. The court reversed judgment for the defendants, requiring that a test of reasonableness be applied to their actions. (Malmad-Florida)
W78-10887

NAVIGABLE WATERS (DREDGE AND FILL DISCHARGE REGULATIONS).
Title 40, Code of Federal Regulations, Part 230, Sections 230.1-230.8 (July 1, 1978).

Descriptors: *Permits, *Dredging, *Environmental effects, *Federal Water Pollution Control Act, Water quality, Water utilization, Environmental control, Administrative agencies, Aquatic environment, Navigable waters, Wetlands, Regulation.

The Environmental Protection Agency (EPA) herein sets forth guidelines for the issuance of permits for the discharge of dredged or fill material at specific disposal sites, pursuant to the Federal Water Pollution Control Act of 1972. Where application of the guidelines precludes the discharge of dredged or fill material, an evaluation is made of the economic impact on navigation and anchorage whidh will occur by failing to use the proposed disposal site. Prohibited are discharge of dredged or fill material at disposal sites which would have an unacceptable adverse effect on municipal water supplies, shellfish beds, fisheries, wildlife, or recreational areas. These EPA regulations describe the physical ecological effects and the chemical-biological interactive effects that may result from the discharge of dredged or fill material. The effects of discharges on aquatic organisms and human uses of navigable waters range from mild disruption to irreversible change at the disposal site. Technical approaches to evaluate such effects are presented. The guidelines for selection of disposal sites are applicable to all activities involving the discharge of dredged or fill material into the navigable waters of the United States. (Curtis-Florida)
W78-10888

OIL POLLUTION PREVENTION.
Title 40, Code of Federal Regulations, Part 112, Sections 112.1-112.7 and appendix (July 1, 1977).

Descriptors: *Oil pollution, *Oil spills, *Water pollution control, *Federal Water Pollution Control Act, Planning, Water law, Regulation, Administrative agencies, Water pollution effects, Water pollution treatment, Navigable waters, Facilities.

The Environmental Protection Agency has established procedures, methods and regulations to prevent the discharge of oil from non-transporation related onshore and offshore facilities into the navigable waters of the United States and adjoining shoreline, pursuant to the Federal Water Pollution Control Act of 1972. These regulations apply to operators and owners of facilities engaged in drilling, producing, storing, refining, processing, transferring, distributing, or consuming oil and oil products, which due to their locations, could reasonably be expected to discharge oil in hamful quantities. Exempted are onshore and offshore facilities which, due to their location, could not reasonablly be expected to discharge harmful quantities of oil into the navibable waters of the United States. The regulations also provide for the preparation and implementation of spill prevention control and countermeasure (SPCC) plans. SPCC plans compliment existing laws and procedures pertaining to safety standards, fire prevention, annd pollution prevention rules intended to minimize the potential for oil discharges. Civil penalties are establshed to deter violations of these oil pollution prevention regulations. Owners and operators would be subject to fines for each day a violation continued. (Curtis-Florida)
W78-10889

WATER QUALITY STANDARDS.
Title 40, Code of Federal Regulations, Part 120, Sections 120. 1-120.115 (July 1, 1977).

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *Salinity, *Colorado River Basin, Administrative agencies, State governments, Legislation, Water quality control, Environmental control, Water pollution, Standards, Regulation.

These Environmental Protection Agency (EPA) herein sets forth guidelines for the issuance of permits for the discharge of dredged or fill material at specific disposal sites, pursuant to the Federal Water Pollution Control Act of 1972. Where application of the guidelines precludes the discharge of dredged or fill material, an evaluation is made of the economic impact on navigation and anchorage which will occur by failing to use the proposed disposal site. Prohibited are discharges of dredged or fill material at disposal sites which would have an unacceptable adverse effect on municipal water supplies, shellfish beds, fisheries, wildlife, or recreational areas. These EPA regulations describe the physical ecological effects and the chemical-biological interactive effects that may result from the discharge of dredged or fill material. The effects of discharges on aquatic organisms and human uses of navigable waters range from mild disruption to irreversible change at the disposal site. Technical approaches are applicable to all activities involving the discharge of dredged or fill material into the navigable waters of the United States. (Curtis-Florida)
W78-10890

STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM.
Title 40, Code of Federal Regulations, Part 124, Sections 124.1-124.94 and appendix (July 1, 1977).

Descriptors: *Water quality standards, *Water pollution control, *Federal Water Pollution Control Act, *Permits, Regulation, Governmental interrelations, Administrative agencies, Pollution abatement, Discharge(Water), Effluents, Monitoring, Planning.

Herein are guidelines specifying procedural and other elements required in a state or interstate program for issuance of National Pollutant Discharge Elimination System (NPDES) permits. After a submitted state or interstate program, which coforms to the guidelines and section 402 of the Federal Water Pollution Control Act, has been approved by the Environmental Protection Agency (EPA), then EPA will suspend its issuance of NPDES permits. Requirements for contents of state statutes which must prohibit all discharges of pollutants without an NPDES permit, form of state statutory authority, and definitions are provided. Permissible exclusions for identified dischargers and state procedures for NPDES filing requirements are outlined. Guidance is also provided concerning: state receipt and use of federal data; date transmission to EPA; identify of signatories of NPDES forms; notice and public participation; formulation of tentative determinations and draft NPDES permits; fact sheets; hearings; prohibited discharges; application of effluent standards and limitations; water quality standards; duration and reissuance of permits; monitoring and reporting; enforcement; disposal of pollutants into wells; concentrated animal feeding operations; separate storm sewers; agricultural and silvicultural activities; resources planning requirements; NPDES forms; and other requirements. (Hoofman-Florida)
W78-10891

BRADFORD V. SIMPSON (LIABILITY IMPOSED FOR EROSION DAMAGE AND CONTROL RESULTING FROM ILLEGAL DAM CONSTRUCTION).
573 P. 2d 149-152 (Idaho, 1978).

Descriptors: *Flood damage, *Bank erosion, *Riprap, *Idaho, *Dams, Erosion control, Soil erosion, Legal aspects, Judicial decisions, Legal review, Negligence, Water law, Rivers, Property values, Dam construction, Erosion, Bank protection, Channels.

In a previous action, the Idaho Supreme Court found that the defendant was liable for flood damage to the plaintiff's property, and remanded the case to the district court for further proceedings on the issue of damage. On rehearing, the district court concluded that as a result of defendant's damming the branch of a river fronting on plaintiff's property, the property suffered considerable erosion damage; was still subject to erosion; could never be restored to its previous condition; that riprapping to prevent continued erosion would cost more than $20,000; and that the value of the property has decreased by almost $25,000. The district court found that the defendant was 90% negligent, and awarded plaintiff 90% of the riprapping cost, plus punitive damages. In this appeal, defendant claimed that the riprapping had already been provided for in a separate action in which the court ordered the state to do the necessary erosion control work at defendant's expense. However, the Idaho Supreme Court found that the area covered by the previous order did not include plaintiff's land and affirmed the district court's decision. (Stump-Florida)
W78-10892

MORSE V. DIVISION OF STATE LANDS (PERMITS FOR LANDFILL PROJECTS MAY BE GRANTED ONLY AFTER A CONSIDERATION OF THE PUBLIC INTEREST AND A SHOWING THAT LAND WILL BE USED FOR WATER-RELATED ACTIVITY.
572 P. 2d 1075-1078 (Or. Ct. App. 1977).

Descriptors: *Oregon, *Landfill, *Permits, *Planning, *Water resources, Recreation, Public rights, Administrative agencies, Navigation, Navigable waters, Legal aspects, Estuaries, Fishing, Conservation, State governments, Legislation.

The city of North Bend, Oregon, applied to defendant Division of State Lands for a permit to fill 32

acres of the Coos Bay estuary to extend a runway at the North Bend Airport. The defendant approved the permit, and plaintiffs, as persons adversely affected by the proposed filling, contested the action. After a hearing, the defendant reapproved the permit, and plaintiffs sought judicial review. The Oregon Court of Appeals reversed the order granting the permit after noticing that the public has a paramount interest in the maintenance of waterways for navigation, fishing and recreation uses, and that the state has a duty to protect that interest. The defendant may issue permits for filling waters, as long as it first considers the public interest. In addition, the Division itself has promulgated several rules to follow, and one of these is that the land created by fill projects must be used for water-related activities. The court noted that all parties agreed that the airport runway would not be used for a water-related activity. The court thus concluded that the permit should not have been issued. (Stump-Florida)
W78-10893

ENVIRONMENTAL DEFENSE FUND, INCORPORATED V. EAST BAY MUNICIPAL UTILITY DISTRICT (UNSUCCESSFUL ACTION TO FORCE UTILITY DISTRICT TO RECLAIM WASTE WATER, RATHER THAN PURCHASE WATER FROM FEDERAL RECLAMATION BUREAU).
572 P. 2d 1128-1142 (Cal., 1977).

Descriptors: *California, *Federal Reclamation Law, *Water supply, *Water reuse, Saline water intrusion, Water demand, Water rates, Water distribution(Applied), Water requirements, Water importing, Rivers, Public utilities.

Plaintiffs, three corporations and three individuals, were residents of an area served by defendant utility district, Plaintiffsf brought an action challenging a contract between the utility district and the United States Bureau of Reclamation which provided for the utility district to purchase water from the Bureau in expectation of increasing demands. Plaintiffs alleged that this would cause future customers to pay a higher price than if the utility were to reclaim waste water; that it would diminish flows on the American River, injuring recreation, increasing salination, and accelerating wild river destruction; and that it would pollute San Francisco Bay. Plaintiffs claimed these actions violated sections of the California Constitution and the California Water Code. In affirming the trial court's dismissal of the action, the California Supreme Court decided that federal law controlled the proceeding, and that appellants failed to state an appropriate cause of action because they based their claims on state law. The court also ruled that plaintiffs should first have sought relief from the regional water quality control board, and having failed to do so, were precluded from maintaining a cause of action against the municipal utility district. (Stump-Florida)
W78-10894

STATE EX REL ASHCROFT V. UNION ELECTRIC COMPANY (NORMAL ACTIVITIES OF POWER GENERATING PLANT NOT PROSCRIBED BY STATE STATUTES EVEN THOUGH THEY RESULT IN OXYGEN DEFICIENT WATER DISCHARGE).
559 S.W.2d 216-224 (Mo. Ct. App. 1977) (Rehearing denied December 5, 1977).

Descriptors: *Missouri, *Dissolved oxygen, *Pollution abatement, *Utilities, Water pollution, Regulation, Dams, Hydroelectric plants, Rivers, Fishkill, Water quality standards, Discharge(Water).

Plaintiff state of Missouri sought to enjoin defendant private electric company from causing or permitting the dissolved oxygen level in waters downstream from the company's power plant from falling below the statutory standard of five milligrams per liter. Plaintiff also sought damages of $10,000 per day until the standard was met, and to recover damages for fish killed. The Kansas City District Court of Appeals ruled that the plaintiff failed to allege facts sufficient to constitute a valid cause of action, or to entitle the state to relief. The court analyzed the appropriate sections of the Missouri Water Quality Standards and of the Missouri Clean Water Law, noting that many of the terms used in the laws were capable of varying interpretations. The court stated that its ultimate goal was to discover and implement the legislative intent in the laws. Attempting to do so, the court concluded that the activities of the electric company in the usual course of its business did not rise to the level of conduct proscribed by the Clean Water Law. (Stump-Florida)
W78-10895

GENERAL REFRACTORIES COMPANY V. ROGERS (MUD AND SEDIMENT DEPOSITS RESULTING FROM OPERATION OF NEARBY MINING OPERATION).
239 S.E. 2d 795-801 (Ga. 1977).

Descriptors: *Mining, *Land reclamation, *Georgia, *Water control, Overburden, Surface waters, Judicial decisions, Diversion, Floods, Sedimentation, Sediment, Mud, Reclamation, Rainfall, Vegetation, Sediment distribution, Dam.

Plaintiff landowner sued defendant mining company, claiming damages to his property. He alleged that defendant's mining operations increased the flow of surface water onto his land, causing large quantities of mud and dirt to be deposited on his property. He, therefore, sought to enjoin these operations. Claiming that defendant's actions were wilful and reckless, plaintiff also demanded both general and punitive damages. The court held in favor of the plaintiff on the issue of damages and also awarded him attorney's fees. The permanent injunction was granted. Defendant appealed, claiming that the plaintiff was not entitled to punitive damages because there was no proof of wilful misconduct or that lack of care that would raise the presumption of a conscious indifference to consequences. The appellate court reversed the award of punitive damages and attorney's fees, finding that no such evidence existed. Instead, the court found that the defendant had acted in compliance with the Surface Mining Act. The permanent injunction, however, was affirmed and remained in force. (Spiegel-Florida)
W78-10896

TEXAS COUNTY IRRIGATION AND WATER RESOURCES ASSOCIATION, INCORPORATED V. CITIES SERVICE OIL COMPANY (USE OF FRESH GROUNDWATER IN SECONDARY OIL RECOVERY).
Okl., 570 P. 2d 49-51 (Okla. 1977).

Descriptors: *Oklahoma, *Secondary recovery(Oil), *Groundwater resources, *Permits, Oil industry, Flooding, Groundwater movement, Management, Irrigation water, Water permits, Regulation, Flood irrigation.

Appellants, a private corporation, joined by the Oklahoma Water Resources Board (Board), appealed the District Court reversal of the Board's decision to grant the corporation a permit to use fresh ground water in a water flood system for secondary oil recovery. Appellee, county irrigation association, protested the approval of the permit on the ground that the statutory definition in the Oklahoma Ground Water Law denotes such use of fresh water as 'waste'. Based on that definition, the irrigation association claimed, and the District Court agreed, that the permit should not have been granted. However, in its reversal of the District Court, the Oklahoma Supreme Court stated that absent express legislation so stating, it would be difficult to decide that the use of fresh ground water for secondary oil recovery is waste per se. The Court interpreted the history of the ground water law as reflecting a legislative intent not to arbitrarily classify all uses of fresh ground water in secondary oil recovery as 'waste'. The Court qualified its holding, saying that such would not necessarily be true under all circumstances. (Stump-Florida)
W78-10897

UNITED STATES V. CITY OF PAWHUSKA, OKLAHOMA (MINERAL RIGHTS UNDER MUNICIPAL RESERVOIRS).
566 F.2d 1132-35 (10th Cir. 1977).

Descriptors: *Oklahoma, *Indian reservations, *Land tenure, *Reservoirs, *Trespass, Acreage, Damages, Federal reservations, Judicial decisions, Land use, Legal aspects, Minerology, Public lands, Reservoir sites, United States, Value, Water law, Oil.

As trustee for an Indian tribe, the United States brought suit against a city, alleging a continuous trespass and seeking monetary damages for the tribes loss of access to certain tribal mineral rights underlying a reservoir maintained by the city. The trial court awarded the United States damages of $50.00 an acre and held that 858.64 acres had been affected by the reservoir. The trial court also vested the defendant city with complete title to the land under the reservoir. The United States appealed the portion of the order that gave the tribe's mineral interest to the city. The City appealed the monetary award, contending that the reservoir affected only 290.93 acres. The Tenth Circuit of Appeals held that damages could be claimed by the United States for only 290.93 acres because the United States had agreed to this in a stipulation. The appellate court also held that the trial court could not award complete title to the land beneath the reservoir to the city because the issue of quieting title was not before the court. (Jordan-Florida)
W78-10898

NATIONAL INDEPENDENT MEAT PACKERS ASSOCIATION V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EFFLUENT REGULATIONS FOR MEAT PROCESSORS).
566 F.2d 41-44 (8th Cir. 1977) Rehearing and Rehearing En Banc Denied January 3, 1978.

Descriptors: *Administrative agencies, *Industrial wastes, *Waste water treatment, Water quality control, Abatement, Chemical wastes, Industries, Industrial plants, Judicial decisions, Law enforcement, Legal aspects, Waste treatment, Water pollution, Water pollution control, Water treatment.

An organization representing a number of relatively large slaughterhouses and meat processors throughout the nation and some of it's individual members petitioned for review of effluent discharge regulations promulgated by the Environmental Protection Agency (EPA). The petitioners advanced a number of challenges to the limitation based on alleged inadequacies and inaccuracies in the technical data upon which the EPA grounded its' determination. The regulatons established limitations on (1) biochemical oxygen demand, (2) total suspended solids, and (3) ammonia. The EPA contended that since the seventh circuit had decided those same issues in another case and still retained jurisdiction, the eighth circuit should defer it judgment. The Eight Circuit Court of Appeals held for the EPA, stating that uniform regulation of water pollution on a nationwide basis was a major purpose of the Federal Water Pollution Control Act. Since essentially all of the technical contentions raised by the petitioners were also presented to the seventh circuit, the court found that the interest in avoiding inter-circuit conflicts was especially strong. Otherwise potentially conflicting decisions would present different interpretations of federal law intended to be uniformly applied on a nationwide scale.
W78-10899

FORD MOTOR COMPANY V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (ADMINISTRATIVE GUIDELINES NECESSARY TO DENYING PERMITS).
567 F.2d 661-77 (6th Cir. 1977).

Descriptors: *Permits, *Adjudication procedures, *Flow augmentation, *Waste dilution, *Water quality standards, Administrative agencies, Cooling water, Effluents, Federal Water Pollution Control Act, Great Lakes, Industries, Industrial wastes, Industrial water, Heavy metals, Metals, Navigation, Regulation, Water pollution, Water pollution control, Water pollution effects.

An appeal was taken by plaintiff automobile manufacturers from an action of the Environmental Protection Agency (EPA). The EPA vetoed modifications of the manufacturer's existing National Pollutant Discharge Elimination System (NPDES) permit. These modifications were proposed by the Michigan Water Resource Commission pursuant to the Federal Water Pollution Control Act (FWPCA). The plaintiff proposed to mix treated effluents from its metal stamping plant with other water from Lake Erie in order to reduce the concentration of pollutants and to assure compliance with water quality standards. The plaintiff contended that the EPA had exceeded its veto authority because there were no published regulations, guidelines or statutory requirements under the FWPCA which prohibited the use of low-flow augmentation to meet water quality standards. The Sixth Circuit Court of Appeals held that the FWPCA allows the EPA to object only to the issuance of NPDES permits which are 'outside the guidelines and requirements' of the FWPCA, objections can not be based upon the EPA's private policy determinations. Since it was clear to the court that the EPA had no prior well-established policy which prohibited low-flow augmentation, the court set aside the EPA veto. (Jordan-Florida)
W78-10900

BURGESS V. M/V TAMANO (OIL SPILL ACCIDENT CAUSED BY MISPLACED BUOY).
564 F. 2d 964-983 (1st Cir. 1977).

Descriptors: *Accidents, *Naval architecture, *Negligence, *Oil pollution, Atlantic Ocean, Damages, Hazards, Legal aspects, Maine, Navigation, Oil, Oily water, Risks, Safety, Ships, Water law, Water pollution, Water pollution sources.

A Norwegian supertanker, her owners and the pilots who were piloting the ship when it struck a submerged ledge and spilled oil brought an action against the United States. The plaintiff alleged that the United States caused the accident by mislocating a buoy. The U.S. counterclaimed for certain cleanup costs. The trial court decided in favor of plaintiff ship and the U.S. appealed. Evidence revealed that a Coast Guard buoy tender had examined the channel two days before the accident and had mistakenly repositioned two buoys but did not reposition the buoy in question. In addition, there was evidence that the collision itself had moved the buoy in question so that an independent surveyor found all three buoys off position after the accident. The appellate court vacated the trials court's decision and held that: (1) the trial court's finding that the buoy was misplaced was clearly erroneous, (2) evidence that the pilot steamed to within a few feet of a buoy known to be almost on top of an invisible ledge established negligence, (3) the owners were liable to the government for cleanup costs, and (4) liability of the ship did not release the pilot from the consequences of his negligence. (Jordan-Florida)
W78-10901

LAFLEUR V. TOPP (FLOODING CAUSED BY NEIGHBOR'S LEVEE).
352 So.2d 426-28 (La. Ct. App. 1977).

Descriptors: *Louisiana, *Boundary disputes, *Drainage area, *Floods, *Levees, Backwater, Boundaries(Property), Dam construction, Dams, Dikes, Drainage, Easements, Flood damage, Land tenure, Legal aspects, Overflow, Spillways, Water law, Water levels.

Plaintiff landowner brought an action against the adjoining landowner seeking an injunction to prohibit the latter from maintaining a dam on his property. The dam allegedly flooded the plaintiff's property by interfering with a natural drain. The plaintiff also sought an order to force the defendant to lower the dam to the level which existed before the defendant raised it in 1974. The dam existed on defendant's property for many years before 1974. In 1974, dirt work was done on the levee. The plaintiff contended that this raised the level of the dam two or three feet and caused water to stand on plaintiff's property. The court held that defendent had a right to maintain the levee only in a way which would not result in water being impounded on plaintiff's property any more than it did before the 1974 work was done. The court further found that the plaintiff had a right to the unimpeded natural servitude of drainage of water from his land through defendant's property. The court directed that a spillway low enough to drain any water impounded on plaintiff's property be built at the defendant's expense. (Jordan-FLorida)
W78-10902

VILLANI V. BERLE (ACTION BY NEW YORK COMMISSIONER OF ENVIRONMENTAL CONSERVATION TO CLOSE SHELLFISH LANDS IN NEW YORK BAYS UPHELD).
398 N.Y.S. 2d 796-805 (1977).

Descriptors: *New York, *Testing procedures, *Shellfish farming, *Coliform, Analytical techniques, Methodology, Shellfish, Pollutant identification, Public health, Harbors, Bays, Fishing.

Plaintiffs, private individuals and municipalities, sought to enjoin defendant New York Commissioner of Environmental Conservation from closing to harvesting certain shellfish areas in the Long Island area on public health grounds. The Commissioner acted after 1975 and 1976 findings by the Regional Office to the Commissioner of Environmental Control of a higher than normal amount of pollutants in the subject waters. This was determined by the coliform standard of testing and use of MPN (most probable number) methodology. Plaintiffs attacked the implementation of these tests as unscientific and claimed that the subsequent closing of the shellfishing areas was illegal and arbitrary. The Suffolk County, New York, court admitted that the testing standards have been criticized over a period of time, but denied the injunction, stating that no other tests have the credentials of valid criteria, standardized methodology, and economy. The court also ruled that, because the Commissioner's action in directing the closing of the shellfish lands involved an administrative determination, it was not necessary to hold a public hearing as required by the State Administrative Procedure Act. (Stump-Florida)
W78-10903

RESERVE MINING COMPANY V. HERBST (DESIGNATION OF ALTERNATE WASTE DISPOSAL SITE AS 'FEASIBLE AND PRUDENT').
256 N.W. 2d 808-852 (Minn., 1977).

Descriptors: *Waste disposal, *Damsites, *Minnesota, *Permits, *Mine wastes, Forests, Disposal, Air pollution, Air pollution effects, Water pollution, Administrative decisions, Public health, Administrative agencies, Pollutants, State governments, Industrial wastes, Wastes, Pollution abatement, Sites, Dam construction, Economic impact, Feasibility.

The state appealed from a court order directing state pollution control agencies to grant a permit to respondent mining company for the construction of an on-land disposal site needed for the disposal of materials that could cause air and water pollution. The state would require disposal at a more remote, forest site, a 'feasible and prudent' alternative posing less hazard to public health. The Montana supreme court held that disposal at either site involved a significant hazard to public health and that the state's choice additionally violated the principle of consolidated land use by intruding into a natural resources recreational oriented area. The court held that the state site was not a 'feasible and prudent' alternative and that the proper course was to require the company to mitigate pollution at its chosen site. Where the evidence showed the undisputed safety of the company proposed waste disposal structures, the statute allowing alternatives where impairment of natural resources is likely has no application. The court will not assume that the company will disregard its responsibility to construct a proper structure. Faced with such evidence, state agencies must consider the economic impact in rendering environmental decisions. (Smith-Florida)
W78-10904

STATE V. HOFFMAN (STATE'S RIGHT TO SUE UNDER FEDERAL STATUTES).
425 F. Supp. 71-80 (S.D.111., 1977).

Descriptors: *Channeling, *Environmental effects, *Navigable rivers, *Natural flow, Channel improvement, Dredging, Federal Water Pollution Control Act, Environment, Fishing, Fish reproduction, Flood control, Aquatic life, Illinois, Environmental control, River beds, Navigable waters, Legal aspects, Dam construction, Water law, Landfills, Levees, Dams, Rivers and Harbor Act.

The state of Illinois brought an action against the Army Corps of Engineers, the Administrator of the Environmental Protection Agency and others for injunctive and other relief to compel the restoration of the Machinau River, a navigable river of the United States, to its natural course. The controversy arose after the defendants rechanneled the course of the river destroying substantial areas of fishing habitat and extensive feeding and spawning areas for aquatic life as well as increasing flood hazards for landowners upstream and downstream from the affected area. The state alleged that the defendants violated several federal statutes including the Rivers and Harbors Act, the Federal Water Pollution Control Act, and the National Environmental Policy Act. The defendants filed motions for summary judgment and dismissal. The District Court held that the defendant's motion for summary judgment was inappropriate because substantial fact issues existed, including the question of navigability of the river and the participation of federal officials in the rechanneling project. The court overruled all of the defendant's motions for dismissal holding that the petition was sufficient to allege a cause of action. (Beamer-Florida)
W78-10905

MOBIL OIL CORPORATION V. KELLEY (STATE JURISDICTION OVER WATER POLLUTION).
426 F. Supp. 230-236 (S.D.Ala., 1976).

Descriptors: *Federal Water Pollution Control Act, *Water pollution, *Oil, *Leases, Legislation, Water Quality Act, Oil fields, Oil industry, Exploration, Natural gas, Drilling, Oil pollution, Water pollution sources, Oil wells, Rent, Alabama, Contracts, Beds, Beds under water, Administrative agencies.

Plaintiff oil company brought an action in federal district court for declaratory and injunctive relief against the state of Alabama concerning leases

held by the plaintiff for drilling of offshore oil wells. The state had granted the plaintiff several leases to submerged land in Mobile Bay, but, later, the state pollution control agency refused to certify plaintiff's application for a permit to drill at a location covered by one of the leases. State certification was necessary in order to obtain a federal permit to drill. Basing jurisdiction on diversity, the plaintiff sought to enjoin the state from refusing to grant certification in the federal district court. The District Court held that the proper forum for judicial review of state certification under the Federal Water Pollution Control Act Amendments was in state court. The court found that the state water pollution control agency had the required knowledge of local factors that should be weighed in reaching a final determination. Since there was adequate state court review available, federal intervention on a state certification question was not necessary for the protection of federal rights. (Beamer-Florida)
W78-10906

MAKRANSKY V. MILLER (USE OF IMPLIED EASEMENTS FOR NAVIGATION).
398 N.Y.S. 2d 575-576 (N.Y.App. Ct. 1977).

Descriptors: *Navigable water, *Docks, *New York, *Bulkheads, Navigation, Riparian rights, Reasonable use, Legal aspects, Easements, Implied benefits, Water law, Claims(Contracts), Boats, Repairing, Adjudication procedure, Properties.

The plaintiff brought an action to enjoin the defendants from interfering with the mooring of boats. Both parties appealed a decision which fixed the rights of the parties to use a dock on a navigable waterway. The appellate court's decision modified the trial court's opinion slightly and as so modified, affirmed the judgement. The court held that the plaintiff is entitled to use of both the south and north sides of the dock pursuant to an implied easement resulting from existing use at the time of severance of ownership. This easement was found to be necessary for the reasonable use of the plaintiff's upland property. However, the court further held that the first twenty feet on the south side of the dock must be reserved to the defendant's use only, pursuant to the defendant's riparian rights as owners of the adjacent bulkhead. This distance was to be measured from the bulkhead. (Spector-Florida)
W78-10907

STATE EX REL. COX V. HIBBARD (STATE REGULATION OF MINING).
570 P. 2d 1190-1195 (Or. App. 1977).

Descriptors: *Oregon, *Regulation, *Permit, *Mining, *Constitutional law, State jurisdiction, Mining engineering, Diversion structures, Trenches, Contracts, Bank stability, Bank erosion, Streambeds, Placer mining, Claims(Contracts), Legal aspects, Administrative agencies, Administrative decisions.

The defendants appealed a decision enjoining them from removing in excess of 50 cubic yards of material in any year from a creek without first obtaining a permit from the Director of Oregon Division of State Lands. The defendants claimed the regulation acted to unconstitutionally deprive them of enjoyment of their property, constituted a taking without compensation, and violated their freedom to contract as secured by the United States Constitution. They also claimed that federal mining laws, the Admissions Act, and the United States Constitution preempted the state's authority to require permits prior to digging water diversion trenches in and near creeks. In this decision, the appellate court upholds the state's claim of authority to require such permits, declares such a system to be compatible with federal constitutional and statutory law, deems there to be no unconstitutional impairment of the right to contract in this case, and states that the Director's actions did not amount to an unconstitutional taking of the defendant's property. (Spector-Florida)
W78-10908

PENDERGRAST V. AIKEN (LIABILITY OF DOWNSTREAM PROPERTY OWNERS FOR FLOOD DAMAGE RESULTING FROM INTERFERENCE WITH STREAM FLOW).
236 S.E. 2d 787-801 (N.C. 1977).

Descriptors: *Surface drainage, *Flood damage, *Surface waters, *Drainage water, *North Carolina, Flood protection, Floodproofing, Rainfall, Rain water, Culverts, Watercourses(Legal aspects), Pipes, Landfills, Streams, Watersheds(Basins), Drainage effects, Drainage practices, Drainage systems, Properties, Drainage.

Plaintiffs, upstream property owners, sought to recover for flood damage allegedly caused by a nuisance on defendant's adjoining downstream property. Defendant, downstream property owners, paid the co-defendant construction company to fill in much of their property with dirt. In order to allow the continued drainage of the surrounding area, defendants placed a pipe in the creek flowing through the property and then filled the creek and property. During subsequent normal rainstorms, the creek backed up. This backup resulted in flooding of the plaintiff's property. Plaintiff contended that the pipe was too small to allow normal drainage. Upon plaintiff's appeal to the Supreme Court of North Carolina, the court held that with respect to surface water drainage, each possessor may make reasonable use of his land even though harm is caused to others, but liability is incurred when flow interference is unreasonable and causes substantial damage. The court called for a new trial due to the lower court's error in instructing the jury on nuisance, damage, and supplemental drainage. (Quarles-Florida)
W78-10909

ESTABLISHMENT OF LAKE IMPROVEMENT DISTRICTS.
Minn. Stat. secs 378.41 through 378.56 (1976).

Descriptors: *Minnesota, *Legislation, *Water resources development, *Lakes, *Comprehensive planning, Administration, State governments, Local governments, Water law, Planning, Regulation, Governmental interrelations, Project planning, Recreation, Conservation, Multiple-purpose projects, Natural resources, Non-structural alternatives, Project purposes, Regional development.

A local-state program for the establishment of lake improvement districts is to be instituted and supervised by the commissioner of natural resources. A county board may designate areas as lake improvement districts in order to finance the development and implementation of programs for water and related land resources management. Designation of districts shall be established by a resolution specifying territorial boundaries, the types of water resource management programs to be established, financing arrangements, and the individual responsible for supervision. Citizens may request creation of lake improvement districts by submitting a petition signed by five percent of the voters in the proposed district to the county board. After holding public hearings, the board shall act on the request. In the event of disapproval, the petition may be presented to the commissioner of natural resources, who may approve it. A petition may also be submitted to the county board requesting a referendum of voters in the proposed district. If the voters approve the creation of a lake improvement district, it is deemed created. The county board may impose service charges on those using lake improvement districts, or levy taxes on property in the district. (Malefatto-Florida)
W78-10910

FEDERAL RECLAMATION AND WATER RIGHTS IN NEVADA,
California State Univ., San Diego. Dept. of History.
D. J. Pisani.
Agricultural History, Vol. 51, No. 3, July, 1977. p 540-558.

Descriptors: *Federal-State water rights conflicts, *Federal reclamation law, *Reclamation states, Competing uses, Indian reservations, Southwest US, *Nevada, *Lake Tahoe, *Paiute Indians, Pyramid Lake, Truchee River, *Newlands Reclamation Act.

Since their initiation in 1905, Federal reclamation projects in Nevada have exacerbated water rights controversies between California and Nevada, as well as between these states and the Federal Government. The dispute over the Federal Government's claim to Lake Tahoe's surplus water, the conflict between the Reclamation Bureau and established agricultural interests in Nevada, and the controversy over the use of Pyramid Lake water exemplify the complications introduced by Federal reclamation projects. Much confusion could have been avoided by post-poning these projects until already existing water rights controversies had been settled. However, the Federal Government is not entirely to blame, as the limited water supply could not satisfy all competing users and the legal system could not adjust quickly enough to the increased importance of water for industrial and recreational use, as opposed to agricultural needs. (Russell-Arizona).
W78-10974

PRODUCTS LIABILITY: LET THE SELLER BEWARE,
M. R. Richard.
Water Well Journal, Vol 32, No 7, p 59-62, July, 1978.

Descriptors: *Insurance, *Legislation, *Product liability suits, Judicial decisions, Water equipment products, Pumps.

New warranty and product safety laws enable consumers who suffer personal or property damage in connection with the use of a product to more easily sue manufacturers. A 1976 estimate shows 1.5 million product liability suits annually. This compels manufacturers to raise their prices. Vulnerable areas in water equipment product design and manufacture are outlined and several lines of action are presented for manufacturers to reduce their chances of being involved in a product liability suit, and to prepare a defense if sued. There is a need for reliable statistics on the specific causes of product liability suits, trends in premium rates, and their influence on prices on consumer goods. Fourteen states now have product liability reform legislation and reforms are expected in all states by 1980. Over 30 product liability bills are pending in both houses of Congress and a House Subcommittee on Miscellaneous Revenue Measures began hearings in June. A case history of a product liability suit involving a defective water well pump is presented. (Purdin-NWWA)
W78-11069

WATER SUPPLY AND CONTROL DEVELOPMENTS SUMMARIZED: ARIZONA.
For primary bibliographic entry see Field 3D.
W78-11076

LE DROIT QUEBECOIS DE L'EAU (THE RIGHT OF THE PEOPLE OF QUEBEC REGARDING WATER),
Quebec, Ministere des Richesses Naturelles.
G. Lord.
Available from Centre de Recherche en Droit Public, Universite de Montreal, Quebec, Canada, 2 Vols., (March, 1977). 1049 p.

Descriptors: *Canada, *Internal water, *Water law, *Water policy, Subsurface waters, Spring waters, Riparian waters, Running waters, Planning, Environmental control, Water quality standards, Water pollution treatment.

In 1975 a comprehensive study was begun of the status of the laws on the interior waters of Quebec. A 1977 report of the principal results of the study covered such topics as: the consitutional setting; the criteria for navigability and buoyancy; individual laws; the laws of state ownership; administrative powers; law regarding water quality; and public laws. In order to analyze the water laws, it was necessary to consider the unique political ambiance of Quebec and its effect on any future laws. It was concluded that Quebec has the requisite legislative power to establish a modern water code comparable to those already enacted by a number of other countries. The first volume includes a thorough discussion of the laws on subterranean waters, spring waters, running waters, and riparian waters, comparing the laws of 1888, 1899, 1919 and 1969, and proposing solutions to the current problems. The second volume discusses municipal waters, irrigation and drainage, flooding, pollution, water quality control, natural resources, environmental quality and conservation. (Beamer-Florida)
W78-11151

REASONABLE-BENEFICIAL USE: NEW STATUTORY STANDARD FOR WATER RESOURCES ALLOCATION-INTERPRETATION AND RECOMMENDATIONS,
Florida Univ., Gainesville. School of Law.
S. Fleming.
Available from Eastern Water Law Center, University of Florida, Holland Law Center, Gainesville, Florida 32611, for $1.75. (Spring, 1978). 29 p, 1 append.

Descriptors: *Legislation, *Florida, *Water resources, Permits, Competing uses, Domestic water, Consumptive use, Usufractuary right, Riparian rights, Water allocation(Policy), Water utilization, Regulation.

The Florida Water Resources Act (Act) requires that a consumptive use permit be issued by a local water management district to any prospective consumptive user of water. The Act mandates issuance of the permit upon proof of a 'reasonable-beneficial' use of the water. However, there are no guidelines to determine what is a 'reasonable-beneficial' use of water. This note attempts to avoid the possibility of successful constitutional attack on the Act by identifying factors which should be used as determinative criteria. Through an analysis of the legislative history of the Act and an examination of judicial construction of the term 'reasonable-beneficial' use by other state court systems, the author determines that other than for domestic use--which has been held a reasonable-beneficial use per se--local districts should balance several factors, includng: economic efficiency; waste; social value; harm to existing users; and the purpose of the use. Although these factors have been identified, the author concludes that a statutory preference system will afford the best implementation of the Act. A model system is appended. (Stump-Florida)
W78-11152

THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS AND MINING OPERATIONS: AN OIL AND GAS LAWYER'S VIEW,
Hanna and Morton, Los Angeles, CA.
For primary bibliographic entry see Field 5G.
W78-11153

THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS, AND MINING OPERATIONS: BITTERSWEET OR UNPALATABLE,
Saunders, Snyders, Ross and Dickerson, Denver, CO.
For primary bibliographic entry see Field 5G.
W78-11154

THE PUBLIC INTEREST IN WATER RIGHTS ADMINISTRATION,
California State Dept. of Water Resources, Sacramento.
R. B. Robie.
Rocky Mountain Minera Law Institute, Vol. 23, p 917-940 (1977).

Descriptors: *Water rights, *Competing uses, *Water allocation(Policy), *Preferences(Water rights), California, Riparian rights, Natural flow doctrine, Reasonable use, Prior appropriation, Public benefits, Beneficial use, Water law.

After reviewing the traditional bases of water rights administration (riparian rights doctrine or natural flow theory, the doctrine of prior appropriation and the California correlative rights system) the author of this article to manage water as a public resource becaise of the changing public needs. Because public interest in water use has increased considerably in recent years, there is a definite need to update these traditional allocation systems. The major portion of this article examines the bases for recognizing the public interest and the assertion and application of that interest. Because many users have an existing property right in their use of water, the power of the state to place additional conditions and restraints upon those existing water rights takes on great significance. The article concludes with a statement that water rights are in a state of evolution, and that new administrative procedures must be developed to fairly protect the growing public interest. (Stump-Florida)
W78-11155

WATER QUALITY MANAGEMENT PLANS AND THEIR IMPACT ON MINING OPERATIONS,
Burlington, White, Burke and Ipsen, Denver, CO.
For primary bibliographic entry see Field 5G.
W78-11156

THE TWO-TIERED MARKET IN WESTERN WATER,
New Mexico Univ., Albuquerque. School of Law.
W. H. Ellis, and C. T. Du Mars.
Nebraska Law Review, Vol. 57, No. 2, p 333-367 (1978).

Descriptors: *Water allocation(Policy), *Irrigation water, *Water management(Applied), *Water risks, Water distribution(Applied), Water consumption, Water law, Water control, Water costs, Legal aspects, Water rights, Reclamation.

Water controlled by Bureau of Reclamation projects and state conservancy districts is insulated from market pressure by federal and state constraints on transferability. The result is an artificially low price level for farming interests able to purchase in the 'project market', an an artificially high price level for industry and municipal interests that must purchase water in the 'native market'. Without congressional action, project water will remain insulated from the native market because farming interests have considerable legal authority for maintaining project water for irrigation purposes only. If the two markets are merged, farming may become unfeasible in some areas due to a possible large increase in the cost of irrigation water rights. Some of the disparity may be reduced by eliminating confusion surrounding the transfer of native water rights, a model for which is provided in this article. The changes needed to reduce transaction costs in the native water market, and thus reduce the discrepancy, would include improving the market allocation of native water, solving quantification problems, reducing the cost of necessary quantification, and avoiding return flow problems. (Rule-Florida)
W78-11157

INDIAN WATER RIGHTS: A STATE PERSPECTIVE AFTER AKIN,
Wyoming Attorney General's Office, Cheyanne.
J. D. Palma, II.
Nebraska Law Review, Vol. 57, No. 2, p 295-318 (1978).

Descriptors: *Prior appropriation, *Reservation doctrine, *Federal-state water rights conflicts, *Indian reservations, Legal aspects, Water rights, Jurisdiction, Judicial decisions, Relative rights, Competing uses, Water supply, Water utilization.

Western United States water rights are determined according to the appropriation doctrine as applied by each state within its borders. Appropriators' rights are currently uncertain, however, where the rights involve waters reserved in part by the federal government for the use of Indian reservations. Where the claims of prior appropriators and Indians conflict, the Indians' reserved right will prevail if their claim is consistent with the original purpose of the reservation. It is not clear how much water could reasonably be required to sustain most reserved right purposes. The extent to which changes in the use or place of use of Indian water rights can be made is also not clear. The resolution of these and other uncertainties over the scope of Indian water rights is complicated by the fact that the reservation doctrine has been judicially created and defined. Issues are adjudicated in a piecemeal fashion and appropriators' water rights remain uncertain. From the states' standpoint there is an imperative need to inventory Indian water requirements and to adjudicate and quantify Indian rights within the state court systems. State jurisdiction would best integrate state water law with the federal claims. (Baumbach-Florida)
W78-11158

ALLOCATION OF RIGHTS TO WATER: PREFERENCES, PRIORITIES AND THE ROLE OF THE MARKET,
Florida State Univ., Tallahassee. School of Law.
J. C. Oeltjin, and L. K. Fischer.
Nebraska Law Review, Vol. 57, No. 2, p 245-282 (1978).

Descriptors: *Water rights, *Water allocation(Policy), *Water policy, *Preferences(Water rights), Water law, Prior appropriation, Beneficial use, Priorities, Legal aspects, Water management(Applied), Water utilization.

Allowing market forces to play an expanded role in the allocation of water rights would encourage efficiency in water use. Governmental action would still be necessary to apportion water rights between the public and private sectors, and to administer the public rights. Riparian rights, water preferences, and the doctrine of prior appropriation are systems in use in various parts of the country, modified in some areas by appropriation permit systems, constitutional, legislative, judicial or administrative preference schemes. No existing preference scheme reflects economic reality. Instead, all represent values which are not likely to continue to represent the most beneficial use of water resources under changing conditions. In some jurisdictions water rights cannot be voluntarily transferred even when neither third parties nor the public interest would be harmed by the transfer. An alternative model of water allocation should reflect market forces, thus providing a realistic market value and an incentive for efficient water use. Most of the current restrictions on water rights impede the movement of rights toward their highest and best uses. Legal restrictions would not be needed if the current uses

reflected the highest possible economic purposes. (Rule-Florida)
W78-11159

ENVIRONMENTAL LAW ISSUES IN THE DEVELOPMENT OF ENERGY RESOURCES,
Texas Tech Univ., Lubbock. School of Law.
F. F. Skillern.
Baylor Law Review, Vol. 29, No. 4, p 739-820 (Fall, 1977).

Descriptors: *Federal Water Poliution Control Act, *Comprehensive planning, *Energy, *Water quality control, Water pollution, Environmental control, Environmental effects, Water pollution sources, Environment, Ecology, Water resources development.

President Carter's National Energy Plan (Plan) presents serious challenges for the development of new energy alternatives. There is concern that development of different energy resources will mean the sacrifice of environmental quality. The environmental issues raised, and the judicial, administrative, and legislative responses are examined in this article, with particular emphasis on the production of oil, gas, coal, lignite, and nuclear energy. Water quality problems arising from production and use of various energy sources are within the scope of the 1972 Federal Water Pollution Control Act Amendments (FWPCA) and are also discussed. Plan objectives include encouraging research and development of new technology and establishing a cooperative effort between federal and state governments to abate or reduce water pollution. A major problem area under the FWPCA was the judicial review of regulations concerning effluent limitations standards. This created another issue dealing with jurisdiction for review of standards set by the federal Environmental Protection Agency. Other problems arose in interpreting the provisions for enforcement of liability for oil discharges and spills imposed under the FWPCA. Cases under the FWPCA are examined in conjunction with the problem areas. (Rule-Florida)
W78-11160

GEOTHERMAL RESOURCE DEVELOPMENT IN TEXAS,
D. A. Howard.
Baylor Law Review, Vol. 29, No. 4, p 993-1012, (Fall, 1977).

Descriptors: *Geothermal studies, *Thermal water, *Proprietory power, *Texas, Water resources development, Water temperature, Energy, Judicial decisions, Regulation, Thermal properties, Steam.

Geothermal energy--the use of steam or water found under intense heat and pressure within the earth--is brought to the surface to generate electricity through steam turbines or is utilized as natural heat. Geothermal energy does not readily fit any current definition of ownership. The 1975 Texas Geothermal Resources Act is similar to the 1970 Federal Steam Act in its resource definition, but the Texas Act has two sections potentially involving the question of ownership. First, the policy statement apparently suggests that the characterization of ownership which encourages the most rapid development of the resource is the most desirable, subject to the protection of correlative rights and the environment. Second, the Texas Railroad Commission is given primary enforcement responsibility over the exploration, development, and production of geothermal energy on public and private lands. Arguably, the legislative intent was that geothermal energy should be part of the mineral estate. Courts and legislatures have apparently assumed that private ownership of geothermal resources will be recognized, so the issue of surface or mineral characterization would appear to depend primarily on the definitional approach adopted by the court. (Rule-Florida)
W78-11161

THE DEEPWATER PORT ACT OF 1974: THE DEFINITION OF ADJACENT COASTAL STATES,
S. C. Barkley.
Baylor Law Review, Vol. 29, No. 4, p 1051-1063 (Fall, 1977).

Descriptors: *Oil industry, *Environmental effects, *Ships, *Deep water, Bodies of water, Legislation, Coasts, Decision-making, Water pollution sources, Regulation, Oceans, Transportation.

The 1974 Deepwater Port Act was passed in response to the need for deeper port facilities for transshipping imported oil from very large crude carriers to smaller tankers for final delivery to United States ports. The Act provides for licensing and regulation of artificial port facilities constructed in international waters off the U.S. coast. Oil would be pumped to the coastline from port facilities through an underwater pipeline. In recognition of the danger of environmental damage to nearby states from oil spills, any state which has been declared an adjacent coastal state would have absolute veto power over the construction and licensing of a deepwater port which posed an environmental threat. Unless the number of states designated as adjacent coastal states for any deepwater port construction license application is limited, most projects run a serious risk of veto. The Secretary of Transportation has interpreted the Act to limit the states that might be designated as adjacent coastal states, relying primarily on environmental impact statements prepared by the U.S. Coast Guard for his designations rather than on the recommendations of the Administrator of the National Oceanographic and Atmospheric Administration. (Rule-Florida)
W78-11162

UNITED NATIONS WATER CONFERENCE: AGREEMENT ON GOALS AND ACTION PLAN,
M. Falkenmark.
Ambio, Vol. 6, No. 4, p 222-227 (July-August, 1977).

Descriptors: *United Nations, *Comprehensive planning, *Water resources development, *Water management(Applied), International commissions, Optimum development plans, Feasibility, Economics, Financing, Irrigation engineering, Agriculture, Water supply, Water conservation.

At the Mar Del Plata Conference attention was directed toward efficient and cooperative use of the earth's fixed stock of water. Major goals included: (1) safe water for every individual by 1990; and (2) a worldwide program for the intensification and improvement of water development in agricultural production. The conference delineated needs and strategies for increased planning and management, training and research, and international cooperation. Resolutions and Action Plans were established. The Action Plans urged individual countries to establish priorities and timetables for the achievement of objectives. Regional and international coordination of research and training programs was urged. It was recommended that mobilization of local sources of finance be encouraged, but that increased loans and grants from foreign sources should also be sought by developing countries. It was further recommended that, within two years of the conference, phased programs of financial requirements should be available for preservation to appropriate governmental bodies. Also proposed was the coordination of international support programs for the mobilization, planning, coordination and monitoring of international financial aid and technical assistance in the field of water development. (Baumbach-Florida)
W78-11163

INTERIM ASSESSMENT OF WASHINGTON STATE SHORELINES MANAGEMENT,
Washington Univ., Seattle. Dept. of Geography.
M. McCrea, and J. H. Feldmann.
Coastal Zone Management Journal, Vol. 3, No. 2, p 119-146 (1977).

Descriptors: *Comprehensive planning, *Shore protection, *Management, *Washington, Coastal structures, Legislation, Land management, Regulation, Project post-evaluation, Coastal engineering, Coasts, Permits.

Washington State's Shoreline Management Act (SMA) has been a pioneer effort in comprehensive land and water management. This article examines the first three years (1971-1974) of the program. Focusing on the permit system as mandated by the SMA, the paper covers three main topics: (1) a general description of how shoreline permits are issued and appealed; (2) an examination of problems encountered in translating legislative policy into administrative action; and (3) an initial assessment of the effect of the SMA on the allocation of coastal resources. An additional analysis is made of shoreline development exempt from SMA permit requirements. The article concludes that the permit process has successfully minimized the environmental damage of developments through modifying, instead of prohibiting development proposals. Such modifications include restricting bulkhead and landfill activities, imposing site planning and landscaping conditions, and scaling down and settling back shoreline structures from the water. However, omitting certain developments from permit requirements has somewhat undermined the intent of the Act; for example, exempt single family residences composed more than one-half of all onshore development in the area examined. (Baumbach-Florida)
W78-11164

LOS ANGELES V. SAN FERNANDO: GROUND WATER MANAGEMENT IN THE GRAND TRADITION,
Southern California Metropolitan Water District of Los Angeles.
V. E. Gleason.
Hastings Constitutional Law Quarterly, Vol. 4, No. 4, p 703-714 (Fall, 1977).

Descriptors: *California, *Water management(Applied), *Prescriptive rights, *Water rights, Judicial decisions, Groundwater reservoirs, Municipal water, Water allocation(Policy), Competing uses, Water storage, Water supply development, Water utilization.

The San Fernando decision represents a major judicial contribution to California groundwater law. The application of the mutual prescription doctrine was limited by: (1) strict requirements for establishing notice of adversity; and (2) confirmation that California law bars prescription of water rights dedicated to public uses. On the issue of groundwater storage rights the court established: (1) the right to store water in natural underground basins as long as the storage does not unreasonably impair native groundwater rights; (2) the right to protect stored water from expropriation by others; and (3) the right to recapture stored water. Further, the court reasserted as a matter of constitutionally mandated public interest, that all water rights must be subject to reasonable conditions and priorities in their use, and that legal solutions to water rights problems must minimize waste and maximize beneficial use. According to this article, the San Fernando opinion has already become a working guide in several areas of water resource management. The article gives a brief review of each of the rulings in the case. (Baumbach-Florida)
W78-11165

MAINTENANCE OF MINIMUM INSTREAM FLOWS IN SOUTH DAKOTA,
T. L. McBride.

South Dakota Law Review, Vol. 23, No. 1, p 181-192 (1978).

Descriptors: *South Dakota, *Water control, *Water conservation, *Public rights, Appropriation, Reservation doctrine, Water utilization, Water permits, Recreation, Fish management, Pollution abatement.

In this comment the author explores the potential for applying existing South Dakota law to protect the state's instream flows. Two basic mechanisms are suggested: (1) appropriation by the state of a quantity of water that is to remain in the watercourse; and (2) reservation of a minimum amount of water necessary to preserve the public interest. In order the appropriation method to be effective, the state must limit the application of or redefine several appropriation doctrine concepts as they would be applied to the state. The author then discusses existing South Dakota law with regard to the beneficial use, man-made diversion requirement, and priority date concepts imbedded in the appropriation doctrine. Similarly, if the reservation mechanism is to be an effective means of protecting instream flows, the author feels that the 'public interest' must be interpreted broadly to include protection of fish, wildlife, and recreation. Whichever mechanism South Dakota chooses, the author concludes that a legislative mandate is needed to expedite the identification of the state's streams and quantities to be protected. (Anderson-Florida)
W78-11166

THE IMPACT OF DEFINING 'BENEFICIAL USE' UPON NEBRASKA WATER APPROPRIATION LAW,
T. E. Icenogle.
Nebraska Law Review, Vol. 57, No. 1, p 199-208 (1978).

Descriptors: *Nebraska, *Legislation, *Beneficial use, *Appropriation, Streamflow, Diversion, Natural recharge, Consumptive use, Preferences(Water rights), Water distribution(Applied), Legal aspects, Water rights.

Nebraska Legislative Bill 149, which would define the types of beneficial uses for which stream water may be appropriated, is currently pending before the state legislature. This article examines the wording of that bill, points out certain shortcomings and suggests improvements to it. Although not defining 'beneficial use', the Nebraska constitution and statutes implicitly recognize four beneficial uses of water: domestic, agricultural, manufacturing, and power generation. The proposed statute would add to those recognized uses the following uses: 'recreation, fish and wildlife, ground water recharge and storage, waste assimilation, navigation, and any other purpose having public value.' Since the bill does not establish any priorities among the categories of uses, the author fears that the statute will result in merely a vague standard permitting wide agency discretion in granting appropriation permits. Additionally, the author feels the bill should explicitly provide that the securing of minimum stream flow and the instream appropriation for recreational, wildlife, and navigational uses are 'beneficial uses' within the scope of the statute. (Anderson-Florida)
W78-11167

GROUNDWATER MANAGEMENT IN NEBRASKA WITHOUT A LEGISLATIVE SOLUTION: IS THERE AN ALTERNATIVE,
M. Klein.
Nebraska Law Review, Vol. 57, No. 1, p 78-90, (1978).

Descriptors: *Nebraska, *Water management(Applied), *Groundwater resources, *Legislation, Analysis, Surface-groundwater relationships, Water resources development, Subsurface waters, Legal aspects, Groundwater, Water conservation.

This analysis of the 1975 Nebraska Ground Water Management Act (Act) reveals several deficiencies in the Act. First, groundwater problem areas are not automatically within the scope of the Act, but must first be designated as a 'control area' by the Director of Water Resources after such designation has been actively sought by persons within the proposed control area. The author reasons that actual problems may go unrecognized or ignored by local citizens and argue that a governmental agency should be given authority to instigate the designation procedure. Secondly, the Act fails to address such important issues as whether private property rights in groundwater are immediately cut off by the Act, whether any priority system exists within the scheme of groundwater control, and whether the Act extinguishes the existing judicial doctrine banning interbasin transfers. In addition, the author notes that the Act lacks a definition of beneficial use and assigns no value to environmental, recreational, or aesthetic considerations in the preference scheme. The author concludes by analyzing the judicial means of resolving the issues raised by the inadequacies of the Act. (Anderson-Florida)
W78-11168

STATE JURISDICTION TO ADJUDICATE INDIAN RESERVED WATER RIGHTS,
J. Taylor, and D. Birdbear.
Natural Resources Journal, Vol. 18, No. 1, p 221-235 (January, 1978).

Descriptors: *Federal-state water rights conflicts, *Reservation doctrine, *Indian reservations, *Prior appropriation, Political aspects, Federal jurisdiction, State jurisdiction, Judicial decisions, Water policy, Competing uses, Water users, Water utilization.

Debate continues over the impact of recent court decisions on whether state or federal courts have the power to adjudicate federally reserved Indian water rights. States seek jurisdiction in hopes of quantifying the amount of water entalled and thus clarifying the rights of appropriators who use partially reserved waters. However, it is feared by some that state courts, some of which are subject to the biases of the electorate, will not adequately protect Indian water rights and the federal trust responsibilities to Indians. A key United States Supreme Court decision recently provided that state and federal courts have concurrent jurisdiction. The authors of this article favor federal jurisdiction. They argue that Indian rights are qualitatively different from other reserved rights in that they protect a people and that they are private, instead of public, rights. Further, these rights are impliedly held in trust for the Indians by the federal government. It is longstanding policy that Indians should be free of state jurisdiction except in limited circumstances, precisely because of the historic power struggle between tribes and states. In such a context, state court neutrality is reasonably questioned. (Baumbach-Florida)
W78-11169

INSTITUTIONAL ALTERNATIVES FOR MANAGING GROUNDWATER RESOURCES: NOTES FOR A PROPOSAL,
Arizona Univ., Tucson. School of Law.
R. E. Clark.
Natural Resources Journal, Vol. 18, No. 1, p 153-161 (January, 1978).

Descriptors: *Water management(Applied), *Comprehensive planning, *Groundwater resources, *International waters, Groundwater availability, Regulation, Permits, Management, Water quality standards, Water conservation, Mexico, Governmental interrelations.

The states of Arizona, New Mexico, California and Texas are the heaviest users of groundwater in the United States. Each of these states has a different system of groundwater law; none has adequate legislation for the protection and management of diminishing supplies within the state and along border areas. The shortage of groundwater in the boundary region between Mexico and the United States intensifies the need for joint management and conservation of their shared groundwater resources. This article proposed, within the framework of the Mexico-United States Treaty and the functions of the International Boundary and Water Commission, a regulatory and administrative approach to the problem. The authors recommended that withdrawals be measured and recorded, that flexible allocation procedures--such as permit systems--be instituted, and that the International Boundary and Water Commission be vested with the necessary administrative authority. Specifically recommended action included: (1) a joint research program to inventory groundwater supplies and detail the areas of availability and present uses; and (2) a goal of annual reports for use in land use planning and for industrial and other development. (Baumbach-Florida)
W78-11170

THE MANAGEMENT OF WATER-LAND-ENVIRONMENTAL RESOURCES AT INTERNATIONAL BOUNDARY REGIONS,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
L. B. Dworsky.
Natural Resources Journal, Vol. 18, No. 1, p 143-151 (January, 1978).

Descriptors: *International Boundary and Water Commission, *Mexico, *Coordination, *Water resources, Federal government, Comprehensive planning, Administration, Decision making, Management, Resources development, Future planning(Projected).

This article outlines some alternatives for improving the management of water, land, and environmental resources located in the boundary region of the United States-Mexico border. The author examines the current forces for change in the physical world and considers whether existing governmental institutions, such as the International Boundary and Water Commission (Commission), are equipped to cope with these changes. The author concludes that the United States and Mexico should establish a Joint Center for the Commission that would have authority to centralize the planning activities of the boundary region and develop a 'watching brief' over the land, water, and environmental matters within that region. The Joint Center would be vested with authority to advise the two countries on courses of action to be taken in response to the problems developed in the 'watching brief.' The author further recommends that a collaborative 'shadow' entity staffed by academic personnel be established for an initial five-year period to cooperate with and facilitate the activities of the Joint Center. (Anderson-Florida)
W78-11171

MINERAL RESERVATION IN LAND PATENTS ISSUED UNDER STOCK-RAISING HOMESTEAD ACT OF 1916 HELD TO INCLUDE GEOTHERMAL RESOURCES--UNITED STATES V. UNION OIL COMPANY OF CALIFORNIA,
D. Fogarty.
Gonzaga Law Review, Vol. 13, No. 1, p 240-248 (Fall, 1977).

Descriptors: *Federal reservations, *Mineral water, *Water rights, *Thermal water, Thermal springs, Mineral industry, Energy, Legal aspects, Judicial decisions, Land tenure, Relative rights.

In United States v. Union Oil Company of California, the United States brought action to preserve its reserved right to 'all coal and other minerals; as provided for in the 1916 Stock-Raisng Homestead Act under which defendants' predecessors were granted the land in question. The question on appeal was whether geothermal resources was encompassed as a reserved mineral. In holding that the geothermal resources were reserved, the court reasoned that: (1) many elements of a geothermal resources system can be classified as minerals; (2) in 1970 Congress specifically included geothermal resources in future mineral reservations; and (3) the established rule of construction in land grant cases is to resolve for the government on questions of what was conveyed. In determining the latter issue, the appeals court looked to the intent and legislative history of the Stock-Raising Homestead Act. The court held that the land grants were meant to provide homesteaders with a portion of the public domain sufficient for raising livestock, and to reserve unrelated subsurface resources--particularly energy sources--for separate disposition. Defendant oil company has appealed this Court of Appeals ruling to the Supreme Court. (Baumbach-Florida)
W78-11172

APPLICATION OF FEDERAL COMMON LAW OF PUBLIC NUISANCE TO INTRASTATE STREAM POLLUTION--COMMITTEE FOR CONSIDERATION OF JONES FALLS SEWAGE SYSTEM V. TRAIN,
C. G. Kroch.
Boston College Industrial and Commercial Law Review, Vol. 18, No. 5, p 929-955 (June, 1977).

Descriptors: *Common law, *Constitutional law, *Federal jurisdiction, *Pollution abatement, Environment, Federal government, Judicial decisions, Legal aspects, Streams, Water pollution, Water pollution control, Federal-state water rights conflicts.

The case of Committee for Consideration of Jones Falls Sewage System v. Train presented the question of whether the federal common law of nuisance could be applied in a suit by private individuals seeking to abate pollution of an intrastate stream. The majority in Jones Falls ruled that the federal common law of nuisance applied only to those cases seeking the abatement of public nuisance in interstate controversies where the complainant is a state and the offenders are creating extraterritorial harm. However, the majority view appears to be an improper restriction upon the use of the federal common law of public nuisance. In light of the federal government's interest in 'navigable waters', as evidenced in numerous pieces of legislation. The decision in Jones Falls does not place a state in the untenable position of fulfilling its responsibility under the Federal Water Pollution Control Act, only to discover itself open to suit by private parties in the federal courts. The decision does strike a blow against environmental enforcement, in that a suit would be difficult to maintain in light of the available state defense that defendant was following federal law. (Jordan-Florida)
W78-11173

SOIL AND WATER CONSERVATION.
Fla. Stats. secs 582.01 through 582.49 (1977).

Descriptors: *Florida, *Water conservation, *Soil conservation, *Legislation, Adoption of practices, Erosion control, Natural resources, Administration, Flood control, Waste water disposal, Navigable waters, Water resources development.

The 1977 Soil and Water Conservation Act (SWCA) was intended by the Florida legislature to implement four major policy goals: (1) prevention of floodwater damages; (2) furthering the conservation, development and utilization of soil and water resources; (3) disposal of water to preserve natural resources, control floods, and prevent impairment of dams and reservoirs; and (4) assist in maintaining the navigability of rivers and harbors. The SWCA provides for the formulation of a Soil and Water Conservation Council, to be composed of five members of the state's farming community. The Council is basically required to advise the Department of Agriculture in connection with the promulgation, administration and enforcement of all laws and regulations relating to soil and water conservation. The SWCA also provides for the creation of soil and water conservation districts which will constitute a governmental subdivision of the state. These districts will carry the real burden of soil and water conservation work, including research and dissemination of information, carrying out of preventive and control measures, purchasing land, and adoption of land use regulations. Each districts actions will be reviewable by the appropriate county court. (Stump-Florida)
W78-11174

FLORIDA AQUATIC PRESERVE ACT.
Fla. Stat. secs. 258.35 through 258.46 (1977).

Descriptors: *Florida, *Conservation, *Water resources, *Legislation, Aquatic environments, Estuaries, Ecology, Wetlands, Aquatic plants, Aquatic habitats, Aquatic life, Preservation.

The 1975 Florida Aquatic Preserve Act (Act) designates as preserves or sanctuaries state-owned submerged lands in areas which have exceptional biological, aesthetic and scientific value. The Act describes 31 preserves, all of which are characterized as being one or more of the following types: (1) biological: set aside to promote certain forms of animal or plant life or their habitats; (2) aesthetic: set aside to maintain certain scenic qualities or amenities; or (3) scientific types: set aside to maintain certan quality features which have scientific value or significance. The aquatic preserves established under the Act include only lands or water bottoms owned by the state or water bottoms; all lands lost by avulsion or by artificially induced erosion; or publicly owned and maintained navigation channels. The Act also provides for the establishment of new aquatic preserves, maintenance of the preserves and for the enforcement of the Act. (Stump-Florida)
W78-11175

ADDITIONS TO LAND ACQUISITION TRUST FUND ACT (AUTHORITY TO CONVEY SUBMERGED LAND).
Fla. Stat. secs. 253.12-253.665 (1977).

Descriptors: *Florida, *Water resources development, *Wetlands, *Internal waters, Administrative agencies, Beds, Dredging, Legal aspects, Regulation, Water law, Project planning, Ownership of beds.

Except for submerged lands already conveyed by deed or statute, the title to all sovereignty tidal and submerged bottom lands is vested in the Board of Trustees of the Internal Improvement Trust Fund. For the purpose of dredge and fill restrictions, the Board shall exercise the same authority over submered lands owned by the state by the right of its sovereignty in navigable freshwater lakes, rivers and streams as it does over other submerged land. All bulkhead lines are established at the line of mean high water or ordinary high water. No person shall dredge or fill beyond the bulkhead line without a permit from the Board. The Board of Trustees may sell and convey submerged land if determined by the Board to be in the public interest, and upon such prices, terms and conditions as it sees fit. However, prior to such sale, the Board must determine to what extent the sale of such submerged land would interfere with the conservation of fish, marine and other wildlife, or other natural resouces. (Jordan-Florida)
W78-11176

BOCA CIEGA BAY AQUATIC PRESERVE: BISCAYNE BAY AQUATIC PRESERVE.
Fla. Stat. secs. 258.16-258.165 (1977).

Descriptors: *Florida, *Bays, *Conservation, *Parks, Dredging, Landfills, Legal aspects, Legislation, Oceans, Preservation, State governments, Water law.

Boca Ciega Bay and Biscayne Bay are herein designated and established as aquatic preserves. It is the intent of the legislature that both bays be preserved in an essentially natural condition so that their biological and aesthetic values may endure for the enjoyment of future generations. The preserves shall include submerged bottom lands, the water column upon such lands, and the islands owned by the state within the boundaries of the preserve. No further dredging or filling of submerged lands in the preserve shall be tolerated by the Board of Trustees of the Internal Improvement Fund, except: (1) such minimum dredging as may be authorized for public navigation projects; (2) such other alterations as may be necessary to enhance the quality or utility of the preserves; (3) such dredging as is necessary for the elimination of hazardous conditions; and (4) such minimum dredging as may be authorized for the construction of marinas and their attendant navigation channels and access roads. Any dredging and filling shall be approved only after public notice and hearings in the area affected. (Jordan-Florida)
W78-11177

FLORIDA SAFE DRINKING WATER ACT.
Fla. Stat. secs. 403.850-403.864 (1977).

Descriptors: *Florida, *Potable water, *Public health, *Regulation, Legislation, Standards, Water quality, Water supply, Water treatment, Water users, Water works, Municipal water.

It is state policy that citizens of Florida shall be assured of the availability of safe drinking water. The state Department of Environmental Regulation (DER) shall adopt and enforce state primary drinking water regulations that shall be no less stringent at any given time than the complete interim or revised national primary drinking water regulations in effect at such time. The state Department of Health and Rehabilitative Services shall establish and maintain laboratories for the conducting of radiological, microbiological, and chemical analysis of water samples from public water systems. Any duly authorized representative of either department may enter, take water samples from, and inspect any property, premises, or place on or at which a public water system is located, at any reasonable time, for the purpose of ascertaining compliance with the law. Both departments shall adopt an adequate plan for the provision of safe drinking water under emergency conditions. Upon receipt of information that a contaminant present in a public water system may present a danger to public health, DER may take such actions as it deems necessary to protect the public health. (Jordan-Florida)
W78-11178

YELLOWSTONE RIVER COMPACT.
N.D. Cen. Code Ann. secs 61-23-01 through 61-23-02 (1960).

Descriptors: *North Dakota, *River basin development, *Water supply, *Interstate compacts, Wyoming, Montana, Water resources development, Drainage systems, Flood control, Watershed management, Interstate rivers, Tributaries.

The North Dakota legislature retified the Yellowstone River Compact in 1950. Enacted into the laws of Montana and Wyoming also, the compact attempts to alleviate controversies between the states arising with respect to the Yellowstone River and its tributaries. The compact: provides

for an equitable division and apportionment of basin waters; encourages the beneficial development and use of the basin's waters; and, acknowledge that future projects or programs affecting the regulation, control or use of basin waters shall recognize the importance of water for irrigation purposes in the signatory states. Included in the compact is a schedule for allocation of unused and unappropriated waters of the interstate tributaries of the Yellowstone River. The compact recognizes all existing rights to the beneficial use of waters of the Yellowstone River, excludes certain uses (such as domestic and stock water uses) from control by the compact, and expressly states that nothing in the compact shall be construed or interpreted so as to adversely affect any rights to the use of the waters of the Yellowstone River by the Indians, their tribes and reservations. (Stump-Florida)
W78-11179

ARTESIAN WELLS.
N.D. Cen. Code Ann. secs 61-20-01 through 61-20-08 (1960), as amended (Supp. 1977).

Descriptors: *Artesian wells, *North Dakota, *Groundwater basins, *Administrative agencies, Wells, Aquifers, Regulation, Well data, Well permits, Legislation, Phreatic lines, Water supply.

Amendments to Chapter 61-20 of the 1977 North Dakota Statutes prescribe the duties of the state water commission. The Commission is generally charged with the duty of advising state citizens as to the practicability of measures affecting the state citizens as to the practicability of measures affecting the state's underground waters. The Commission is also specifically required to: (1) counsel owners on the most desirable control and use of their wells; (2) make a record of well flows and pressures to learn about the fluctuations and permanence of the artesian supply; (3) record and keep for public reference certain details of the character of water and construction and history of wells; (4) enforce all laws pertaining to artesian wells; and (5) publish bulletins containing necessary information concerning artesian wells and the state's phreatic waters. Prior to these amendments, these duties were handled by the state geologist. The statute also requires valves on all artesian wells by which the flow is controlled, and generally allows only as much flow as is necessary for ordinary use by the owner. The statute makes provisions for clogged wells and wild wells, and schedules penalties for violations of the statute. (Stump-Florida)
W78-11180

PEOPLE OF THE STATE OF NEW YORK V. BONDI (UNLESS MARSH OR WETLAND IS ON FINAL STATE WETLANDS MAP, IT IS NOT SUBJECT TO STATE ENVIRONMENTAL CONSERVATION LAW RESTRICTIONS).
404 N.Y.S. 2d 521-524 (1978).

Descriptors: *New York, *Wetlands, *Land classification, *Water conservation, Freshwater, Permits, Regulation, Legal aspects, Water policy, Mapping, Land use.

Plaintiff state of New York filed an application to reargue dismissed charges against defendant landowner. The state claimed the defendant owned wetlands subject to the state's Environmental Conservation Law (statute) and had altered them without an appropriate permit. The defendant contended that his lands had never been mapped in accordance with the statute, and therefore were not subject to the rules prescribed by the statute. The court ruled that although included on a preliminary map, defendant's land had never been officially mapped and included within protected areas on the final state Fresh Water Wetlands Map mandated by the statute. The state also charged defendant with activity prohibited by the statute--specifically bulldozing cattails and covering them with dirt. The court ruled that because the state failed to allege or show that the bulldozing was not conducted for the purpose of growing agricultural products--an exclusion to regulated activities under the statute--the initial dismissal of charges would be affirmed. (Stump-Florida)
W78-11181

CONTROL, PREVENTION, AND ABATEMENT OF POLLUTION OF SURFACE WATERS.
N.D. Cen. Code Ann. secs 61-28-01 through 61-28-18 (Supp. 1977).

Descriptors: *North Dakota, *Water pollution control, *Surface waters, *Administrative agencies, Legislation, Pollution abatement, Water quality control, Waste treatment, Water quality standards, Regulation, Penalties(Legal).

Chapter 61-28 of the North Dakota Code was enacted to give the state power to control, prevent, and abate the pollution of surface waters in North Dakota. The statute specifically prohibits the pollution of or discharge of any wastes into state waters. The state Water Pollution Control Board (Board), acting jointly with the state health council, has authority to adopt, amend, or repeal rules and standards pertaining to the quality of state waters. While the Board also fixes penalties for violations, it does not give sufficient owner status to the state to support a civil action for damages against one who unlawfully pollutes a stream and thereby causes the destruction of fish. The Board consists of heads of the departments of health, water conservation, and game and fish, the state geologist and six citizens--representing municipal, industrial, wildlife and agricultural interest--who are appointed by the governor. The Board is charged with supervision and development of comprehensive programs for the prevention, control and abatement of water pollution. Specific guidelines, powers and duties are delegated to the Board. (Stump-Florida)
W78-11182

WATER CONSERVATION.
N.D. Cen. Code Ann. secs 61-15-01 through 61-15-10 (1960), as amended (Supp. 1977).

Descriptors: *Legislation, *Water policy, *North Dakota, *Water conservation, Water permits, Water rights, Civil law, Governments, Regulation, Legal aspects, Permits, Planning.

Chapter 61-15 of the North Dakota Code codifies the state policy in regard to control and supervision of water and wildlife conservation projects. The law vests power in the state to control navigable lakes, which are defined as those having been meandered and whose metes and bounds have been established by the government of the United States in a public lands survey. Actual authority is vested in the state engineer, who may accept aid from the federal government. The law also includes a specific provision for the state engineer to take necessary action to conserve and rehabilitate water levels in the Turtle Mountain region of the state. Municipalities are given specific permission to construct dams across a certain portion of the Red River. In 1977, the law was amended and section 61-15-04, which originally mandated that necessary easements be granted to the United States, now makes such grants optional. Section 61-15-07, which provided that the value of land shall not be diminished by conservation projects carried out on it, was repealed in 1977. A third amendment changed the penalty for draining a meandered lake. (Stump-Florida)
W78-11183

GENERAL RULES GOVERNING IRRIGATION.
N.D. Cen. Code Ann. secs 61-14-01 through 61-14-15 (1960), as amended (Supp. 1977).

Descriptors: *North Dakota, *Irrigation, *Water rights, Legislation, Irrigation permits, Regulation, Water distribution(Applied), Irrigation canals, Irrigation ditches, Irrigation practices.

Chapter 61-14 of the North Dakota Code prescribes general rules, including definitions and penalties, governing irrigation in the state. Water not used beneficially by the party entitled to its use for a three-year period reverts to the states. The amount of water that may be appropriated for irrigation shall not exceed the rate of one cubic foot per second for each 80 acres, for a specified time in each year. Water use rights remain appurtenant to the land, but if beneficial or economic use becomes impracticable, the water rights may be severed from the land and attached to other land upon approval of the state engineer. The statute includes a requirement for the construction and maintenance of a headgate where water is diverted and provides a penalty for violation. The statute also regulates bridges over ditches and canals, liens on land, seepage water, and disposition of state lands. The 1977 Supplement to the statute provides authority for the state engineer to allow a higher rate of diversion for irrigation, repeals the section declaring water rights appurtenant to the land, and changes the penalty schedule. (Stump-Florida)
W78-11184

STATE OF WASHINGTON V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (VALID EFFLUENT GUIDELINES NECESSARY FOR EPA AUTHORITY).
573 F. 2d 583-592 (9th Cir. 1978).

Descriptors: *Permits, *Waste disposal, *Industrial wastes, *Washington, Administrative agencies, Federal government, Federal Water Pollution Control Act, Pulp wastes, Sulfite liquors, Water pollution, Water quality, Standards.

Plaintiffs state of Washington and Scott Paper Company sought injunctive relief against federal Environmental Protection Agency's (EPA) veto of a state discharge permit. The permit had been issued by the state to the company for discharge of paper mill wastes into Puget Sound. After a jurisdictional problem was resolved, the trial court held that the EPA had no valid basis to veto the state permit. The EPA's veto power over state discharge permits is contingent on the antecedent formulation of effluent limitation guidelines in the form of regulations promulgated in conformity with rule-making provisions of the federal Administrative Procedures Act. Absent such legitimate regulations, the achievement of effluent reductions through application of the best possible technology is not one of the 'requirements of the Act' within the meaning of the statute. The veto based on the ad hoc determination of what constituted the best possible technology for the plant and not on uniform effluent limitations standards expressed on an industrywide basis was invalid because Congress did not intend to deprive permit applicants the procedural opportunity to participate in the formulation of administrative guidelines and regulations. (Jordan-Florida)
W78-11185

STATE WATER CONTROL BOARD V. HOFFMAN (FEDERAL JURISDICTION OVER HISTORICALLY NAVIGABLE WATERS).
574 F. 2d 191-194 (4th Cir. 1978).

Descriptors: *Navigable waters, *Virginia, *Lakes, *Rivers and Harbors Act, Administrative agencies, Interstate rivers, Navigable rivers, Permits, Regulation, Water control, Federal jurisdiction, Water resources development.

In a suit requesting injunctive relief, the Virginia Water Control Board challenged the jurisdiction of the U.S. Army Corps of Engineers over a small, artificial lake under the Rivers and Harbors Act.

The Act requires a permit from the Corps for the placing of any structure in a navigable water of the United States. The Virginia board contended that the lake--which was created in 1964 by impounding waters of the Upper Roanoke River--was exempt from the permit requirement, because of a 1976 Amendment to the Act which exempted bodies of water considered navigable solely on the basis of historical use in interstate commerce. The Corps argued that the lake could also be considered navigable based on its present navigational capability. The Fourth Circuit Court of Appeals held that the lake was exempt from the Acts permit requirement. The court stated that the lake was precisely the type of lake that Congress intended to exempt from the permit requirement. The court declared that there was no evidence which would support a finding of navigability of the lake based upon its present capability. (Jordan-Florida)
W78-11186

INLAND STEEL COMPANY V. ENVIRONMENTAL PROTECTION AGENCY (CURRENT PERMIT CAN INCLUDE CONDITION THAT SUBSEQUENTLY ADOPTED DISCHARGE STANDARDS WILL BE APPLICABLE TO DISCHARGER).
574 F. 2d 367-374 (7th Cir. 1978).

Descriptors: *Industrial wastes, *Permits, *Toxicity, *Water pollution, *Treatment, Administrative agencies, Federal government, Federal Water Pollution Control Act, Standards, Waste water, Water law, Water pollution, Waste treatment.

The steel company petitioned for a review of an Environmental Protection Agency permit which allowed the steel company to discharge pollutants in waste water, but reserved the right to modify the permit to reflect subsequently adopted toxic pollutant standards. The steel company argued that such a reservation was beyond the EPA's power. The seventh circuit court of appeals held that the reservation was within EPA's power and upheld the permit. The court stated that Congress did not intend to deny the EPA the power to include in a permit a provision authorizing discharge modifications reflecting more stringent, subsequently adopted standards. EPA could choose to issue permits of extremely short duration, and thus assure that any new toxic pollutant standard would be complied with quickly. Having given the EPA this power, Congress would have had no reason to withhold the authority claimed in this case. The court went on to say that the EPA is given broad discretion to choose the means by which to implement the Act. EPA is authorized to prescribe such regulations as are necessary to carry out its functions. (Jordan-Florida)
W78-11187

OMAHA INDIAN TRIBE, TREATY OF 1854 WITH THE UNITED STATES V. WILSON (TITLE TO RESERVATION LAND AS AFFECTED BY A CHANGE IN THE COURSE OF A BOUNDARY RIVER).
575 F. 2d 620-651 (8th Cir. 1978).

Descriptors: *Accretion(Legal aspects), *Avulsion, *Missouri River, *Boundary disputes, Bank erosion, Boundaries(Property), Federal jurisdiction, Interstate rivers, Reliction, Indian reservations, Navigable rivers, Thalweg.

An 1854 treaty created an Indian reservation on certain lands located west of the main channel of the Missouri River. By 1923, the river had moved more than two miles to the west of the original boundary line. The plaintiff Indians contended that the doctrine of avulsion applied and that the boundary line remained at the 1854 location. The defendants asserted that early movements of the river had completely washed away the reservation land, and that the land now within the former boundary was soil which had accreted to Iowa riparian land. The trial court decided in favor of the defendants on the basis of Nebraska law. The Eighth Circuit Court of Appeals reversed the district court on the grounds that federal law should have been applied to decide a boundary dispute involving interstate boundaries. Under federal law, non-Indians are required to assume the burden of proof to show that Indians no longer have lawful title to reservation land. The court held that the defendants' evidence was too speculative and uncertain to show that the reservation boundary had shifted by reason of accretion. (Jordan-Florida)
W78-11188

OIL SPILLS: THE POLICY OF PREVENTION AND THE STRATEGY OF RECOVERY,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 5G.
W78-11205

SOME POLITICAL-INSTITUTIONAL FACTORS AFFECTING EFFORTS TO CONSERVE WATER IN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Political Science.
R. D. Davies, and B. A. Haines.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 038, Price codes: A05 in paper copy, A01 in microfiche. Washington Water Research Center, Pullman, June 1978. 71 p, 2 fig, 10 tab, 34 ref, 12 append. OWRT A-090-WASH(1), 14-31-0001-7101.

Descriptors: *Alternative planning, Institutions, Legal aspects, Decision making, *Political constraints, *Washington, *Water conservation, *Institutional constraints, *Attitudes, Social values.

The legal doctrine that use of water must be reasonable has been interpreted recently by courts to proscribe some relatively common wasteful practices in the west. However, it is difficult for courts to provide the kind of broad, prospective, informed and sustained efforts to counteract waste that would be possible through administrative mechanisms. The extent to which administrative mechanisms are adopted and successfully implemented depends in part on support and opposition from water users and those who represent them. In this study relevant perceptions and attitudes of individuals interested and/or influential in Washington state water policy were surveyed by means of a mailed questionnaire. Most respondents agreed that water was becoming more scarce, and the principal causes of scarcity were felt to be insufficient precipitation, deficient storage, inadequate monitoring, lack of governmental planning and regulation, and wasteful practices by agricultural, municipal/domestic and industrial users. Respondents were most suppportive of proposals to (1) institute voluntary programs for improving conservation, and (2) impose negative incentives on users who waste water. The lease support was given to proposals for positive incentives to encourage more efficient practices. Attitudes and perceptions of respondents from non-profit, development-oriented associations were closer to those of state officials than to the profit-makers whom they represented. This suggests that efforts to promote conservation may be more effective if associations of water users are encouraged to participate more actively in them.
W78-11212

THE EFFECTS OF THE USE AND REGULATION OF SEPTIC TANK SYSTEMS UPON LAND USE IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional Planning.
For primary bibliographic entry see Field 5G.
W78-11216

PROBLEMS IN ATTEMPTING TO TRANSLATE STATUTORY STANDARDS INTO EMISSION LIMITATIONS UNDER AIR AND WATER POLLUTION CONTROL LEGISLATION,
Yeshiva Univ., New York. School of Law.
For primary bibliographic entry see Field 5G.
W78-11240

SUMMARY, NEW HAMPSHIRE WATER QUALITY STANDARDS.
New Hampshire Water Supply and Pollution Control Commission, Concord.
For primary bibliographic entry see Field 5G.
W78-11241

ENVIRONMENTAL POLICY STANDARDS.
De Kalb County, Georgia, Code, Chapter 6A, Supplement 12 (1975).

Descriptors: *Georgia, *Local governments, *Conservation, *Land development, Regulation, Environmental effects, Penalties(Legal), Standards, Flood control, Erosion control, Drainage, Permits.

All persons proposing new development or construction within DeKalb County (Georgia) after June 11, 1974, shall submit to the development director a site plan illustrating the means of conformance with the policy provisions set forth in this county ordinance and illustrating compliance with applicable development standards established by this ordinance. In addition, such persons shall be required to furnish bond or other financial security necessary to insure installation of required structures. The development director or the roads and drainage director (Directors) may inspect any development commenced after June 11, 1974, to determine compliance with the standards of this ordinance and may issue a notice of violation to the property owner, or, if the Directors determine that the violation is willful and hazardous to the public, they may issue a court summons. After notice of violation, if compliance is not obtained within the time designated by the Directors, summons shall be issued for the owner to appear in recording court. Public policies of DeKalb County and specific development standards for grading, vegetation protection, erosion and sedimentation control, and drainage are also set forth in the ordinance. (Anderson-Florida)
W78-11243

WATER PROBLEMS IN THE RURAL ENVIRONMENT--ALTERNATIVE SOLUTIONS FOR WATER SUPPLY AND WASTEWATER DISPOSAL.
For primary bibliographic entry see Field 3F.
W78-11244

SUPREME COURT DECLARES STATE LAW CONTROLS RIVERBED TITLE ISSUES,
Environmental Law Reporter, Vol. 7, No. 3, p 10045-10047 (March, 1977).

Descriptors: *Judicial decisions, *Navigable rivers, *Ownership of beds, *Federal-state water rights conflicts, Riparian rights, Navigable waters, Legal aspects, Beds under water, Federa jurisdiction, Water policy, State jurisdiction, Rivers.

The United States Supreme Court overturned a three-year-old decision and declared that ownership disputs concerning beds of interstate navigable waters must be decided as a matter of state law rather than federal com mon law. The recent decision concerned an attempt by the state of Oregon to eject a sand company from parcels it had been mining for more than 40 years. The parcels were not part of the riverbed when Oregon was admitted to the Union, but became part of the river's main channel after a gradual shift in course resulting from high water stages and a flood. Oregon courts, following federal common law principles,

held that the mining company owned the land, and that the state's right could be served by assetion of a navigation servitude. The Supreme Court reversed, retracting its earlier assertion of continuing federal interest in navigable, intrastate riverbeds. The implications of this position on the federal level are not certain. Federal lands bordering rivers are now subject to state riparian rules, which may affect the scope and nature of federa water projects. (Rule-Florida)
W78-11245

INTERIOR'S FAILURE TO COMPLY WITH NEPA BLOCKS ATLANTIC OCS OIL LEASING.
Environmental Law Reporter, Vol. 7, No. 4, p 10067-10070 (Arpil, 1977).

Descriptors: *Altantic Ocean, *Oil industry, *Exploration, *Judicial decisions, Legislation, Continental shelf, Environmental effects, Natural resources, Regulation, Adjudication procedure, Energy, Water quality control.

A recent federal district court ruling voided the first sale of outer continental shelf oil and gas exploration and production leases for areas off the Atlantic coast because the final environmental impact statement inadequately compiled with National Environmental Policy Act requirements. The court had earlier issued a preliminary injunction against the opening of bids for the lease sale, but is was stayed by the Second Circuit Court of Appeals because of the national interest in increasing domestic energy supplies, and because there would be no irreparable harm from simply opening the bids. The effect of the recent district court decision has been stayed pending completion of the appeal process. However, the district court decision was based on findings of fact which the court of appeals must accept as presumptively valid, so the decision may be difficult to reverse. Unless the Interior Secretary can show that the impacts of adverse state and local regulation can be accomodated, the decision to appeal will place the Interior in a position of arguing that outer continental shelf development must take place regardless of economic cost or the disruption of state and local regulatory structures. (Rule-Florida)
W78-11246

PRATHER V. EISENMANN (IRRIGATION WATER USER LOWERING WATER TABLE LIABLE FOR DAMAGES TO ADJACENT DOMESTIC WELL OWNERS).
261 N.W.2d 766-772 (Neb. 1978).

Descriptors: *Water wells, *Water level fluctuations, *Penalties(Legal), *Nebraska, Aquifer management, Water supply, Irrigation effects, Reasonable use, Water demand, Groundwater availability, Irrigation wells, Pumping.

Plaintiffs, domestic well owners, brought action to enjoin defendant from pumping groundwater from an irrigation well. Plaintiffs lost the use of their domestic wells soon after defendant began pumping water from the irrigation well at the rate of 650 gallons per minute. Tests made by hydrologists showed that the irrigation well and the domestic wells were drawing from the same aquifer, which could be defined with reasonable scientific certainty, and that defendant's pumping depressed the artesian head of the domestic wells. Further, the cone of influence caused by defendant's pumping intercepted of affected the plaintiffs' wells, and to obtain water from their wells during periods when defendant was pumping, the plaintiffs would have to pump water from the top of the shale. The Nebraska Supreme Court affirmed a district court decision for the plaintiffs, and held that by operating an irrigation well in such a manner so as to render the plaintiffs' domestic wells useless during the pumping period, defendant was liable for necessary and reasonable expenses to restore the wells by lowering the plaintiffs' pumps to shale. (Rule-Florida)
W78-11247

GUIDELINES FOR PREPARATION OF WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W78-11249

FREEDOM OF RESEARCH AT SEA SLIPPING AWAY,
Woods Hole Oceanographic Institution, MA.
P. M. Fye.
Sea Technology, Vol. 8, No. 6, p 10-14 (June, 1977).

Descriptors: *Law of the sea, *United Nations, *Oceanography, *Foreign research, International law, Oceans, Foreign countries, Project planning, Economic impact, Research and development, Exploitation, Exploration.

Responding to questions regarding growing restrictions on oceanographic research, the author of this article discusses the necessity for a maximum oceanic research effort. When the 200-mile economic zone was being considered for inclusion in the United Nations Law of the Sea Conference Treaty, many developing nations argued that anyone wishing to do research within the economic zone must first obtain the consent of the neighboring coastal state. These countries viewed oceanography as a tool of military comination and industrial exploitation that would not contribute to solutions of their respective economic problems. However, the author makes clear that vigorous scientific programs carried out cooperatively by many nations working together and sharing results will benefit all mankind, particularly by providing a basis for good management of fisheries, allocating other marine resources, and in gaining an understanding of the oceans' effect on weather and climate. The author reviews several strategies designed to persuade developing nations of the fact that oceanographic research will be useful to them, and concludes by calling for a dramatic drive to reduce the restrictions on oceanographic research. (Stump-Florida)
W78-11250

CONSERVATION DISTRICTS AND 208 WATER QUALITY MANAGEMENT, NON-POINT SOUCE IDENTIFICATION AND ASSESSMENT; SELECTION OF BEST MANAGEMENT PRACTICES; MANAGEMENT AGENCIES; REGULATORY PROGRAMS,
National Association of Conservation Districts, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11251

FEDERAL PLAN FOR THE ACQUISITION OF WATER DATA--FISCAL YEARS 1978 AND 1979.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11267

THE RELATIONSHIP OF 'SPARTINA ALTERNIFLORA' TO MEAN HIGH WATER,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W78-11300

6F. Nonstructural Alternatives

THE VIRGINIA COAST RESERVE: ACQUISITION STRATEGIES FOR COASTAL ZONE PRESERVATION,
Nature Conservancy, Arlington, VA.
P. F. Noonan.
Coastal Zone Management Journal, Vol. 3, No. 4, p 405-17, 1977.

Descriptors: *Conservation, *Virginia, *Seashores, *Barrier Islands, *Coasts, Land management, Land resources, Natural resources, Protection, Coastal marshes, Regions, Land development, Land use, Recreation, Preservation, Wetlands, Zoning, Islands, Easements, Regulation, Atlantic coastal plain.

Preserving and protecting environmentally valuable natural lands is the basic purpose of The Nature Conservancy, a national conservation organization. As part of its program, it has acquired 13 of Virginia's Barrier Islands over the past seven years. The islands were threatened with development, which would have destroyed one of the last remaining natural seashore areas in the nation. Acquisition of the islands was either by outright purchase, or through donations from private individuals and philanthropists. Godwin Island, the first obtaned, was purchased in a bargain sale, the seller receiving a 30% tax deduction. The purchase was prompted by a development firm's plan to turn three adjoining islands into a luxury resort complex. These three islands were later purchased by the Conservancy after the developer became convinced of the project's unfeasibility. At this point the Conservancy became determined to preserve the entire chain. It acquired the nine other islands with varying degrees of difficulty. Despite its success, the organization realizes that land acquisition is not always feasible. It proposes comprehensive coastal zone management programs, along with other strategies, to insure protection of these naturally valuable areas. (Malefatto-Florida)
W78-10787

ENVIRONMENTAL PROTECTION: MODEL ORDINANCES FOR USE BY LOCAL GOVERNMENTS.
Metropolitan Council of the Twin Cities Area, MN.
For primary bibliographic entry see Field 6E.
W78-10801

MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND,
Colorado State Univ., Fort Collins. Dept. of Earth Sciences.
For primary bibliographic entry see Field 4C.
W78-11064

POLICY AND PROGRAM ANALYSIS OF AN OPEN LAND APPROACH TO FLOOD PLAIN MANAGEMENT,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
J. P. Royer, B. T. Wilkins, and D. J. Allee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 930, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, (August 1978). 125 p, 15 fig, 27 tab, 26 ref, 4 append. OWRT B-056-NY(1), 14-34-0001-7170.

Descriptors: *Flood plains, *Parks, *Land use, Flood plain zoning, Recreation, Non-structural alternatives, *New York, *Community development, Land management, Water policy, Regional analysis, *Susquehanna River Basin(NY), Benefits, Surveys, Attitudes.

The Nation's approach to flood problems has been changing in recent years: The trend is from reliance on structure and towards programs to influence the use of flood-prone land. Moreover, new emphases have been placed on environmental values and open land opportunities. A land use strategy frequently considered to simultaneously meet these needs is the acquisition and use of flood plains for parks, open space, and other non-

intensive uses. A case study of communities in the Susquehanna River Basin of southern New York was used to identify land use patterns important to a policy of acquiring flood-prone land, to examine the economic rationale for an open land approach, and to assess the political viability of an open land strategy. An inventory of flood-plain land-uses in 51 southern New York communities revealed a pattern of land use change related to community size. Based on this pattern, the small, but growing communities and the communities immediately upstream and downstream from major population centers were judged to be the most likely to benefit from flood plain acquisition. The flood plains in these communities were mostly in inactive agricultural and idle uses. Mailed surveys to heads-of-households in six communities and community officials in 13 communities showed regulatory measures for managing flood-plain use were widely supported and preferred to land acquisition. Support for acquisition was modest, but the use of flood plains for parks and open space was viewed as the best long-term use. Estimated benefits to households from the use of flood plains for parks were small and diffuse. But when considered in aggregate and projected over time, these benefits were enough to justify flood plain acquisition in some communities.
W78-11201

WASTEWATER MANAGEMENT PLANNING: SOURCES OF CONFLICT IN THE EVALUATION OF ALTERNATIVES,
Clark Univ., Worcester, Mass. Dept. of Environmental Affairs.
For primary bibliographic entry see Field 5G.
W78-11202

THE EFFECTS OF THE USE AND REGULATION OF SEPTIC TANK SYSTEMS UPON LAND USE IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional Planning.
For primary bibliographic entry see Field 5G.
W78-11216

6G. Ecologic Impact Of Water Development

A COMPREHENSIVE METHODOLOGY FOR ASSESSING ENVIRONMENTAL IMPACT,
British Columbia Univ., Vancouver. Dept of Soil Science.
M. W. Sondheim.
Journal of Environmental Management, Vol 6, No 1, p 27-42, January 1978. 2 fig, 4 tab, 28 ref.

Descriptors: *Environmental effects, *Environmental control, *Methodology, *Assessment, Dams, Projects, Rating, Multiresources, Impact statements, Alternative planning, Equations, Water resources.

A methodology for assessing environmental impact is developed and tested. Advantages of this technique over other methods include: the ability to evaluate simultaneously a large number of project alternatives; the capability of incorporating directly a very broad definition of 'environment' in the assessment process; the segregation of the subjective components of the study; the possibility of including direct public participation in the assessment process; the use of interval or ratio rating schemes instead of ordinal ones; and the examination of specific potential impacts in the way(s) deemed most suitable. The methodology was devised in response to a problem involving whether or not a dam should be constructed at a given site; however, it should be noted that the methodology is applicable to a wide variety of situations. (Bell-Cornell)
W78-10652

FINAL REPORT, ENVIRONMENTAL IMPACT MODEL DEVELOPMENT FOR NAVAL OPERATIONS,
Naval Weapons Center, China Lake, CA. Public Works Dept.
J. R. Ouimette.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A015 288 Price codes: A03 in paper copy, A01 in microfiche. Final Report, NWC TP 5793, Naval Weapons Center, China Lake, California, August 1975. 28 p, 2 fig, 4 tab 52 ref.

Descriptors: *Simulation analysis, *Model studies, *Environmental impact, Water pollution, Air pollution, Methodology, U.S. Navy, Cost effective, Systems analysis.

Simulation models are the most commonly used tools for relating residual emissions, such as air, water, and noise, to environmental quality. The model can be defined as a mathematical description of the transport, dispersion, and transformation processes that occur in a given medium. The role of the simulation model in the environmental impact process is to predict pollutant concentrations so that they can be related to impact on various ecosystem receptors. This report examines various air and water models and environmental impact methodologies to determine suitability for Navy needs. Certain models are recommended for Navy use to maintain a cost-effective information response system.
W78-10667

GUIDELINES FOR EPA REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS ON PROJECTS INVOLVING IMPOUNDMENTS.
Curran Associates, Inc., Northhampton, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 725, Price codes: A07 in paper copy, A01 in microfiche. June, 1975, 120 p.

Descriptors: *Environmental effects, *Impoundments, *Administrative agencies, *Decision-making, *Water resources development, Impounded waters, Reservoir construction, Detention reservoirs, Conservation, Coordination, Governments, Legal aspects, Legislation, Projects, Water management(Applied), Water policy, Water supply, Reservoirs, Planning, Regional development.

The Environmental Protection Agency (EPA) involvement in the impoundment process stems from the mandates of the National Environmental Policy Act of 1969 and the Clean Air Act Amendments of 1970. With the exception of highly controversial projects, the bulk of EPA impoundment project reviews has been and will continue to be conducted at the regional level. To adequately perform these reviews, each regional Environmental Impact Statement (EIS) Coordinator and his attendant review personnel must have the best available information on both the technical and procedural aspects of EIS reviews on these projects. This document provides the guidance necessary to properly review impoundment projects. The approach of the guidelines is one of unifying the various review and technical documents currently in use by placing them in the context of the impoundment project review process. Several review 'check lists' are provided and should be utilized to insure that all relevant areas have been reviewed. This report will be used as the draft version of the EPA guidelines for the review of EIS's on projects involving impoundments. (Beamer-Florida)
W78-10761

AN ANALYSIS OF THE SCOPE OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT ON THE GARRISON DIVISION UNIT PROJECT: APPLYING A TOTALITY OF CIRCUMSTANCES TEST,
P. Bossert.
North Dakota Law Review, Vol. 53, No. 3 p 427-48. 1977.

Descriptors: *Missouri River, *North Dakota, *Reservoir construction, *Multiple-purpose reservoirs, *Multiple-purpose projects, Diversion structures, Environmental effects, Reclamation, Environment, Projects, Irrigation, Reservoirs, Flood control, Judicial decisions, Navigation, Wildlife, Recreation, Alternative planning, Administrative agencies, Evaluation.

Several reclamation projects are currently under way in the Missouri River Basin. One such project, the Garrison Diversion Unit in North Dakota, envisions construction of five multiple-purpose reservoirs on the Missouri River for flood control, navigation, irrigation, power, domestic and sanitary purposes, and wildlife and recreation. This article analyzes the scope of the final Environmental Impact Statement (EIS) completed by the Bureau of Reclamation in compliance with the National Environmental Policy Act of 1969. The statement has been criticized by federal agencies and public interest groups as being insufficient for failing to analyze the full scope of the project's environment impacts on the entire Missouri River Basin. To determine whether a segmented EIS such as the one prepared for the Garrison Diversion Unit is proper, the courts generally apply a 'totality of circumstances' test. This test analyzes the independent utility of a segment, the irretrievable commitment of resources to a segment, and the foreclosure of alternatives to a project caused by segmentation. The author concludes that two EIS's were in order here, one assessing broad effects and one detailing specific impacts. (Spector-Florida)
W78-10785

THE NEW FEDERAL WATER POLLUTION CONTROL ACT AND ITS IMPACT ON NUCLEAR POWER PLANTS,
Consolidated Edison Co. of New York, Inc., New York.
For primary bibliographic entry see Field 5G.
W78-10861

ENVIRONMENTAL DEFENSE FUND, INC. V. HOFFMAN (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT CHALLENGED).
For primary bibliographic entry see Field 6E.
W78-10867

SIERRA CLUB V. CAVANAUGH (REQUIREMENT OF ENVIRONMENTAL IMPACT STATEMENTS FOR CONSTRUCTION OF RURAL WATER SYSTEMS).
For primary bibliographic entry see Field 6E.
W78-10881

COUNTY OF SUFFOLK V. SECRETARY OF THE INTERIOR (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 6E.
W78-10886

ENVIRONMENTAL LAW ISSUES IN THE DEVELOPMENT OF ENERGY RESOURCES,
Texas Tech Univ., Lubbock. School of Law.
For primary bibliographic entry see Field 6E.
W78-11160

DREDGING IN ESTUARIES - A GUIDE FOR REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS. SYMPOSIUM/WORKSHOP PROCEEDINGS, MARCH 1977, RESTON, VIRGINIA,
Research Triangle Inst., Research Triangle Park, NC.; and Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2L.
W78-11222

SOCIOECONOMIC IMPACTS OF OUTER CONTINENTAL SHELF OIL AND GAS DEVELOPMENT-A BIBLIOGRAPHY,
Geological Survey, Reston, VA.
M. L. Pattison.
Circular 761, 1977, 66 p.

Descriptors: *Bibliographies, *Resources development, *Environmental effects, Sites, Land use, Oil fields, Gases, Water pollution sources, *Outer Continental Shelf, *Socioeconomic impacts, Environmental impacts.

The bibliography lists reports which are concerned primarily with the socioeconomic impacts of OCS oil and gas development or which, although not primarily concerned with such impacts, include sections that contain significant discussion of them. Several of the cited reports do not address socioeconomic issues directly, but have been included because of their value in providing a broad picture of OCS oil and gas development and the associated terminology and/or techical aspects. (Sinha - OEIS)
W78-11232

INTERIM HIERARCHICAL REGIONAL CLASSIFICATION SCHEME FOR COASTAL ECOSYSTEMS OF THE UNITED STATES AND ITS TERRITORIES,
Fish and Wildlife Service Fort Collins, CO.
For primary bibliographic entry see Field 2L.
W78-11233

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME I: PROCESSING SYSTEMS SUMMARY.
Dames and Moore, Salt Lake City, UT.; and EIC Corp., Newton, MA.
For primary bibliographic entry see Field 5C.
W78-11239

ENVIRONMENTAL POLICY STANDARDS.
For primary bibliographic entry see Field 6E.
W78-11243

7. RESOURCES DATA

7A. Network Design

FEDERAL PLAN FOR THE ACQUISITION OF WATER DATA--FISCAL YEARS 1978 AND 1979.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11267

7B. Data Acquisition

AN INEXPENSIVE PRECIPITATION GAUGE,
New Mexico State Univ., University Park. Dept. of Agronomy.
B. A. Buchanan, R. L. DeVelice, and N. S. Urquhart.
Soil Science Society of America Journal, Vol 42, No 3, p 532-533, May-June 1978. 2 fig, 2 ref.

Descriptors: *Rain gages, *Design, *Equipment, Precipitation(Atmospheric), Rainfall, Measurement, Instrumentation, Gages, Gaging, Arid lands, Meteorology.

An inexpensive, yet accurate, precipitation gauge was developed from readily available materials. The gauge accurately estimated precipitation as measured by a standard Weather Bureau gauge for 35 precipitation events in a one-year period. This enexpensive gauge has been used successfully in the field for two years. (Sims-ISWS)
W78-10523

SUB-SERVICE SURVEYING.
Water and Waste Treatment, Vol. 21, No. 6, p 29, June, 1978.

Descriptors: *Tracking techniques, *Sewers, *Drains, *Electromagnetic waves, *Remote sensing, Electronic equipment, Instrumentation, Marking techniques, Mapping, Analytical techniques, Pipes, Sewerage, Municipal wastes.

The electro-magnetic subsurface GPR 104 Drain Locator, manufactured by Electro-location Ltd., of Bristol, England, eliminates the need to excavate trial holes in locating the course of uncharted drains or sewers. A probe is rodded, jetted, or floated through the pipe; signals are transmitted by the probe to a hand-held surface receive equipped with earphones. The GRP 104 Drain Locator has reportedly saved the Cheltenham Borough in England the large expense of excavating the trial holes generally required to locate and map subsurface drains. (Lisk-FIRL)
W78-10723

EXTREME EVAPOTRANSPIRATION BY IRRIGATED ALFALFA: A CONSEQUENCE OF THE 1976 MIDWESTERN DROUGHT,
Nebraska Univ., Lincoln. Agricultural Meteorology Section.
For primary bibliographic entry see Field 2D.
W78-10923

PROBABLE MAXIMUM PRECIPITATION ESTIMATES, COLORADO RIVER AND GREAT BASIN DRAINAGES,
National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W78-10925

WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS.
National Sanitation Foundation, Ann Arbor, MI.
For primary bibliographic entry see Field 5A.
W78-10927

RADIATIVE TRANSFER MODEL FOR REMOTE SENSING OF SUSPENDED SEDIMENTS IN WATER,
MITRE Corp., McLean, VA. METREK Div.
For primary bibliographic entry see Field 2J.
W78-10930

EXTRACTION AND INJECTION OF SOIL WATER WITH HOLLOW-FIBER SEMIPERMEABLE MEMBRANES,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 2G.
W78-10939

A PORTABLE CHAMBER FOR RAPID EVAPOTRANSPIRATION MEASUREMENTS ON FIELD PLOTS,
South Carolina Agricultural Experiment Station, Florence.
For primary bibliographic entry see Field 2D.
W78-11028

ESTIMATING FIELD EROSION LOSSES FROM FALLOUT CESIUM-137 MEASUREMENTS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W78-11116

7C. Evaluation, Processing and Publication

CHARACTERIZATION OF YIELD AND ECONOMIC LOSS FROM NONUNIFORM FERTILIZER DISTRIBUTION USING COMPUTER SIMULATION,
Nebraska Agricultural Experiment Station, Lincoln.
For primary bibliographic entry see Field 3F.
W78-10595

GROUND-WATER RESOURCES OF TANGIPAHOA AND ST. TAMMANY PARISHES, SOUTHEASTERN LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10620

SURFACE WATER RECORDS OF COOK INLET BASIN, ALASKA, THROUGH SEPTEMBER 1975,
Geological Survey, Anchorage, AL. Water Resources Div.
D. R. Scully, L. S. Leveen, and R. S. George.
Open-file report 78-498 (basic data), 1978. 102 p, 2 fig.

Descriptors: *Hydrologic data, *Surface waters, *Streamflow, *Discharge(Water), *Water temperature, Seepage, Streams, Gaging station, Flow rates, Water yield, Lakes, Basic data collections, Alaska, *Cook Inlet Basin(Alas).

This report summarizes records of streamflow and water temperature collected prior to October 1, 1975, in the Cook Inlet Basin of south-central Alaska. Streamflow records for gaging stations are tabulated as monthly and annual summaries and annual extremes. For those gaging stations at which continuous or daily water temperature records have been collected, monthly summaries of water temperature extremes are shown. For other gaging stations periodic water temperatures are published. Discharge at crest-stage partial-record stations and at miscellaneous sites is tabulated. Results of seepage investigations are presented for 4 streams. (Woodard-USGS)
W78-10621

A GROUND-WATER INVENTORY OF THE WAIALUA BASAL-WATER BODY, ISLAND OF OAHU, HAWAII,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10622

LOW-FLOW FREQUENCY OF GEORGIA STREAMS,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-10623

WATER-RESOURCES SETTING, MARTIN COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
R. A. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 064, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-68, February 1978. 37 p, 20 fig, 1 tab, 7 ref.

Descriptors: Water resources, *Surface waters, *Groundwater, *Hydrologic cycle, *Hydrogeology, Maps, Aquifers, Water table, Water levels, Saline water intrusion, Water utiliza-

tion, Drainage systems, Rainfall, Evaporation, Topography, *Florida, Martin County(Fla), Physiographic subdivisions.

This report describes some basic principles of hydrology as they apply to Martin County, Florida. The major land features are described first, then the hydrologic cycle and surface-water and ground-water resource. Specific problems associated with population growth and the county's development, such as saltwater intrusion and water use, are cited and sections have been included to deal with these problems. The report is intended to provide a background on the water resource of Martin County to those who do not have the time nor the need to delve deeply into the county's hydrologic conditions or its water-management problems. It is freely illustrated and uses a minimum of text to explain the illustrations. General data on the water resources of the county are given, but few specific basic data are presented. (Woodard-USGS)
W78-10626

WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1976.
Geologica Survey, Raleigh, NC. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 316, Price codes: A18 in paper copy, A01 in microfiche. Water-Data Report NC-76-1, March 1977. 411 p, 4 fig.

Descriptors: *North Carolina, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for North Carolina consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 146 gaging stations, stage and contents for 24 lakes and reservoirs, water quality for 20 gaging stations, and water levels for 54 observation wells. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements in this report. The collection of water-resources data in North Carolina is a part of the National Water-Data System operated by the U.S. Geological Survey in cooperation with State, municipal, and Federal agencies. (Woodard-USGS)
W78-10627

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1977.
Geological Survey, Towson, MD. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 561, Price codes: A15 in paper copy, A01 in microfiche. Water-Data Report MD-DE-77-1, May 1978. 319, 4 fig.

Descriptors: *Maryland, *Delaware, *Hydrologic data, *Surface waters, *Groundwater, Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Maryland and Delaware consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 107 gaging stations, stage and contents for 1 reservoir, water quality for 53 gaging stations and 37 wells, and water levels for 29 observation wells. Also included are data for 87 low-flow partial-record stations, 19 crest-stage partial-record stations, and 4 tidal crest-stage partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Maryland and Delaware. (Woodard-USGS)
W78-10628

WATER RESOUCES DATA FOR NEVADA, WATER YEAR 1977.
Geological Survey, Carson City, NE. Water Resources Div.
Water-Data Report NV-77-1, April 1978. 334 p, 9 fig.

Descriptors: *Nevada, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Nevada consist of records of discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 120 gaging stations; stage and contents for 20 lakes and reservoirs; water-quality data for continuing-record stations at 27 stream sites and for partial-record stations at 8 stream sites, 2 lake sites, and 15 wells; and water level for 165 observation wells. Also included are 106 crest-stage partial-record stations and 13 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Nevada. (Woodard-USGS)
W78-10629

GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1971-75,
Geological Survey, Lawrence, KA. Water Resources Div.
M. E. Broeker, H. J. McIntyre, Jr., and J. M. McNellis.
Kansas Geological Survey, Lawrence Basic Data Series Ground-Water Release No 6, 1977. 526 p, 12 fig, 3 tab, 23 ref.

Descriptors: *Water wells, *Groundwater, *Water levels, *Water levels fluctuations, *Kansas, Well data, Basic data collections.

This report contains the resuls of water-level measurements made in about 1,700 selected wells in 83 counties in Kansas during 1971-75. The report is the twelfth in a series of water-level reports published by the Kansas Geological Survey. The results of the measurements indicate that water levels in most of Kansas responded primarily to normal seasonal fluctuations in recharge and discharge during 1971-75. (Woodard-USGS)
W78-10630

RAINFALL-RUNOFF DATA FOR SELECTED BASINS, PORTLAND, OREGON, AND VANCOUVER, WASHINGTON, 1973-77,
Geological Survey, Portland, OR. Water Resources Div.
A. Laenen, and G. L. Solin.
Open-file report 78-291, 1978. 48 p, 2 fig, 4 tab, 4 ref.

Descriptors: *Rainfall-runoff relationships, *Small watersheds, *Streamflow, *Oregon, *Washington, Gaging stations, Flow rates, Storm runoff, Hydrologic data, Drainage area, Land use, Portland-Vancouver area, Basin characteristics.

In the Portland-Vancouver area, storms and floods are presently being studied in 16 basins with drainage areas ranging from 0.21 to 6.63 square miles and with various basin slopes, degrees of imperviousness, and mixes of land use. Fanno Creek basin in Portland has the longest period of rainfall-runoff record, starting in 1973; Tryon Creek basin in Portland is next with a record starting in 1974. Records in all other basins began in 1975. For each basin, data are tabulated for daily precipitation on a yearly basis and for 5-minute precipitation and 5-minute streamflow for selected storms. (Woodard-USGS)
W78-10631

HYDROLOGIC RECONNAISSANCE OF THE YAMPA RIVER DURING LOW FLOW, DINOSAUR NATIONAL MONUMENT, NORTHWESTERN COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
T. D. Steele, D. A. Wentz, and J. W. Warner.
Available from OFSS, USGS, Box 25425, Fed. Ctr. Denver, Colo. 80225; paper copy, $1.75; microfiche, $3.50.

Descriptors: *Hydrologic data, *Streamflow, *Water quality, *Low flow, *Trace elements, Bottom sediments, Data collections, Sampling, Water chemistry, Colorado, *Yampa River, *Dinosaur National Monument.

A hydrologic reconnaissance of a 74-kilometer reach of the Yampa River in Dinosaur National Monument in Colorado was made during the low flow in mid-August 1976. Stream discharge, which was measured every 16 to 24 kilometers, ranged from 9.4 to 10.6 cubic meters per second. Variations in streamflow were explained, in part, by underflow, loss to ground water, and evaporation. Specific conductance was measured about every 2 kilometers and indicated a downstream increase on the order of 11 to 12 percent for the reach. Except for mercury, bottom-sediment trace-element concentrations in the study reach were less than maximum concentrations determined during August-September 1976 for bottom sediments at unperturbed sites upstream in the Yampa River basin. At one of five sampling sites, the mercury concentration in bottom sediments exceeded the maximum measured upstream level. (Woodard-USGS)
W78-10632

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--HAWAII REGION,
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10635

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--TENNESSEE REGION,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10637

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--GREAT LAKES REGION,
Geological Survey, Indianapolis, MO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-10638

HYDROLOGIC RECONNAISSANCE OF THE DUGWAY VALLEY-GOVERNMENT CREEK AREA, WEST-CENTRAL UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
J. C. Stephens, and C. T. Sumsion.
Utah Department of Natural Resources, Salt Lake City, Div of Water Rights, Technical Publication No 59, 1978, 42 p, 3 fig, 1 plate, 9 tab, 18 ref.

Descriptors: *Water sources, *Ephemeral streams, *Groundwater resources, *Water quality, *Hydrologic data, Snowmelt, Precipitation(Atmospheric), Aquifer characteristics, Water wells, Water yield, Groundwater recharge, Water analysis, *Utah, *Dugway Valley-Government Creek area, Western Utah desert basins.

The Dugway Valley-Government Creek area covers about 890 square miles in west-central Utah. Total annual precipitation on the area averages about 380,000 acre-feet. Most streams are ephemeral except for a few in their upper reaches--all are ephemeral below the altitude of about 6,000 feet. Ground-water recharge from precipitation is about 7,000 acre-feet annually. Recharge is from snowmelt and thunderstorms and occurs principally in coarse alluvium of higher valleys and lower mountain slopes above 6,000 feet. About 5,000 acre-feet of ground water enters the area annually from the Sevier Desert by way of the Old River Bed. Total estimates recharge is thus about 12,000 acre-feet annually. Ground water moves generally northwestward to the Great Salt Lake Desert. Streamflow in the upper Government Creek area generally contains less than 500 milligrams per liter of dissolved solids and is calcium bicarbonate type water. Whereas wells along the eastern base of the Dugway Range discharge water containing more than 5,000 milligrams per liter of dissolved solids in which sodium and chloride are the predominant ions. Most of the water in the area is satisfactory for livestock and, except for that in western and northern Dugway Valley, the water is generally satisfactory for irrigation. (Woodard-USGS)
W78-10644

PROBABLE YIELDS OF WELLS IN THE SAND-AND-GRAVEL AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
R. W. Devaul.
Wisconsin Geological and Natural History Survey map, 1975. 1 sheet.

Descriptors: *Wisconsin, *Aquifers, *Maps, *Water yield, *Groundwater resources, Groundwater potential, Groundwater availability, *Sand-and-gravel aquifer(Wis).

A map, at a scale of 1:100,000, shows the probable yields of wells in the sand and gravel aquifer, Wisconsin. The sand-and-gravel aquifer includes all saturated permeable glacial material and some recent alluvium overlying Wisconsin's bedrock. It underlies more than three-fourths of Wisconsin and is essentially the only source of ground water in the north-central one-third of the State. The aquifer occurs at the land surface or buried beneath less permeable materials. It is commonly less than 100 feet thick but is locally thicker than 300 feet. About one-fourth of Wisconsin's municipalities obtain their water supply from this aquifer. Well yields, in gallons per minute, are generally delineated by four probability ranges--areas where chances of more than 100 gallons per minute are poor to areas where chances of more than 1,000 gallons per minute are good. Yields depend on the thickness of the aquifer penetrated as well as the lithology of the rocks. (Woodard-USGS)
W78-10646

PROBABLE YIELDS OF WELLS IN THE SANDSTONE AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
R. W. Devaul.
Wisconsin Geological and Natural History Survey map, 1975. 1 sheet.

Descriptors: *Wisconsin, *Aquifers, *Sandstones, *Water yield, *Groundwater resources, Groundwater potential, Maps, Groundwater availability, *Sandstone aquifer(Wis).

A map, at a scale of 1:100,000, shows the probable yields of wells in the sandstone aquifer, Wisconsin. The sandstone aquifer consists of a series of water-bearing sandstone and dolomite formations totaling several hundred feet in thickness over most of their extent. These rocks are more than 1,500 feet thick in extreme southeastern Wisconsin. Well yields, in gallons per minute, are really delineated by four probability ranges--areas where chances of more than 100 gallons per minute are poor to areas where chances of more than 1,000 gallons per minute are good. Yields depend on the thickness of the aquifer penetrated as well as the lithology of the rocks. (Woodard-USGS)
W78-10647

A PROGRESS REPORT ON ESTUARY MODELING BY THE FINITE-ELEMENT METHOD,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2L.
W78-10648

INFORMATION EXCHANGE ON COMPUTER PROGRAMS (EXCHANGE D'INFORMATION DES PROGRAMMES D'ORDINATEURS),
International Inst. for Hydraulic and Environmental Engineering, Del Delft (Netherlands); and Waterloopkundig Lab., Delft (Netherlands).
Edition 1, International Association for Hydraulic Research, Delft, Netherland, January 1977. 81 p.

Descriptors: *Computer programs, *Hydraulics, *Water resources, *Catalogues, Keywords, Program index.

During several of the last International Association for Hydraulic Research (I.A.H.R.) Congresses, the need to create a facility for information exchange on existing computer programs in the field covered by the I.A.H.R. was expressed. As a result, the Technical Section on the Use of Computers in Hydraulics and Water Resources of the I.A.H.R. started a pilot project. A preliminary report of this activity was published in July 1975. Discussions at the XVIth Congress in Sao Paulo lead to a final form for the questionnaire as shown at the end of this report. At the time of preparation of the report, 161 different contributions had been received, but a considerable extension is foreseen in the coming years, and an annual updating will be made. Presented herein is a catalogue of existing computer programs in the fields of hydraulics and water resources. The information is provided in both French and English. Prospective contributors are requested to use the form at the end of this report or the forms attached to forthcoming journals of the Association. (Bell-Cornell)
W78-10664

WSP2 COMPUTER PROGRAM. A WATER SURFACE PROFILE COMPUTER PROGRAM FOR DETERMINING FLOOD EVALUATIONS AND FLOOD AREAS FOR CERTAIN LOW RATES. USER'S GUIDE,
Soil Conservation Service, Washington, DC. Engineering Div.
Available from the National Technical Information Service Springfield, VA 22161, as PB-260 751, price codes: A04 in paper copy, A01 in microfiche.
Technical Release No. 61, May, 1976. 61 p, 1 fig.

Descriptors: *Computer programs, *Water flow, *Bridges, Methodology, Data collections, Flooding, Evaluation, Analytical techniques, *Water surface profile, Water-bridge interaction.

The WSP2 (Water Surface Profile 2) computer program can aid in the determination of flow characteristics for a given set of stream and floodplain conditions. Specifically, it can compute water surface profiles in open channels, and it can estimate head losses at restrictive sections, including roadways with either a bridge opening or culverts. WSP2 is written in Fortran IV language and was developed on an IBM 360/65 computer. Three subprograms (HROFDA, DATE, and REREAD) were written in assembly language. The program requires about 220 kilobytes of core storage and three temporary data files. Specific information about the data files is on comment cards at the beginning of the program listing. Because the computations require a large amount of physial data on valley shape, roughness, flow restriction, etc., an attempt was made to make data entry as easy and flexible as possible. Punched output cards provide direct input to SCS flood routing and economic analysis computer programs. (Bell-Cornell)
W78-10669

FEASIBILITY STUDY FOR DEVELOPMENT AND IMPLEMENTATION OF A MODEL STATE INFORMATION SYSTEM (M.S.I.S.) FOR EPA'S SAFE DRINKING WATER PROGRAM.
American Management Systems, Inc. Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-10762

INTRODUCTION TO THE MODEL STATE INFORMATION SYSTEM (MSIS).
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-10810

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM, VOLUME II: EXHIBITS.
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-10811

THE RELIEF AND LAND FORM MAP OF AUSTRALIA: DOES IT SHOW ROCK TYPES AND LAND FORMS OF HYDROLOGIC SIGNIFICANCE,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
T. A. McMahon.
Catena, Vol. 4, No. 1/2, June 1977, p. 189-199, 4 tab, 3 fig, 6 ref.

Descriptors: *Topographic mapping, *Hydrography, *Geologic mapping, Petrology, Geomorphology, Terrain analysis, Profiles, Surveys, *Rocks, Correlation analysis, Hydrologic aspects, Low flow, *Australia.

An examination was made of the usefulness of the relief and land form map of Australia from a hydrologic point of view. The map, published in 1969, is to scale of 1:5,000,000 and shows relief, land form, and rock types which were thought to be of general hydrologic significance. Prepared by the Australian Water Resources Council advisory panel on representative basins, this map was used to ascertain areas with similiar morpholithology for the purpose of selecting Australian representative basins. 156 Australian catchments were studied and correlation and contingency analysis and analysis of variance were performed to determine the Map's general usefulness in defining hydrologic characteristics. Low flow hydrologic characteristics were related to rainfall, relief, land form

and lithology as described by the map. Results indicated that the land form map of Australia is a useful tool in deifferentiating qualitatively low flow characteristics and that it does show rock types and land forms of hydrologic significance. (Tickes-Arizona).
W78-10963

PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME IV. DATA ANALYSIS UTILITY PROGRAMS.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W78-11091

RECONNAISSANCE MEASUREMENTS AND SEDIMENT YIELD ESTIMATES IN BASINS WITH INSUFFICIENT DATA,
Technical Univ. of Prague (Czechoslovakia).
For primary bibliographic entry see Field 2J.
W78-11114

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, VOLUME 8,
Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 6A.
W78-11207

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME V, TURBULENT ENERGY PROGRAM,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 2L.
W78-11210

AQUACULTURE TECHNIQUES: WATER USE AND DISCHARGE QUALITY,
Idaho Univ., Moscow. Coll. of Fisheries, Wildlife and Range Sciences.
For primary bibliographic entry see Field 5G.
W78-11219

MARINE PASTURES: A BY-PRODUCT OF LARGE (100 MEGAWATT OR LARGER) FLOATING OCEAN THERMAL POWER PLANTS,
Lamont-Doherty Geological Observatory. Palisades, NY.
For primary bibliographic entry see Field 5G.
W78-11228

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOLUME IX, THE COMPUTER PROGRAM,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 5B.
W78-11231

THE DEVELOPMENT OF AN INTEGRATED SYSTEM FOR WATER QUALITY MANAGEMENT PLANNING,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5G.
W78-11242

WATER RESOURCES DATA FOR OREGON, WATER YEAR 1977.
Geological Survey, Portland, OR. Water Resources Div.
Water-Data Report OR-77-1, June 1978. 607 p, 5 fig, 1 tab.

Descriptors: *Oregon, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Oregon consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 283 gaging stations, stage only records for 10 gaging stations, stage and contents for 45 lakes and reservoirs, water quality for 79 gaging stations, and water levels for 97 observation wells. Also included are 157 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Oregon. (Woodard-USGS)
W78-11252

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 977, Price codes: A14 in paper copy, A01 in microfiche.
Water-Data Report MA-RI-77-1, May 1978. 304 p, 5 fig, 1 tab.

Descriptors: *Massachusetts, *Rhode Island, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Massachusetts and Rhode Island consist of records of stage, discharge, and water quality of streams; contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 109 gaging stations, monthend contents for 15 lakes and reservoirs, water quality for 23 gaging stations, and water levels for 110 observation wells. Also included are data for 22 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. A few pertinent stations (not included above) in bordering States are also included in this report. These data represent that portion of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Massachusetts and Rhode Island. (Woodard-USGS)
W78-11253

WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1977.
Geological Survey, Raleigh, NC. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 883, Price codes: A18 in paper copy, A01 in microfiche.
Water-Data Report NC-77-1, May 1978. 395 p, 4 fig.

Descriptors: *North Carolina, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for North Carolina consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 149 gaging stations, stage and contents for 24 lakes and reservoirs, water quality for 146 gaging stations, and water levels for 55 observation wells. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements in this report. The collection of water-resources data in North Carolina is a part of the National Water-Data System operated by the U.S. Geological Survey in cooperation with State, municipal, and Federal agencies. (Woodard-USGS)
W78-11254

URBAN STORMWATER RUNOFF DATA FOR A RESIDENTIAL AREA, POMPANO BEACH, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
H. C. Mattraw, Jr., J. Hardee, and R. A. Miller.
Open-file report 78-324, 1978. 108 p, 2 fig, 4 tab, 5 ref.

Descriptors: *Storm runoff, *Rainfall-runoff relationships, *Water quality, *Urban hydrology, *Hydrologic data, Rainfall, Chemical analysis, Runoff, Rain water, Florida, *Pompano Beach area, *Broward County.

Rainfall, storm-sewer discharge, and water-quality analyses of storm runoff are summarized for a single-family residential area near Pompano Beach, Florida. The area of the drainage basin is 41 acres of which 61 percent is pervious sod lawns and 39 percent is impervious roofs, driveways and streets. The land surface is nearly flat with a gentle, eastward slope. Storm runoff flows eastward along grass swales into a sewer collection system on the eastern boundary of the area that in turn joins a 36-inch diameter storm drain. Runoff loads of 12 or more water-quality constituents were computed for 32 storms between April 1974 and September 1975. Chemical analyses of rainfall for 3 storms are included. (Woodard-USGS)
W78-11258

MONITORING WATER-QUALITY DURING PILOT DREDGING IN THE WILLAMETTE AND COLUMBIA RIVERS, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11261

FEDERAL PLAN FOR THE ACQUISITION OF WATER DATA--FISCAL YEARS 1978 AND 1979.
Geological Survey, Reston, VA. Water Resources Div.
Office of Water Data Coordination Report, May 1978. 30 p, 2 fig, 10 tab, 5 append.

Descriptors: *Programs, *Federal government, *Water resources, *Projects, *United States, Data collections, Hydrologic data, Regional analysis, Data storage and retrieval, *U.S. Geological Survey, Environmental Protection Agency, *National Water Data Network.

This report summarizes the Federal agencies' plans and needs for water data and gives the status of implementation of the Geological Survey's National Water Data Network, the Environmental Protection Agency's National Water Quality Surveillance System, and other coordintion-related activities for fiscal years 1978 and 1979. The report generally follows the same format as that of the report for fiscal year 1977, with all sections updated. However, several activities are reviewed in the Federal Plan for the first time. These include the National Hydrologic Bench-Mark Network, listing all currently active statons and parameters covered, and the National Water-Use Data System. Current and planned program activities in the field of water-data acquisition are summarized

for each participating agency through fiscal year 1979. (WoodardoUSGS)
W78-11267

GEOHYDROLOGY OF THE GREAT BEND PRAIRIE, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, KA. Water Resources Div.
S. W. Fader, and L. E. Stullken.
Kansas Geological Survey, Lawrence, Irrigation Series No 4, May 1978. 19 p, 7 fig, 5 plates, 1 tab, 36 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water utilization, Irrigation, Water quality, Water wells, Water yield, Water levels, Potentiometric level, Withdrawal, Industrial water, Municipal water, Groundwater recharge, Maps, Hydrologic data, Kansas, *Great Bend Prairie.

Unconsolidated deposits of Pliocene and Pleistocene age comprise the principal aquifer in the Great Bend Prairie, Kans. Forty-five million acre-feet of ground water are estimated to be in storage in these deposits. Only about 60 percent of this amount may be usable owing to an insufficient saturated thickness and to high mineralization of water locally. Yields to irrigation wells are commonly between 500 and 1,000 gallons per minute, and yields of as much as 2,000 gallons per minute may be available in localities where the saturated thickness is greater than 100 feet. In 1940, there were about 30 municipal and industrial wells and 50 irrigation wells in the area. In 1973, there were about 200 municipal and industrial wells and 950 irrigation wells; and in 1974. The steadily increasing withdrawal rate has not produced long-term declines of water levels that may be distinguished from the effects of climatic changes. The average annual recharge rate to ground water from precipitation is estimated to be about 2 inches. (Woodard-USGS)
W78-11268

FLOOD INVESTIGATIONS IN NEVADA THROUGH 1977 WATER YEAR, PROGRESS REPORT 17,
Geological Survey, Carson City, NY. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-11269

WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, SEPTEMBER 1977.
Geological Survey, Tallahassee, FL. Water Resources Div.
P. D. Ryder, and L. R. Mills.
Open-file report 78-311, April 1978. 13 p, 2 fig, 4 plates, 1 tab, 2 ref.

Descriptors: *Maps, *Aquifer characteristics, *Groundwater, *Water table, *Potentiometric level, Water wells, Withdrawal, Seasonal, Effects, Water levels, Florida, *Tampa Bay area, Floridan aquifer, Surficial aquifer.

The water table in the surficial aquifer and the potentiometric surface of the Floridan aquifer in a 1,200 square-mile area in west-central Florida are mapped semiannually by the U.S. Geological Survey. Maps are prepared on the basis of water levels measured in wells each May to coincide with seasonal low levels; and in September, when levels are high. The mapped area for this report contains nine producing wells fields which supplied 76.2 million gallons on September 21, 1977, to municipalities in the Tampa Bay area. The effect of localized withdrawal of groundwater from the Floridan aquifer is shown on the maps as cones of depression in both the potentiometric surface and water table. In September, water levels in observation wells in the Floridan aquifer were above those measured in May. These increases ranged from about 1 foot at the Eldridge-Wilde well field to about 25 feet at the Sun City well field. (Woodard-USGS)
W78-11270

DISCHARGE, GAGE HEIGHT, AND ELEVATION OF 100-YEAR FLOODS IN THE HUDSON RIVER BASIN,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-11271

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1974-78,
Geological Survey, Lakewood, CO. Water Resources Div.
R. G. Borman.
Available from the OFSS, USGS Box 25425, Fed. Ctr Denver, CO 30225; Paper copy, $4.75; Microfiche, $3.50. Open-file report 78-499, May 1978. 30 p, 2 fig, 1 tab.

Descriptors: *Groundwater resources, *Water wells, *Water levels, *Water level fluctuation, *Aquifers, Colorado, *Northern High Plains, Ogallala Formation.

Water-level measurements were made in more than 600 well in January 1978 in the northern High Plains of Colorado. Changes in water levels from January 1977 to January 1978 ranged from a rise of about 22 feet in Phillips County to a decline of about 14 feet in Yuma County. Measurements for January 1978 and the four preceding winters are given in a table. (Woodard-USGS)
W78-11273

JANUARY 1978 WATER LEVELS, AND DATA RELATED TO WATER-LEVEL CHANGES SINCE 1940 OR 1950, WESTERN KANSAS,
Geological Survey, Garden City, KS. Water Resources Div.
M. E. Pabst.
Open-file report 78-409, April 1978. 179 p, 4 tab.

Descriptors: *Groundwater, *Water levels, *Observation wells, *Kansas, *Water level fluctuations, *Irrigation, Seasonal, Groundwater recharge, Aquifers, Hydrogeology, *Western Kansas.

Water-level measurements were made in about 1,450 observation wells in 34 counties as part of an annual inventory of ground-water conditions in western Kansas. The measurements were made in midwinter, mostly in January 1978, when pumping was minimal and water levels had recovered from the effects of pumping during the previous irrigation season. Tables show the depths to water in 1940 or 1950 (the predevelopment years), 1966 (a year of abnormally high rainfall), 1977, and 1978; water-level changes from 1940-78 or 1950-78 and from 1966-78, and from 1977-78; and average annual changes from 1940-78 or 1950-78 and from 1966-78. Also shown are saturated thicknesses of the deposits in 1940 or 1950 and in 1978 and the amount of change in feet and percentage. (Woodard-USGS)
W78-11275

GROUNDWATER DATA FOR THE SALT BASIN, EAGLE FLAT, RED LIGHT DRAW, GREEN RIVER VALLEY, AND PRESIDIO BOLSON IN WESTERNMOST TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
D. E. White, J. S. Gates, J. T. Smith, and B. J. Fry.
Open-file report 77-575, March 1978. 120 p, 8 fig, 3 tab, 5 ref.

Descriptors: *Groundwater resources, *Water wells, *Springs, *Water quality, *Aquifers, Well data, Water levels, Water analysis, Chemical analysis, Water utilization, Irrigation, Industrial water, Municipal water, Water supply, Domestic water, Texas.

From October 1971 through October 1974, the U.S. Geological Survey collected groundwater data in the basins in Texas west of the Pecos River drainage area and northwest of the Big Bend country. The basins included are, from east to west: The Presidio Bolson; the Salt Basin; Green River Valley, Eagle Flat, and Red Light Draw. The data collection program consisted of an inventory of all major irrigation, municipal-supply, and industrial wells; selected stock and domestic wells; and selected springs. Water samples were collected from representative wells and springs for chemical analyses. (Woodard-USGS)
W78-11276

8. ENGINEERING WORKS

8A. Structures

SHORE EROSION CONTROL STRUCTURE,
Sandgrabber, Inc., Bay City, MI. (Assignee).
S. S. Fair.
U.S. Patent No. 4,073,145, 7 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 421, February 14, 1978.

Descriptors: *Patents, *Shore protection, *Beach erosion, Breakwaters, Coastal structures, Sea walls, Waves(Water).

A seawall structure adapted to combat erosion of a shoreline by wave action comprises a perforate wall arranged along and substantially parallel to the shoreline and having openings facing seaward through which the water of incoming waves may pass. Each opening through the wall forms a tortuous passage for the water so that the energy of the water is dissipated gradually as it flows through the wall, thereby enabling sand entrained in the water to be deposited landward and seaward of the wall, as well as in the openings of the wall. The wall is composed of blocks arranged in horizontal rows and vertical courses, the upper edges of the blocks in the outermost rows projecting above the upper edges of the blocks of the next adjacent rows to provide an interlocking relationship between blocks of the outermost rows and the blocks of the next adjacent rows, as well as to provide for vertical deviations in the openings through the wall. (Sinha-OEIS)
W78-10704

UNDERWATER TRUSSES FOR BREAKWATER STRUCTURE,
T. Ono.
United States Patent No. 4,074,497, 7 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 867, February 21, 1978.

Descriptors: *Patents, *Breakwaters, *Waves(Water), Engineering structures, Barriers, Protection, *Trusses, Underwater construction.

Underwater trusses of three-dimensional structure are adapted to be used as a breakwater or an underwater structure for protecting an underwater construction from impact of waves. Hollow web members are engaged at the ends with joint members which are provided with holes for holding the end of the web members. The hollow members are provided at an intermediate position with a flange extending perpendicularly to the members. A truss structure is constructed by use of the hollow web members and the joints. (Sinha-OEIS)
W78-10713

GUIDELINES FOR EPA REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS ON PROJECTS INVOLVING IMPOUNDMENTS.
Curran Associates, Inc., Northhampton, MA.
For primary bibliographic entry see Field 6G.
W78-10761

COMPARISON OF VIBRATION TEST RESULTS FOR A MODEL AND PROTOTYPE ARCH DAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects Lab.
R. D. Crowson, and C. D. Norman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 060, Price codes: A04 in paper copy, A01 in microfiche. Technical Report N-77-1, March 1977. 53 p, 22 fig, 16 tab, 6 ref.

Descriptors: *Dams, *California, *Arch dams, *Vibrations, Laboratory tests, Model studies, Onsite investigations, Structures, Hydraulic structures, Concrete structures, Mechanical properties, Mechanical engineering, *North Fork Dam(Calif).

Vibration tests were conducted on both the prototype and a 1:24-scale model of the North Fork Dam in northern California, a double curvature arch dam, to determine natural frequencies, model shapes, damping ratios, and hydrodynamic pressures. Two vibrators mounted on the crest of the dam were used as input excitation sources for both series of tests. Electromagnetic shakers capable of a 40-lb output were used in the model tests, while counterrotating, eccentric mass exiters capable of a 5,000-lb output were employed for the model, whereas accelerations were measured in the same locations on the prototype. Measurements in both curves were taken at the dam-reservoir interface while the structures were excited at resonant frequencies. Damping in both model and prototype ranged from approximately 2 to 5% of critical. These values were consistent with structural damping values for these types of structures. (Sims-ISWS)
W78-10937

8B. Hydraulics

FINAL REPORT, ENVIRONMENTAL IMPACT MODEL DEVELOPMENT FOR NAVAL OPERATIONS,
Naval Weapons Center, China Lake, CA. Public Works Dept.
For primary bibliographic entry see Field 6G.
W78-10667

A STUDY OF NEAR WELL GROUNDWATER FLOW AND THE IMPLICATIONS IN WELL DESIGN,
New South Wales Univ., Kensington (Australia). Water Research Lab.
R. J. Cox.
Report No. 148, March 1977. 233 p, 132 fig, 22 tab, 153 ref, 3 append.

Descriptors: *Groundwater, *Water wells, *Design, *Finite element analysis, *Flow, Hydrology, Analytical techniques, Optimization, Aquifers, Equations, Darcy flow, Nonlinear flow, Velocity, Hydraulic gradient, Analogue model, Electrolytic tank.

Presented are the results of an investigation of groundwater flow to wells. The finite element method was used to examine a wide range of practical well flow problems that have not been previously investigated in sufficient detail. Results of the numerical solutions provide practicing groundwater hydrologists with more complete information which may be used in the selection of an optimal well design. Since the flow within the near well zone exerts a disproportionately large effect on the performance of a well, considerable emphasis is placed upon investigating factors which may significantly alter the flow behavior close to the well. The effects of nonlinear flow, aquifer inhomogeneity, well geometry and boundary conditions are examined in detail. Verification of the finite element solutions by comparison with known analytical solutions and experimental results from an electrolytic tank analogue and a large scale sand-box model is described. For the various well-aquifer systems investigated, the well performance results are presented in design tables and figures. Extensive use of general dimensionless groupings of the design variables simplifies the presentation of results. The application of the results in the optimization of well design is discussed. (Bell-Cornell)
W78-10668

WSP2 COMPUTER PROGRAM. A WATER SURFACE PROFILE COMPUTER PROGRAM FOR DETERMINING FLOOD EVALUATIONS AND FLOOD AREAS FOR CERTAIN LOW RATES. USER'S GUIDE,
Soil Conservation Service, Washington, DC. Engineering Div.
For primary bibliographic entry see Field 7C.
W78-10669

CONVERGENCE OF FOUR-POINT IMPLICIT WATER WAVE MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-10912

VARIED FLOW FUNCTIONS FOR CIRCULAR CHANNELS,
Newcastle-upon-Tyne. (England). Dept. of Civil Engineering.
C. Nalluri, and J. H. Tomlinson.
Journal of Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings paper 13889, p 983-1000, July 1978. 2 fig, 4 tab, 11 ref.

Descriptors: *Backwater, *Channels, *Flow, Conduits, Flow profiles, Gradually varied flow, Open channels, Pipes, Hydraulics, *Backwater profiles, Backwater curves.

Hydraulic engineers often are required to compute backwater curves, and the existing methods cannot be applied accurately to closed conduits as the flow approaches the crown. This paper reviewed the Keifer and Chu method which uses the dimensionless parameter Q/QCAP. A new approach was developed to compute backwater curves in circular channels in which the factor Q/QCAP is removed so that errors are not introduced by having to interpolate these values. This new method is applicable for all possible bed slope conditions (horizontal, adverse), which is a distinct advantage over the other existing techniques. Semigraphical methods also were suggested to increase the speed of computation of backwater curves. (Lee-ISWS)
W78-10913

MATHEMATICAL SIMULATION OF DAM-BREAK FLOW,
Ljubljana Univ. (Yugoslavia). Dept. of Civil Engineering.
R. Rajar.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings Paper 13883, p 1011-1026, July 1978. 10 fig, 23 ref.

Descriptors: *Dam failure, *Mathematical models, *Floods, Hydraulic models, Hydraulics, Open channel flow, Rivers, Unsteady flow, Waves(Water), Fluid mechanics, Equations, Nonprismatic channels, St. Venant equation.

A one-dimensional mathematical model for the simulation of this flow was described, especially the boundary conditions and the application of numerical schemes to highly nonprismatic channels. To analyze the applicability and the accuracy of the mathematical model, four physical models were used. The conclusions were: (1) in relatively nonprismatic rivers, the order of accuracy of the mathematical model described is 15% to 20%, and the model becomes unreliable in some extreme cases; (2) the main part of the error is due to the imperfection of the St. Venant equations used and only a smaller part to the inaccuracy of numerical methods; and (3) two explicit numerical schemes were investigated, the diffusive and the Lax-Wendroff scheme, the latter being more accurate. For the calculation of flow in highly nonprismatic channels, both schemes require completion of the St. Venant equations by a dissipative term in order to prevent instability and to achieve better simulation of the flow. (Lee-ISWS)
W78-10914

CALIBRATION TECHNIQUE FOR 1-D UNSTEADY FLOW MODELS,
National Weather Service, Silver Spring, MD. Hydrologic Research Lab.
D. L. Fread, and G. F. Smith.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings Paper 13892, p 1027-1044, July 1978. 10 fig, 2 tab, 19 ref.

Descriptors: *Unsteady flow, *Calibrations, *Model studies, Channels, Fluid mechanics, Friction, Hydraulics, Mannings equation, Mathematical models, Open channel flow, Optimization, Rivers, Roughness(Hydraulic), Optimization techniques, *Roughness-discharge relationship, Unsteady flow equation.

A simple and efficient optimization technique is presented for determining the continuous piecewise linear variation of the roughness parameter with dischare (or stage) for each reach of the river system bounded by gaging stations or major tributary confluences. The optimization technique was based on a modified Newton-Raphson gradient-type algorithm and the application of a decomposition principle that simplifies the treatment of complex river systems of dendritic (tree-type) configuration. The observed-computed stage hydrograph RMS errors coincident with the optimal roughness-discharge relationship range from essentially 0 for ideal systems with no observational errors from 0.2 ft to 0.7 ft (0.06 to 0.21 m) for complex natural systems. The required computation time (IBM 360-195) is about 0.005 sec per time step per distance step when the optimization technique is coupled with a weighted four-point implicit finite difference approximation of the unsteady flow equations. (Lee-ISWS)
W78-10915

TOTAL LOAD OF BED MATERIALS IN OPEN CHANNELS,
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-10916

FLUID ROUTING BY CHARACTERISTIC METHODS,
Lanchester Polytechnic, Coventry (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-10918

WAVE SETUP ON A SLOPING BEACH,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-10929

FRICTION LOSSES IN CORRUGATED METAL PIPE.
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 313, Price codes: A04 in paper copy, A01 in microfiche. Report No. 40-1, July 1955. 67 p, 29 fig, 10 tab, 6 ref.

Descriptors: *Pipe flow, *Flow friction, *Fluid friction, Metal pipes, Roughness(Hydraulic), Reynolds number, Darcys law, Mannings equation, Paving, Pipes, Conduits, Hydraulic conduits, Hydraulics, Corrugated pipes.

The purpose of this study was to determine friction factors for 3-, 5-, and 7-ft-diam corrugated metal pipe, as indicated by head-loss measurements for a range of velocities up to approximately 10 fps for 5-, and 7-ft-diam pipe and 16 fps for 3-ft-diam pipe. Tests were conducted on new, straight, corrugated pipe of standard manufacture that was assembled in a manner similar to a conventional installation. Water from the forebay pool of Bonneville Dam was supplied to the test section through 6-ft smooth pipe. The results of the study indicated that a close correlation existed between Reynolds number and both Darcy's friction coefficient 'f' and Manning's roughness coefficient 'n' throughout the range of experimental discharges reproduced for study. The value of Manning's 'n' remained almost constant at 0.024 during observations of open-channel flow in unpaved corrugated metal pipe 3 and 5 ft in diam that were laid on a slope of 0.005. Values of 'n' for 5-ft-diam pipe having paved inverts varied with the per cent of paving and the depth of flowing water in test pipe laid on a slope of 0.002. (Sims-ISWS)
W78-10934

STABILITY TESTS OF NAWILIWILI BREAKWATER REPAIR,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
D. D. Davidson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A051 620, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper H-78-4, January 1978. 28 p, 4 pl, 11 photos, append.

Descriptors: *Breakwaters, *Hydraulic models, *Hawaii, *Dolosse, *Nawiliwili Harbor(Hawaii), Rubble-mound breakwaters.

Undistorted-scale hydraulic model tests (1:30.5) were conducted to investigate the adequacy of dolos repair sections considered for use on the Nawiliwili breakwater, Island of Kauai, Hawaii. Test sections 1 and 1A were considered for repair to breakwater sta 15+00 to 20+00 and test sections 2 and 3 were considered for sta 2+00 to 15+00 and 5+00 to 12+00, respectively. Results of the tests indicated that all of the repair sections tested are of adequate stability for the test conditions and locations for which they were tested. (WES)
W78-10948

REGIONAL GEOLOGY SERIES: PART VII,
National Water Well Association, Worthington, OH.
H. Heiss.
Water Well Journal, Vol 32, No 9, p 57-58, August, 1978. 1 fig.

Descriptors: *Groundwater, *Mountains, *Aquifers, *Water wells, *Drilling, Rotary drilling, Crystalline rocks, Rocky Mountain Region.

The Western Mountain Ranges Region is an area of rugged, high mountains composed of hard, dense and impermeable crystalline rocks. Fault zones in some areas may act as conduits or as barriers to ground water flow. Alluvial aquifers in valleys provide much of the region's ground water. Wells penetrating the glacial outwash in the Spokane Valley can yield as much as 60 million gallons per day with moderate drawdown. Hard volcanic rocks produce most of the area's water. Basalts yield up to 110 gpm while andesites range from one to 20 gpm. Two types of wells are drilled in the Western Mountain Range: the rock well; and the alluvium well. Rock wells are drilled using air/mud rotary rigs with a downhole hammer. Development in hard rock consists of air surging or hydraulic fracturing. Alluvial wells are drilled using the mud rotary method. These wells are usually less than 100 feet deep and gravel packed. They must be carefully cased and grouted to seal off contaminated water. (Purdin-NWWA)
W78-11071

GEOTHERMAL DRILL BIT IMPROVEMENT-SPECIFIC APPLICATION TO THE GEYSERS,
Terra Tek, Inc., Salt Lake City, UT.
For primary bibliographic entry see Field 8G.
W78-11082

INHIBITOR CUTS PIPE LOSS IN GEOTHERMAL DRILLING,
Union Oil Co. of California, Brea.
For primary bibliographic entry see Field 8G.
W78-11084

THE SUBTERRENE ROCK MELTING CONCEPT APPLIED TO THE PRODUCTION OF DEEP GEOTHERMAL WELLS,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 8G.
W78-11085

GUIDE TO DRILLING, WORKOVER AND COMPLETION FLUIDS, (1978-79),
Gulf Publishing Co., Houston, TX.
For primary bibliographic entry see Field 8G.
W78-11087

SEDIMENT PROBLEMS AT INTAKES FOR HYDROPOWER PLANTS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
H. D. Sharma, and H. R. Sharma.
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 330-337, July 1977. 6 fig, 9 ref.

Descriptors: *Intakes, *Hydroelectric plants, *Sediment control, *Model studies, Diversion structures, Hydraulic structures, Rivers, Running waters, Sedimentation, Sediment transport, Hydraulic models, Analytical techniques, Trapping, Foreign research, Foreign countries, Desilting, *India.

Unique solutions evolved to solve sediment problems at the intake structures of some major Himalayan run-of-river schemes were described. Considerations for fixing the layout of a power intake to minimize sediment entry were discussed. Different solutions of sediment problems at power intakes discussed are expected to help the designer in finding a suitable solution to his problem, depending upon the project constraints and the topographical features of the site. It was shown that efficient solutions can be solved to suit the site conditions and the project constraints with the help of model studies. In the absence of suitable topographical features, favorable flow curvature can be induced at the intake by providing an appropriate length of divide wall, if the diversion work is a barrage. (See also W78-11113) (Humphreys-ISWS)
W78-11148

A CASE HISTORY OF PORT MANSFIELD CHANNEL, TEXAS,
Coastal Engineering Research Center, Fort Belvoir, VA.
J. M. Kieslich.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A042 651, Price codes: A04 in paper copy, A01 in microfiche. General Investigation of Tidal Inlets (GITI) Program, Report No. CERC-GITI-12, May 1977. 10 fig, 7 tab, 5 append.

Descriptors: *Sediment transport, *Inlets(Waterways), *Baseline studies, *Hydraulics, Texas, Coasts, Resources development, Water quality, Outer Continental Shelf, Tidal inlets, Longshore transport, Ports.

A case history and analysis of Port Mansfield channel, an artificial, jettied inlet between the Gulf of Mexico and Laguna Madre, Texas is presented. Deposition has occurred in the channel entrance since its opening. Seaward migration of the updrift beach and shoaling in the channel entrance indicate that sand is bypassing the jettied entrance. Short-term predictions of inlet stability using the O'Brien prism-area relationship (Jarrett, 1976), Iscoffier's (1940) stability criteria, and the Brunn and Gerritsen (1960) ratio of tidal prism to the gross annual longshore transport rate, correctly predict the unstable nature of the channel. Tidal exchange volumes and velocities are not large enough to maintain the design cross-sectional area in the presence of the existing longshore transport. (Sinha-OEIS)
W78-11235

LABORATORY INVESTIGATION OF TIDAL INLETS ON SANDY COASTS,
California Univ. Berkeley. Hydraulic Engineering Lab.
R. E. Mayor-Mora.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 021, Price codes: A06 in paper copy, A01 in microfiche. Army Coastal Engineering Research Center, General Investigation of Tidal Inlets (GITI) Program, Report No. CERC-GITI-11, April 1977. 105 p, 43 fig, 8 tab, 12 ref. DACW72-71-C-0005.

Descriptors: *Inlets(Waterways), *Coasts, *Baseline studies, *Water quality, Resources development, Hydraulics, Laboratory tests, Outer Continental Shelf, Tidal inlets.

Experiments were conducted on a fine sand barrier separating two 1 foot-deep basins representing an ocean and a 94- by 64-foot bay. Pilot channels with varying geometric characteristics were cut through the barrier to communicate the basins and thus create an ocean-inlet-bay system subsequently subjected to ocean tide and wave action. Measurements were made of cross-sectional areas, water surface elevations at ocean, bay, and inlet current velocities for a number of cycles (sinusoidal tides) until the water surface fluctions in the bay became periodic for each run. Exploratory studies included runs with jettied inlets, with freshwater inflow into the bay, inlets under mild and steep ocean waves, and to determine the effect of model bed ripple orientation on the friction coefficient of the inlet channel. Experimental data are presented in tabular and photographic form, and as plots correlating the various dimensionless hydraulic parameters (e.g., tidal range damping coefficient, bay super-elevation, mean current velocity timelog between maxima and minima, duration of ebbtide) to the repletion coefficient, K, and to a proposed parameter. These results are compared to the basic theoretical solution of the problem by Keulegan (1967) and to an extension of the Keulegan theory. Comparison of tidal prisms and minimum flow areas are made between the laboratory results and available field data. An appendix includes plots summarizing the inlet channel's geometrical properties for the experiments. (Sinha - OEIS)

W78-11236

SUPPLEMENTARY HYDRAULIC ANALYSIS OF PROPOSED BRIDGE SITE ON MOHAWK RIVER, WHITESBORO, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-11272

8C. Hydraulic Machinery

RUGGED SELF-PRIMING PUMPS.
Water Services, Vol. 82, No. 987, p 290, May, 1978.

Descriptors: *Pumps, *Hydraulic equipment, *Sludge disposal, *Storm water, *Sealants, Protective coatings, Equipment, Design data, Solid wastes, Electric motors, Waste water treatment, Municipal wastes.

Gormann-Rupp 'T' series self-priming pumps, supplied by Wade Engineering Ltd. of Brighton, England, can upgrade existing or outmoded sewage treament plants. The pumps can provide recirculation, storm flow balancing, and sludge removal without excessive structural modifications to the plant. The Gorman-Rupp seal protects the pump; when weather proofing and anti-frost heating elements are incorporated into the pump's design, no housing is required. Complete pumping units with motor and bedplate or bareshaft units, attachable to an electric motor, are available in 75, 100, 150, 200, and 250 mm sizes. The T4 series can accommodate 75 mm solids, 33.5 m heads, a discharge of up to 530 gal/min, and connection to suction lifts up to 7.6 m. (Lisk-FIRL)
W78-10548

NEW CONCEPT CLAIMED FOR SEWAGE AERATION.
For primary bibliographic entry see Field 5D.
W78-10609

MOTORISED VALVE SYSTEM FOR SLUDGE VESSEL.
For primary bibliographic entry see Field 5E.
W78-10674

DUAL PURPOSE VEHICLE.
For primary bibliographic entry see Field 5E.
W78-10682

SELF-CLEANING FIXED DREDGE,
T. L. Schoonmaker.
U.S. Patent No. 4,074,535, 6 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 880, February 21, 1978.

Descriptors: *Patents, *Dredging, Channel improvement, Jets, Nozzles, Orifices, diffusion, Equipment, Dredges.

A stationary dredge is described in which a generally horizontal pipe is laid on the bottom of the waterway which is connected to the suction line of a pump. The horizontal line is provided with perforations into which sand and silt are drawn by the suction of the pump. Clear water is supplied to the horizontal line near the perforations closest to the connection to the pump to dilute the slurry passing through the perforated pipe and thereby reduce clogging. One disadvantage of this system is that when used in areas having high kelp growth or where a large amount of nongranular debris such as cans, bottles or water-logged driftwood have settled on the bottom, these non-granular debris are drawn by suction over the perforations, thereby clogging them. In this invention the orifices are cleared of debris by high velocity water jets from a number of nozzles, each nozzle being directed across a separate one of the orifices of the horizontal pipe. Groups of selected nozzles at spaced intervals along the horizontal pipe are separately connected by pipes to a source of high pressure fluid. The high velocity jets of water mix with the bottom sand to degrade any solid matter which tends to block the orifices. (Sinha-OEIS)
W78-10714

DRAINAGE AND SEWAGE PUMPS.
Water and Waste Treatment, Vol. 21, No. 6, p 41, June, 1978.

Descriptors: *Pumps, *Sewage, *Solid wastes, *Drainage systems, *Submergence, Equipment, Hydraulic machinery, Impellers, Linings, Rubber, Sumps, Equipment, Design data, Electric power, Waste water disposal, Waste water treatment, Municipal wastes.

Sweden's Pumpex A. B. drainage and sewer pumps will be distributed in England by Sykes Pumps Ltd. Pumpex manufactures six drainage pumps with output capacities of 70-840 gpm. Two models are equipped with torque flow impellers for solids handling and are available with rubber liners for abrasive solids loads or without liners for pumping sludges and non-abrasive slurries. Voltage ratings range over 240 or 110 volts for single phase to 415 or 550 volts for three phase. The drainage pumps with diameters down to 285 mm are suitable for narrow trenches and other restricted areas; all the drainage pumps can operate in series or in parallel configurations. Submersible sewage pumps are available as mobile units or stationary units attached to a wet sump or submerged in a wet pit. The modular pumps may be supplied with single channels or with torque flow impellers with solids capacities up to 125 mm. The 56 torque flow impeller equipped models have capacities up to 1,210 gpm; single channel pumps are available in 40 models with capacities up to 2,100 gpm. The wet pit submerged pump units may be raised for maintenance by disconnecting the volute positioned at the bottom of the sump. Sewage pumps have voltage ratings of either 415 volts in three phase or 240 volts single phase. (Lisk-FIRL)
W78-10719

JAPANESE GAS FROM SEWER SLUDGE.
For primary bibliographic entry see Field 5D.
W78-10741

CENTRIFUGAL SEWAGE PUMP,
Kabushiki Kaisha Sogo Pump Seisakusho, (Osaka) Japan. (Assignee)
S. Tsukube.
United States Patent 4,076,179. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol 967, No 4, p 1427, February, 1978. 1 fig.

Descriptors: *Centrifugal pumps, *Equipment, *Patents, *Impellers, *Pumps, Design criteria, Separation techniques, Sewage, Waste water treatment, Municipal wastes.

A centrifugal sewage pump consisting of a semi-open impeller with a disk-like impeller shroud has been patented. The shroud has multiple impeller vanes and is mounted on a pump shaft. The front face of the impeller shroud contains depressions forming annular inner and outer edges. The outer edge of the shroud is covered with a shroud ring of a pump casing. Each impeller vane on the front face of the shroud disk extends out from the shroud and has a smooth front edge. An inner face casing, located in front of the impeller, surrounds a suction valve for removing solid wastes. The height of the impeller's outer periphery is 30-70% of the water passage clearance between the inner face casings. Two portions of the shroud front face are located in symmetrical positions without backward depressions. (Lisk-FIRL)
W78-10989

WATER SUPPLIES FOR INDUSTRIAL FIRE PROTECTION,
Peerless-Midwest, Inc., Granger, IN.
For primary bibliographic entry see Field 4B.
W78-11070

DRILLING IN THE YEAR 2025,
A. B. Stanley.
Water Well Journal, Vol 32, No 6, p 55-57, June, 1978.

Descriptors: *Drilling, *Drilling equipment, *Forecasting, Water wells.

The future of the water well drilling industry is predicted. Various well drilling machinery and water well equipment will undergo remarkable improvements. These include submersible motors, drilling rigs, drill bits, check valves, well screens, casings and points, pitless units, underground cameras, submersible pumps, underground tanks, and windmills. Drillers will begin to install more waste treatment systems and closed loop water reuse systems. The work of the water well driller should become easier and he should be able to drill more wells each year with the same number of employees. His position in the community will become more important as surface water shortages and pollution force a growing population to turn to groundwater and the person who can produce it. (Purdin-NWWA)
W78-11072

INCREASED PENETRATION RATES ACHIEVED WITH NEW EXTENDED NOZZLE BITS,
Shell Oil Co., Houston, TX.
C. A. Pratt.
Journal of Petroleum Technology, Vol 30, p 1191-1198, August, 1978. 11 fig, 1 tab, 8 ref.

Descriptors: *Drilling equipment, *Rotary drilling, *Nozzles, *Penetration, Drill bits, Drilling costs, Hydraulic tubes.

The importance of hydraulic effect on penetration rate has been known since 1940. It was noted that the total fluid impact force is inversely proportional to the distance from the nozzle. The first long nozzle for rotary rock bits experienced three problems: mechanical failure of the extender tubes; tube extensions too short to influence the bit performance; and long lead times required to manufacture some designs. A new extender-nozzle/center-jet (EN/CJ) bit was designed to be: strong enough to prevent breakage while entering the hole during drilling; long enough to reduce the distance between the jet nozzle and hole bottom to 1 1/2 inch; installed easily on standard bits; and flexible enough to allow changing the jet size at the well site. Field tests of the EN/CJ bits have shown that the hydraulic nozzle life with high weight mud systems should exceed 35 hours. Compared with standard bits the EN/CJ bits average a 28% increase in penetration rate. Also, they show a greater improvement for penetration rates on small-to-medium-sized rigs than on large rigs. EN/CJ bits will reduce drilling costs in most situations. The cost-per-foot savings is a function of both increased penetration rate and rig operation costs. (Purdin-NWWA)
W78-11080

8E. Rock Mechanics and Geology

INVESTIGATION OF ACOUSTIC BOUNDARY WAVES AND INTERFERENCE PATTERNS AS TECHNIQUES FOR DETECTING FRACTURES,
Shell Development Co., Houston, TX.
For primary bibliographic entry see Field 8G.
W78-11081

8F. Concrete

FILTER BED FLOOR TILES.
Water and Waste Treatment, Vol 21, No 6, p 31, June, 1978.

Descriptors: *Filters, *Tiles, *Concretes, *Cements, *Filtration, Construction materials, Installation, Construction, Corrosion control, Sulfates, Waste water treatment, Municipal wastes.

E. C. C. Quarries Ltd. of Croft, England, has begun production of completely concrete filter bed floor tiles for waste water treatment plants. The precast filter tiles are constructed of sulfate-resistant cement concrete in an average scale of 2.5 tiles/sq m and up to 700 mm square. The tiles have a crushing strength above 50.0 Newton/sq mm at 28 days and are supplied with layout designs which include ducts up to 300 mm wide for solid bed floors. It is reportedly possible for two employees to install a floor 22 m in diameter withing 8 hrs; lifting cradles for direct installation of the bed by a crane are provided. The floor tiles supply full coverage of the filter bed, maximum drainage, and basal aeration. (Lisk-FIRL)
W78-10696

NEW GROUTING METHODS.
Ground Water Age, Vol 12, No 12, p 43-44, 56, August, 1978. 4 fig.

Descriptors: *Grout curtains, *Grouting, *Concrete dams, *Drilling, Reservoir leakage, Seepage, Concrete technology.

Three improvements in deep grout curtain construction were demonstrated at a Texas dam. They are: (1) drilling larger than normal grout holes; (2) mechanizing the preparation of the grout mix; (3) faster grout installation by use of flexible hose on grout reels. Using a truck-mounted rotary drill rig equipped with a 9 7/8-inch diameter roller cone bit, drillers rapidly put down larger than usual holes with penetration rates up to 120 feet per hour. Removal of cuttings was accomplished by use of an air-water injection system. A 1:1 water to cement slurry was transported from a batch plant by truck to a fully-mechanized grout handler and pumping unit consisting of twelve one yard, agitated holding tanks and three high capacity grout pumps. Flexible, braided hose was substituted for time-consuming rigid pipe, reducing hole preparation time from one hour to five minutes each. Some holes required more grout than others due to greater pore size. Unexpected clay strata also required adjustments in grouting. These innovative improvements of the grouting operation give away nothing in grout curtain effectiveness while boosting efficiency substantially, thus cutting costs. (Purdin-NWWA)
W78-11086

8G. Materials

ELECTROSTATIC WATER TREATMENT,
Electrostatic Equipment Co., Kansas City, MO. (Assignee).
For primary bibliographic entry see Field 5F.
W78-10708

FRICTION LOSSES IN CORRUGATED METAL PIPE.
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W78-10934

COMPARISON OF VIBRATION TEST RESULTS FOR A MODEL AND PROTOTYPE ARCH DAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects Lab.
For primary bibliographic entry see Field 8A.
W78-10937

PRODUCTS LIABILITY: LET THE SELLER BEWARE,
For primary bibliographic entry see Field 6E.
W78-11069

SEALS FOR GEOTHERMAL ROLLER DRILL BITS,
Terra Tek, Inc., Salt Lake City, UT.
R. R. Hendrickson, C. Carwile, L. Matson, and R. W. Winzenried.
Journal of Pressure Vessel Technology, Vol 99, p 614-618, November, 1977. 9 fig, 2 tab, 5 ref.

Descriptors: *Geothermal studies, *Drilling equipment, *Drill bits, *Sealants, Elastomers, Thermal stress.

Almost all geothermal drilling is done with unsealed roller drill bits. Drilling fluid provides cooling and retards abrasion but do little to lubricate bearings. Sealed drill bits are not feasible for geothermal application due to temperature limitations on the elastomer seals. Factors affecting seal life in a geothermal environment include: high formation temperature, heating due to friction, rotational eccentricities of the cutter cone due to bearing wear, abrasive particles drawn into the seal, and hydrogen sulphide gas in geothermal steam. These factors were simulated in seal tester. Several elastomer seals were tested and found to have varying temperature limits from 175 degrees C to 235 degrees C which are below the required temperature of 240 degrees C. Four heterogeneous seals were built and tested. They had a higher temperature limit than the homogeneous elastomer seals. Several metal-to-metal seals with a plasma coating will permit much higher sealing forces than would otherwise be possible. Use of a perfected 'geothermal' seal may allow higher rpm's and increased footage. (Purdin-NWWA)
W78-11077

ENGINEERING ASPECTS OF GEOTHERMAL DEVELOPMENT WITH EMPHASIS ON THE IMPERIAL VALLEY OF CALIFORNIA,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
For primary bibliographic entry see Field 4B.
W78-11078

INVESTIGATION OF ACOUSTIC BOUNDARY WAVES AND INTERFERENCE PATTERNS AS TECHNIQUES FOR DETECTING FRACTURES,
Shell Development Co., Houston, TX.
E. A. Koerperich.
Journal of Petroleum Technology, Vol 30, p 1199-1207, August, 1978. 9 fig, 1 tab, 20 ref.

Descriptors: *Borehole geophysics, *Fractures(Geologic), *Sonic logs, Sound waves, Subsurface investigations.

While many techniques for detecting fractures in reservoir rock have been proposed and tested, no technique can accurately and consistently respond to fracture zones. Also, conventional sonic logs are less sensitive to vertical fractures than to horizontal ones. Two methods of detecting vertical fractures were tested. They are: measure amplitudes of the low frequency boundary wave traveling along the borehole wall between transmitter and receiver of an axially oriented array; investigate patterns of reflected or mode converted energy that may originate from acoustic discontinuities such as fractures. It was concluded that boundary wave amplitudes and interference patterns recorded on an axially oriented acoustic logging tool are unreliable indicators of vertical fractures. These negative results are due to (1) vertical travel path of the acoustic waves, whereby vertical fractures provide negligible interruption to the path, (2) tool frequency, and (3) effects of mud cake. However, S-wave amplitude attenuation is an effective way to locate vertical fractures provided the transducer array is perpendicular to fracture planes. Under optimum conditions, interference patterns are visible on a variable density X-Z or a wiggle X-Y presentation. Interference patterns caused by boundary wave reflections are clearer and more numerous than patterns caused by P and S waves. (Purdin-NWWA)
W78-11081

GEOTHERMAL DRILL BIT IMPROVEMENT-SPECIFIC APPLICATION TO THE GEYSERS,
Terra Tek, Inc., Salt Lake City, UT.
R. R. Nielsen, L. M. Barker, and C. Carwile.
Journal of Pressure Vessel Technology, Vol 99, p 619-623, November, 1977. 6 fig, 4 tab, 5 ref.

Descriptors: *Geothermal studies, *Drilling equipment, *Drill bits, *Bearings, Steel, Thermal stress.

Current geothermal wells are drilled using conventional oil-well drill bits which are not designed for the high temperatures of geothermal reservoirs. Consequently, the average bit life is drastically reduced adding to the expense of geothermal drilling. A research and development program was undertaken to determine the weakness in the drill bits, improve them, and test them in the laboratory and the field. A study of used bits from geothermal drilling showed the major causes of failure were excessive bearing and gage wear. Research bits were developed by using steels with superior hot hardness for bearing structures. A test vessel was used to compare wear of conventional bits and research bits. Measured parameters included: pressure, water temperature, bit friction pin and roller bearing race temperatures, rpm, torque, and bit weight. The research bit tested under identical conditions showed five to ten times less bearing wear. Additional laboratory tests and field tests are planned. (Purdin-NWWA)
W78-11082

INHIBITOR CUTS PIPE LOSS IN GEOTHERMAL DRILLING,
Union Oil Co. of California, Brea.
P. W. Fischer, and D. E. Pyle.
World Oil, Vol 187, No 2, p 55-57, August 1, 1978. 4 tab, 12 ref.

Descriptors: *Geothermal studies, *Inhibitors, *Drill pipe, *Corrosion control, *Erosion control, Drilling, Cost analysis.

Severe deterioration of drill pipe in geothermal drilling prompted Union Oil Co. to develop Unisteam, a corrosion-erosion inhibitor. Unisteam greatly reduces well costs by increasing drill pipe life and lowers the incidence of twist-offs caused by corroded pipes. Corrosion-erosion is caused by a combination of factors including high temperature, steam, water, salts, oxygen, and high velocity, abrasive drill cuttings. A material is needed to reduce the impact of abrasive cuttings and prevent the protective film from being eroded. This material, an amine resin, is totally water soluble at ambient temperature but becomes a viscous non-water soluble polymer above 250 degrees F. Tables itemizing pipe history using the inhibitor, drill pipe costs while air drilling, inhibitor injection rate, and inhibitor costs show a minimum cost saving of $19,000 per well. Unisteam is also effective in liquid dominated geothermal reservoirs. Success requires maintaining fluid pH between 9.5 and 11 and injecting inhibitor at rates to maintain 40 ppm of inhibitor in the return fluid. Ammonium hydroxide is the most effective pH control agent, but environmental restrictions limit the amount. Sodium hydroxide is a safe alternative pH control agent. (Purdin-NWWA)

W78-11084

THE SUBTERRENE ROCK MELTING CONCEPT APPLIED TO THE PRODUCTION OF DEEP GEOTHERMAL WELLS,
Los Alamos Scientific Lab., NM.
J. H. Altseimer.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-UR-76-1302, Price codes: A02 in paper copy, A01 in microfiche. Report LA-UR-76-1302, (1976). Submitted to 11th Intersociety Energy Conversion Engineering Conference, September 12-17, 1976. 7 p, 12 fig, 11 ref.

Descriptors: *Drilling equipment, *Geothermal studies, *Subterrene drilling, Rotary drilling, Wells, Computer models, Melting, Drill bits.

The Subterrene concept is a system of excavating and penetrating rocks or soil by melting and simultaneously providing rock fracturing, debris removal, and wall stabilization. Melting bits for different rock types have been tested and a number of small scale operations have been successfully conducted. A bit life of up to 100 hours has been obtained. However, rates of penetration are low, averaging only about .2 mm/s. A computer model, GEOWELL, was developed to compare the Subterrene concept with rotary drilling. The major technical and cost items used in GEOWELL include: well design, surface equipment, drill pipe, bits, electric power generation and transmission, drilling fluids, and hole support. The results of the analysis indicate that no insurmountable technical barriers exist. It is recommended that rotary and melting techniques be combined to realize minimum overall well costs. Well cost is affected more by penetration rate than by bit lifetime. The current rate has to be increased to at least .8 mm/s to match the cost of rotary drilling. (Purdin-NWWA)
W78-11085

GUIDE TO DRILLING, WORKOVER AND COMPLETION FLUIDS, (1978-79),
Gulf Publishing Co., Houston, TX.
World Oil, Vol 186, No 7, p 53-98, June, 1978. 1 tab. T. R. Wright, Jr. editor.

Descriptors: *Drilling fluids, *Specification, Rotary drilling.

A comprehensive guide to drilling fluids is presented in tabular form which defines the basic system classification and function of over 1350 fluids. Also provided is a description of each material and the companies from which it is available. The definitions reflect general industry practice and terminology, and incorporate descriptions adapted by the American Petroleum Institute (API) and the International Association of Drilling Contractors (IADC), although no endorsement nor approval is claimed or intended. Low and high pH water-base systems, low solids systems, oil-base systems, and air, gas, mist systems are described. The various functions of fluids are explained. (Purdin-NWWA)
W78-11087

8I. Fisheries Engineering

STATE OF THE GONADS OF THE KUBAN SEVRYUGA ACIPENSER STELLATUS BELOW THE DAM OF THE FEDOROVSKIY HYDRAULIC INSTALLATION, AND ITS SIGNIFICANCE FOR ARTIFICIAL PROPAGATION,
L. V. Badenk, G. G. Korniyenko, L. A. Gashchenko, and V. P. Shchigel'skaya.
Journal of Ichthyology, Vol 16, No 4, p 583-591, 1976. 6 tab, 11 ref. (translated from the Russian).

Descriptors: Dams, *Reservoirs, Forebay, *Freshwater fish, Fish migration, Commercial fisheries, Fish establishment, *Fish farming, Fish behavior, Fish physiology, *Fish handling facilities, Fish stocking, *Sturgeons, Russia, *Don River, Fedorovskiy hydraulic installation, Maturity,, Mature fish.

The physiological state is described of the Kuban sevryuga, Acipenser stellatus, caught at different points of the spawning route (in the river delta and below the dam of the Fedorovskiy Hydraulic Installation) and the degree of maturity of the gonads established on the basis of a study of histological sections and the biochemical formation of the oocytes. The method of selecting mature fish for commercial breeding is described. The results obtained provide a biological basis for the organization of a more controlled and efficient fish-rearing establishment in the Azov-Kuban region. (Katz-EIS)
W78-10819

FISH DIVERSION AND TRANSPORTATION SYSTEM FOR POWER PLANT APPLICATION,
Stone and Webster Engineering Corp., New York.
E. P. Taft, and Y. G. Mussalli.
Fisheries, Vol. 3, No. 3, p. 2-5, May-June 1978. 2 fig., 1 tab., 4 ref.

Descriptors: *Impingement, *Intakes, *Screens, *Powerplants, Engineering structures, *Bypasses, Equipment, Design, Mortality, Design flow, Hydraulic design, Cooling water, Electric powerplants, Laboratory tests, Fish barriers, Conveyance structures, Alosa.

An angled, flush-mounted traveling screen has been tested in order to determine its potential for alleviating fish impingement at the cooling water intakes of electric power plants. Laboratory studies have shown that an angled screen is 100% effective in diverting alewives (Alosa pseudoharengus) to a bypass and that these fish can be transported safety through a pipe and jet pump system with low resultant mortality. Such systems are presantly incorporated in the design of two large power plants being constructed on Lake Ontario. (EIS-Katz).
W78-10999

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

INFORMATION EXCHANGE ON COMPUTER PROGRAMS (EXCHANGE D'INFORMATION DES PROGRAMMES D'ORDINATEURS),
International Inst. for Hydraulic and Environmental Engineering, Del Delft (Netherlands); and Waterloopkundig Lab., Delft (Netherlands).
For primary bibliographic entry see Field 07C.
W78-10664

SEAGRASS LITERATURE SURVEY,
Virginia Univ., Charlottesville. Dept. of Environmenta Sciences.
For primary bibliographic entry see Field 02L.
W78-10958

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, VOLUME 8,
Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 06A.
W78-11207

SOCIOECONOMIC IMPACTS OF OUTER CONTINENTAL SHELF OIL AND GAS DEVELOPMENT-A BIBLIOGRAPHY,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 06G.
W78-11232

10F. Preparation Of Reviews

EROSION AND SOLID MATTER TRANSPORT IN INLAND WATERS SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
For primary bibliographic entry see Field 02J.
W78-11113

FACTORS INFLUENCING EROSION IN DISPERSIVE CLAY AND METHODS OF IDENTIFICATION,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W78-11121

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 23
DECEMBER 1, 1978

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 23
DECEMBER 1, 1978

W78-11301 -- W78-12100

e Secretary of the U.S. Department of the Interior has de-
rmined that the publication of the periodical is necessary in the
nsaction of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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ABSTRACT SOURCES

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

THEORETICAL MODELS OF HYDROLOGIC PARAMETERS USING DERIVED DISTRIBUTION TECHNIQUES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. L. Bras, and S-O. Chan.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 500-520, 1978. 11 fig, 16 ref.

Descriptors: *Parametric hydrology, *Stochastic processes, *Mathematical models, *Rainfall-runoff relationships, *Probability, Hydrologic data, Volume, Analytical techniques, Equations, Intensity, Duration, Kinematic wave theory, Systems analysis.

The frequency distribution of the volume of water above certain threshold discharge rates resulting from runoff is developed. This is accomplished using basic and accessible information: the joint probability density function of rainfall intensity and duration together with expressions, to be derived, relating the volume of interest to rainfall intensity and duration. The resulting closed form expression for the probability density function of the volume will be very useful in the design of flood control structures in urban areas. (See also W78-11386) (Bell-Cornell)
W78-11389

DESCRIPTIVE PROPERTIES OF HYDROLOGY MODELS FOR THE EXPLICIT STOCHASTIC OPTIMIZATION OF MULTI-RESERVOIR OPERATIONS,
Alcan Smelters and Chemical Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 4A.
W78-11414

STREAMFLOW MODELING OF UPPER INDUS RIVER CATCHMENTS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
S. Selvalingam, and A. Masood.
Water Resources Bulletin, Vol 14, No 4, p 827-841, August 1978. 11 fig, 6 ref.

Descriptors: *Streamflow, *Synthetic hydrology, *Model studies, Mathematical models, Watersheds(Basins), Runoff, Surface runoff, Rivers, River basins, Tributaries, Simulation analysis, Hydrographs, Rainfall, Rainfall-runoff relationships, Hydrology, *Indus River(Pakistan).

The streamflows of three tributaries, Siran, Haro, and Soan in the upper Indus River catchment in Pakistan, were simulated using SSARR and Tank Models. Channel characteristics of the main Indus River also were determined using the two models. The basin characteristics were derived by trial and error method and were verified using the data for the period 1964-1970. Comparison of the two model performances showed that low flows were better reproduced by SSARR, while the high flows were simulated with equal accuracy by both models. (Sims-ISWS)
W78-11881

A QUASI-LINEAR SPATIALLY DISTRIBUTED CELL MODEL FOR THE SURFACE RUNOFF SYSTEM,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
M. H. Diskin, and E. S. Simpson.
Water Resources Bulletin, Vol 14, No 4, p 903-918, August 1978. 7 fig, 3 tab, 10 ref.

Descriptors: *Surface runoff, *Watersheds(Basins), *Model studies, Mathematical models, Runoff, Rainfall, Precipitation(Atmospheric), Precipitation excess, Excessive precipitation, Hydrographs, Analytical techniques, Synthetic hydrology, Hydrology.

The paper presented a spatially distributed model consisting of cells that are interconnected in a pattern similar to the major drainage network of the watershed. Each cell receives as input the rainfall excess for the area represented by the cell as well as inflows from cells located upstream. Outflow from the cell is derived by routing the total input through the cell assuming it to be a linear reservoir during the storm. The time constant of the cell, however, was allowed to vary from storm so that the model may be described as a quasi-linear model. The model was tested with rainfall excess and direct surface runoff data available for a medium size watershed with satisfactory results. The time constant was found to be related to the rainfall excess of the storms studied, its value decreasing with the increase in the total rainfall excess. (Sims-ISWS)
W78-11882

AN APPLICATION OF THE RUTTER MODEL TO THE ESTIMATION OF THE INTERCEPTION LOSS FROM THETFORD FOREST,
Institute of Hydrology, Wallingford (England).
J. H. C. Gash, and A. J. Morton.
Journal of Hydrology, Vol 38, No 1/2, p 49-58, July 1978. 3 fig, 1 tab, 15 ref.

Descriptors: *Model studies, *INterception, *Forests, Hydrology, Rainfall-runoff relationship, Estimating, Rainfall, Evaporation, Stations, Weather, *Rutter model, Rainfall interception, Interception loss, Forest structures.

The Rutter model of rainfall interception in forests has been used with data from an automatic weather station, to estimate interception loss from Thetford Forest, for 21 four-week periods during 1975 and 1976. The estimates were compared with measurements of the interception loss, with good agreement between observed and predicted evaporation. The sensitivity of the model to the 2 major characteristics of the forest structure also was investigated. (Lee-ISWS)
W78-11887

FLOW GENERATION BY CATCHMENT MODELS OF DIFFERING COMPLEXITY - A COMPARISON OF PERFORMANCE,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
For primary bibliographic entry see Field 2E.
W78-11888

COMPARISON OF EAST FRACTIONAL GAUSSIAN NOISE AND BROKEN LINE MODELS FOR GENERATING ANNUAL FLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. Srikanthan, and T. A. McMahon.
Journal of Hydrology, Vol 38, No 1/2, p 81-92, July 1978. 5 fig, 4 tab, 9 ref.

Descriptors: *Streamflow, *Streams, *Australia, *Model studies, Mathematical models, Synthetic hydrology, Rivers, Markov processes, Analytical techniques, Hydrology, Fast fractional Gaussian noise models, Broken line processes.

A comparison was made between the fast fractional Gaussian noise (ffGn) and broken line (BL) models using the data from 14 Australian streams. An alternative procedure (similar to that of ffGn) was suggested for the use of BL model and applied to actural data. From the results, it was found that BL model is computationally more efficient and preserves the long-term persistence effects as well as the ffGn model. (Sims-ISWS)
W78-11890

FIRM OUTFLOW FROM MULTIANNUAL RESERVOIRS WITH SKEW AND AUTOCORRELATED INFLOWS,
Technical Univ. of Lisbon (Portugal). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11891

FLOW AGAINST DISPERSION IN ADSORBING POROUS MEDIA,
California Univ., Davis. Dept. of Land, Air and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-11894

MICRO-RELIEF SURFACE DEPRESSION STORAGE: CHANGES DURING RAINFALL EVENTS AND THEIR APPLICATION TO RAINFALL-RUNOFF MODELS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
J. K. Mitchell, and B. A. Jones, Jr.
Water Resources Bulletin, Vol. 14, No. 4, p 777-802, August 1978. 4 fig, 11 tab, 11 ref.

Descriptors: *Runoff, *Depression storage, *Soil surfaces, *Model studies, *Laboratory tests, Mathematical models, Surface runoff, Rainfall, Simulated rainfall, Rainfall simulators, Storage, Soils, Erosion, Infiltration, Watersheds(Basins), Hydrology, Micro-relief.

Micro-relief surface depression storage is one of the dynamic components of the rainfall-runoff process. The quantification of the effect of rainfall intensity and duration on the micro-relief was the subject of this study. Micro-relief measurements were made on 88 soil bin samples before and after the application of simulated rainfall events. The surface depression changes were described with empirical equations, using basic rainfall, surface hydrology, and soil parameters and their cross products as independent variables. A rainfall-runoff model demonstrated the values of a dynamic description of the surface depression storage function. (Sims-ISWS)
W78-11934

GROUND WATER-SURFACE WATER RELATIONS IN THE SILVER CREEK AREA, BLAINE COUNTY, IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-11978

PROGRESS REPORT ON HYDROLOGIC INVESTIGATIONS OF SMALL DRAINAGE AREAS IN NEW HAMPSHIRE--PRELIMINARY RELATIONS FOR ESTIMATING PEAK DISCHARGES ON RURAL, UNREGULATED STREAMS,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-11988

AN ANALYSIS OF STREAM TEMPERATURES, GREEN RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-11989

DISTRIBUTION OF PHYTOPLANKTON IN MARYLAND LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.

For primary bibliographic entry see Field 5C.
W78-12100

2B. Precipitation

DEVICE FOR EXTRACTING ENERGY, FRESH WATER AND POLLUTION FROM MOIST AIR,
For primary bibliographic entry see Field 3B.
W78-11949

2C. Snow, Ice, and Frost

A LEGAL REGIME FOR THE ARCTIC,
For primary bibliographic entry see Field 6E.
W78-11331

PRELIMINARY RUNOFF AND STREAMFLOW PREDICTIONS IN THE HUMBOLDT RIVER BASIN BASED ON SNOW DISTRIBUTION MEASUREMENTS FROM SEQUENTIAL SATELLITE IMAGERY,
Nevada Univ. System, Reno. Renewable Natural Resources Div.
For primary bibliographic entry see Field 4A.
W78-11366

SNOWMELT-FROZEN SOIL CHARACTERISTICS FOR A SUBARCTIC SETTING,
Alaska Univ., College. Inst. of Water Resources.
D. L. Kane, R. D. Seifert, J. D. Fox, and G. S. Taylor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 093, Price codes: A04 in paper copy, A01 in microfiche. Report No. IWR-84, January 1978. 64 p, 19 fig, 2 tab, 27 ref, append. OWRT A-054-ALAS(1), 14-34-0001-7004.

Descriptors: *Snowmelt, *Frozen ground, *Cold regions, *Infiltration, *Soil moisture, *Soil temperature, Snow cover, Soil properties.

The pathways of soil water in cold climates are influenced, in addition to the normal forces, by the presence of permafrost and the temperature gradients in the soil system, whereas the infiltration of surface water into the soil system in a function of moisture levels, soil type and conition of the soil (whether it is frozen or not). Snowfall, with subsequent surface storage over a period of several months, typifies Alaskan winters. This snowfall often accounts for 50 per cent or more of the annual precipitation, with ablation occurring over a time span of 2 to 3 weeks in the spring. The melt period represents an event when large quantities of water may enter the soil system; the possibilities exist for recharging the groundwater system, or else generating surface runoff. The objective of this study was to determine the magnitude of potential groundwater recharge from snowmelt. Instrumentation was installed and monitored over two winter seasons to quantify the accumulation and ablation of the snowpack. Thermal and moisture data were collected to characterize the snowpack and soil conditions prior to, during, and following the ablation. Lysimeters were installed at various depths to intercept soil water. The volume of potential areal recharge for 1976 was 3.5 cm and for 1977 was 3.0 cm, which represented about 35 per cent of the maximum snowpack content. It is concluded that permafrost-free areas can contribute significantly to groundwater recharge during snowmelt ablation.
W78-11377

ICEBERG CALVING FROM FLOATING GLACIERS BY A VIBRATING MECHANISM,
Department of the Environment, Ottawa (Ontario). Glaciology Div.
G. Holdsworth, and J. Glynn.
Nature, Vol 274, No 5670, p 464-466, August 3, 1978. 2 fig, 18 ref.

Descriptors: *Icebergs, *Antarctic, *Vibrations, Model studies, Mathematical models, Mechanical properties, Ice, Waves(Water), Ocean waves, Glaciers, Oceans, Sea ice, Iceberg calving, Ice tongue, Super tabular icebergs.

Observations of Antarctic super tabular icebergs, which can exceed 100 km on a side, have shown that their origin frequently can be traced to previously existing super ice tongues, which are a class of massive seawars-extending ice shelves. Furthermore, a history of cyclic growth and calving can often be inferred or demonstrated. Because the calvings do not generally occur along a line coincident with the grounding line, where, under normal tidal flexure the stresses are greatest, and because multiple fracturing is observed, a nontidal theory for ice-tongue fracture was sought. A mechanism for generating significant bending stresses at locations along an ice tongue far from the grounding zone is by vibration of the glacier in a mode higher than the fundamental. In this report, an approximate analysis of the modes of free vibration of a buoyant, elastic, tapering ice tongue floating in shallow water of variable depth was outlined. (Sims-ISWS)
W78-11421

ICE SHEET TOPOGRAPHY BY SATELLITE ALTIMETRY,
EG and G Washington Analytical Services Center, Inc., Rockville, MD.
R. L. Brooks, W. J. Campbell, R. O. Ramseier, H. R. Stanley, and H. J. Zwally.
Nature, Vol 274, No 5671, p 539-543, August 10, 1978. 5 fig, 1 tab, 20 ref.

Descriptors: *Remote sensing, *Radar, *Ice cover, Topography, Topographic mapping, Radar, Satellites(Artificial), Mapping, Ice, Glaciology, *Greenland, Ice sheets, GEOS3, Radar altimeters, Satellite altimetry.

The surface elevation of the southern Greenland ice sheet and surface features of the ice flow were obtained from the radar altimeter on the GEOS 3 satellite. The achieved accuracy in surface elevation was approximately 2 m. As changes in surface elevation are indicative of changes in ice volume, the mass balance of the present ice sheets could be determined by repetitive mapping of the surface elevation, and the surface could be monitored to detect surging or significant changes in ice flow. (Sims-ISWS)
W78-11422

THE CAUSES OF GLACIATION,
Lethbridge Univ. (Alberta). Dept. of Geography.
C. B. Beaty.
American Scientist, Vol 66, No 4, p 452-459, July-August 1978. 3 fig, 60 ref.

Descriptors: *Glaciation, *Climatology, *Model studies, Mathematical models, Glaciers, Ice, Climates, Oceans, Solar radiation, Albedo, Volcanoes, Geology, Ice ages, Contributing factors, Continental drift.

Possible contributing factors that caused the major glaciations of the earth were studied using a mathematical model. Five of these factors were found to have a role in the glaciation. It was concluded that major glaciations have been caused not by dramatic changes in the earth's climate, but by the conjunction of several discrete factors at times when the continents were located at high latitudes. (Sims-ISWS)
W78-11434

DAMS ON PERMAFROST,
For primary bibliographic entry see Field 8D.
W78-11435

APPROXIMATE METHOD OF CALCULATING THE TEMPERATURE STEADY STATE OF WATER-PERMEABLE DAMS,
For primary bibliographic entry see Field 8D.
W78-11436

APPROXIMATE CALCULATION OF THE THERMAL REGIME OF RESERVOIRS FORMED BY A FROZEN DAM,
For primary bibliographic entry see Field 8D.
W78-11438

ALTERNATE METHODS OF AVALANCHE CONTROL (INTERIM) (1975-1976), PHASE II,
Washington Univ., Seattle. Dept. of Civil Engineering.
E. R. LaChapelle, J. B. Johnson, J. A. Langdon, C. R. Morig, and E. M. Sacket.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 364, Price codes: A05 in paper copy, A01 in microfiche. Washington State Highway Department, Olympia, Research Program Report 19.2, July 1976. 96 p, 30 fig, 17 ref, 3 append.

Descriptors: *Avalanches, *Snow management, *Snow, *Washington, Snowpacks, Snow cornice, Hazards, On-site investigations, Equipment, Vibrations, Interfaces, Snow cover, Model studies, Mathematical models, *Avalanche control, Air bags, Gas exploders, Vibrators.

This interim report summarized results from the second year of investigation into alternate methods of avalanche control. Four different methods of controlling snow avalanches were investigated. These methods are: (1) artificial release by inflation of air bags under the snow; (2) artificial release by exploding a gas-oxygen mixture in special containers placed under the snow (gas exploders); (3) artificial release by initiating fracturing in snow through vibration; and (4) modification of the snow-earth interface, either to inhibit avalanche formation or to enhance avlanching and prevent build-up of dangerous amounts of snow. During the second winter, field tests of these methods were made. Results of these tests were reported. Also, a mathematical model of the solutions for the interruption of the creep and glide of a snowpack by rigid structures was reported. Mechanical resonance of snow was investigated. (See also W77-05810) (Sims-ISWS)
W78-11441

COMPRESSIBILITY CHARACTERISTICS OF COMPACTED SNOW,
Cold Regions Research and Engineering Lab., Hanover, NH. Applied Research Branch.
G. Abele, and A. J. Gow.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-028 622, Price codes: A04 in paper copy, A01 in microfiche. CRREL Report 76-21, June 1976. 53 p, 38 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Snow, *Compressibility, *Compressive strength, *Mechanical properties, Physical properties, Trafficability, Crystals, Crystalization, Crystallography, Ice, Stress, Density, Deformation, Compaction, Strength of materials, Temperature, Laboratory tests, Cold regions.

The effects of snow temperature and initial density on the stress vs density and stress vs deformation relationships were investigated for shallow compacted snow in the density range of 0.28 to 0.76 g/cu m, for a stress range of 0.5 to 72 bars and a temperature range of -1 to -34C at a deformation rate of 40 cm/s. A decrease in temperature increases the resistance to stress, the effect increasing with appied stress. For any stress, an increase in the initial density results in an increase in the resulting density, the effect decreasing with an increase in stress. The approximate yield envelopes,

which define the stress required to initiate any deformatin of snow of a particular density and temperature, were determined. Rapid compaction of snow resuls in extensive recrystallization, significantly different from that of naturaly compacted snow. At a stress of 72 bars, transformation to ice occurs only at temperatures above -19C, (See also W76-00537) (Sims-ISWS)
W78-11442

WINTER CURRENTS IN LAKE HURON,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W78-11445

EVALUATION OF FREEZE-THAW DURABILITY OF STABILIZED MATERIALS.
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W78-11874

INSULATED ROAD STUDY,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
E. Penner.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, , Transportation Research Board, National Academy of Sciences, Washington, D.C., p 80-83, 1976. 6 fig, 8 ref.

Descriptors: *Frost action, *Roads, *Canada, On-site tests, Frozen ground, Frost protection, Testing procedures, Soil moisture, Frost heaving, Insulation, Porous media, Soil temperature, Soils, Subgrade soil, Insulated road.

The results of a 3-year insulated road study showed that frost penetration inward from the edge of an insulated area is about the same as the downward penetration on a control section. Moisture accumulated in the frost-susceptible subgrade after the frost line penetrated the insulation. During periods of rapid cooling, the temperature of the surface above an insulated pavement may be lowered sufficiently to permit surface icing if atmospheric moisture conditions are suitable. Terminating the insulation without feathering induces abrupt changes in elevation in the roadway as a result of heaving. (See also W78-11865) (Humphreys-ISWS)
W78-11877

BRINE DRAINAGE AND CONVECTION IN YOUNG SEA ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
T. M. Niedrauer.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-043 351, Price codes: A05 in paper copy, A01 in microfiche. Scientific Report No 15 to Office of Naval Research, July 1977. 80 p, 30 fig, 2 tab, 21 ref. N00014-76-C-0234.

Descriptors: *Sea ice, *Brines, *Albedo, *Baseline studies, Desalination, Water resources, Environments, Convection, Outer Continental Shelf, Environmental impacts, Brine channels.

In a series of experiments using a 1.6 mm thick freezing tank, thin sections of salt water ice were grown which exhibit the same drainage features as natural sea ice. The tank design permitted photographs to be taken, while thermocouples mounted in the tank walls recorded the temperature profiles within the ice. Convection was observed in both the skeleton layer and in the brine channels by the flow of dyed brine. Flow in the skeleton layer was cusp-like in appearance, consisting of narrow downflow regions separated by broad upflow regions. Several brine channels were usually present in the ice and convective overturning occurred in these channels. The convection caused temperature fluctuations of 0.05C, which calculations show increase the vertical heat flux by 2%. The brine drainage channels, which were usually sloped 30 to 60 degrees to the horizontal, always had isotherms tilted from 0 to 13 degrees in the same direction. The brine channels move both horizontally and vertically through the ice by melting their lower walls and freezing on the upper walls. An analysis based on the heat flux due to brine channel convection shows that convection can drive these wall movements. Observations suggest that most of the brine movement in the channels is caused by recirculation of water from below the ice. The formation of brine pockets from brine tubes was also observed. (Sinha-OEIS)
W78-11965

2D. Evaporation and Transpiration

ESTIMATING LAKE EVAPORATION WITH FLOATING EVAPORIMETERS AND WITH WATER BUDGET,
National Water Board of Finland, Helsinki. Hydrological Office.
J. Jarvinen.
Nordic Hydrology, Vol 9, No 2, p 121-130, 1978. 1 fig, 3 tab, 6 ref.

Descriptors: *Evaporation, *Lakes, *On-site investigation, On-site data collections, Analytical techniques, Water balance, Evaporation pans, Evaporimeters, Instrumentation, Measurement, Equations, Water loss, Foreign research, Winds, Temperature, Data processing, Limnology, *Finland.

A short review of the 4 lake evaporation research projects in Finland was given. Three of the lakes studied are situated in southern Finland and one in the north. One of the lakes is deep in Finnish terms, and the rest are shallow. The methods used and the results obtained in 1971-1974 also were discussed in this paper. The results were compared with those of a Class A pan station. (Sims-ISWS)
W78-11428

THE PROJECTED IMPACT OF WATER HYACINTH INFESTATION IN TEXAS,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 4A.
W78-11605

AN APPLICATION OF THE RUTTER MODEL TO THE ESTIMATION OF THE INTERCEPTION LOSS FROM THETFORD FOREST,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2A.
W78-11887

BRINE DRAINAGE AND CONVECTION IN YOUNG SEA ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2C.
W78-11965

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-11972

2E. Streamflow and Runoff

PRELIMINARY RUNOFF AND STREAMFLOW PREDICTIONS IN THE HUMBOLDT RIVER BASIN BASED ON SNOW DISTRIBUTION MEASUREMENTS FROM SEQUENTIAL SATELLITE IMAGERY,
Nevada Univ. System, Reno. Renewable Natural Resources Div.
For primary bibliographic entry see Field 4A.
W78-11366

TAIL BEHAVIOUR OF RIVERFLOW PROBABILITY DENSITIES,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11388

RELIABILITY OF PROBABILITY-DISTRIBUTED MODELS,
Universidade Federal do Rio de Janeiro (Brazil).
D. Machado.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 521-525, 1978. 6 ref.

Descriptors: *Reliability, *Stochastic processes, *Probability, *Streamflow, *Catchments, *Mathematical models, Risks, Optimization, Outflow, Estimating, Simulation analysis, Water resources, Planning, Sampling, Equations, Systems analysis, Lumped model, Distributed system, Sensitivity analysis, Uncertainty, Variability.

Optimization methods are challenged by various problems having no easy solution. One of these is that traditional methods of optimization are capable of providing only lumped best-fit parameter values, as if catchments were spatially homogeneous. This can lead to poor results in a forecasting procedure. The specification of a confidence interval for forecasted outflow values is of considerable importance. This work estimates an 'a priori' confidence interval for model simulated outflow under the hypothesis of the parameters being variables in a probabilistic sense and independent of each other. The method is based on the determination of the variance of a dependent variable as a function of the sampling variance of several independent variables. (See also W78-11386)
W78-11390

STOCHASTIC ANALYSIS OF THE RESIDUALS OF A CONCEPTUAL MODEL,
McGill Univ., Montreal (Quebec). Faculty of Management.
G. S. Cavadias, and S. K. Gupta.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 536-555, 1978. 9 fig, 6 tab, 4 ref, append.

Descriptors: *Stochastic processes, *Time series analysis, *Model studies, *Watersheds(Basins), *Streamflow, Hydrologic data, Simulation analysis, Methodology, Estimating, Regression analysis, Hydrologic cycle, Systems analysis.

The main justification for the establishment of research watersheds is the potential usefulness of the resulting data for understanding the complex relationships between the elements of the hydrologic cycle. To achieve this understanding, it is necessary to formulate adequate models for the relevant hydrological processes. For this purpose, various conceptual models have been fitted to the data from research basins. An analysis of the results of these studies indicates that the dif-

ferences between simulated and observed flows exhibit some patterns. This study analyzes these patterns using the methodology of univariate and multivariate time series analysis, in order to understand the limitations of the modeling process and improve the agreement between simulated and observed flows. The study approach is in the direction of combining conceptual and stochastic hydrological models whose separate development over the years has created considerable confusion in the minds of users as to the results of hydrological research. The combination of conceptual and stochastic models outlined herein seems to result in a clarification of the nature of the residuals of the conceptual model, and it may find various applications both in the planning and operation of water resource projects. (See also W78-11386) (Bell-Cornell)
W78-11391

STOCHASTIC MODEL OF A FLOOD FORECAST-RESPONSE PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4A.
W78-11401

POSTERIOR DISTRIBUTION OF THE PARAMETERS OF THE PEARSON TYPE III DISTRIBUTION; AN APPLICATION TO DESIGN FLOOD SERIES ANALYSIS,
Chile Univ., Santiago.
B. Espildora, F. J. Samaniego, and J. Amorocho.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 714-731, 1978. 12 ref.

Descriptors: *Design flood, *Parametric hydrology, *Estimating, *Probability, *Uncertainty, Risks, Decision making, Statistical methods, Constraints, Low flow, High flow, Equations, Mathematical models, Entropy, Maximization, Lagrange multipliers, Bayesian analysis, Systems analysis.

Decisions involved in the selection of criteria for water resources systems design often call for the stochastic modeling of hydrologic variables, such as the peak inflows entering a reservoir. These decisions must be made with the recognition that considerable uncertainties exist with respect to the appropriate form of the model, as well as to its structural parameters. This paper discusses a general method for the derivation of the posterior distribution of these parameters, representing the probability assigned to their values after sample information becomes available. This sample information is combined with knowledge previously available, as represented by a 'prior' probability distribution of the parameters, by application of the Bayesian method of analysis. Specifically, the solution proposed here is applicable to decision analyses in which a hydrologic variables is modeled as having a Pearson Type III distribution. Noninformative prior distributions are developed via entropy maximization. The risk of a given decision may thus be evaluated as the expected risk relative to the posterior distribution here outlined. (See also W78-11386) (Bell-Cornell)
W78-11402

THE RELIABILITY OF LOW FLOW REGIONAL EQUATIONS IN BRITISH COLUMBIA,
Water Survey of Canada, Vancouver (British Columbia). Planning and Studies Section.
R. M. Leith.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 733-747, 1978. 4 fig, 3 tab, 3 ref, 2 append.

Descriptors: *Reliability, *Estimating, *Low flow, *Least squares method, *Kalman filtering, Networks, Hydrometry, *British Columbia, Regional analysis, Statistical methods, Probability, Equations, Systems analysis, Physiographic parameters, Canada.

The reliability of estimates of low flows is examined by least squares fitting and Kalman filtering. These techniques applied to a network of hydrometric stations in British Columbia allow the contribution of individual stations to be assessed. The changes in reliability of estimates are studied as a function of the changes in the size of the network. The subdivision of the study area is examined by a split test sample with inconclusive results. Factors such as common time base of the data and season of occurrence of low flow are found to influence the accuracy of low flow estimates. (See also W78-11386) (Bell-Cornell)
W78-11403

STOCHASTIC MODELS OF EXTREME FLOWS AND THEIR APPLICATION TO DESIGN,
Montreal Univ. (Quebec). Ecole Polytechnique.
P. Todorovic.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 763-783, 1978. 4 fig, 19 ref, 3 append.

Descriptors: *Stochastic processes, *Extreme events, *Streamflow, *Mathematical models, Design, Equations, Hydrographs, Systems analysis, Seasonal, Variations, Bivariate point process, Poisson process.

Frequently in various investigations, considerations of stochastic models often involve different functionals of a bivariate point process. Considered herein are the definition and methods for analysis of such a process. Discussed are properties of this stochastic structure and the conditions under which it becomes a bivariate Poisson process. The distribution functions of several functionals (generally speaking, a functional of a stochastic process is a stochastic process) of this Poisson process are also given. The second part of the paper considers applications of the previous results in analysis of extreme flows. In this respect, two processes (functionals of the bivariate point process) are of particular interest. The First one chi(t) represents, roughly speaking, the largest of all exceedances in the interval of time (0,t) of a level xo by the streamflow hydrograph. The second process T(t) represents the time of the largest exceedance chi(t). The joint distribution function of these two processes is determined. Finally, some problems concerning the application of these results to problems of design are discussed. (See also W78-11386) (Bell-Cornell)
W78-11405

THE DISTRIBUTION OF THE EXTREME OF A MIXTURE RANDOM VARIABLE WITH APPLICATIONS IN HYDROLOGY,
Utah State Univ., Logan. Dept. of Applied Statistics and Computer Science.
R. V. Canfield.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 784-790, 1978. 8 ref.

Descriptors: Hydrology, *Streamflow, *Estimating, *Extreme events, Floods, Runoff, Distribution, Equations, Systems analysis, Graphical methods, Extreme value theory, Tail characteristics.

Present methods of estimating return periods and probabilities of flood events do not work well when runoff originates from nonhomogeneous sources. In this case, the random variable describing daily river height may be viewed as a mixed random variable. The most important consideration in selecting a distribution for use in describing maximum yearly river height is the behavior of the right tail of the distribution. It is from the right tail that return periods and probabilities of rare events are determined. Good empirical fit of a distribution to a data set is not sufficient to ensure that the chosen distribution can provide a good fit to a given tail. Unfortunately, many distributions can provide a good fit to a given data set with each having very different tail characteristics. Thus some theoretical principle is needed to assist in the choice of a distribution. Extreme value theory is used here as the guiding principle. Using an extension of the theory to mixture random variables, the extreme value approximation of distribution of maximum yearly river height F(h) is for two sources of runoff: F(h) = phi (h) phi i'(h) i,i' = 1,2,3 where phi i (h) and phi i'(h) are classical extreme value distributions of which there are only three different types. In addition to narrowing the choice of distributions down to three types, the tail characteristic of these types are very different which further simplifies the problem of choice. Estimation of the parameters of F(h) is considered for one choice of extreme value type. (See also W78-11386) (Bell-Cornell)
W78-11406

ANALYSIS OF EXTREME EVENTS IN STATIONARY DEPENDENT SERIES,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
D. Rosbjerg.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 3 fig, 5 ref.

Descriptors: Hydrology, *Time series, *Markov processes, *Value, *Distribution, *Extreme events, Annual, Streamflow, Sampling, Equations, Probability, Mathematical models, Systems analysis, Long-term records.

In order to obtain an extreme value distribution corresponding to discrete stationary dependent series, an approximate first-order Markov process is considered. On the basis of this model, which supposed to be good for moderately persistent series, the distribution function for the maximum value of the process in a given interval of time is developed. A strongly persistent discrete series can be approximated by a continuous one for the purpose of making use of the extreme value distribution for stationary continuous processes developed by Ditlevsen (1971). However, comparison of the two extreme value distributions in this case shows nearly identical results, indicating that the developed extreme value distribution can be used not only for moderately persistent series, but in all cases as well. The theoretical extreme value distribution is compared with extreme values obtained from long-term annual streamflow records, showing good agreement. Finally, some comments concerning loss of information about the extreme events due to discrete sampling are given. (See also W78-11386) (Bell-Cornell)
W78-11407

A NONPARAMETRIC APPROACH TO THE ANALYSIS OF EXTREME HYDROLOGIC EVENTS,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. P. Lettenmaier, and S. J. Burges.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Canada, June 26-28, 1978, p 799-818, 1978. 4 fig, 3 tab, 11 ref.

Descriptors: Hydrology, *Optimization, *Linear programming, *Extreme events, *Estimated mo-

ments, Constraints, Monte Carlo method, Error, Maximization, Sensitivity analysis, Exceedance probabilities, Confidence bounds, Mathematical models, Equations, Systems analysis, *Floods.

Many planning and design problems require estimates of the magnitude of extreme hydrologic events. Current practice involves fitting of an analytical distribution to an observed sequence of extremes. The fitted distribution is then interpolated or, more commonly, extrapolated to the return period of interest. Error is inherent in both distribution choice and parameter estimation. An alternative method which eliminates the necessity for distribution identification is explored herein. The approach is based on a linear programming formulation for the maximum and minimum exceedance probabilities of an (artibrary) distribution with a given set of moments taken as constraints. The probability density function is approximated as a cubic spline fit at a pre-specified set of nodes, where the distribution is constained only to have the given moments and to be unimodal with two given inflections and positive curvature in both tails. The method requires that the user specify (1) the number of nodes to be used, (2) node allocation to event levels, and (3) inflection locations. Exploratory Monte Carlo tests, conducted using samples of size 30 drawn from an Extreme Value Type I distribution with Cv = 0.6, showed that the upper 68% and 90% maximum exceedance probabilities derived from repeated use of the linear programming approach agreed closely with the upper parametric confidence bounds for the Extreme Value Type I distribution. Although preliminary, the results suggest that more detailed documentation of the approach as a possible alternative to present practice is warranted. (See also W78-11386) (Bell-Cornell)
W78-11408

A NON-GAUSSIAN STOCHASTIC MODEL FOR DESIGN-EXTREMES OF WATER RESOURCES SYSTEMS,
Technical Univ. of Lisbon (Portugal).
L. V. Tavares.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds), University of Waterloo, Waterloo, Canada, June 26-28, 1978, p 819-830, 1978. 5 tab, 2 fig, 5 ref.

Descriptors: Hydrology, *Stochastic processes, Water resources, *Systems analysis, *Extreme events, Design, Equations, Rivers, Behavior, Distribution, Sensitivity analysis, Return periods, Autocorrelation, Daily, Runoff, Mathematical models, Simulation analysis.

The development of models for autocorrelated extremes has to be obtained in order to improve its design and management. However, most results of the Theory of Extremes have been obtained either for random variables (e.g., Gumbel, 1958) or for gaussian processes (e.g., Cramer & Leadbetter, 1967 and Qualls & Watanable, 1975) and therefore in applied studies either the autocorrelation or the non-gaussian behavior of the exogenous magnitudes is usually ignored. In this paper, the exact distribution of extremes of a non-gaussian stationary discrete process is obtained and their crossing intervals are studied in terms of the autocorrelation coefficients for any level of crossing. Thus a sensitivity analysis of the expected return periods and of their variances in relation to the autocorrelation coefficients can be accomplished using the results presented herein. Finally, a successful application of this process to the modeling of daily runoff for a Portuguese River is considered. (See also W78-11386) (Bell-Cornell)
W78-11409

ON THE PREDICTION OF EXTREME FLOWS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering.
M. Grigoriu.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 831-852, 1978. 10 fig, 3 tab, 16 ref.

Descriptors: *Flood protection, *Runoff, *Extreme flows, *Statistical methods, Markov processes, Measurement, Probability, Daily, Rivers, Runoff coefficient, Equations, Systems analysis, Prediction, Random sequences, Tirgua River(Venezuela).

A method for extreme flood analysis using all available measurements of a runoff series is developed. An approximation of the distribution of the extremes of correlated random sequences is formulated based on the crossing approach. It is shown that the correlation of Gauss-Markovian runoffs can be generally ignored in flood analysis. The independence hypothesis replacing the original series by a white sequence of identical marginal probability law is also tested with satisfactory results against actual data in the Tirgua River, Venezuela. The proposed method for flood prediction seems to perform suitably even in the case of rivers observed for short periods; it features computational simplicity. (See also W78-11386) (Bell-Cornell)
W78-11410

INCORPORATION OF FORECASTED TOTAL SEASONAL RUNOFF VOLUMES INTO RESERVOIR MANAGEMENT STRATEGIES,
Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
K. Hoshi, and S. J. Burges.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 853-872, 1978. 7 fig, 8 tab, 15 ref.

Descriptors: *Reservoir operation, *Streamflow forecasting, *Runoff, *Multiple-purpose reservoirs, Seasonal, Volume, Probability, Linear programming, Hydrologic data, Pacific Northwest, U.S., Reservoir releases, Constraints, Economic efficiency, Optimization, Benefit maximization, Mathematical models, Equations, Systems analysis, Snowmelt, Chance-constrained programming, Cedar River(Washington), Multiple objectives, Decision rules.

Forecasts of total snowmelt seasonal runoff volumes were used to determine rules for hypothetical reservoirs to determine the relative advantage of using forecasted flow over the unconditional flow state. Comparisons were made using chance-constrained linear programming (CCLP) formulations for the operation of a single multiple-purpose reservoir (flood mitigation, water supply, and hydropower generation) with and without snowmelt runoff forecasts. Two reservoir sizes, one approximately 20% and the other 100% of the mean annual flow of a river, were examined. Flow data from the Cedar River, Washington, were used to reflect runoff patterns typical of much of the Pacific Northwest region. Conditional streamflow distributions for months March-August were developed for given total March-August runoff volume amounts. These conditional distributions were used to develop Linear Decision Rules (LDR's) for release from the reservoir. LDR's were also developed for the maximum ignorance state. Economic benefits were computed for maximum ignorance operating rules (Type A), Type A operating rules with conditional inflows (Type B), and LDR's and benefits based on the conditional flows (Type C). In general, under Type C operation there was less uncertainty in the cumulative distribution of water supply and reservoir freeboard (surrogate for flood control) than when Type A operation was used. Explicit inclusion of the total seasonal runoff forecast into reservoir operation reduces physical operating uncertainty and generates larger benefits than are determined by operating under circumstances of maximum ignorance, i.e., where only unconditional streamflow distributions are available. (See also W78-11386) (Bell-Cornell)
W78-11411

APPLICATION OF FEATURE PREDICTION MODEL IN HYDROLOGIC TIME SERIES SYNTHESIS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
U. S. Panu, and T. E. Unny.
Supplemental article: Abstract only, in: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 20 p, 4 fig, 6 tab, 16 ref. (Reprint available from author).

Descriptors: *Streamflow, *Stochastic processes, *Time series analysis, *Statistical methods, *Watersheds(Basins), *Markov processes, *Hydrologic data synthesis, Performance, Evaluation, Mathematical models, Rivers, Canada, Computer programs, Distribution, Monthly, Extreme value, Prediction, Pattern structure, Equations, Algorithms, Systems analysis.

A procedure is developed to incorporate multivariate normal distribution for the intra-pattern structure and first order Markovian dependence for the inter-pattern structure in the application of the Feature Prediction model for streamflow synthesis. Synthesized streamflow realizations for a large size watershed (Fraser River) and for a small size watershed (Black River) are found very satisfactory under various tests. The synthesized realizations are found embedded with properties associated with the sequence of low flows (critical period) and also with the sequence of peak flows (extreme-value probability distribution) that are comparable with the corresponding properties possessed by the historical sample. Although more available, only the first 30 years of streamflow for each river have been used, since historical records usually available are characteristically of this duration. (See also W78-11386) (Bell-Cornell)
W78-11416

INCREASED RELIABILITY OF LOW WATER ANALYSES THROUGH SIMULATION OF TIME SERIES,
Coblenz Federal Inst. of Hydrology (West Germany).
G. Huthman, and H.-J. Liebscher.
Supplemental article: Abstract only (p 713), in: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 14 p, 8 fig, 2 tab, 10 ref. (Reprint available from author).

Descriptors: *Low flow, *Reliability, *Time series analysis, *Simulation analysis, Hydrographs, Daily, River flow, Frequency analysis, Drainage areas, Rivers, Germany, Uncertainty, Linear systems, Fourier transform, Equations, Mathematical models, Systems analysis.

This study was undertaken in order to increase the reliability of low water analyses from short data series where the evaluation of extreme values does not provide a proven basis for planning. By simulating discharge hydrographs, an attempt has been made to extend the available data series without modifying the statistical parameters; a compound procedure is introduced which is based on multiple frequency response analysis and linear ARMA processes and which allows the utilization of information from discharge hydrographs of neighboring areas where hydrologically and climatologically similar conditions prevail. The simulation results for the low water range are compared to the results obtained with the simulation procedure based on

the separation of the mean annual variation and the subsequent superposition by an AR process. The improvement of the simulation process with the aid of the procedure described herein considerably increases the reliability of low water analyses. (See also W78-11386) (Bell-Cornell)
W78-11418

CRITICAL DROUGHT REVISITED,
University of Western Ontario, London. Dept. of Mathematics.
A. I. McLeod, and K. W. Hipel.
Supplemental article: Abstract only, in: Proceedings, Volume II, p 732, 'International Symposium on Risk and Reliability in Water Resources.' E. A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 17 p, 5 tab, 13 ref, append. (Reprint available from author).

Descriptors: *Droughts, *Time series analysis, *Model studies, Hydrology, *River flow, *Simulation analysis, Reservoir design, Reservoir operation, Stochastic processes, Monthly, Equations, Systems analysis, Parameter estimation.

A family of monthly hydrological (MHD) models is presented for modeling natural time series. Tha Akaike information criterion is suggested as a means for selecting which type MHD mode to fit to a given data set. MH processes are determined for 25 monthsly riverflow time series and it is shown using simulation procedures that these models adequately preserve the critical period statistics. Consequently, MH models can be used for reservoir design and operation. (See also W78-11386) (Bell-Cornell)
W78-11419

ANALYSIS OF HYDROLOGIC DATA USING PEARSON TYPE III DISTRIBUTION,
Central Water and Power Research Station, Poona (India).
V. M. Shaligram, and V. S. Lele.
Nordic Hydrology, Vol 9, No 1, p 31-42, 1978. 1 fig, 4 tab, 4 ref.

Descriptors: *Flood frequency, *Frequency curves, *Statistical methods, Hydrologic data, Rivers, Distribution patterns, Estimating, Numerical analysis, Prototypes, *Extreme value distribution, *Pearson type III distribution, Confidence intervals, Skewed data.

Historical annual floods for 15 rivers in India and one stream in the U.S. were utilized for deriving long-term estimates using maximum likelihood method with extreme value distribution. The results showed that most peak flows were under estimated, and their departures from respective prototype magnitudes were of the order of 10 to 40%. These flood sequences also were analyzed using Pearson type III distribution. The departures were significantly reduced. However, the confidence intervals were larger with the Pearson type than with the extreme value distribution. The hydrologic data, in general, is skewed, and the use of Pearson type III distribution improves the goodness of fit of the prototype and model values, though at the expense of slightly less precise estimates. (Singh-ISWS)
W78-11423

STREAM BOTTOM SEDIMENTATION IN ILLINOIS RIVERS: PRELIMINARY EVALUATION ON USGS GAGING STATION DATA,
Northern Illinois Univ., DeKalb. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-11440

STREAMFLOW MODELING OF UPPER INDUS RIVER CATCHMENTS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
For primary bibliographic entry see Field 2A.
W78-11881

A QUASI-LINEAR SPATIALLY DISTRIBUTED CELL MODEL FOR THE SURFACE RUNOFF SYSTEM,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-11882

FLOW GENERATION BY CATCHMENT MODELS OF DIFFERING COMPLEXITY - A COMPARISON OF PERFORMANCE,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
W. V. Pitman.
Journal of Hydrology, Vol 38, No 1/2, p 59-70, July 1978. 3 fig, 4 tab, 4 ref.

Descriptors: *Africa, *Watersheds(Basins), *Model studies, Mathematical models, Streamflow, Rainfall-runoff relationships, Hydrology, Water storage, Water yield, Monthly, Catchment models, Statistical tests.

Four deterministic rainfall-runoff models of differing degrees of complexity were tested with a data set derived from a comparatively well-instrumented catchment in South Africa. A comprehensive set of statistical tests on simulated monthly flows indicated that the simple models based on daily or monthly input performed quite as satisfactorily as the complex models which rely on hourly input. Therefore, it was concluded that models utilizing daily or even monthly input would be adequate in water resources studies where storage-yield determinations can be based on monthly data. (Lee-ISWS)
W78-11888

SEQUENTIAL GENERATION OF MONTHLY STREAMFLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. Srikanthan.
Journal of Hydrology, Vol 38, No 1/2, p 71-80, July 1978. 2 fig, 2 tab, 9 ref, 1 append.

Descriptors: *Streamflow, *Model studies, *Mathematical models, Flow, Monthly, Annual, Analytical techniques, Streams, Rivers, Data processing, Hydrology, Climatology.

A possible modification to the disaggregation scheme proposed by Valencia and Schaake to generate skewed monthly streamflows was suggested. The modified procedure was applied to two Australian streams, and the results were compared with those of the two-tier model of Harms and Campbell. It was concluded that either one of the methods can be used to generate streamflows sequentially. The advantage of using a two-tier model for a single site is that it is simple and can be applied to almost all streams. The disaggregation scheme does not preserve the skewness of the last month flow, and its use is limited in certain cases where the skewness of the random variables becomes very large. (Sims-ISWS)
W78-11889

COMPARISON OF EAST FRACTIONAL GAUSSIAN NOISE AND BROKEN LINE MODELS FOR GENERATING ANNUAL FLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-11890

FLOODS IN WESTERN NORTH CAROLINA, NOVEMBER 1977 - A LESSON FOR THE FUTURE,
North Carolina Water Resources Research Inst., Raleigh; Geological Survey, Raleigh. Water Resources Div.; and North Carolina Dept. of Natural Resources and Community Development, Raleigh.
J. M. Stewart, R. C. Heath, and J. N. Morris.
North Carolina Water Resources Research Institute of the University of North Carolina, 1978. 24 p, 4 fig, 1 tab.

Descriptors: *Floods, *Flood damage, *Peak discharge, *Flood data, *North Carolina, Yancey County, Ashe County, Sixteen-county area.

Floods on November 5 and 6, 1977, affected a 16-county area of about 9,000 square miles in the western part of North Carolina. The most serious flooding occurred in two areas totaling about 1,800 square miles; one centered on Yancey County and the other on Ashe County. Flood peaks in these areas were at or near record levels. Peaks in the remainder of the 7,200 square-mile area were well below the maximums of record. Thirteen lives were lost and damage exceeded 50 million dollars, making this one of the worst floods to hit North Carolina in terms of lives lost and property damage. This report describes the November flood and the damage it caused, compares the November flood to other large floods, and mentions the flood-related programs of Federal, State, and local agencies. (Woodard-USGS)
W78-11973

FLOOD PROFILES FOR CYPRESS CREEK, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11987

PROGRESS REPORT ON HYDROLOGIC INVESTIGATIONS OF SMALL DRAINAGE AREAS IN NEW HAMPSHIRE--PRELIMINARY RELATIONS FOR ESTIMATING PEAK DISCHARGES ON RURAL, UNREGULATED STREAMS,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-11988

EFFECTS OF FOREST AND AGRICULTURAL LAND USE ON FLOOD UNIT HYDROGRAPHS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
W. Sangvaree, and V. Yevjevich.
Hydrology Paper No 92, July 1977. 29 p, 19 fig, 31 tab, 31 ref, 3 append. OWRT A-002-COLO(21).

Descriptors: *Unit hydrographs, *Land use, *Forests, *Agricultural runoff, *Central US, *Southeast US, Agricultural watersheds, Watersheds(Basins), Storm runoff, Flood peak, Slopes, Rain, Regression analysis, Peak discharge, River basins, Hydrologic properties, Geomorphology, Flood hydrographs, Gamma function.

The effects of forest and agricultural land uses on flood unit hydrographs of small catchments was the subject of this paper. A total of 105 floods from small catchments was used in the study, of which 8 are predominantly forest and 14 predominantly agricultural land-use catchments, with areas ranging from 0.12 to 7.19 sq mi, situated in the eastern and central United States. Floods were caused by rainstorms of less than 6 hours duration. Derived unit hydrographs of flood events are affected by non-uniform distribution of rainfall. It was found that the same representative, unit hydrograph peak flow equation is applicable to both forest and agricultural land-use catchments.

The average rise time, T sub a, is mainly dependent on land use and catchment physiographic factors A (area), S sub H (slopes), H (total fall), F sub 1 and C sub f (percentage of forest cover). A concept of representative catchment, equal for all the studied river basins, was introduced to separate the effects of geometry from those of land use. For a given small catchment, the agricultural land use means a greater flood peak with a faster surface runoff, while the forest land use means a smaller flood peak with a surface runoff. (Visocky-ISWS)
W78-12011

2F. Groundwater

GROUNDWATER PROTECTION IN THE CHRISTINA BASIN,
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
For primary bibliographic entry see Field 4B.
W78-11315

HYDROLOGY AND GROUND WATER SUPPLY OF THE BOISE AREA,
Boise Center for Urban Research, ID.
For primary bibliographic entry see Field 4B.
W78-11444

MECHANISMS OF SUBSIDENCE DUE TO UNDERGROUND OPENINGS,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W78-11866

INDUCED AND NATURAL SINKHOLES IN ALABAMA CONTINUING PROBLEM ALONG HIGHWAY CORRIDORS,
Geological Survey, Tuscaloosa, Al., Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-11867

SUBSIDENCE CONTROL FOR STRUCTURES ABOVE ABANDONED COAL MINES,
GAI Consultants, Inc., Monroeville, PA.
For primary bibliographic entry see Field 4B.
W78-11868

GROUND SUBSIDENCE ASSOCIATED WITH DEWATERING OF A DEPRESSED HIGHWAY SECTION,
California Dept. of Transportation, Sacramento. Office of Transportation Lab.
For primary bibliographic entry see Field 4B.
W78-11869

GEOLOGIC INDICATORS OF CATASTROPHIC COLLAPSE IN KARST TERRAIN IN MISSOURI,
Missouri Dept. of Natural Resources, Rolla. Div. of Geology and Land Survey.
J. H. Williams, and J. D. Vineyard.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 31-37, 1976. 4 fig, 31 ref.

Descriptors: *Geologic formations, *Karst, *Collapse, *Missouri, Reviews, Subsidence, Land subsidence, Sinks, Carbonate rocks, Geology, Bedrock, Weathering, Limestones, Surveys, Indicators, Geologic indicators.

Althought the records of 97 catastrophic collapses in Missour karst terrain have emphasized such man-made causes as dewatering, vibration, or water saturation, there is an underlying commonality of geologic features that offers insight into ways to avoid collapse problems in highway and other construction. Collapse events are more likely to occur in areas overlain by moderately thick residual soil, in losing valleys, and in wet seasons. Significant collapses have occurred where there was no indication of sinkholes or other typical karst landforms. Of the numerous collapses related to highway construction, most have involved upward stopping of residum from underlying cavernous channels in carbonate bedrock, and have been triggered byconstructional or operational activities that altered drainage conditions. Exploration for incipient collapses is costly and more effective in limited areas. Analysis of geologic indicators such as losing steams, relict karst landforms, and residuum type and thickness, as well as speleological data offer more cost-effective techniques to define target locales for subsequent detailed exploration. Initial exploration with a backhoe generally gives more useful near-surface data than drilling. Drilling is necessary, however to validate evidence inferred by surface geologic indicators and geophysical methods such as fixed-depth resistivity and high-precision gravity surveys. (See also W78-11865) (Humpreys-ISWS).
W78-11870

SUBSURFACE CAVITY DETECTION: FIELD EVALUATION OF RADAR, GRAVITY, AND EARTH RESISTIVITY METHODS,
Southwest Research Inst., San Antonio, TX.
For primary bibliographic entry see Field 7B.
W78-11871

MATHEMATICAL MODEL FOR PREDICTING MOISTURE MOVEMENT IN PAVEMENT SYSTEMS,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-11872

UNSATURATED TRANSIENT AND STEADY-STATE FLOW OF MOISTURE IN SUBGRADE SOIL,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-11873

EFFECT OF THE INERTIA TERM IN ONE-DIMENSIONAL FLUID FLOW IN DEFORMABLE POROUS MEDIA,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak, and M. R. Madhav.
Journal of Hydrology, Vol 38, No 1/2, p 139-146, July 1978. 3 fig, 7 ref.

Descriptors: *Groundwater movement, *Porous media, *Model studies, Mathematical models, Unsteady flow, Steady flow, Darcy's law, Pore pressure, Groundwater, Hydralic conductivity, Equations, Mathematics, Hydrology.

An analytical investigation to study the effect of inertial forces on the one-dimensional fluid flow in deformable porous media caused by a sudden increase in external stress was presented. The solutions showed that the presence of an inertial force leads to higher excess piezometric pressure and a slower subsidence rate in the early stages. However, in terms of magnitude, the effect seems to be insignificant. (Sims-ISWS)
W78-11892

ANALYTICAL SOLUTIONS FOR TWO-REGIME WELL FLOW PROBLEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak.
Journal of Hydrology, Vol 38, No 1/2, p 147-159, July 1978. 6 fig, 1 tab, 27 ref.

Descriptors: *Mathematical models, *Equations, *Aquifers, *Water wells, *Penetration, Darcys law, Steady flow, Reynolds number, Velocity, Energy gradient, Particle size, Artesian heads, Two-regime flow, Non-Darcy flow, Partial penetration.

Steady-state analytical solutions to the problems of fully penetrating and nonpenetrating wells, incorporating the concept of the existence of a non-Darcy flow regime around the well and a Darcian flow regime away from the well, were presented. For these problems, the exact distances to which the non-Darcy flow extends were quantified. The consequences of neglecting non-Darcy flow regime around the well in the estimation of piezometric heads and discharge (or flux) were made clear and discussed. (Visocky-ISWS)
W78-11893

FLOW AGAINST DISPERSION IN ADSORBING POROUS MEDIA,
California Univ., Davis. Dept. of Land, Air and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
M. A. Marino.
Journal of Hydrology, Vol 38, No 1/2, p 197-205, July 1978. 18 ref, 1 append. CSRS CA-D*-WSE-3081-H, CA-D*-WSE-3461-H.

Descriptors: *Mathematical models, *Porous media, *Adsorption, *Groundwater movement, Aquifers, Dispersion, Solutes, Equations, Mass transfer, Model studies, Concentrations, One-dimensional flow.

A mathematical analysis was presented of simultaneous dispersion and adsorption of a solute within finite porous media with flow and dispersion in opposite directions. The dispersion systems are adsorbing the solute at rates proportional to their concentration. The flow is assumed to be one-dimensional in a horizontal direction. Concentrations varying as exponential functions of time are enforced at the source of the dispersion, while a condition in which the change in concentration is proportional to the flow is applied at the other boundary. Different forms for the solutions were given to facilitate the computation of particular values. The solutions are useful for quantitatively predicting the possible control of spreading of poor quality water by freshwater flow. (Visocky-ISWS)
W78-11894

HYDRAULIC CONDUCTIVITY OF ROCKFILL,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
J. A. McCorquodale, and A. A. A. Hannoura.
Journal of Hydraulic Research, Vol 16, No 2, p 123-137, 1978. 8 fig, 2 tab, 27 ref.

Descriptors: *Hydraulic conductivity, *Rock fill, *Equations, Gravels, Permeameters, Reynolds number, Darcys law, Hydraulic radius, Hydraulics, Mathematical studies, *Non-Darcy flows, River gravels, Darcy friction factor.

Dimensionless equations for the hydraulic conductivity of crushed rock and river gravel were developed on the basis of approximately 1,250 permeameter tests. Experimental data of a number of researchers were used in the correlations. Grain sizes varied from 0.55 to 0.79 mm, and pore Reynolds numbers were in the range of 0.001 to 20,000. The data were divided into two flow regimes, and separate equations were proposed for each regime. Surface roughness was incorporated in the equations for high Reynolds number regime. The correlations also account for the wall effect. (Lee-ISWS)
W78-11896

POROUS MEDIUM DEFORMATION IN MULTIPHASE FLOW,
Princeton Univ., NJ. Dept. of Civil Engineering.
J. Bear, and G. F. Pinder.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol 104, No EM4, Proceedings Paper 13926, p 881-894, August 1978. 1 fig, 1 tab, 13 ref. NSF-ENG 75-16072,ERDA W-7405-ENG.48.

Descriptors: *Consolidation, *Deformation, *Porous media, Fluid mechanics, Elasticity(Mechanical), Subsidence, Mathematical models, Equations, Surface tension, Two-phase flow, Displacement.

The deformation of a porous medium occupied by more than one fluid phase can be described using classical point equations integrated over the porous medium. The resulting system of governing equations was expressed in terms of macrascopic variables that have precise mathematical and physical definitions. It was found that the momentum balance for the entire porous medium contains terms involving surface tension that have heretofore been neglected. (Visocky-ISWS)
W78-11897

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WILLCOX AREA, COCHISE AND GRAHAM COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11967

MAPS SHOWING GROUND-WATER CONDITIONS IN THE YUMA AREA, YUMA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11968

MAPS SHOWING GROUND-WATER CONDITIONS IN THE EASTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA AND PINAL COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11969

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WESTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA COUNTY, ARIZONA--1977,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11970

AVAILABILITY OF GROUND WATER IN THE PISCATAQUA AND OTHER COASTAL RIVER BASINS, SOUTHEASTERN NEW HAMPSHIRE,
Geological Survey, Concord, NH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11971

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
R. P. Novitski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 118, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-48, June 1978. 25 p, 7 fig, 3 tab, 14 ref.

Descriptors: *Wetlands, *Hydrologic budget, *Water quality, *Sedimentation, Inflow, Discharge(Water), Evapotranspiration, Groundwater movement, Precipitation(Atmospheric), Phosphorus, Nitrogen, *Wisconsin, *Nevin wetland(Wisc).

The Nevin wetland near Madison, Wis., is an area of ground-water discharge. Ground water enters the wetland as springflow and as leakage upward through the organic wetland soils. The average annual water budget was based on the 3 years 1974 through 1976. Inflow was composed of direct precipitation (7 percent), surface-water inflow (4 percent), and ground-water inflow (89 percent). Outflow from the wetland was composed of streamflow (92 percent) and evapotranspiration (8 percent). Some ground water flowed beneath the wetland but did not discharge within the study area. Ground-water inflow contained 95 percent of the nitrogen that entered the wetland, precipitation contained 2 percent, and surface-water inflow contained 3 percent. Sixty-six percent of the phosphorus input was from ground water, 31 percent from surface water, and 3 percent from precipitation. The wetland retained 21 percent of the nitrogen and 7 percent of the phosphorus that entered. It also retained 80 percent of the sediment that entered. (Woodard-USGS)
W78-11972

GROUND WATER-SURFACE WATER RELATIONS IN THE SILVER CREEK AREA, BLAINE COUNTY, IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-11978

GROUND-WATER STORAGE IN THE JOHNSON VALLEY AREA, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-11984

APPRAISAL OF SHALLOW GROUND-WATER RESOURCES AND MANAGEMENT ALTERNATIVES IN THE UPPER PEACE AND EASTERN ALAFIA RIVER BASINS, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-11985

GEOHYDROLOGIC DATA FROM THE JEMEZ MOUNTAINS AND VICINITY, NORTH-CENTRAL NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11986

2G. Water In Soils

FATE OF TRACE ELEMENTS IN SEWAGE SLUDGE-AMENDED SOILS,
Dayton Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-11363

SNOWMELT-FROZEN SOIL CHARACTERISTICS FOR A SUBARCTIC SETTING,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2C.
W78-11377

HYDRAULIC CONDUCTIVITY OF SOILS: UNIFIED APPROACH TO THE STATISTICAL MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Y. Mualem, and G. Dagan.
Soil Science Society of America Journal, Vol 42, No 3, p 392-395, May-June 1978. 12 ref. NSF ENG-7611542.

Descriptors: *Hydraulic conductivity, *Soils, *Statistical models, Unsaturated flow, Porous media, Soil moisture, Pore pressure, Equations, Mathematical models, Darcy's law, Tortuosity, Relative permeability.

Conceptual theory of the hydraulic conductivity of unsaturated porous media was presented. This analysis permits the systematic derivation of the models of E.C. Childs and N. Collis George, M.R.J. Wyllie and G.H.F. Gardner, and Y. Mualem, as well as other existing and new versions, from common statistical principles. The resulting formulas of unsaturated hydraulic conductivity can be classified into three categories: (1) universal formulas independent of the soil type which result from extremely simplifying assumption; (2) formulas with one type which result from extremely simplifying assumptions; (2) formulas the one degree of freedom, and (3) formulas with two degrees of freedom. The latter two types of equations result from accounting for the correlation between pores and the tortuosity of flow path. These formulas can be adjusted to soil type to represent better the variability of soil properties and to increase the accuracy of the predicted hydraulic conductivity. However, in this stage it is a potential advantage only. Empirical study should be followed in order to derive the optimal methods of estimating the unknown parameters. (Visocky-ISWS)
W78-11420

AN IMPROVED SOIL-SAMPLING PROCEDURE FOR THE PREDICTION OF DISSOLVED INORGANIC PHOSPHATE CONCENTRATIONS IN SURFACE RUNOFF FROM PASTURE,
Massey Univ., Palmerston North (New Zealand). Agricultural and Horticultural Sciences.
For primary bibliographic entry see Field 5A.
W78-11432

DAMS ON PERMAFROST,
For primary bibliographic entry see Field 8D.
W78-11435

APPROXIMATE METHOD OF CALCULATING THE TEMPERATURE STEADY STATE OF WATER-PERMEABLE DAMS,
For primary bibliographic entry see Field 8D.
W78-11436

METHOD FOR THE STUDY OF INFILTRATION UNDER FIELD CONDITIONS: FIRST RESULTS,
A. Feodoroff.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 278, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 649, October 1977. 18 p, 8 fig, 1 tab, 12 ref. Translation of Communication at the International Symposium on Erosion, Prague (Czechoslovakia), p 19-29, June 1970.

Descriptors: *Infiltration, *Soil moisture, *Drainage, On-site investigations, Model studies, Measurement, Rainfall, Precipitation(Atmospheric), Tensiometers, Pressure, Soil water, Percolation, Soils, Soil science.

The method consistes of estimating the penetration of rainwater by the reaction of tensiometers located at different depths. The method permits

calculating the rates of infiltration and of drainage (or of redistribution) as well as the extent of saturation of the soil by the feedwater. At a second stage, these results can be related to the characteristics of the soil (porosity), initial moisture content, water deficit) and to the rainfall intensity. (Sims-ISWS)
W78-11437

SOIL MOISTURE TRANSPORT DURING THE 1974-1975 AND 1975-1976 WATER YEARS,
Atlantic Richfield Hanford Co., Richland, WA.
G. V. Last, P. G. Easley, and D. J. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as ARH-ST-146, Price codes: A08 in paper copy, A01 in microfiche. Report ARH-ST-146, December 1976. 150 p, 77 fig, 39 tab, 7 ref, 3 append. ERDA EY-76-C-06-2130.

Descriptors: *Soil moisture, *Soil water movement, *Percolation, *Washington, Lysimeters, Soil moisture meters, Nuclear moisture meters, Infiltration, Evaporation, Seasonal, Wetting, Soil water, Data collections, Climatology, Soil science.

The rate and direction of soil moisture movement in Hanford sediments were determined for the 1974-1975 and 1975-1976 water years. The data for these determinations were obtained from 2 large lysimeters located on the 200 Area plateau near the center of the Hanford reservation. During the 1974-75 water year, meteoric moisture percolated to a depth of 2.5 m with a peak moisture content of 10.5 volume-percent. This percolation envelope was eliminated by evaporation during the hot dry summer of 1975. The 1975-76 water year had only 70% of the normal precipitation, thus the percolation envelope was small and penetrated to a depth of only 2 m. However, in spite of this shallow depth and low volume of moisture, the percolation envelope was not eliminated by the end of the water year because of lower seasonal temperatures and higher humidity during the drying season. Moisture content of sediments in the 4-18 m depth showed no relative change throughout the 2 water years, and no moisture accumulated at the bottom of the lysimeters, which indicates that there is no deep percolation of meteoric moisture at this site and no recharge to the groundwater. (Sims-ISWS)
W78-11447

CALIBRATION OF SELECTED INFILTRATION EQUATIONS FOR THE GEORGIA COASTAL PLAIN,
Agricultural Research Service, Beltsville, MD. Plant Physiology Inst.
W. Rawls, P. Yates, and L. Asmussen.
Report ARS-S-113, July 1976. 110 p, 2 fig, 8 tab, 25 ref, 1 append.

Descriptors: *Infiltration, *Coastal Plain, *Georgia, Calibrations, Soils, Infiltration rates, Soil moisture, Soil profiles, Moisture tension, Rainfall, Equations, *Infiltration equations, *Georgia Coastal Plain.

Experimental infiltration data were obtained for 11 Coastal Plain soils. A total of 77 infiltration runs were made. Initial soil-moisture measurements, detailed soil-profile descriptions, and moisture-tension measurements also were made. The final infiltration rates ranged between 0.12 in/h and 4.61 in/h (0.30-11.71 cm/h) for all soils except Kershaw. At a rainfall application rate of 6.25 in/h (15.88 cm/h), all water continued to infiltrate on Kershaw soils. The data were fit to equations proposed by Horton, Green and Ampt, Phillip, Holtan, and Snyder. Adequate determinations of infiltration rates were obtained with each of the five equations tested, but the best representations of the infiltration-capacity curves were obtained from Horton's and Snyder's equations. Green and Ampt's, Phillip's, and Holton's equations consistently overestimated the early portion of the infiltration-capacity curve and underestimated the later portion. The wide variation in equation parameters between applications in situations in which similar initial conditions existed on the same soil was caused by experimental error rather than by the fit of the equations to the data. The results of fittings could be used as a guide for applying the equations in the Coastal Plain. (Roberts-ISWS)
W78-11449

THE EFFECT OF WASTE WATER REUSE IN COLD REGIONS ON LAND TREATMENT SYSTEMS,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 5D.
W78-11787

POLIOVIRUS REMOVAL FROM PRIMARY AND SECONDARY SEWAGE EFFLUENT BY SOIL FILTRATION,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5D.
W78-11789

SUBSIDENCE OVER MINES AND CAVERNS, MOISTURE AND FROST ACTIONS, AND CLASSIFICATION.
For primary bibliographic entry see Field 4B.
W78-11865

MATHEMATICAL MODEL FOR PREDICTING MOISTURE MOVEMENT IN PAVEMENT SYSTEMS,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
B. J. Dempsey, and A. Elzeftawy.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 48-55, 1976. 9 fig, 32 ref.

Descriptors: *Moisture content, *Mathematical models, *Porous media, *Paving, Flow ates, Soil water movement, Model studies, Darcys law, Flow, Hydraulic conductivity, Theoretical analysis, Analytical techniques, Equations, Laboratory tests.

Reported herein was the development of a comprehensive moisture model for predicting moisture conditions in pavement systems, based on the Philip and de Vries equations for nonisothermal moisture movement and heat conduction. By using numerical methods, the implicit finite difference approximations to the moisture movement and heat-transfer equations were programmed for computer solution. Validation studies indicated that the moisture model could be used to predict accurately isothermal moisture conditions in pavement systems. The model also used to show the relative influence of nonisothermal conditions on pavement moisture content. The model was applicable to a wide range of boundary conditions and could be used with climatic input data to predict the moisture-temperature regime in pavement systems. (See also W78-11865) (Humphreys-ISWS).
W78-11872

UNSATURATED TRANSIENT AND STEADY-STATE FLOW OF MOISTURE IN SUBGRADE SOIL,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
A. Elzeftawy, and B. J. Dempsey.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington D.C., p 56-61, 1976. 7 fig, 25 ref.

Descriptors: *Moisture content, *Soil water, *Unsaturated flow, *Laboratory tests, Mathematical models, Analysis, Hydraulic conductivity, Diffusivity, Measurement, Instrumentation, Data collections, Steady flow, Subgrade soil.

A general procedure for determining the soil-water properties necessary for predicting moisture movement in subgrade soils was described. A gamma-ray transmission method was used for the nondestructive measurement of the water content and a tensiometer-pressure transducer arrangement of measure the soil-water pressure (suction); the unsaturated hydraulic conductivity, diffusivity, and soil-water characteristics functions were evaluated of AASHO A-4 subgrade soil. The soil was compacted in a column at uniform density and moisture content and tested under isothermal conditions. A water table was established at the bottom of the soil column, and the transport of water through the subgrade soil was studied. The mathematical procedures for determining the soil-water properties from the laboratory data were described, and the use of the experimentally determined hyraulic conductivity, soilwater diffusivity, and soil-water characteristics functions in the prediction of moisture changes in an AASHO A-4 soil was demonstrated. The experimentally evaluated soil-moisture parameters are necessary for the prediction of moisture content and its movement in subgrade soil. (See also W78-11865) (Humphreys-ISWS)
W78-11873

PORE STRUCTURE OF SELECTED HAWAIIAN SOILS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State. Univ., Ames. Engineering Research Inst.
R. A. Lohnes, E. R. Tuncer, and T. Demirel.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions; and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C. p 76-79, 1976. 4 fig, 2 tab, 28 ref.

Descriptors: *Soils, *Soil physical properties, *Hawaii, *Pores, Laboratory tests, Porous media, Porosity, Soil types, Sands, Silts, Clays, Plasticity index, Liquid limits, Specific gravity, Size, Distribution, Testing procedures.

Many studies have emaphasized that the structure of fabric of deeply weathered tropical soils has important influences on their engineering behavior. This study attempted to characterize the structure of five soils from the island of Oahu, Hawaii, by mercury injection porosimetry. All the soils were derived from basalt, but each had weathered under a different mean annual rainfall. A comparison of air-dried, oven-dried, and freeze-dried samples showed that the method of during has little effect on the pore size distribution. The results of the comparison were interpreted as evidence that the structure of these soils is more stable than that of soils in which the main bonding material is clay. From 89 to 72% of the voids in these soils fall within a size range greater than 0.004 micrometer. Although the void ratio variations between these soils do not show any systematic trends, the pore size distributions do. The soils that had developed under wetter climates have higher pecentages of pores smaller than 2 micrometer in diameter and a more uniform pore size distribution. The pore size distributions can be related to the mineral and chemical contents of the soils in that soils weathered in wetter environments are higher in sesquioxide content and lower in kaolinite content. (See also W78-11865)(Humphreys-ISWS)
W78-11876

THE DEPENDENT DOMAIN THEORY APPLIED TO SCANNING CURVES OF ANY ORDER IN HYSTERETIC SOIL WATER RELATIONSHIPS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.

A. Poulovassilis, and W. M. El-Ghamry.
Soil Science, Vol. 126, No. 1, p 1-8, July 1978. 9 fig, 13 ref.

Descriptors: *Soil water, *Hysteresis, *Model studies, Mathematical models, Wetting, Drying, Moisture content, Pressure, Pore pressure, Soils, Theoretical analysis, Soil science, Dependent domain theory.

The dependent domain theory was extended to cover scanning curves of any order in the hystertic relationship between soil water content, theta, and presure, P. It was argued that if the distribution function, F, for thedomains depends on the most recent reversal value of P, than F depends also on all the previous reversal values. Experimental primary scaning curves and scanning curves of the first, second, and third orders of the relationship between theta and P for a sand were presented, and the hysteretic behavior of this experimental relationship was compared with that predicted by the dependent domain theory. (Sims-ISWS)
W78-11879

A SIMPLE METHOD TO STUDY PESTICIDE SORPTION IN SOILS AT SHORT TIME INTERVALS,
Central Rice Research Inst., Cuttack (India). Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5B.
W78-11880

HYDRAULIC CONDUCTIVITY OF ROCKFILL,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-11896

MICRO-RELIEF SURFACE DEPRESSION STORAGE: CHANGES DURING RAINFALL EVENTS AND THEIR APPLICATION TO RAINFALL-RUNOFF MODELS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-11934

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-11972

LINEAR AND NONLINEAR MODELS OF INFILTRATION FROM A POINT SOURCE,
Arizona Water Resources Research Center, Tucson.
J. Ben-Asher, D. O. Lomen, and A. W. Warrick.
Soil Science Society of America Journal, Vol 42, No 1, p 3-6, January-February 1978. 6 fig, 11 ref. OWRT B-045-ARIZ(7).

Descriptors: *Infiltration, *Irrigation, *Soil water movement, *Model studies, Mathematical models, Analytical techniques, Equations, Soils, Soil water, Soil types, Diffusion, Hydraulic conductivity, Moisture content, Wetting, Drying, Soil science, Trickle irrigation, Matric flux potential.

Numerical and analytical solutions for water flow from a point source were compared. The numerical solution was for the nonlinear moisture flow equation, and the analytical solution was for the corresponding linearized form. For cyclic conditions, results were approximately the same with regard to range in values between the wettest and driest values. However, the numerical results showed a faster response both for wetting and drying. Computational times required of the analytical solution were of the order of 1/20 to 1/200th of that required for the finite difference solutions. (Sims-ISWS)
W78-12012

EFFECTS OF SOIL MOISTURE ON THE DIFFUSION COEFFICIENTS AND ACTIVATION ENERGIES OF TRITIATED WATER, CHLORIDE, AND METRIBUZIN,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
H. D. Scott, and R. F. Paetzold.
Soil Science Society of America Journal, Vol 42, No 1, p 23-27, January-February 1978. 3 fig, 2 tab, 25 ref. OWRT A-021-ARK(2).

Descriptors: *Diffusion, *Soil moisture, *Solutes, Laboratory tests, Moisture content, Soils, Soil horizons, Adsorption, Radioisotopes, Tritium, Chlorides, Herbicides, Soil temperature, Soil water, Soil water movement, Soil science, Metribuzin, Tortuosity.

Diffusion coefficients of tritiated water, chloride, and metribuzin were determined in Captina silt loam as functions of soil water content and soil temperature. Tritiated water and metribuzin were found to diffuse in both liquid and vapor phases, whereas chloride diffusion was restricted to the solution phase. For a given soil water content, values of the diffusion coefficients were larger in soil samples from the Ap horizon than in those from the B2t horizon for tritiated water and chloride. This was attributed to the greater tortuosity in the B2t horizon. Metribuzin had similar diffusion coefficients in both horizons, apparently reflecting offsetting effects due to the greater adsorption by the Ap and greater tortuosity in the B2t. Thermodynamic studies indicated that the energy requirement for diffusion of these solutes was inversely related to soil moisture content for tritiated water and metribuzin. Activation energies for chloride diffusion were lower than for other solutes at equal soil water contents. (Sims-ISWS)
W78-12013

PROGRAM AND ABSTRACTS: SYMPOSIUM ON NONBIOLOGICAL TRANSPORT AND TRANSFORMATION OF POLLUTANTS ON LAND AND IN WATER.
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-12015

VERTICAL MOVEMENT AND DISTRIBUTION OF ORGANICS IN SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W78-12018

CHEMICAL DEGRADATION OF ORGANIC POLLUTANTS IN SOIL,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5B.
W78-12021

PHOTOLYSIS OF PESTICIDES ON SOIL SURFACES,
Georgia Univ., Savannah. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-12023

OXIDATION AND REDUCTION OF PESTICIDES IN SOILS AND SEDIMENTS,
Department of Agriculture Beltsville, MD.
For primary bibliographic entry see Field 5C.
W78-12032

ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12090

2H. Lakes

CHARACTERIZATION OF NUTRIENTS AND ALGAL BLOOMS AT ABIQUIU AND COCHITI RESERVOIRS,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11367

MODELING PHOSPHORUS CYCLING IN LAKE SEBASTICOOK NEWPORT, MAINE,
Maine Univ. at Orono. Dept. of Mathematics.
For primary bibliographic entry see Field 5C.
W78-11368

DETERMINATION OF THE SECONDARY PRODUCTION AND POPULATION DYNAMICS OF THE ZOOPLANKTON OF THE LAKE CHAMPLAIN ECOSYSTEM,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11376

MIXING PROCESSES IN LAKES,
Technical Univ. of Denmark, Copenhagen (Denmark). Inst. of Hydrodynamics and Hydraulic Engineering.
N. E. Ottesen Hansen.
Nordic Hydrology, Vol 9, No 2, p 57-74, 1978. 11 fig, 1 tab, 24 ref.

Descriptors: *Lakes, *Mixing, *Turbulence, Diffusion, Model studies, Dispersion, Stratification, Entrainment, Winds, Water circulation, Model studies, Mathematical models, On-site investigations, Tracers, Foreign research, Limnology, *Sweden.

A review of the available methods for analyzing turbulent mixing in lakes was presented. The different types of flow were classified, and their turbulence characteristics were described. The diffusion caused by turbulence was examined with the conclusion that no reliable analytical description is available for the moment; so for technical purposes, field surveys were recommended. Entrainment processes in stratified lakes were analyzed by considering the turbulent energy exchange, and analytical expressions for common types of flow were presented. Finally, windrows, their origin and their effect on the mixing, were described. (Sims-ISWS)
W78-11424

WIND INDUCED CIRCULATION IN LAKES,
Lulea Univ. (Sweden). Div. of Water Resources Engineering.
L. Bengtsson.
Nordic Hydrology, Vol 9, No 2, p 75-94, 1978. 8 fig, 26 ref.

Descriptors: *Lakes, *Winds, *Water circulation, Model studies, Mathematical models, Mixing, Turbulence, Stratification, Currents(Water), Seiches, Water temperature, Thermocline, Foreign research, Limnology, *Sweden.

In most lakes the wind is the most important flow generating mechanism. In this paper, the problem of wind generated circulation - directly wind induced currents and seiches - in small lakes was reviewed. Many field observations were presented and discussed. In the thermocline and the hypolimnion, forced seiche currents were shown to dominate the directly induced wind currents. Different kinds of non-convective mathematical lake models were discussed and applied to different small lakes. Comparisons of observed and calculated current showed that lake models can be used to reproduce the currents of the upper 3-4 metres in a lake. The interaction between large-scale flow and turbulent flow is yet unknown; and therefore,

it is not possible to explain the physical current pattern and density anomalies at greater depth. In respect to the limited knowledge on turbulent processes in lakes, it is acceptable to apply a quadric relationship between wind stress and wind speed with a drag coefficient of about 0.001. (Sims-ISWS)
W78-11425

A ONE-DIMENSIONAL NUMERICAL MODEL FOR TEMPERATURE STUDIES IN LAKES,
Trondheim Univ. (Norway). Vassdrags- og Havnelaboratoriet.
A. Thendrup.
Nordic Hydrology, Vol 9, No 2, p 92-104, 1978. 9 fig, 10 ref.

Descriptors: *Lakes, *Water temperature, *Model studies, Mathematical models, Temperature, Winds, Mixing, Diffusion, Convection, Heat transfer, River flow, Inflow, Discharge(Water), Seasonal, Foreign research, Foreign countries, Limnology, *Norway.

Most hydroelectric schemes change the seasonal variation of river discharge. As a result, the temperature in lakes downstream of a hydroelectric plant will be changed. The numerical model described in this paper was developed to calculate the change in the vertical temperature distribution. The model was applied to two Norwegian lakes. (Sims-ISWS)
W78-11426

EXAMINATION OF THE SUMMER STRATIFICATION,
Lund Univ. (Sweden).
U. Svensson.
Nordic Hydrology, Vol 9, No 2, p 105-120, 1978. 6 fig, 15 ref, 1 append.

Descriptors: *Stratification, *Lakes, *Summer, *Model studies, Mathematical models, Temperature, Water temperature, Thermocline, Mixing, Thermal stratification, Heat, Foreign countries, Foreign research, Solar radiation, Lake morphometry, Limnology, *Sweden, *Lake Velen(Sweden).

The seasonal stratification in lakes was examined by a Qualitative evaluation of important physical processes and with the aid of a mathematical model. From the description of the physical processes, it was realized that the observed vertical temperature distribution is the synthesis of a number of complicated and inter-dependent phenomena. The mathematical model was employed for a quantitative estimate of the importance of lake morphometry and transparency. It was found that the vertical variation of horizontal area and variations in transparency strongly influence the thermal structure of a lake. Measurements of the temperature distribution in Lake Velen were compared to predictions obtained by the mathematical model. The agreement was found to be satisfactory, and it was concluded that the mathematical model provides a realistic way of studying and predicting the summer stratification. (Sims-ISWS)
W78-11427

ESTIMATING LAKE EVAPORATION WITH FLOATING EVAPORIMETERS AND WITH WATER BUDGET,
National Water Board of Finland, Helsinki. Hydrological Office.
For primary bibliographic entry see Field 2D.
W78-11428

EUTROPHICATION MODELS FOR LAKES,
Vandkvalitetsinstitut, Hoersholm (Denmark).
For primary bibliographic entry see Field 5C.
W78-11429

WINTER CURRENTS IN LAKE HURON,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
J. H. Saylor, and G. S. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 847, Price codes: A04 in paper copy, A01 in microfiche. NOAA Technical Memorandum ERL GLERL-15, EPA-905/4-75-004, December 1976. 117 p, 87 fig, 21 ref, 2 append.

Descriptors: *Currents(Water), *Winter, *Lake Huron, Current meters, Temperature, Circulation, Water temperature, Epilimnion, Winds, Gradients(Streams), Cycles, *Winter currents, Moorings, Grid, Lake-scale circulation, Cyclonic flow, Winter circulation, Geostrophic balance, Annual cycles.

Twenty-one current meter moorings were deployed in Lake Huron during winter 1974-75. The moorings were set in November 1974 and retrieved approximately 6 months later. The stations were configured on a coarse grid to measure the lake-scale circulation during winter. Water temperature also was recorded in nearly all of the 65 current meters deployed. Results revealed a strong cyclonic flow pattern in the Lake Huron Basin persisting throughout the winter. The observed winter circulation is very similar to what is now believed to be the summer circulation of epilimnion water, although the winter currents penetrate to deeper levels in the water column and are more intense. Winter cyclonic flow persists in a nearly homogeneous water mass, while summer currents exhibit an almost geostrophic balance with observed water density distributions. This suggests that the current field driven by prevailing wind streses across the lake's water surfce may have been largely responsible for establishing the horizontal gradients of water density observed in the lake during summer. The effects of ice cover were examined, and the distribution and movement of the ice cover with respect to lake current and temperature fields were discussed. (Roberts-ISWS)
W78-11445

LAKE ONTARIO ATLAS: INTERNAL WAVES,
New York Sea Grant Inst., Albany.
D. Landsberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 177, Price codes: A05 in paper copy, A01 in microfiche. Report NYSSGP-OA-77-011, 1977. 83 p, 32 fig, 4 tab, 50 ref.

Descriptors: *Internal waves, *Lake Ontario, *Thermocline, Temperature, Water temperature, Lakes, Winds, Stability, Coriolis force, Seiches, Mixing, Energy transfer, Limnology.

The long internal waves in the offshore zone of Lake Ontario consist of Poincare waves, one for each mode of motion, which stand across the lake and either stand or vary exponentially along it. The wavelengths of these waves are proportional to the basin width. The periods approach but never exceed the inertial period, and the lower mode oscillations travel faster and decay more slowly than the higher mode oscillations. The first and third modes are the most commonly observed in Lake Ontario, but the periods of all modes are so close together that they are difficult to separate and form an interference pattern. In the nearshore zone, the internal waves consist of 2 oppositely rotating internal Kelvin waves and quasi--geostrophic waves (formed from combinations of Poincare waves which satisfy the nearshore boundary conditions) of near inertial period and wavelength which depends on the internal Rossby radius of deformation. The sloping bottom in the nearshore zone causes the period of the internal Kelvin waves to be about 30 days, and the currents associated with these waves can be considered steady. However, when the internal rossby radius of deformation equals and then exceeds the effective shelf width, resonance occurs between the quasi-geostrophic-waves and the internal Kelvin waves, and the latter rotates with a perid of 12 to 16 days. This is believed to cause the observed cyclonic resultant transport in Lake Ontario in summer in the nearshore zone. (Sims-ISWS)
W78-11448

THE PHOSPHORUS STATUS OF EUTROPHIC LAKE SEDIMENTS AS RELATED TO CHANGES IN LIMNOLOGICAL CONDITIONS-PHOSPHORUS MINERAL COMPONENTS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-11509

MERCURY AND CHLORINATED HYDROCARBONS IN PLANKTON OF LAKE PAIJANNE, FINLAND,
Jyvaskyla Univ. (Finland). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-11526

EFFICACY OF COPPER SULPHATE IN THE SUPRESSION OF APHANIZOMENON FLOS-AQUE BLOOMS IN PRAIRIE LAKES,
Fisheries and Marine, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5G.
W78-11527

SURVEY OF THE SELENIUM CONTENT IN THE AQUATIC BIOTA OF WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-11529

PHYTOPLANKTON OF AN INSHORE AREA OF GEORGIAN BAY, LAKE HURON, PRIOR TO REDUCTIONS IN PHOSPHORUS LOADING,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5C.
W78-11530

DECLINES IN THE NEAR-SHORE PHYTOPLANKTON OF LAKE ERIE'S WESTERN BASIN SINCE 1971,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5C.
W78-11531

STUDIES OF THE LAKE WINGRA WATERSHED: AN INTERIM REPORT,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-11532

THE LITTORAL AND PROFUNDAL BENTHIC NEMATODES OF LAKES WITH DIFFERENT TROPHY,
Warsaw Univ. (Poland). Zoological Inst. and Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W78-11533

NUTRIENTS AND PRODUCTIVITY AS INDICATORS OF THERMAL EFFLUENT UPWELLING INTERACTIONS IN LAKE MICHIGAN,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5B.
W78-11537

THE EFFECTS OF SIMAZINE ON THE MOLLUSCAN FAUNA OF MORIANE LAKE, NEW YORK,
State Univ. of New York Coll. at Oneonta. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11539

NITROGEN TRANSFORMATIONS WITHIN THE TROPHOGENIC ZONE OF LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-11545

SIX POLLUTED LAKES: A PRELIMINARY EVALUATION OF THE TREATMENT AND RECOVERY PROCESSES,
Uppsala Univ. (Sweden). Algal Assay Lab.
For primary bibliographic entry see Field 5G.
W78-11549

ESTIMATION OF TOXICITY USING CULTURED MAMMALIAN CELLS OF THE ORGANIC POLLUTANTS RECOVERED FROM LAKE BIWA,
Kyoto Inst. of Public Health (Japan).
For primary bibliographic entry see Field 5C.
W78-11566

HYDROLOGIC INVENTORY AND EVALUATION OF NEVADA PLAYAS,
Nevada System Univ., Reno. Desert Research Inst.
R. L. Bateman, and J. W. Hess.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 327, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center, Project Report No. 49, January 1978. 52p, append. OWRT A-070-NEV(1).

Descriptors: *Playas, Hydrologic data, Hydrologic data(Playas), Groundwater discharge(Playas), Water quality, Conductivity, Surveys, *Nevada(Playas).

One hundred and fifteen major playas greater than 0.25 sq/mi in area have been indentified and catalogued in Nevada. They are located throughout the state in areas of internal drainage. The average playa size is 18 sq./mi, with the largest being approximately 450 sq. mi in area. Sixty-eight (59%) of the playas actively discharge groundwater; many are terminal discharge sites. Forty-seven of Nevada's playas (41%) do not discharge groundwater to any measurable extent. Depth to groundwater may be in excess of 1000 ft under some of these dry playas. Groundwater quality, as measured by specific electrical conductivity, ranges from approximately 1000 umhos/cm associated with some non-discharging playas to greater than 100,000 umhos/cm in several discharging playas. Playa surfaces range from dry, hard and smooth through salt or evaporite crusts to very porous, puffy and sticky. Nevada playas have many potential uses including recreation, mineral recovery and liquid and solid waste disposal.
W78-11573

AN EVALUATION OF THE EFFECT OF DRAWDOWN ON THE TROPHIC STATUS OF A SMALL RESERVOIR,
Georgia Coll., Milledgeville. Center for Environmental Study and Planning.
For primary bibliographic entry see Field 5G.
W78-11576

SEASONAL PERIODICITY OF DIATOMS, AND SILICON LIMITATION IN OFFSHORE LAKE MICHIGAN, 1975,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W78-11587

DISSOLUTION OF DIATOM FRUSTULES AND RECYCLING OF AMORPHOUS SILICON IN LAKE MICHIGAN,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W78-11588

THE SPECIES DIVERSITY, NUMBERS AND BIOMASS OF BENTHIC NEMATODES IN CENTRAL PART OF LAKES WITH DIFFERENT TROPHY,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W78-11589

THE NEMATODES OF THE ROOT REGION OF AQUATIC MACROPHYTES, WITH SPECIAL CONSIDERATION OF NEMATODE GROUPINGS PENETRATING THE TISSUES OF ROOTS AND RHIZOMES,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W78-11590

THE LARGE-SCALE OPERATIONS MANAGEMENT TEST (LSOMT) WITH THE WHITE AMUR AT LAKE CONWAY, ORLANDO, FLORIDA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-11606

BASELINE DATA REPORT--LAKE CONWAY GRASS CARP PROJECT,
Florida State Game and Fresh Water Fish Commission, Orlando.
For primary bibliographic entry see Field 5G.
W78-11607

AQUATIC MACROPHYTE SAMPLING IN LAKE CONWAY,
Florida Dept. of Natural Resources, Orlando. Bureau of Aquatic Plant Research and Control.
For primary bibliographic entry see Field 5G.
W78-11608

BIOLOGICAL BASELINE STUDIES OF THE LAKE CONWAY, FLORIDA, SYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5G.
W78-11609

BACKGROUND WATER-QUALITY ANALYSIS OF LAKE CONWAY,
Orange County Pollution Control Dept. Orlando, FL.
For primary bibliographic entry see Field 5G.
W78-11610

PROPOSED RELATIONSHIPS BETWEEN WHITE AMUR AND THE AQUATIC ECOSYSTEM AT LAKE CONWAY, FLORIDA,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5G.
W78-11611

CULTURE TECHNIQUES FOR THE PRODUCTION OF MONOSEX WHITE AMUR,
Fish Farming Experimental Station, Stuttgart, AR.
For primary bibliographic entry see Field 5G.
W78-11612

TOTAL PHOSPHORUS MODEL FOR THE GREAT LAKES, (DISCUSSION),
Cleveland State Univ., OH.
For primary bibliographic entry see Field 5C.
W78-11623

WISCONSIN TRIBUTARY LOADINGS TO THE UPPER GREAT LAKES,
Wisconsin Dept. of Natural Resources, Madison. Div. of Environmental Protection.
For primary bibliographic entry see Field 5B.
W78-11628

FECUNDITY OF BLUEGILL AND WARMOUTH FROM A SOUTH CAROLINA BLACKWATER LAKE,
Carolinas Virginia Nuclear Power Associates, Inc., new Hill, NC. Energy and Environmental Center.
For primary bibliographic entry see Field 5C.
W78-11649

ENVIRONMENTAL CARCINOGENESIS STUDIES IN FISHES OF THE GREAT LAKES OF NORTH AMERICA,
Guelph Univ. (Ontario). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-11724

FISH, WILDLIFE, AND RECREATIONAL VALUES OF MICHIGAN'S COASTAL WETLANDS,
Eastern Michigan Univ., Ypsilanti. Dept. of Geography and Geology.
E. Jaworski, and C. N. Raphael.
Michigan Department of Natural Resources, February 1978, 209 p. 25 fig, 62 tab, 205 ref, 1 append. Wetlands Value Study, Phase 1.

Descriptors: *Wetlands, *Michigan, *Value, Coastal marshes, Freshwater marshes, *Recreation, Sport fishing, Commercial fishing, Wildlife, Waterfowl, Furbearers, Ducks, Evaluation, Return(Monetary), Waste treatment.

Michigan has 105,855 acres of coastal wetlands which represent 3.5% of the state's total wetland acreage. In terms of average economic value for fish, wildlife, and recreation, Michigan's coastal wetlands cntribute an estimated $489.69 per wetland acre/year, for a total of $51.8 million/yr. Specifically, these economic values, in decreasing order of value, are: sport fishing ($286), nonconsumptive recreation ($138.24), waterfowl hunting ($31.23), trapping of furbearers ($30.44), and commercial fishing ($3.78) per wetland acre/yr. Inclusion of other values, e.g., waste assimilation and filtering of suspended solids, as well as ecological values could increase the average annual economic return to over $3000/acre. Historical data reveal that Michigan, since the mid-1800's has lost approximately 70% of its original coastal wetlands; available data suggest that at least 20% of the existing coastal wetlands; available data suggest that at least 20% of the existing coastal wetlands may be developed by private interests within the next decade. Wetlands in Saginaw Bay, Lake St. Clair, Lower Detroit River, and along the western shore of Lake Erie appear to be more significant economically, support the heaviest recreational use, and are, in selected areas, subject to the most intensive developmental pressures. (Stihler-Mass)
W78-11752

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME I, PRESERVING THE STATISTICAL STRUCTURE IN LAKE TRANSPORT CALCULATIONS,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11863

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME II, COMPARATIVE STUDY OF THE MATHEMATICAL FORMULATIONS FOR PRIMARY PRODUCTIVITY IN STRATIFIED LAKES,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11864

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFYGL, PART II, NITROGEN AVAILABLE IN LAKE ONTARIO TRIBUTARY WATER SAMPLES AND URBAN RUNOFF FROM MADISON, WISCONSIN,
Texas Univ. at Dallas.
For primary bibliographic entry see Field 5C.
W78-11992

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFYGL, PART III, ALGAL NUTRIENT LIMITATION IN LAKE ONTARIO DURING IFYGL,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5C.
W78-11993

SURVEY OF CHEMICAL FACTORS IN SAGINAW BAY (LAKE HURON),
Cranbrook Inst. of Science, Bloomfield Hills, MI.
For primary bibliographic entry see Field 5C.
W78-11994

DISTRIBUTION OF PHYTOPLANKTON IN SOUTH CAROLINA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-11995

DISTRIBUTION OF PHYTOPLANKTON IN MISSISSIPPI LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-11996

ASSESSMENT OF THE EFFECTS OF NUTRIENT LOADINGS ON LAKE ONTARIO USING A MATHEMATICAL MODEL OF THE PHYTOPLANKTON.
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5C.
W78-11998

TROPHIC EQUILIBRIUM OF LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-12001

DISTRIBUTION OF PHYTOPLANKTON IN WEST VIRGINIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12002

THE TROPHIC STATUS AND PHOSPHORUS LOADINGS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington.
For primary bibliographic entry see Field 5C.
W78-12003

STANDING CROP OF BENTHIC INVERTEBRATES OF LAKE WINGRA AND LAKE MENDOTA, WISCONSIN,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5C.
W78-12004

CHANGES IN SUBMERGED MACROPHYTES IN GREEN LAKE, WISCONSIN FROM 1921 TO 1971,
For primary bibliographic entry see Field 5C.
W78-12006

PHOTOSYNTHESIS OF THE SUBMERGENT MACROPHYTE CERATOPHYLLUM DEMERSUM IN LAKE WINGRA,
Istituto Italiano di Idrobiologia, Pallanza (Italy).
For primary bibliographic entry see Field 5C.
W78-12007

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
C. L. Hawkes.
Presented at Proc. Intrn'l Congr. Energy and the Ecosystem, 1978. 5 p, 3 fig, 2 tab, 4 ref.

Descriptors: *Ponds, *Impoundments, *Water quality, *Aquatic habitats, *Rooted aquatic plants, *Lake morphology, *Clay, *Coal, *Strip mines, Great plains, North Dakota, South Dakota, Wyoming, Water fowl, Zooplankton, Bentonite, *Strip mine impoundments, *Livestock water impoundments, Semiarid lands, Wetland vegetation.

That ponds in the Northern Great Plains can be valuable aquatic habitats is illustrated by production of 2 million ducks annually upon approximately 220 thousand livestock ponds that were in the region in 1964. Strip mining for coal, bentonite clay and other minerals in the Northern Great Plains provides the opportunity for, or perhaps in some cases, the inevitability of water retaining impoundments. Where coal seams up to 100 feet thick are removed impoundments providing high quality aquatic habitats may be a desirable option. As a basis for stip mine pond design and management criteria, 43 existing strip mine ponds are being surveyed for selected parameters including water chemistry, invertebrate populations, plant communities, waterfowl use and basin morphometry. The ponds being investigated are located in North and South Dakota and Wyoming and represent both coal and bentonite mine impoundments of widely varying age. These unique impoundments of the semiarid northern Great Plains exhibit qualities related to their geographic location, geology, climate and the nature of the mining treatment. (Forest Service)
W78-12038

2I. Water In Plants

INSTREAM FLOW AND THE REPRODUCTIVE EFFICIENCY OF SOCKEYE SALMON,
Washington Univ., Seattle. College of Fisheries.
For primary bibliographic entry see Field 8I.
W78-11361

PRESPAWNING MORTALITY AND THE REPRODUCTIVE EFFICIENCY OF CEDAR RIVER SOCKEYE SALMON (SUPPLEMENTAL REPORT),
Washington Univ., Seattle. College of Fisheries.
For primary bibliographic entry see Field 8I.
W78-11362

SEEDLING RESPONSE TO PHOTOPERIOD AND THERMOPERIOD BY SALTMEADOW CORDGRASS, SPARTINA PATENS, FROM OCRACOKE ISLAND, NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Botany; and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
E. D. Seneca.
Chesapeake Science, Vol 15, No 4, p 230-246, December, 1974. 2 fig, 6 ref.

Descriptors: *Photoperiodism, *Thermoperiodism, Biomass, *North Carolina, *Seedling response, *Saltmeadow cordgrass, *Ocracoke Island(NC), Coasts.

The study deals with the response of Saltmeadow Cordgrass, a dominant perennial grass in the high, irregularly-flooded salt marshes along the Atlantic and Gulf coasts, to various photoperiod-thermoperiod treatments. Seedlings of Saltmeadow Cordgrass were exposed to thermoperiods of 18-14, 22-18, 26-22, and 30-26C under both short- and long-day conditions for a 12 week experimental period. Seedlings in the long-day photoperiod produced significantly more biomass than those under the short-day photoperiod in the 22-18, 26-22, and 30-26C thermoperiods. Seedling biomass increased from the 22-18 to the 26-22 to the 30-26C thermoperiod under long-day conditions. Under short-day conditions, only the thermoperiod increase from 26-22 to 30-26C resulted in a significant increase in seedling biomass. Seedlings grown under long-day conditions were taller and produced more culms and rhizomes than those under short-day conditions at the same temperatures. Flowering occurred only under long-day conditions in the 22-18, 26-22, and 30-26C thermoperiods and only on seedlings left under experimental conditions for an extended period of time. (Maroncelli-Mass)
W78-11750

SALT MARSH VEGETATION: LATITUDINAL GRADIENTS IN THE ZONATION PATTERNS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
E. C. Pielou, and R. D. Routledge.
Oecologia, Vol 24, No 4, p 311-321, 1976. 3 fig, 2 tab, 12 ref, 1 append.

Descriptors: *Salt marshes, *Vegetation, *Latitudinal studies, *Ecological distribution, Competition, Coastal marshes, *Canada, Rooted aquatic plants, Wetlands, Zonation, Polymorphism.

Zonation patterns of salt marsh vegetation were examined at latitudes ranging from 44 degrees 40 minutes north at Halifax, Nova Scotia to 58 degrees 50 minutes north at Churchill, Manitoba. In all areas examined the landward boundaries of the species' zones were more nearly coincident (i.e., more clustered) than their seaward boundaries. A conspicuous latitudinal trend was found: the clustering of both landward and seaward boundaries increased with increasing latitude. Evidence that between-species competition influences the locations of zone boundaries was also obtained. Increasing widths of the zones of salt marsh plants with increasing latitude may be due to the less stable climates at high latitudes resulting in local populations of plant which tend to have a high genetic variability. (Stihler-Mass)
W78-11751

FISH, WILDLIFE, AND RECREATIONAL VALUES OF MICHIGAN'S COASTAL WETLANDS,
Eastern Michigan Univ., Ypsilanti. Dept. of Geography and Geology.
For primary bibliographic entry see Field 2H.
W78-11752

SEASONAL CHANGES IN THE PRODUCTIVITY, CALORIC CONTENT, AND CHEMICAL COMPOSITION OF A POPULATION OF SALT-

MARSH CORD-GRASS (SPARTINA ALTERNIFLORA),
Rutgers - The State Univ., Camden, NJ. Dept. of Biology.
E. R. Squiers, and R. E. Good.
Chesapeake Science, Vol 15, No 2, p 63-71, June, 1974. 5 fig, 3 tab, 38 ref.

Descriptors: *Seasonal, *Productivity, *Standing crops, Population, Biomass, Vegetation, Salt marshes, Caloric content, Chemical composition, Salt-marsh Cord-grass, Growing season, *New Jersey, *Great Bay(NJ).

During the 1972 growing season, the productivity of a short form and a tall form of salt-marsh cordgrass was studied by the harvest method in the vicinity of the Rutgers Marine Sciences Center on Great Bay near Tuckerton, New Jersey. The aboveground biomass of living and dead grass was determined and subsamples were analyzed for caloric equivalents, ash, nitrogen, crude protein, crude fiber, ether extract, and nitrogen free extract. Salt-marsh cord-grass had peak standing crops of 1,592 g/sq.m. for tall form and 592 g/sq.m. for short form. Standing crops of crude fiber, ether extract, nitrogen free extract, and caloric values are a function of dry matter production while nitrogen components seem to be influenced by some other factor. Seventy percent of the crude protein was present in early summer at a time when dry weight was less than 50% of its maximum value. The data indicate that the amount of nitrogen that the plant accumulates in its aboveground parts early in the growing season is directly related to the peak of dry matter standing crop. The early spring accumulation of nitrogen may act to offset shortages at the peak of the growing season. The chemical composition of litter and soil samples suggests that biological breakdown of plant material occurs at the soil surface. (Maroncelli-Mass)
W78-11755

EFFECTS OF GRAZING ON A SALT MARSH,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 4C.
W78-11758

THE CONSERVATION OF WETLAND HABITATS FOR WATER FOWL IN SOUTHERN AFRICA,
Wildlife Society of Southern Africa, Pinetown; and Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
For primary bibliographic entry see Field 6G.
W78-11759

EFFECT OF OVERSTORY REMOVAL ON PRODUCTION OF SHRUBS AND SEDGE IN A NORTHERN MINNESOTA BOG,
Forest Service (USDA), Grand Rapids, MN. North Central Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W78-11760

THE SIGNIFICANCE OF THE SURFACE FILM IN SALT MARSH PLANKTON METABOLISM,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 2L.
W78-11761

PROPAGATION OF SMOOTH CORDGRASS, SPARTINA ALTERNIFLORA, FROM SEED IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
S. W. Broome, W. W. Woodhouse, Jr., and E. D. Seneca.
Chesapeake Science, Vol 15, No 4, p 214-221, December, 1974. 6 fig, 2 tab, 14 ref.

Descriptors: *Seeds, *Marsh plants, *Marshes, *Germination, Vegetation establishment, Marsh management, Intertidal areas, Salt marshes, Wetlands, Dredging, Spoil banks, North Carolina, *Propagation, *Spartina alterniflora.

Spartina alterniflora, the dominant vascular plant of the intertidal zone of bays and estuaries along most of the east coast of North America, produces large quantities of viable seed, particularly when stands are vigorous and relatively young. Excellent germination occurred when seeds were harvested as near maturity as possible, stored in burlap sheets at 2-3C for 1 month, and submerged in estuarine or sea water at 2-3C until seeding the following spring. Direct seeding from April until early June is an effective method of establishing new stands of S. alterniflora on dredge spoils in protected areas. The elevational range over which seedlings can be expected to survive is limited to the upper 20-50% of that occupied by natural stands in a given area. Seedling survival range is affected by the exposure of a site to normal wave action and the occurrence of storms; exclusion of light and air due to longer inundation at lower elevations is also a factor. Complete cover is achieved the first growing season and the aboveground standing crop produced from seed in one growing season can exceed that produced from transplants and may approach that of long established marshes. (Maroncelli-Mass)
W78-11764

THE GROWTH OF SPHAGNUM: SOME EFFECTS OF ENVIRONMENT,
Westfield Coll., London.
R. S. Clymo.
Journal of Ecology, Vol 61, No 3, p 849-869, November, 1973. 8 fig, 7 tab, 18 ref.

Descriptors: *Sphagnum species, *Moses, *Environmental effects, *Plant growth, Microenvironment, Hydrogen ion concentration, Calcium, Inorganic compounds, Ions, Distribution, Water table, Evaporation, Drying, Resistance.

Two problems are dealt with: the distribution of Spaghum on a large scale in relation to H+ and Ca2+ concentration and supply; smaller scale distribution of different species of Sphagnum in microhabitats of pool, lawn and hummock. The growth of up to twelve species of Sphagnum was measured in experiments with factorial combinations of pH (3.5-7.5) with Ca2+ (0.05-5.0 m-equiv./l), and of water table (surface to -10 cm) with shading (none to 0.82). Most plants grew well at low pH and Ca2, and nearly as well at high pH or high Ca 2+, but high pH with high Ca 2+ was lethal to most species. S. squarrosum was notably more tolerant than the other species tested. Growth in weight and in length were highly correlated in most of these treatments, except when water supply and shade were the variables. In unshaded conditions growth in weight was greater at lower water-table levels, but water table had little effect if the plants were shaded. By contrast, growth in length was less in low water-table conditions, particularly if the plants were shaded too. The pattern of response of different species to water table and shade was not clearly correlated with field distribution. There was a positive correlation between growth and supply of inorganic ions (varied concentration and flow rate). Dessication tolerance, in an artificial test, showed no correlation with field behavior, but evaporation rate (used as a measure of supply) and ability to maintain a high capitulum water content did. The surface irregularity of a Sphagnum carpet decreases as the water table falls, and a mechanism to explain this is proposed. (Maroncelli-Mass)
W78-11765

LEAF RESISTANCE AND XYLEM POTENTIAL DIFFER AMONG BROADLEAVED SPECIES,
Northeastern Forest Experiment Station, Durham, NH.
C. A. Federer.
Forest Science Vol. 23, No. 4, December 1977, 411-419.

Descriptors: *Stomata, *Moisture stress, *Soi water-plant relationships, Transpiration, Decidu ous trees, Shrubs, Plant water potential.

Mean leaf diffusive resistance in unstressed tree and shrubs of 27 species in New Hampshire an southern Maine ranged only from 2.5 to 4.5 s/c after normalizing to 15 mbar vapor pressu deficit. One species Spiraea latifolia, had a high resistance, 5.8 s/cm. During water stress, stoma partially closed at xylem pressure potentials th differed among genera, averaging -15 bar for Bet la, -17 for Populus, -21 for Quercus, and -23 fo Prunus. The potentials did not decrease further a resistances increased. Stressed Quercus and Pru nus seedlings had lower potentials than did large trees. (Forest Service)
W78-12070

2J. Erosion and Sedimentation

PREPARATION AND ANALYSIS OF WATE SEDIMENT AND PLANT SAMPLES FO METALS,
South Dakota State Univ., Brookings. Dept. o Chemistry.
For primary bibliographic entry see Field 5A.
W78-11372

STREAM BOTTOM SEDIMENTATION IN IL LINOIS RIVERS: PRELIMINARY EVALUA TION ON USGS GAGING STATION DATA,
Northern Illinois Univ., DeKalb. Dept. of Geolo gy.
J. B. Leedy, and R. C. Flemal.
Illinois Water Information System Group Repor of Investigations No. 10, June 1978. 12 p, 5 fig, tab, 4 ref.

Descriptors: *Sedimentation, *Erosion, *Stream gages, *Illinois, Data processing, Sediments, Bottom sediments, Streamflow, Rivers, Streams, Geomorphology, Channels, Channel flow, Channel morphology, Discharge(Water), Degradation(Stream), Aggradation.

Among the many alleged problems of sediment pollution is that deposition of sediment on stream bottoms both destroys bottom habitat and inhibits the functining of bottom-dwelling organisms due to excessive burial, clogging of feeding organs, etc. While it is well documented that such adverse effects can occur, it remains to be fully documented that effects of this type are common, that they are the result of man-induced phenomena rather than natural processes. As part of this general question, data were explored that might give some clues as to the (1) natural conditions of Illinois streams before the advent of widespread agriculturally-induced land disturbance, (2) changes in stream conditions which have occurred in post-settlement times, and (3) current and possible future status of stream channel erosion and sedimentation. Part of this general investigation has lead us to explore the record of U.S. Geological Survey stream gaging meaurements. These consists of recordings of gage height, channel cross-sectional area, and channel width made each time a field discharge measurement was collected at a standard USGS gaging site. It is felt that if there are demonstrable changes in stream channel geometry in recent times, these ought to be expressed in the gaging measurements. (Sims-ISWS)
W78-11440

TURBULENCE EFFECTS ON SETTLING AND TRANSPORT OF SOLID PARTICLES IN SUSPENSION,
Pisa Univ. (Italy). Inst. of Hydraulics.
V. Milano.

Available from the National Technical Information Services, Springfield, VA 22161 as N76-19375, Price codes: A03 in paper copy, A01 in microfiche. NASA Technical Translation 16,907, Mar 76. 28 p, 4 fig, 46 ref. Trans. of 'Effetti della turbolenza sulla sedmentazione e sul transporto in sospensione di particelle solide', Inst. of Hydraulics, Univ. of Pisa, (Italy), Pub. No 1515, S 31, p 447-475.

Descriptors: *Turbulence, *Sediments, *Suspended solids, *Model studies, Mathematical models, Settling velocity, Sediment transport, Streamflow, Turbidity, Sedimentology.

The settling of suspended solid particles was discussed in terms of concentration at a point and the probability that a particle traverses the point at a given instant by use of equation of motion. Models for a particle in turbulent water were developed. (Sims-ISWS)
W78-11446

THE PHOSPHORUS STATUS OF EUTROPHIC LAKE SEDIMENTS AS RELATED TO CHANGES IN LIMNOLOGICAL CONDITIONS-PHOSPHORUS MINERAL COMPONENTS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-11509

PROCEEDINGS OF THE FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE, 1963.
Agricultural Research Service, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 380, Price codes: A00 in paper copy, A01 in microfiche. Report SED/COM-02. Conference held January 28-February 1, 1963, Jackson, Mississippi, Miscellaneous Publication No. 970, Agricultural Research Service, Washington, D.C., June 1965. 938 p.

Descriptors: *Sedimentation, *Conferences, *Rivers, *Reservoirs, *Estuaries, Sediment control, Stream erosion, Erosion control, Scour, Coasts, Dredging, Harbors, Streams, Channels, Model studies, Hydraulic models, Data collections, Laboratory tests, On-site investigations, Surveys, Sampling, Sediments, Bank stabilization, Instrumentation, Equipment, Bed load, Reservoir silting, Watersheds(Basins), Alluvial channels, Sediment transport.

This publication contained the 91 papers and discussions of the second Federal inter-agency sedimentation conference. The meeting was a working conference in which representatives of Federal agencies and of universities could discuss sedimentation problems and methods being used for their investigation and solution. The broad topics covered included: land erosion and control; sediments in streams; sedimentation in estuaries, harbors, and coastal areas; sedimentation in reservoirs; laboratory investigation; and field investigations. (See also W77-00775) (Humphreys-ISWS)
W78-11898

LITTORAL ENVIRONMENT OBSERVATIONS AND BEACH CHANGES ALONG THE SOUTHEAST FLORIDA COAST,
Coastal Engineering Research Center, Fort Belvoir.
For primary bibliographic entry see Field 2L.
W78-11962

SURFICIAL SEDIMENTS AND SEAGRASSES OF EASTERN GREAT SOUTH BAY, N.Y.,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W78-11963

ENTRAPMENT OF SUSPENDED MATERIALS IN THE SAN FRANCISCO BAY-DELTA ESTUARY,
Bureau of Reclamation, Sacramento, CA. Water Quality Branch.
For primary bibliographic entry see Field 2L.
W78-11964

FLUVIAL SEDIMENT STUDY OF FISHTRAP AND DEWEY LAKES DRAINAGE BASINS, KENTUCKY - VIRGINIA,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-11991

HYDROLOGIC TRANSPORT PROCESSES FOR POLLUTANTS IN WATER AND ON SEDIMENTS,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5B.
W78-12016

PATTERNS OF DEPOSITION OF RADIONUCLIDES IN SEDIMENTS,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5B.
W78-12019

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2H.
W78-12038

2K. Chemical Processes

SELENIUM IN SOUTH DAKOTA GROUND AND SURFACE WATER,
Geological Survey, Vermillion, SD.
For primary bibliographic entry see Field 5A.
W78-11371

PREPARATION AND ANALYSIS OF WATER SEDIMENT AND PLANT SAMPLES FOR METALS,
South Dakota State Univ., Brookings. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-11372

HYDROSPHERIC TRACE ELEMENTS AND THEIR APPLICATION IN TRACING WATER POLLUTANTS,
Oregon State Univ., Corvallis. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-11375

A RAPID AUTOMATED SYSTEM FOR THE ANALYSIS OF DISSOLVED TOTAL ORGANIC NITROGEN IN AQUEOUS SOLUTIONS,
Michigan Univ., Ann Arbor. Environmental Chemistry Lab.
For primary bibliographic entry see Field 5A.
W78-11885

CHEMISTRY OF WATERS IN THE GEOPRESSURED ZONE FROM COASTAL LOUISIANA -- IMPLICATIONS FOR THE GEOTHERMAL DEVELOPMENT,
Geological Survey, Menlo Park, CA. Water Resources Div.
Y. K. Kharaka, P. M. Brown, and W. W. Carothers.
Geothermal Resources Council, TRANSACTIONS, Vol. 2, p 371-374, July 1978. 3 fig, 1 tab, 9 ref.

Descriptors: *Geothermal studies, *Thermal water, *Water quality, *Geochemistry, Water analysis, Chemical analysis, Oil fields, Dissolved solids, Trace elements, Louisiana, *Gulf Coast, Vermillion Parish, St. Mary Parish, Iberia Parish.

Detailed chemical analyses of 27 formation-water samples from 7 oil and gas fields in the Lafayette area, Louisiana, show that the salinity of water in the geopressured zone ranges from about 22,000 to 275,000 mg/liter dissolved solids. The large differences in the salinity of water in the geopressured zone from different fields result mainly from interaction of water with salt beds. The concentrations of H2S (<1 mg/liter), silica (<114 mg/liter), and a number of toxic trace metals are low in the geopressured geothermal waters. The relatively high salinity of these waters, however, and the moderately high concentrations of environmentally toxic components (boron, up to 69 mg/liter, and ammonia, up to 100 mg/liter, for example) are unfavorable to geothermal development. The chemical data indicate that careful evaluation of the compatibility of the spent geothermal waters and the waters in the formations used for injection will be required to minimize loss of porosity due to precipitation of carbonates and sulfates of Ca, Sr, and Ba. (Woodard-USGS)
W78-11980

WATER-QUALITY RECORDS FOR THE HUBBARD CREEK WATERSHED, TEXAS, OCTOBER 1974 - SEPTEMBER 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11981

AN ANALYSIS OF STREAM TEMPERATURES, GREEN RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
H. W. Lowham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 062, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-13, January 1978. 41 p, 14 fig, 5 tab, 11 ref.

Descriptors: *Water temperature, *Wyoming, *Streams, *Estimating, *Computer models, Analytical techniques, Regional analysis, Statistical methods, *Green River basin(Wyo).

A method for estimating temperatures of streams in the Green River basin, Wyoming, utilizes a regional model for estimating mean daily temperatures of streams at unmeasured sites. The regional model was developed by describing annual temperature patterns at 43 measured sites and by applying the harmonic function $T = M + A \cdot \sin(0.0172\ t + C)$- where: T is mean daily temperature; M, A, and C are harmonic coefficients calculated from data for each stream-temperature station; and t is the day of the water year. Application of the equation for estimating temperatures at unmeasured sites requires regionalized estimates of M, A, and C. Regional estimates were developed with the aid of multiple-regression techniques, whereby the calculated harmonic coefficients were regressed against physical and climatic characteristics of the stream-temperature stations. Stream elevation was a significant factor affecting water temperature. Analysis of areal and temporal variations in temperature showed that springs, irrigation return flows, and reservoir storage were affecting reaches of several major streams. (Woodard-USGS)
W78-11989

EFFECTS OF SOIL MOISTURE ON THE DIFFUSION COEFFICIENTS AND ACTIVATION ENERGIES OF TRITIATED WATER, CHLORIDE, AND METRIBUZIN,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.

W78-12013

ACIDITY OF RAIN AND SNOW: A POTENTIAL PROBLEM FOR NEW HAMPSHIRE,
Northeastern Forest Experiment Station, Durham, NH.
J. W. Hornbeck, and R. S. Pierce.
New Hampshire Forest Notes, Winter 1977-78(131): p. 6-7.

Descriptors: *Chemistry of precipitation, *Forests, *Acidity, Leaching, Hubbard Brood Experimental Forest, Precipitation acidity.

Studies at the Hubbard Brook Experimental Forest have characterized the chemistry of precipitation falling on New Hampshire, and have identified and defined some of the potential impacts. A major finding is that precipitation is acidic, largely as a result of human activities. The more obvious impacts, such as leaching of nutrients from foliage, have been determined, but many of the impacts are more subtle and will require further study. (Forest Service)
W78-12037

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2H.
W78-12038

RECOVERY OF A DEFORESTED ECOSYSTEM,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 4C.
W78-12071

2L. Estuaries

FRESHWATER INFLOW AND ITS EFFECT ON THE SALINITY AND BIOTA OF SHALLOW LAGOONS, (PARTS I AND II),
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
J. van de Kreeke, J. D. Wang, R. G. Rehrer, and M. A. Roessler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 111, Price codes: A06 in paper copy, A01 in microfiche. Publication No. TR77-4, September 1976. 100 p, 78 fig, 5 tab, 19 ref. OWRT C-4253(no. 9038)(1), 14-31-0001-9038.

Descriptors: *Biological communities, Fresh water, *Salinity, *Spatial distribution patterns, Estuaries, *Florida, Tides, *Dispersion, Circulation, Flood control, *Mathematical models, Statistical methods, *Lagoons(Shallow), *Model studies, *Salt transport.

Using field measurements an earlier developed (finite difference) hydrodynamics model was calibrated. The model is based on the one-dimensional long wave equations, including the advective terms. For the inlets separate algortihms are used based on the inlet equations. Friction factors in the lagoon rage between F = 0.002 and F = 0.017 as compared to a value of F = 0.0025 often cited in the literature. The numerical model yielded values of the tidally averaged discharge of 150 cfs and 50 cfs respectively without and with the baroclinic term. A typical value of the fresh water inflow is 500 cfs. In the far field the salt transport is governed by the tidally averaged discharge and the trapping effect. Closer to the source of fresh water inflow, gravitational circulation is important. A real time salt transport model based on the one-dimensional longitudinal dispersion equation was developed and calibrated. The dispersion coefficient was assumed constant. A value of 1100 ft(2)/sec best fits the data. The overall flushing time was estimated as one week. A statistical treatment of results of trawl and grab samples showed that maintaining salinities of 30 ppt (corresponding to a fresh water discharge of 100 cfs) or higher in the interior part of the lagoon would permit the further expansion into the lagoon of the rich species assemblage presently existing near north Lake Worth Inlet.
W78-11381

BIBLIOGRAPHY ON THE EFFECTS OF PRESCRIBED BURNING AND MAMMAL AND WATERFOWL UTILIZATION OF WETLANDS: ANNOTATED LITERATURE SEARCH WITH SELECTED ABSTRACTS,
Fish and Wildlife Service, Annapolis, MD. Div of Ecological Services.
For primary bibliographic entry see Field 10C.
W78-11385

POLYCHLORINATED BIPHENYL (PCB) DEGRADING BACTERIA AND PCB IN ESTUARINE AND MARINE ENVIRONMENTS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-11430

SURFACE CIRCULATION AND REPLACEMENT OF WATER IN MONTEREY BAY,
San Jose State Univ. CA.; and Moss Landing Marine Labs., CA.
For primary bibliographic entry see Field 5B.
W78-11431

CALIBRATION OF SELECTED INFILTRATION EQUATIONS FOR THE GEORGIA COASTAL PLAIN,
Agricultural Research Service, Beltsville, MD. Plant Physiology Inst.
For primary bibliographic entry see Field 2G.
W78-11449

RECREATION--MARINE PROMISE.
University of Southern California, Los Angeles. Sea Grant Program.
For primary bibliographic entry see Field 6B.
W78-11451

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE. SPECIAL REPORT II: A NON-LINEAR PROGRAMMING MODEL FOR EVALUATING WATER SUPPLY POLICIES IN THE TEXAS COASTAL ZONE,
Texas Univ. at Austin. Div. of Natural Resources and Environment.
For primary bibliographic entry see Field 5G.
W78-11454

THE GROWTH OF ECONOMIC VALUES IN PRESERVATION: AN ESTUARINE CASE STUDY,
Oregon Univ., Eugene. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-11502

EFFECT OF NUTRIENT ENRICHMENT ON GROWTH OF THE EELGRASS ZOSTERA MARINA IN THE CHESAPEAKE BAY, VIRGINIA, USA,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W78-11512

RESPONSE TO POLYCHLORINATED BIPHENYLS OF MARINE PHYTOPLANKTON ISOLATES CULTURED UNDER NATURAL CONDITIONS,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W78-11528

LONG-TERM VARIATION OF ORGANOCHLORINE RESIDUES AND ASSEMBLAGES OF EPIBENTHIC ORGANISMS IN A SHALLOW NORTH FLORIDA (USA) ESTUARY,
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 5C.
W78-11538

IONIZATION OF AMMONIA IN SEAWATER: EFFECTS OF TEMPERATURE, PH, AND SALINITY,
Sea Research Foundation, West Hartford, CT Inst. for Aquarium Studies.
For primary bibliographic entry see Field 5C.
W78-11553

ASSIMILATION OF CO2 IN THE DARK COMPARED TO PHYTOPLANKTON PRODUCTION IN A SMALL COASTAL INLET,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Fisheries and Marine Service.
For primary bibliographic entry see Field 5C.
W78-11584

A SEASONAL STUDY OF THE DISTRIBUTIONS OF SURFACE STATE VARIABLES IN LIVERPOOL BAY. I. WINTER DATA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W78-11585

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN, I. INTRODUCTION - THE STUDY AND THE STUDY AREA,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 5C.
W78-11624

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN III. NUMERICAL ABUNDANCE AND BIOMASS,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 5C.
W78-11625

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN V. ECOLOGY OF THE COPEPODA,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 5C.
W78-11626

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN VII. ECOLOGY OF THE AMPHIPODA,
Australian Museum, Sydney.
For primary bibliographic entry see Field 5C.
W78-11627

LIBRARY U. OF ILLINOIS - CHAMPAIGN

A THREE-YEAR STUDY AT WINSOR COVE: SALT MARSH GRASSES AND NO. 2 FUEL OIL,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11637

THE CHEDABUCTO BAY SPILL - ARROW, 1970,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5B.
W78-11648

ORGANIC POLLUTION OF BOTTOM MUD IN THE SETO INLAND SEA AND ITS REMOVAL EXPERIMENT,
Nansei Regional Fisheries Research Lab., Hiroshima (Japan).
For primary bibliographic entry see Field 5G.
W78-11659

A SURVEY OF THE FISH POPULATIONS OF THE MIDDLE SEVERN ESTUARY BASED ON POWER STATION SAMPLING,
Bath Univ. (England). School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-11662

DISTRIBUTION AND ABUNDANCE OF HYDROCARBON-UTILIZING BACTERIA IN SEDIMENTS OF CHEDABUCTO BAY, NOVA SCOTIA, IN 1976,
Fisheries and Marine Service, Halifax (Nova Scotia).
For primary bibliographic entry see Field 5B.
W78-11694

APPARENT EFFECTS OF FLOODING ON DISTRIBUTION AND LANDINGS OF INDUSTRIAL BOTTOMFISH IN THE NORTHERN GULF OF MEXICO,
National Marine Fisheries Service, Pascagoula, MS. National Marine Fisheries Center.
M. Russell.
Northeast Guld Science, Vol 1, No 2, p. 77-78, 1977. 2 fig, 1 tab, 11 ref.

Descriptors: *Floods, *Bottom fish, Floodwater, *Guld of Mexico, Commercial fish, Commercial fishing, Fish populations, Nutrient, Mississippi River, Flood routing, Flood control.

Evidence is presented that suggests river discharge affected bottom fish distribution from January through June 1972 and 1973. Also, normal commercial concentrations of industrial bottomfish were not seen on the inshore grounds from Mobile Bay, Ala. to Trinity Shoal, La. during peak flood periods in 1973. Comparison between river runoff and annual bottomfish landings for the last 17 years, however, indicates that flooding may be beneficial to annual production, by increasing availability of nutrients and extending the estuarine nursery boundaries. (EIS-Katz)
W78-11722

SEEDLING RESPONSE TO PHOTOPERIOD AND THERMOPERIOD BY SALTMEADOW CORDGRASS, SPARTINA PATENS, FROM OCRACOKE ISLAND, NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Botany; and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2I.
W78-11750

SALT MARSH VEGETATION: LATITUDINAL GRADIENTS IN THE ZONATION PATTERNS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-11751

EMIGRATION OF JUVENILE ATLANTIC CROAKERS, MICROPOGON UNDULATUS, FROM A SEMI-IMPOUNDED MARSH IN SOUTHWESTERN LOUISIANA,
Louisiana Cooperative Wildlife Research Unit, Baton Rouge.
P. M. Yakupzack, W. H. Herke, and W. G. Perry.
Transactions of the American Fisheries Society, Vol 106, No 6, p 538-544, November, 1977. 3 fig, 22 ref.

Descriptors: *Juvenile fish, *Marine fish, Movement, *Seasonal, Gulf of Mexico, Fish, Marshes, Estuaries, *Louisiana.

Descriptions of the emigration patterns of juvenile Atlantic croakers from their nurseries in estuarine waters have varied from (1) gradual seaward movements, to (2) mass outward movements, to (3) a 'bleeding off' of the larger individuals. Emigration patterns are reported for a semi-impounded marsh within a few kilometers of the Gulf of Mexico. Patterns were monitored by trawling within the nursery and continuous trapping in the nursery outlet. Early in the year (February and March) croakers were small and tended to move in and out of the nursery with the tide. Thereafter there was an increasing divergence in the size of trawl- and trap-caught croakers. The fish taken in the trap were consistently the larger, indicating that larger juveniles were continually 'bleeding off' and emigrating back to the Gulf. (Stihler-Mass)
W78-11753

SEASONAL CHANGES IN THE PRODUCTIVITY, CALORIC CONTENT, AND CHEMICAL COMPOSITION OF A POPULATION OF SALT-MARSH CORD-GRASS (SPARTINA ALTERNIFLORA),
Rutgers - The State Univ., Camden, NJ. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-11755

THE SIGNIFICANCE OF THE SURFACE FILM IN SALT MARSH PLANKTON METABOLISM,
Georgia Univ., Sapelo Island. Marine Inst.
J. L. Gallagher.
Limnology and Oceanography, Vol. 20, No. 1, p 120-123, January, 1975. 3 fig, 2 tab, 13 ref.

Descriptors: *Plankton, *Metabolism, *Surfaces, *Films, *Salt marshes, Water, Tides, Water level fluctuations, *Georgia, Pigments, Photosynthesis, Respiration, Coastal marshes, Marshes, Wetlands, Water column.

Comparisons were made between plankton communities associated with surface films and the remainder of the water column in a Georgia salt marsh. The fluorescence of acetone extracts indicated that a film several orders of magnitude richer in plant pigments than the underlying water developed as the tide rose over the marsh surface. As the tide ebbed, the concentration of pigment in the film dropped to levels similar to those in the water below. About 37% of plankton net photosynthesis was concentrated in the surface film. Respiration of the film averated 21% of the gross phogosynthesis while the ratios of photosynthesis to respiration ranged from 10.9 to 2.5. Data suggest that surface film is one of the centers of metabolic activity in a marshland system. (Maroncelli-Mass)
W78-11761

PROPAGATION OF SMOOTH CORDGRASS, SPARTINA ALTERNIFLORA, FROM SEED IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2I.
W78-11764

PROCEEDINGS OF THE FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE, 1963.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 2J.
W78-11898

AMMONIA DISTRIBUTIONS IN THE SURFACE WATERS OF LIVERPOOL BAY,
University Coll. of North Wales, Menai Bridge. Marine Sciences Labs.
For primary bibliographic entry see Field 5B.
W78-11958

A STUDY OF COPPER, LEAD AND CADMIUM SPECIATION IN SOME ESTUARINE AND COASTAL MARINE WATERS,
Australian Atomic Energy Commission, Lucas Heights.
G. E. Batley, and D. Gardner.
Estuarine and Coastal Marine Science, Vol 7, No 1, p 59-70, July 1978. 1 fig, 4 tab, 26 ref.

Descriptors: *Estuaries, *Heavy metals, *Water pollution, *Analytical techniques, *Pacific Ocean, *Australia, *Water quality, Copper, Lead, Cadmium, Outer Continental Shelf.

The potential of a heavy metal speciation scheme to reflect differences in metal distributions within a water mass was evaluated in a study of soluble copper, lead and cadmium speciation in water samples from five stations in the Port Hacking Estuary (Australia) and one coastal Pacific Ocean station. The observed metal distributions were found to be consistent with the other measured physical and chemical properties of the sampled waters. In all samples, the percentages of metals associated with colloidal matter were high, amounting to 40-60% of total copper, 45-70% of total lead and 15-35% of total cadmium. The scheme was used to follow changes in metal speciation under different sample storage conditions. Storage at 4 degrees C in polythene containers was shown to prevent losses or changes in speciation of the metals studieds. (Sinha - OEIS)
W78-11959

DESORPTION OF RADIOACTIVITY FROM NEARSHORE SEDIMENT,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5B.
W78-11961

LITTORAL ENVIRONMENT OBSERVATIONS AND BEACH CHANGES ALONG THE SOUTHEAST FLORIDA COAST,
Coastal Engineering Research Center, Fort Belvoir.
A. E. DeWall.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-047 608, Price codes: A08 in paper copy, A01 in microfiche. Technical Paper No 77-10, October 1977. 171 p, 68 fig, 5 tab, 8 append.

Descriptors: *Beach erosion, *Waves(Water), *Resources development, Baseline studies, Florida, Littoral, Coasts, Outer Continental Shelf, Nearshore environment, Environmental impact.

Daily and weekly surveys and observations of the beach and nearshore were made at Jupiter, Boca Raton, and Hollywood, Florida, for 4 1/2 years between 1969 and 1973. During this relatively storm-free period, mean annual breaker height varied from a high of 0.9 meter at Jupiter, the northernmost site, to 0.5 meter at Hollywood, the southernmost site. This decrease in wave energy

reaching the shoreline is attributed to the varying protection afforded by the Bahama Banks, 80 km offshore of Hollywood. Wave and longshore current directions were observed to change seasonally, with directions from the northeast dominating during October through March and from the southeast during April through September. The magnitude of beach changes, as defined by shoreline position and sand volume on the beach, decreased from north to south and is relatively low compared with typical U.S. east coast beaches. Contributing factors include the sheltering effect of the Bahama Banks, the lack of significant storms, and the underlying coquina limestone which characteristically crops out just below the MSL shoreline, forming a protective reef that effectively retards erosion. Beach changes were seasonal in nature, but were reversed at Boca Raton, where beach width and sand volume were highest during the winter months. Seasonal beach changes were two to three times greater than year-to-year changes. (Sinha-OEIS)
W78-11962

SURFICIAL SEDIMENTS AND SEAGRASSES OF EASTERN GREAT SOUTH BAY, N.Y.,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
G. T. Greene, A. C. F. Mirchel, W. J. Behrens, and D. S. Becker.
Special Report No 12, Reference 77-9, January 15, 1978. 33 p, 11 fig, 2 tab, 42 ref, 2 append.

Descriptors: *Sediments, *Grasses, *Baseline studies, Nutrients, Resources development, New York, Outer Continental Shelf, Environmental impact, Mercenaria mercenaria, Zostera marina, *Great South Bay(NY).

During the spring of 1977 a study was conducted of the sediments in eastern Great South Bay from Homans Creek east to Smith Point. A total of 186 stations were sampled in the open bay and in channels, creeks and rivers. Sediments were characterized according to two variables - particle size and organic content. During the summer of 1977 a suvey was made of the distribution and density of seagrasses present in the study area. Most Bay bottom consists of sandy sediments with low organic content. High organic muds were found in the deeper areas of the Bay off Bayport and in Patchoque and Bellport Bays. Distribution of mud and organic content was closely correlated with depth. Gravel content of sediments was usually very low. Somes areas, however, contained high percentages of shell material. Creek sediments were extremely high in mud and organic content. Approximately 1/3 of the Bay sediments were covered with rooted seagrasses, almost exclusively Zostera marina. Estimation of the total biomass of seagrasses in the study area suggested they may play an important role in the nutrient balance of the Bay. The character of sediments in the Bay probably has a large effect on growth, survival and abundance of the commercially important hard clam, Mercenaria mercenaria, and these relationships are discussed. (Sinha-OEIS)
W78-11963

ENTRAPMENT OF SUSPENDED MATERIALS IN THE SAN FRANCISCO BAY-DELTA ESTUARY,
Bureau of Reclamation, Sacramento, CA. Water Quality Branch.
J. F. Arthur, and M. Ball.
U.S. Bureau of Reclamation Report, 'Entrapment of Suspended Materials in the San Franciso Bay-Delta Estuary', April 1978. 118 p, 50 fig, 2 tab, 63 ref.

Descriptors: *Estuarine environment, *Suspended load, *Water quality, Baseline studies, Water pollution, Resources development, California, Outer Continental Shelf, Entrapment, Niomysis mercedis.

Measurements of suspended materials in the upper San Francisco Bay-Delta Estuary, California, made during the 5-year period (1968-1973) preceding the present study, demonstrated that in the Sacramento River system the maximum concentration of phytoplankton, nutrients, and suspended solids occurred in Suisun Bay area. Current theory on sediment transport in estuaries, results of other studies, and data collected in the present study suggest two-layered flow circulation patterns in the freshwater-saltwater mixing zone combined with the flocculation, aggregation, and settling of suspended particles cause suspended materials to accumulate at concentrations exceeding those found either upstream or downstream. The general area where this accumulation occurs has been termed the entrapment zone. This study demonstrated the entrapment zone location fluctuates tidally 2-6 miles (3-10 km) and moves landward with decreasing river discharge. The location of the entrapment zone is related to and can be approximated from salinity concentration, as measured by specific conductance. Total suspended solids (TSS), particulate nutrients, phytoplankton, Neomysis mercedis (Holmes), certain other zooplankton, and juvenile striped bass (young-of-the-year) are concentrated in the zone. (Sinha-OEIS)
W78-11964

THE DYNAMICS OF AN ESTUARY AS A NATURAL ECOSYSTEM,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 5C.
W78-11966

THE IMPACT OF SUBTIDAL SEWAGE OUTFALLS ON THE INTERTIDAL MACROFAUNA OF SEVERAL CENTRAL PUGET SOUND BEACHES,
Washington Univ., Seattle.
J. W. Armstrong.
PhD Thesis, 1977. 233 p.

Descriptors: *Outfall sewers, *Intertidal areas, *Estuaries, *Benthic fauna, *Sampling, Shellfish, Invertebrates, Beaches, Sands, Sediments, Sea water, Bioindicators, Bioassay, Water pollution sources, Municipal wastes, Waste water disposal.

The intertidal macrofauna were surveyed over a 21-mo period at five beaches located near municipal outfall sewers in Puget Sound, Washington. The 80 sites, sampled every three months, were characterized by fine-grained wave-rippled sand or cobble-strewn mixed sediments. Sampling yielded 302 species of intertidal invertebrates and fish; infauna and epifauna were screened from sediment samples. The control beach and the beach considered most likely to be affected by the outfall discharges yielded the highest number of species; 10-15% fewer species were obtained from the other sites. Substrate type rather than the extent of pollution controlled the degree of species differentiation; benthic faunal diversity was greater in individual samples than the variability between different beach samples. Saxidomus giganteus and Macoma inquinata collected at the beach most likely to be affected by outfall discharges did not exhibit deteriorated bivalve condition index values; growth rates of Hemigrapsus oregonenesis and S. giganteus were not substantially different from those at other beaches. Although several species of pollution-indicating polychaete feeding types were collected at all beach sites, the proportions were similar at all beaches and not considered to be related to waste disposal. Stepwise discriminant analyses yielded no pollution-related gradients; benthic faunal variations were primarily dependent upon sediment type. (Lisk-FIRL)
W78-12095

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

PROCESS FOR THE PURIFICATION OF I DUSTRIAL EFFLUENTS,
CIBA-GEIGY Corp., Ardsley, NY. (Assignee).
For primary bibliographic entry see Field 5F.
W78-11945

3A. Saline Water Conversion

DESALINATION APPARATUS,
K. F. Ziehm, Jr.
U.S. Patent No. 4,077,849, 6 p, 7 fig, 12 ref; Of cial Gazette of the United States Patent Offic Vol 968, no 1, p 271, March 7, 1978.

Descriptors: *Patents, *Desalination apparatu *Water treatment, *Water quality control, *Wat purification, Separation techniques, Solar rad tion, Solar distillation, Condensers, Solar stills.

Solar heat-absorbing metal members such as bal rollers or a metal endless belt is employed to i tially absorb solar heat in a heating chamber. T metal members pass beneath a transparent cov and become heated through absorption of the sol radiation passing through the cover. The me members with their latent heat then pass direct into a vaporizing chamber where they are spray with sea water or other salt or saline water. T latent heat causes the salt-free water to vaporiz The vapors are condensed by a condenser syste such as condenser tubes which pass cooler raw s water. The condensed vapors are collecte thereby providing substantially purewater. Aft the metal members pass throught the vaporizi chamber they are encrusted with the salts of th sea water and are immediately rinsed in a rins tank which is supplied with warm rinse water con ing from the condenser tubing. After such rinsin the rinsed portions of themetal members return t the heating chamber for solar reheating and repetition of the vaporizing and rinsing function (Sinha - OEIS)
W78-11938

REVERSE OSMOSIS SYSTEM WITH AUTO MATIC PRESSURE RELIEF VALVE,
Desalination Systems, Inc., Escondido, CA (Assignee).
D. T. Bray.
U.S. Patent No. 4,077,883, 7 p, 5 fig, 4 ref; Officia Gazette of the United States Patent Office, Vo 968, No 1, p 280, March 7, 1978.

Descriptors: *Patents, *Desalination, *Wate quality control, *Water purification, Reverse os mosis, Semi-permeable membranes, Flow control Valves.

A restrictor in the form of an elongated small duct or tube is employed for brine or concentrate flow control in a reverse osmosis system. The duct is composed of two portions, one end of one being connected to the brine output of a semipermeable membrane cartridge, while one end of the other is connected to the brine disposal system. The other ends of both these duct portions are connected with the interior of a common compartment which in turn, is connected through a pressure relief or check valve with the purified water collector of the semipermeable membrane cartridge. When the pressure in the purified water collector of the semipermeable membrane cartridge. When the pressure in the purified water collector exceeds the pressure in the compartment, the check valve opens and purified water flows into the compartment and out through the portion of the elongated small duct or tube leading to concentrate disposal. The small diameter duct or tube thereby acts as a restrictor for concentrate of brine flow control and

also for controlling a check or pressure relief valve for pressure control in the purified water collection and storage system. (Sinha - OEIS)
W78-11942

SOLAR POTABLE WATER RECOVERY AND POWER GENERATION FROM SALINOUS WATER,
UOP Inc., Des Plaines, IL. (Assignee).
J. F. Spears, Jr.
U.S. Patent No. 4,078,975, 10 p, 1 fig, 19 ref; Official Gazette of the United States patent Office, Vol 968, No 2, p 646, March 14, 1978.

Descriptors: *Patents, *Desalination, *Desalination processes, *Solar distillation, Separation techniques, Heated water, Saline water, Electric power production, Turbines, Condensation, *Solar radiation heat sink.

A Process for recovering potable water from a source of saline water--e.g. sea and/or ocean water is described. Certain modification afford the simultaneous generation of power. A portion of saline water and an air stream are introduced into a solar radiation heat sink, with the air stream flowing over the saline water. Heated, water containing air is withdrawn from the heat sink and reduced in temperature to recover potable water. The heated water from the heat sink may be recycled or at least in part introduced into a flash separation zone, maintained at a subatmospheric pressure to provide a non-saline vaporous phase which is passed through a turbine, from the resulting motion of which power is generated. The existing turbine vapors are cooled and/or condensed via indirect contact with a second portion of saline water to recover additional potable water. Alternatively, the heated, water-containing air stream may be cooled by vaporizing a hydrocarbon which then passes through a turbine for the purpose of producing energy. Saline water which is returned to the original source is at a temperature not more than 15 degrees F greater than the coldest water obtained from the source. (Sinha-OEIS)
W78-11944

3B. Water Yield Improvement

PRIMARY SOURCES OF SOUTHERN CALIFORNIA'S WATER SUPPLY: HISTORICAL DEVELOPMENT AND SUFFICIENCY IN TIME OF DROUGHT,
Southern California Metropolitan Water District, Los Angeles.
C. Boronkay, and H. Hutchinson.
Los Angeles Bar Journal, Vol. 53, No. 3, p. 136-150 (September, 1977).

Descriptors: *California, *Water supply, *Drought, *Imported water, Water shortage, Water resources, Water transfer, Water storage, Water distribution(Applied), Water management(Applied), Colorado River Aqueduct, Planning.

Without importation of water to augment its water supply, Southern California could not support its present population. This becomes even more apparent with the current crought there. This article reviews the primary sources of Southern California's water supply including their history, physical characteristics and relevant legal decisions. It concludes with a summary of efforts and adjustments being made in an attempt to deal with the current drought. The sources of water supply include the Colorado River, the Owens Valley and the Sacramento -San Joaquin Delta (through the State Water Project). These sources are examined in great detail. Despite these extensive sources, Southern California's population exerts a great demand on the drought-decreased water supply. The history of the drought is traced along with responsive programs and resultant problems. It is concluded that through careful planning and sound water management, Southern California should be able to deal with the drought with minimum inconvenience. To achieve this goal of minimum inconvenience however, 4 conditions must be met. These include: (1) water use reduction; (2) obtaining additional state project water; (3) maintaining flow from the Colorado River Aqueduct; and (4) a normal weather pattern. (Quarles-Florida).
W78-11325

THE PROJECTED IMPACT OF WATER HYACINTH INFESTATION IN TEXAS,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 4A.
W78-11605

DEVICE FOR EXTRACTING ENERGY, FRESH WATER AND POLLUTION FROM MOIST AIR,
C. E. Ockert.
U.S. Patent No. 4,080,186, 5 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 1064, March 21, 1978.

Descriptors: *Patents, *Water vapor, Precipitable water, Condensation, Atmosphere, Vapor pressure, Vortices, Rotational flow, Structures, Stacks.

The invention relates to the controlled use and exploitation of energy in the heat of vaporization of water vapor in moist air. This device has been given the name 'Tornook' since it utilizes the characteristics of the natural winds known as the Tornado and the Cinook. The particular characteristics utilized are the energetic low pressure vortex and the rapid condensation and precipitation which occur in the Tornado, and the 'Chinook Wind' effect which causes air to be come heated when it is repressurized after being stripped of the moisture content by passing through a region of low barometric pressure. The Tornook comprises a large stack with an extended base, with inlets in the base arranged to impart a rotational velocity to the incoming air which is then accelerated into a tornadic vortex as the flowfield contracts through a transitional plenum region and enters the stack. The resulting lowering of the static pressure provides a density difference which assists in sustaining the flow, and the low pressure also causes a rapid precipitation of the moisture from the air. Energy can be extracted from the rapidly rotating air mass before its rotation is removed and it is repressurized with a consequent heating which maintains a relatively low density as the air passes up through the top of the stack. (Sinha - OEIS)
W78-11949

3C. Use Of Water Of Impaired Quality

MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-11632

SYSTEM CURBS NITROGEN IN PLANT-EFFLUENT STREAMS,
Cooperative Farm Chemicals Association, Lawrence, KS.
For primary bibliographic entry see Field 5D.
W78-11767

PROTECTION OF SURFACE WATERS AGAINST EXCESSIVE SALINITY BY MEANS OF SALINE WASTE-WATERS DISCHARGE CONTROL,
Institute for Meteorology and Water Management, Warsaw (Poland).
For primary bibliographic entry see Field 5G.
W78-12040

3D. Conservation In Domestic and Municipal Use

WATER RATIONING: THE VIEW FROM MARIN COUNTY,
Marin Municipal Water District, CA.
For primary bibliographic entry see Field 6E.
W78-11303

DEVELOPMENT OF A REGIONAL INFORMATION SYSTEM FOR HYDROLOGIC MODELING,
Maryland Univ. College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W78-11379

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: REPORT.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11470

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX B--WATER SUPPLY, DEMAND AND DEFICIT.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11471

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX C--ENGINEERING FEASIBILITY OF ALTERNATIVE WATER SUPPLY PROJECTS.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11472

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME I--EFFECTS OF WATER SUPPLY DEFICITS IN THE WASHINGTON METROPOLITAN AREA.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11473

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHWESTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME II--SOCIO-ECONOMIC IMPACT STUDY OF ALTERNATIVE WATER SUPPLY SYSTEMS,
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11474

RESEARCH NEEDS RELATING TO WATER/LAND PROBLEMS IN URBANIZING AREAS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-11578

SOURCE, USE, AND DISPOSITION OF WATER IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 6D.

W78-11983

INTEGRATING ECOLOGICAL AND SOCIAL CONSIDERATIONS INTO URBAN FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W78-12014

3E. Conservation In Industry

WATER POLLUTION CONTROL IN METAL FINISHING INDUSTRY,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W78-11380

ECONOMIC ANALYSIS OF PROPOSED AND INTERIM FINAL GUIDELINES - INTEGRATED IRON AND STEEL INDUSTRY,
Temple, Barker and Sloane, Inc., Wellesley Hills, MA.
For primary bibliographic entry see Field 5G.
W78-11491

SYSTEM CURBS NITROGEN IN PLANT-EFFLUENT STREAMS,
Cooperative Farm Chemicals Association, Lawrence, KS.
For primary bibliographic entry see Field 5D.
W78-11767

TOWARD THE EFFLUENT-FREE BLEACHED KRAFT PULP MILL (VERS L'USINE DE PATE KRAFT BLANCHIE SANS EFFLUENT),
Centre Technique du Papier, Grenoble (France).
M. Pichon, and E. Muratore.
ATIP (Association Technique de l'Industrie Papetiere) Revue, Vol 31, No 9, p 324-333, November, 1977. 10 fig, 30 ref, 2 tab.

Descriptors: *Water pollution control, *Kraft mills, Chemical recovery, Pulp and paper industry, Sodium chloride, Bleaching wastes, Industrial wastes, Wastes, Water pollution sources, Water reuse, Recycling, Crystallization, Evaporation, Effluents, Air pollution, Bleaching wastes, Pulp wastes, White liquor(Kraft process), Green liquor(Kraft process).

Water pollution control efforts in modern bleached kraft pulp mills attempt to reduce the volume of bleaching effluents while maintaining the NaCl concentration in the circuits at an acceptable level. Measures for attaining these goals include direct, split-flow, and jump-stage countercurrent recycling of effluents, displacement bleaching, and the use of antipollution bleaching sequences. Processes for eliminating NaCl include crystallization-evaporation of white liquor (Rapson-Reeve process), crystallization of green liquor (Ahlstrom process), purification of electrostatic precipitator dust (MacMillan-Bloedel process), and scrubbing of recovery boiler gases. (Speckhard-IPC)
W78-11899

CLOSED WATER CYCLE SYSTEMS AT PULP AND PAPER MILLS (SISTEMY ZAMKNUTOGO VODOPOL'ZOVANIYA NA PREDPRIATIYAKH OTRASLI),
N. I. Dubitskaya.
Bumazhnaya Promyshlennost', No 10, p 30-32, October, 1977. 5 fig.

Descriptors: *Pulp and paper industry, *Water conservation, Wastes, Industrial wastes, Water pollution sources, Europe, Foreign countries, Recycling, Water, Water reuse, Closed systems, Ukraine, Soviet Union(USSR).

The Ukrainian Giprobum (State Institute for Planning of Pulp and Paper and Hydrolysis Industry Plants) in cooperation with research institutes has developed several closed water cycle systems for pulp and paper mills. Many of these systems are already in operation or are being introduced. Water-recycling systems developed for the following mills are described and illustrated: the Proletarii mill (manufacturing electric insulation board); the Kherson mill (manufacturing pulp and filter paper); the Malin mill (manufacturing capacitor, copying base, and electrolytic medium); and the Zhidachev board mill. All systems considerably reduced the consumption of fresh water and the volume of effluents to be purified. (Stapinski-IPC)
W78-11901

IMPROVED HEAT ECONOMY WITH LOCKMAN PRE-EVAPORATION AT THE HUSUM SULFATE MILL USING DIGESTER FLASH STEAM,
MoDo-Chemetics A. B., Ornskoldsvik (Sweden).
L. Olauson.
Canadian Pulp and Paper Association Technical Section, 64th Annual Meeting (Montreal), Preprints, p A65-A72, January 31-February 3, 1978. 9 fig, 2 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Evaporation, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Foreign countries, Heat exchangers, Steam, Pulp and paper industry, Black liquor, Kraft mills, Sweden, Europe, Evaporators, Water conservation, Energy conservation.

The Lockman multiflash pre-evaporation column is directly connected to the Kamyr continuous digester at a kraft mill of MoDoCell AB. in Husum, Sweden. The evaporator uses the flash steam from the flash tanks as a primary heat source and is directly fed with black liquor from the last flash tank. In the Lockman multiflash evaporator, the black liquor first passes through all the heat exchangers in series and then through the flash chambers in series. The evaporative capacity of the installed unit is 34 tons of water/hr and, based on a 1000-ton/day digester capacity, could easily be increased to 80 tons/hr by adding extra flash chambers to the column. The total requirement of live steam for evaporation is decreased by more than 33% us by using the Lockman column. (Swichtenberg-IPC)
W78-11904

IN-PLANT RECYCLE AND REUSE IN AN INTEGRATED FINE PAPER MILL,
Boise Cascade Corp., Rumford, ME.
D. E. Peakes.
Canadian Pulp and Paper Association Technial Section, 64th Annual Meeting (Montreal), Preprints, p B43-B51, January 31-February 3, 1978. 9 fig, 4 tab.

Descriptors: *Pulp and paper industry, *Water reuse, *Water conservation, Recycling, Water pollution sources, Flow, Suspended solids, Biochemical oxygen demand, Wastes, Industrial wastes, Pulp wastes, Maine, Sampling, Kraft mills, Groundwood mills, Coated paper, Industrial water.

The integrated groundwood/kraft pulp and coated paper mill of Boise Cascade Corp. (Rumford, Maine) instituted in-plant water recycling and reuse systems to reduce flow, suspended solids, and BOD to the effluent treatment plant. A comprehensive in-plant sewer sampling and reporting program provided management with the data needed to minimize losses and to document the effect of the recycle and reuse systems. The process sewer that would eventually be the feed to the effluent treatment plant was reduced from 45 mgpd in 1972 to 23.71 mgpd in September 1977, which is 5% below the treatment plant's design capacity. (Swichtenberg-IPC)

W78-11906

EFFLUENTS FROM PAPER MILLS,
C. A. Roberts.
Effluent and Water Treatment Journal, Vol 12, 12, p 659-662, December, 1972. 1 fig, 8 ref, 1 tab

Descriptors: *Pulp and paper industry, *Effluer Suspended solids, Wastes, Industrial was Water pollution sources, Settling basins, Fl tion, Filtration, Wste water treatment, Wa treatment, Water pollution treatment, Slu disposal, Biochemical oxygen demand, Aera lagoons, Trickling filters, Activated sludge, Wa conservation, Water reuse, Recycling, Wa Consumptive use, Pulp wastes, Closed syste White water(Paper machines), Paper machines.

Although the paper industry uses large amount process water, only about 10% is actually c sumed in the papermaking process. Since much the polluting load of a paper mill effluent res directly from the presence of raw materials in water, there is strong economic incentive recover these materials and recycle them. This led to an increasing use of recovery systems in paper-machine white water system. Three devi for recovering suspended solids are discussed, cluding gravity settling chambers, flotat devices, and mechanical filters. Also discussed sludge disposal and methods of reducing B (long-residence lagoons, aerated stabilizat basins, extended aeration, trickling filters, and tivated sludge treatment). When discharge regu tions are very stringent, there are strong incenti to increase primary in-plant treatment, redu process water requirements, and increase water recycle rate. All of these steps approach ideal goal of a totally closed mill system a reduce water pollution. (Witt-IPC)
W78-11909

COST OF ENVIRONMENTAL CONTROL THE PULP AND PAPER INDUSTRY (NAKLAI NA OCHRANU ZIVOTNEHO PROSTREDIA PRIEMYSLE CELULOZY A PAPIERA),
Vyskumny Ustav Papieru a Celulozy, Bratisla (Czechoslovakia).
For primary bibliographic entry see Field 5D.
W78-11917

MODERN METHODS OF UTILIZATION KRAFT PULP MILL CONDENSATI (WSPOLCZENSNE SPOSOB ZAGOSPODAROWANIA KONDENSATOW CELULOZOWNI SIARCZANOWYCH),
Instytut Celulozowo-Papierniczy, Lodz (Poland)
U. Lubienska.
Przeglad Papierniczy, Vol 34, No 1, p 24-2 January, 1978. 15 ref, 4 tab.

Descriptors: *Pulp wastes, *Condensates, *Kra mills, *Water reuse, *Waste water treatmer Wastes, Industrial wastes, Pulp and paper indu try, Publications, Steam, Black liquor, Evapor tion, Recycling, Pulp washing, White liquor(Kra process), Waste treatment, Water pollution trea ment, Water pollution sources, Water purificatio

The composition of kraft pulp mill condensat from digester relief, digester blow, and blac liquor evaporation, methods of condensate purif cation (with steam or air), and the recycling condensates into the production line (for pul washing and screening and for white liqu preparation) are discussed on the basis of recer pertinent literature. (Stapinski-IPC)
W78-11918

CORROSION IN CLOSED WHITE WATE SYSTEMS,
Institute of Paper Chemistry, Appleton, WI.
For primary bibliographic entry see Field 5C.
W78-11919

CONOMICAL EXPEDIENCY OF FLOTATION AVEALL MODERNIZATION
EKONOMICHESKAYA TSELESOOBRAZ-OST' MODERNIZATSII FLOTATSIONNYKH OVUSHEK),
sesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi romyshlennost, Moscow (USSR).
or primary bibliographic entry see Field 5D.
778-11926

UTOMATIC WATER SUPPLY MACHINE AVTOMAT PODACHI VODY),
otlasskii Tsellyulozno-Bumazhnyi Kombinat USSR).
M. Tipunin.
sellyuloza Bumaga i Karton Referativnaya Infor-natsiya, No. 29, p 5-6, October, 1977. 1 fig.

escriptors: *Water supply, *Water reuse, *Pulp nd paper industry, Foreign countries, Recircu-ted water, Water conservation, Pumps, Fresh-vater, Pipelines, Valves, Recycling, Water, Auto-natic control, Electronic equipment, Soviet Jnion(USSR), Sack paper.

A water supply system for treating sack paper is sed at the Kotlas Pulp and Paper Mill (USSR), in vhich recirculated or fresh water is supplied to the acuum pump through pipelines by a series of alves pneumatically controlled by a ransistorized swith which has an electric-contact nanometer. With this system valves in the fresh nd recirculated water sulply lines open and close utomatically, depending on the supply pressure f either line. The valves can also close the recir-ulated water pipeline and open the freshwater ine, or close the freshwater line and allow only ecirculated water to be used in the pulp, or close oth the fresh and recirculated lines. (DuVAll-PC).
W78-11927

UTILIZATION OF SCRUBBER WATER FROM LIME RECOVERY FURNACES (UTILIZATSIYA SKRUBBERNYKH VOD IZVESTEREGENERAT-SIONNYKH PECHEI),
Bratskii Lesopromyshlennyi Kompleks (USSR).
A. V. Slautin, and E. P. Semenova.
Tsellyuloza Bumaga i Karton Referativnaya Infor-matsiya, No. 31, p 6, November, 1977.

Descriptors: *Pulp wastes, *Kraft mills, *Lime kilns, *Scrubber water, *Water reuse, *Industrial water, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Filtration, Burning, Pulp and paper industry, Effluents, Lime, Sludge, Bleaching wastes, Gas scrubbers.

About 95% of the particulates emitted from lime kiln furnaces are caught on the scrubbers. Tests have shown that soluble materials in scrubber water (81-86% calcium carbonate, 5-9% calciu oxide, 1.5-2.5% magnesium oxide, 0.8-1.3% silicon oxide, and 0.08-0.09% aluminum oxide) can be used to obtain lime. The content of caustic lime obtained from mud is 87% and that from particu-late trapping is 84%. The scrubber water is clarified, and the sludge from the clarifier (39-49% dry) is put on a vacuum filter, mixed with washed white liquor sludge, and delivered to the furnace. The quality of the lime obtained is not changed. Clarified scrubber water can also be used to neutralize acidic bleaching effluents. It has also been proposed that the clarified scrubber water be used to wash lime mud. (DuVall-IPC).
W78-11928

3F. Conservation In Agriculture

PUMPING BILLIONS INTO THE DESERT--THE CASE AGAINST THE CENTRAL ARIZONA PROJECT,
For primary bibliographic entry see Field 6E.
W78-11317

A PARAMETRIC STUDY OF THE VALUE OF HYDROLOGICAL INFORMATION FOR IRRIGATION AND HYDROPOWER MANAGEMENT OF THE FEATHER RIVER,
Econ, Inc., Princeton, NJ.
For primary bibliographic entry see Field 4A.
W78-11456

GRAIN AND FERTILIZER MOVEMENTS IN RESPONSE TO WATERWAY USER CHARGES,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W78-11497

MANAGING FARMLAND TO IMPROVE WATER QUALITY,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Information.
For primary bibliographic entry see Field 5G.
W78-11523

PENETRABLY MOUNTED EMITTER FOR CONDUITS,
Harmony Emitter Co., Inc., Tucson, AZ. (Assignee).
R. C. Harmony.
U.S. Patent No. 4,077,570, 7 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 968, no 1, p 180, March 7, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Conduit, Application equipment, Flow control, Emitters.

A miniaturized emitter, penetrably mounted within the wall of a conduit having a fluid to be dispensed, emits a constant volume output flow irrespective of changes in fluid pressure within the conduit. An annular flange laterally biased by an inscribed annular pressure chamber sealingly seats the emitter against the wall of the conduit. A pair of downwardly depending skirts having striae on facing surfaces, in combination with the extant pressure on the opposing sides of the skirts, regulate the passage size within the emitter to maintain constant the rate of output fluid flow regardless of presure variations the conduit. (Sinha - OEIS)
W78-11936

FLUID FLOW REGULATOR,
Harmony Emitter Co., Tucson, AZ. (Assignee).
R. C. Harmony.
U.S. Patent No. 4,077,571, 9 p, 14 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 968, no 1, p 180, March 7, 1978.

Descriptors: *Patents, *Irrigation, *Flow control, Irrigation practice, Irrigation efficiency, Application equipment.

Irrigation devices intended for industrial use are generally connected to a source of irrigation water which contains suspended particulate matter. To overcome the clogging effects of the particulate matter, the outlet ports in these devices are generally of resilient material to permit them to expand as necessary to pass the particulate matter. Where a port expands to pass the particulate matter, the rate of water flow simultaneously increases. The increased water flow tends to reduce the water pressure within the common envelope feeding the devices and results in a reduction of water flow through the remaining devices resulting in uneven irrigation. This invention presents a non-clogging requlator that controls the rate of fluid flow from within a fluid conveying conduit regardless of pressure variations within the conduit and irrespective of the presence of particulate matter within the fluid. (Sinha - OEIS)
W78-11937

LAWN SPRINKLER,
Toro Co., Minneapolis, MN. (Assignee).
J. J. Walto.
U.S. Patent No. 4,078,726, 6 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 968, No 2, p 566, March 14, 1978.

Descriptors: *Patents, Irrigation, Sprinklee irrigation, Irrigation efficiency, Irrigation practices, Application equipment, Strainers.

A pop-up sprinkler has a vertically extensible and retractable spray head assembly and means for flushing the channel in which the assembly moves with outflowing water both when the assembly extends and when it retracts. The arrangement permits the use of a strainer built into the spray head assembly and replaceable, after installation of the sprinkler by simply removing the spray head. (Sinha - OEIS)
W78-11943

SOURCE, USE, AND DISPOSITION OF WATER IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-11983

AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY,
Agricultural Research Service, Beltsville, MD. Agricultural Engineering Research Div.
For primary bibliographic entry see Field 5G.
W78-12081

4. WATER QUANTITY MANAGEMENT AND CONTROL

ANALYSIS OF HYDROLOGIC DATA USING PEARSON TYPE III DISTRIBUTION,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 2E.
W78-11423

4A. Control Of Water On The Surface

FEDERAL APPROPRIATION AND THE RECLAMATION ACT OF 1902,
For primary bibliographic entry see Field 6E.
W78-11306

PUMPING BILLIONS INTO THE DESERT--THE CASE AGAINST THE CENTRAL ARIZONA PROJECT,
For primary bibliographic entry see Field 6E.
W78-11317

GENERAL PLAN IMPLEMENTATION: THE GROWTH-PHASING PROGRAM OF SACRAMENTO COUNTY,
California Univ., Davis. Inst. of Governmental Affairs; and California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 6B.
W78-11364

PRELIMINARY RUNOFF AND STREAMFLOW PREDICTIONS IN THE HUMBOLDT RIVER BASIN BASED ON SNOW DISTRIBUTION MEASUREMENTS FROM SEQUENTIAL SATELLITE IMAGERY,
Nevada Univ. System, Reno. Renewable Natural Resources Div.
P. T. Tueller.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 122, Price codes: A03 in paper copy, A01 in microfiche. Desert Research Inst. Pub. No. 43005. Water Resources Center Cooperative Rept. Series Pub. No. AG-2, April 1978. 27 p, 13 fig, 2 tab, 17 ref. OWRT-A-064-NEV(1).

Descriptors: *Sequential satellite imagery, *Runoff, Streamflow predictions, *Nevada, Remote sensing, Forecasting, Snow distribution, *Streamflow forecasting, Measurement, *Humboldt River Basin(Nev).

Since snow does not fall at the same intensity or volume over a given area, it is difficult to extrapolate data to apply over large land areas based upon only a few gaging devices located at various points along a snow course or a single rain gage for an entire valley or mountain range. Based upon past data gathered from the field and subsequent calculations, reasonably accurate figures concerning future water resources can be forecasted from snow course measurements. The objectives of this study were to investigate the feasibility satellite imagery; to develop correlations between snow line changes in the Humboldt River Basin on the 1973 imagery and predicted runoff on various tributaries having streamflow gages; and to develop a preliminary runoff prediction model for the Humboldt River watershed based on these calculations. Preliminary analysis establishes the feasibility of supplementing existing snow course measurement data with temporal LANDSAT evaluations. Recommendations for future research in this area are made, and suggestions are presented for various techniques to aid in accurate predictions. (Smith-Nevada)
W78-11366

THE INVENTORY AND DISTRIBUTION OF WATER AND ASSOCIATED LAND RESOURCES IN THE GARRISON/DEVILS LAKE REGION OF ND: AN APPLICATION OF RESOURCE DATA ACQUIRED BY ERTS,
North Dakota Univ., Grand Forks. Dept. of Geography.
R. D. Mower.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 091, Price codes: A03 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report No. WI-221-047-78, June 1978. 26 p, 1 tab, 6 fig, 22 ref. OWRT A-047-NDAK(1), 14-34-0001-7072.

Descriptors: *Remote sensing, *Land resources, Terrain analysis, Watersheds, Land management, Data collections, *Hydrologic data, Garrison, Satellites(ARtificial), *ERTS, Land use, *North Dakota, *Devils Lake Basin(N Dak).

This study was designed to inventory and spatially analyze water and land resources in the Garrison/Devils Lake Region of North Dakota utilizing resources data acquired by ERTS. Preliminary land use studies in Mercer County involved the interpretation of black and white, and color infrared (CIR) aerial photographic imagery (1:24,000), a LANDSAT color composite image (1:250,000), a Mead Dijit Graphics Generator (DGG) image (1:225,000), and a Mead Digital Laser Printer (DLP) image (1:600,000). Subsequent land use/land cover research in the Devils Lake Basin has included the interpretation and analysis of LANDSAT computer compatible tape (CCT) data using both the General Electric IMAGE 100 Multispectral Analysis System and the Bendix Multispectral Data System (M-DAS). Collaboration between Bendix Aerospace Systems Division and the North Dakota Regional Environmental Assessment Program (REAP), with assistance from the North Dakota Institute for Remote Sensing (UNDIRS), produced a land cover map at a scale of 1:500,000 for the State of North Dakota. The results of this study, in both tabular and graphic format, have been available to various planning agencies in North Dakota and to all special task force units established by the Devils Lake Committee.
W78-11373

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-11386

TAIL BEHAVIOUR OF RIVERFLOW PROBABILITY DENSITIES,
Birmingham Univ. (England). Dept. of Civil Engineering.
N. T. Kottegoda.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources', E.A. McBean, et al. (Eds.), University of Waterloo Waterloo Ontario, Canada, June 26-28, 1978, p 480-498, 1978. 8 fig, 4 tab, 20 ref.

Descriptors: Water resources, *Risks, *River flow, *Stochastic processes, *Probability, Behavior, Equations, Reliability, Gaging stations, Skewness, Nonparametric analysis, Parametric hydrology, Systems analysis, Statistical methods.

Probability densities of riverflow series are nonnormal for physical reasons. Most empirical density functions have positive coefficients of skewness which increase with the closeness of spacing in discrete series. Of particular interest are the distributions of high and low values because tail behavior has an important bearing on performance of water resource systems, reliabilities of yields, and risks involved. Such studies should lead to realistic modeling of extreme events in hydrology. To study extreme behavior, 17 sequences of recorded daily river flows from the U.S. are examined. Gnedenko's statistic and the F distribution are used to test the nature of the tail densities. The significance of departures from the exponential type of probability distribution is determined. The alternative hypothesis denotes either heavy or light tails which decrease to zero at slower and faster rates, respectively, than the exponential type. In addition, stable and Weibull families of distributions are examined. Because results are affected by serial correlation and seasonality, independent residuals are used. Considered also are practical problems such as tail area limits, method of testing, significance levels, and bias. Graphical and theoretical results do not support the theory of heavy tails. (See also W78-11386) (Bell-Cornell)
W78-11388

UNCERTAINTIES IN LAKE MANAGEMENT,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6A.
W78-11398

STOCHASTIC MODEL OF A FLOOD FORECAST-RESPONSE PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
R. Krzysztofowicz, D. Davis, L. Duckstein, and M. Fogel.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 697-712, 1978. 2 fig, 2 tab, 6 ref.

Descriptors: *Stochastic processes, *Flood forecasting, *Mathematical models, *Markov processes, Evaluation, Flood damage, Rivers, Flood plains, Optimization, Constraints, Costs, Methodology, Decision making, Algorithms, Dynamic programming, Probability, System performance, Uncertainty, *Effectiveness, Systems analysis.

A stochastic model of a Flood Forecast-Respons (FFR) process has been developed. The purpos of this model is to provide a means for quantitativ evaluation of effectiveness of FFR systems reducing flood damage. The FFR system is decon posed conceptually into the forecasting syste and response system. The sequence of forecasts the flood crest and the actual river stages a described by means of a Markov process. Th flood plain dweller's response to the sequence forecasts is formulated as a random duratio multistage, discrete-space decision process und uncertainty. A set of measures of effectiveness f evaluating the performance of the FFR system proposed, and results of a case study a presented. (See also W78-11386) (Bell-Cornell)
W78-11401

THE RELIABILITY OF LOW FLOW RE GIONAL EQUATIONS IN BRITISH COLUM BIA,
Water Survey of Canada, Vancouver (Britis Columbia). Planning and Studies Section.
For primary bibliographic entry see Field 2E.
W78-11403

WET AND DRY PERIODS IN REGIONA WATER EXCHANGE,
Technical Univ. of Istanbul (Turkey). Dept. Hydraulic and Water Power.
For primary bibliographic entry see Field 6A.
W78-11404

THE DISTRIBUTION OF THE EXTREME OF MIXTURE RANDOM VARIABLE WITH APPL CATIONS IN HYDROLOGY,
Utah State Univ., Logan. Dept. of Applie Statistics and Computer Science.
For primary bibliographic entry see Field 2E.
W78-11406

ON THE PREDICTION OF EXTREME FLOWS
McGill Univ., Montreal (Quebec). Dept. of Civ Engineering.
For primary bibliographic entry see Field 2E.
W78-11410

OPTIMAL DESIGN OF RESERVOIRS I HYDROPOWER SYSTEMS WITH EXPLICI CONSIDERATION OF RISK,
Technical Univ. of Istanbul (Turkey). Dept. Civil Engineering.
M. Bayazit.
In: Proceedings, Volume II, 'International Sym posium on Risk and Reliability in Wat Resources.' E.A. McBean, et al. (Eds.), Universit of Waterloo, Waterloo, Ontario, Canada, June 2 28, 1978, p 874-888, 1978. 5 fig, 19 ref.

Descriptors: *Reservoir design, *Reservo storage, *Stochastic processes, *Hydropowe *Benefit function, *Benefit maximizatio *Operating policy, Simulation analysis, Dynam programming, Optimization, *Risks, Flow Methodology, Energy, Dams, Reservoir capacity Tigris River, Operations research, Equation Mathematical models.

Storage reservoirs are usually designed an operated on the basis of historical inflows. In suc a treatment, it is not possible to incorporate th concept of risk of failure. However, sever economic losses may arise due to the failure providing the contracted yield. Such losses may b evaluated by using synthetic flow series. Herein the design of a hydropower storage reservoir performed using a stochastic approach. The com plexity of the structure of inflows, the reservo operating rule, and the benefit and loss functio do not allow the problem to be solved by analytic methods such as range analysis and stochasti reservoir theory. Therefore, reservoir design performed by simulation. The loss due to a defic

the firm energy production is included in the net nefit function. Various statistics of firm energy ficit are calculated by simulating the operation the reservoir using a monthly flow model. An pirical operation rule is employed which is later proved by dynamic programming. Thus, the opnum values of the storage capacity and the firm wer contract are determined. The size of the servoir computed by this method is larger than t computed by the conventional method. (See o W78-11386) (Bell-Cornell)
78-11412

ESCRIPTIVE PROPERTIES OF HYDROLOGY ODELS FOR THE EXPLICIT STOCHASTIC PTIMIZATION OF MULTI-RESERVOIR PERATIONS,
can Smelters and Chemical Ltd., Montreal uebec).
Thompstone, D. K. Sen, and P. Pilon.
: Proceedings, Volume II, 'International Symsium on Risk and Reliability in Water esources.' E.A. McBean, et al. (Eds.), University Waterloo, Waterloo, Ontario, Canada, June 26-, 1978, p 909-924, 1978. 1 fig, 1 tab, 28 ref.

escriptors: Hydrology, *Mathematical models, Reservoir operation, *Optimization, *Stochastic rocesses, Methodology, Risks, Reliability, robability, Inflow, Seasonal, Equations, Alorithms, Systems analysis, Screening, Descripve checking, Parameter estimation.

ydrology models for solving reservoir operating roblems may be used implicitly to synthesize a rge sample of equi-probable sequences of natural flows to the system or may be explicitly incorprated in an optimization algorithm. In the latter ase, a very simple representation of the complex ochastic process of inflow generation is required keep the optimization algorithm computaonally feasible. This paper applies simplifying asumptions of complete temporal independence nd complete spatial dependence of inflows to ydrology models being investigated for an exlicit stochastic optimization approach to operatg multi-reservoir systems. It presents a ethodology for critically analyzing the descripve properties of such models. Basically, model arameters are estimated using sample inflows, hese 'estimated model parameters' and the odel-form determine certain 'dictated model arameters', and the dictated model parameters re studied to determine if they are reasonable ith respect to the sample data. This analysis is illstrated using a single reservoir, and complete nd distributed representations of a multi-reseroir system. The influence of season length is emonstrated for the multi-reservoir cases. The ethod of analysis presented is preferable to ither (1) rejecting such models out of hand for heir simplicity, or (2) blindly accepting them ecause they suit a particular optimization alorithm. (See also W78-11386) (Bell-Cornell)
V78-11414

APPLICATION OF FEATURE PREDICTION MODEL IN HYDROLOGIC TIME SERIES SYNTHESIS,
Waterloo Univ. (Ontario). Dept. of Civil Engineerng.
For primary bibliographic entry see Field 2E.
W78-11416

INCREASED RELIABILITY OF LOW WATER ANALYSES THROUGH SIMULATION OF TIME SERIES,
Coblenz Federal Inst. of Hydrology (West Germany).
For primary bibliographic entry see Field 2E.
W78-11418

CRITICAL DROUGHT REVISITED,
University of Western Ontario, London. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W78-11419

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA, REPORT,
Colorado School of Mines, Golden, Dept. of Geology.
For primary bibliographic entry see Field 7C.
W78-11439

ANNOTATIONS OF SELECTED LITERATURE ON NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
For primary bibliographic entry see Field 6F.
W78-11455

A PARAMETRIC STUDY OF THE VALUE OF HYDROLOGICAL INFORMATION FOR IRRIGATION AND HYDROPOWER MANAGEMENT OF THE FEATHER RIVER,
Econ, Inc., Princeton, NJ.
F. Sand.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-27636, Price codes: A11 in paper copy, A01 in microfiche. Report No 75-127-5 August 1975. Prepared for the National Aeronautics and Space Administration, Office of Applications, Washington, DC. 37 fig, 23 tables. NASW-2558.

Descriptors: *Reservoir yield, *Water levels, *Hydrology, *Water utilization, *Hydroelectric power, *Remote sensing, *Reservoir, *Reservoir management(Applied), *Parametric hydrology, Flood control, Flood forecasting, Snowmelt, Rainfall, Water demand, Evaporation, Model studies, *Feather River(CA), *Oroville Dam(CA), *Soil Conservation Service Model, *OROSIM Simulation Model, *Simulation models.

This case study of the Oroville Dam and Reservoir examines the relationship between hydrological forecasts and economic benefits in the area of irrigation and hydropower. Improved accuracy of seasonal basin runoff measurement and a lengthening of the forecast period are necessary factors to lessen power generation constraints and to estimate levels of water elevation in the reservoir. A lessening of power generation constraints can lead to increased production of electricity and more economic gain. Better knowledge of seasonal water supply leads to a maximum yield from planted crops. Regression analysis was used to determine the extent to which improved snowcover measurements could contribute to more precise runoff forecasting. Satellite mapping of the snowcover and improved simulation models are two techniques suggested to improve runoff forecasts. These results are obtained under existing flood control regulations and power generation plans. No large-scale policy changes are suggested, although investigation of the optimal policy with regard to maximizing economic output is warranted. (Coan-NC)
W78-11456

FLOOD PLAIN INFORMATION: MANTUA CREEK, GLOUCESTER COUNTY, NEW JERSEY, CHESTNUT BRANCH AND EDWARDS RUN.
Army Engineer District, Philadelphia, PA.
Prepared for Gloucester County Planning Board, NJ, November 1972, 31 p, 13 fig, 24 plates, 4 tab.

Descriptors: *New Jersey, *Flood profiles, *Flood data, *Peak discharge, *Nonstructural alternatives, Floods, Flood flow, Historic floods, Flow duration, Flood plains, Standard project flood, Flood protection, Flood plain zoning, Warning systems, Building codes, Land use, Planning, *Mantua Creek(NJ), Gloucester County(NJ), *Chestnut Branch(NJ), *Edwards Run(NJ), Floodway design flood.

The study area includes Mantua Creek from its confluence with the Delaware River, its tributaries Edwards Run and chestnut Branch, and their flood plains within Gloucester County, New Jersey. The flood plains are mostly rural, but substantial development exists in an near urban areas. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Flooding is mainly caused by heavy rainfall, with the main flood season occurring during the late summer and early fall. The Pitman gage, located at Wadsworth Dam and Kressey Lake, has been maintained by the USGS since 1940. The worst flood recorded at the Pitman gage occurred on September 1, 1940, cresting at 75.1 feet, mean sea level (msl) and discharging 4,200 cubic feet per second (cfs). At the same location, the Floodway Design Flood would crest at 73.9 feet msl and would discharge 1,300 cfs, while the Standard Project Flood would crest at 76.2 feet msl and would discharge 3,000 cfs. No structural flood control measures are anticipated in the area. Nonstructural measures are being both used and developed. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11461

FLOOD PLAIN INFORMATION STUDY: SHENANGO AND MAHONING RIVERS, LAWRENCE COUNTY, PENNSYLVANIA -- SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
Prepared for Lawrence County Regional Planning Commission, PA, February 1965, 14 p, 2 fig, 14 plates, 2 tab.

Descriptors: *Pennsylvania, *Flood forecasting *Flood data, *Flood peak, *Flood protection *Non-structural alternatives, *Control structures Floods, Flood plains, Standard project flood Flood plain zoning, Warning systems, Building codes, Land use, Planning, Zoning, Levee, Embankments, Dikes, Floodwalls, Dams, Reservoirs Channel improvement, Floodproofing, *Mahoning River(PA), *Shenango River(PA), New Castle(PA), Lawrence County(PA), Flood plain management, Intermediate regional flood.

The study area includes the flood plains of the Shenango and Mahoning Rivers in Lawrence County, Pennsylvania. The flood plains are densely developed in the vicinity of New Castle and several small towns, but they are otherwise deveoted to non-intensive uses. Flood data were obtained from topographic maps, field studies historical sources, and stream gage records. On both rivers, the worst recorded flood occurred on March 26, 1913, cresting at 209.92 feet mean sea level (MSL) on the Shenango River and 216.84 feet msl on the Mahoning River. One flood control reservoir exists on the Shenango river and another is near completion. Two flood control reservoirs exist on the Mahoning River and another is under construction. The Standard Project Flood (SPF) as modified by these structures, would crest at 207.8 feet msl on the Shenango River and 221.3 feet msl on the Mahoning river. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. Alternative means to accomplish this end are described. Structural means include dams and reservoirs, levees, dikes or floodwalls, channel improvements or watershed treatment. Nonstructural means include channel and floodway encroachment lines, zoning, subdivision regulations, building codes, and flood proofing requirements. (Nessa-NC)
W78-11462

FLOOD PLAIN INFORMATION STUDY: SEWICKLEY CREEK AND JACKS RUN,

HEMPFIELD TOWNSHIP, PENNSYLVANIA--SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
Prepared for Hempfield Township Planning Commission, PA, March 1967, 24 p, 7 fig, 14 plates.

Descriptors: *Pennsylvania, *Flood profiles, *Flood data, *Flood protection, *Nonstructural alternatives, *Control structures, Floods, Flood peak, Flood plains, Standard Project Flood, Flood plain zoning, Land use, Planning, Levee, Dikes, Floodwalls, Dams, Floodproofing, Hempfield Township(PA), Westmoreland County(PA), *Jacks Run(PA), *Sewickley Creek(PA), Flood plain management, Intermediate regional flood.

The study area involves the flood plains of Sewickley Creek and Jacks Run in Hempfield Township, Westmoreland county, Pennsyvlania. The Sewickley Creek and Jacks Run flood plains contain mostly non-intensive uses, except in the urban areas. Along Sewickley Creek, developed property subject to flood damage is minimal. The wide flood plain at the confluence of the two streams is especially susceptible to flooding. Flood data were obtained from topographic maps, field studies, historical sources and stream gage records. The worst flood recorded in the study area occurred on October 15, 1954, cresting at 945.6 feet, mean sea level (msl) at the mouth of Jacks Run, and at 930.5 feet msl at the mouth of Sewickley Creek. The only flood control structure in the study area was constructed on Jacks Run in 1960. The Intermediate Regional Flood (IRF), as modified by this structure, would crest at 950.5 feet msl on Jacks Run, while the Standard Project Flood (SPF) would crest at 954.0 feet msl. The same floods on Sewickley Creek would respectively crest at 933.5 and 940.0 feet msl. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11463

FLOOD PLAIN INFORMATION: WEST FORK RIVER, HARRISON COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Harrison County Planning Commission, WV, November 1976, 33 p, 13 fig, 11 plates, 6 tab.

Descriptors: *West Virginia, *Flood data, *Flood peak, Floods, Flood flow, Historic floods, Flood plains, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Reservoirs, Harrison County(PA), *West Fork River(PA), 100-year flood, 500-year flood.

The study area includes the West Fork river and its flood plain within the limits of Harrison county, West Virginia. Land use in the flood plain is commercial, residential, and industrial. Flood data were obtained from topographic maps, field studies, historical sources and stream gage records. Most serious flooding occurs from December through May and results from heavy rain and snowmelt. The worst recorded flood at enterprise, West Virginia, occurred on March 7, 1967, discharging 36,500 cubic feet per second (cfs) and cresting at 897.5 feet mean sea level (msl). At the same location, the 100-year flood would discharge 50,000 cfs and would crest at 903.9 feet msl, while the 500-year flood would discharge 64,000 cfs and would crest at 908.7 feet msl. Fourteen bridges in the study area would be obstructive to the 100-year flood. A flood control dam is planned for the West Fork River which would reduce major floods by 1 to 2 feet. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11464

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, CATTARAUGUS COUNTY, NEW YORK.
Army Engineer District, Pittsburgh, PA.
Prepared for Cattaraugus County Planning Commission, NY, August 1976, 36 p, 15 plates, 8 tab.

Descriptors: *New York, *Flood profiles, *Flood data, *Flood peak, *Non-structural alternatives, Floods, Floodwater, Flood flow, Historic floods, Flow duration, Flood plains, Flood protection, Warning systems, Land use, Planning, Control structures, Cattaraugus County(NY), *Allegheny River(NY), 100-year flood, 500-year flood.

The study area includes the Allegheny River and its flood plain in Cattaraugus County, New York. The flood plain is intensely developed in the urban area, but the notable developments are mostly protected by local flood control projects. Flooding may occur at any time of year and results either from rainfall, snowmelt, or both. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The worst flood recorded at the Salamanca gage occurred in June 1972, discharging 76,000 cubic feet per second (cfs) and cresting at 1382.0 feet, mean sea level (msl). At the same location, the 100-year frequency flood would discharge 64,000 cfs and would crest at 1379.6 feet msl, while the 500-year frequency flood would discharge 91,000 cfs and would crest at 1384.0 feet msl. There are no significant obstructions to flood flows. This study is intended for use in making land planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11465

FLOOD PLAIN INFORMATION: HOBBLE CREEK, SPRINGVILLE, UTAH.
Army Engineer District, Sacramento, CA.
Prepared for City of Springville, UT, June 1973, 28 p, 11 fig, 10 plates, 3 tab.

Descriptors: *Utah, *Flood profiles, *Flood data, *Peak discharge, Floods, Flood flow, Historic floods, Flood frequency, Flood peak, Flow duration, Flood damage, Flood protection, Warning systems, Standard Project Flood, *Hobble Creek(UT), Springville(UT), Intermediate Regional Flood.

The study area involves Hobble Creek and its flood plain in the vincinity of Springville, Utah. Agricultural, residential, and minor commercial and transportation land uses are found on the flood plain; flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Flooding from cloudburst storms occurs from late spring to early fall. Snowmelt flooding occurs from late spring to early summer; snowmelt causes some of the worst flooding in the area. The worst know flood occurred in 1909, before stream gage records were kept. The worst recorded flood--a snowmelt flood-occurred in May 1952, discharging 1,250 cubic feet per second (cfs) at the Springville gage and flooding about 745 acres. At the downstream study limit, the Intermediate Regional Flood (IRF) would discharge 1,950 cfs and would crest at 4,497.5 feet mean sea level (msl), while the Standard Project Flood (SPF) would discharge 4,550 cfs and would crest at 4,498 feet msl. Twenty of 21 bridges in the study area and a culvert would be obstructive to these flood flows. Structural and non-structural flood control measures have been recommended but not implemented. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11466

FLOOD PLAIN INFORMATION: LOGAN RIVER, LOGAN, UTAH.
Army Engineer District, Sacramento, CA.
Prepared for City of Logan and Cache County, UT, June 1973, 26 p, 13 fig, 9 plates, 5 tab.

Descriptors: *Utah, *Flood profiles, *Flood dat *Peak discharge, Floods, Flood flow, Histor floods, Flood peak, Flood plains, Standard Proje Flood, Flood protection, Warning systems, Lar use, Planning, Logan(UT), *Logan River(UT Cache County(UT), Intermediate Regional Flood

The study area includes the Logan river and i flood plain in the vicinity of Logan, Cache Cou ty, Utah. Land use within the flood plain is cu rently non-intensive, although residential develo ment is beginning to take place. Neither structur nor non-structural meaures are planned authorized on a scale commensurate with t damage potential of large floods. Flood data we obtained from topogrqphic maps, field studie historical sources, and stream gage record Flooding results from rapid snowmelt and usual occurs from April through June. Cloudbursts a not considered to be a flood threat. The wor flood recorded in the study area occurred in M 1907, discharging 2,480 cubic feet per second (cf A large flood in June 1971 discharged 1,680 cfs. the same location, the Intermediate Region Flood (IRF) would discharge 2,450 cfs and wou crest at 4,655 feet mean sea level (msl) while t Standard Project Flood (SPF) would dischar 2,800 cfs and would crest at 4,656 feet msl. Six the 10 bridges in the study area are obstructive flood flow. This study is intended for use in ma ing land use planning and management decisio concerning flood plain utilization. (Nessa-NC)
W78-11467

FLOOD PLAIN INFORMATION: BLACKSMIT FORK AND SPRING CREEK, MILLVILL UTAH.
Army Engineer district, Sacramento, CA.
Prepared for Cache County, UT, May 1976, 27 12 fig, 16 plates, 6 tab.

Descriptors: *Utah, *Flood forecasting, *Flo profiles, *Flood data, *Peak discharge, *Flo peak, Floods, Flood flow, Indirect flood measur ment, Streamflow forecasting, Historic flood Stage-discharge relations, Flood plains, flood pr tection, Non-structural alternatives, Warni systems, Land use, Planning, Cache County(UT *Blacksmith Fork(UT), *Spring Creek(UT), 10 year flood, 500-year flood.

The study area involves the portions of Millvill Nibley, and Providence, and adjoining areas Cache county, Utah, that are subject to floodi from Millville Canyon Creek, Spring Creek, a Blacksmith Fork. The flood plain consists prima ly of agricultural land uses, with some residenti and commercial development. Flood data were o tained from topographic maps, field studie historical sources, and stream gages records f Blacksmith fork. The main flood season occu from April through September. Flooding resul from heavy general rains, intense local thu derstorms, or snowmelt. Ten bridges Balcksmith fork and 12 culverts on Spring Cre create obstructions to flood flows. There are flood damage reduction measures in the stu area. The maximum recorded peak flow Blacksmith Fork occurred in May 1917, dischar ing 1,620 cubic feet per second (cfs); a snowm flood in May 1971 had a peak flow of 825 cfs. approximately the same location, the 100-ye flood would discharge 1800 cfs and would crest 4,471 feet mean sea level (msl), while the 500-ye flood would discharge 4,150 cfs and would crest 4,475 feet msl. This study is intended for use making land use planning and management de sions concerning flood plain utilization. (Ness NC)
W78-11468

SPECIAL FLOOD HAZARD INFORMATIO REPORT: NORRIS CREEK AND TRIBUT RIES, ABBEVILLE, SC.
Army Engineer District, Savannah, GA.
Prepared for City of Abbeville, and Abbevil County, SC, March 1972, 6 p, 5 plates.

Descriptors: *South Carolina, *Flood data, *Non-structural alternatives, Floods, Indirect flood measurement, Food forecasting, Flood profiles, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Flood protection, Land use, Planning, Floodproofing, Abbeville(SC), Abbeville County(SC), *Norris Creek(SC), Blue Hill Creek(SC), Parker Creek(SC), North Parker Creek(SC), Intermediate Regional Flood.

The City of Abbeville, South Carolina, is drained by Blue Hill and Parker Creeks. The streams converge just east of the city to form Norris Creek. All three watercourses are contained entirely within Abbeville County. Agricultural, residential and commercial uses are found in the flood plain. Most structural flood damage occurs along Blue Hill Creek as it flows through an industrial area of Abbeville. Flood data were obtained from topographic maps, historical sources, and field studies. Stream gage records are not available. Serious flooding occurred in March 1966 after two days of intense rainfall. On Blue Hill Creek, this flood crested at 472 feet, mean sea level (msl) at South Main Street. At the same location, the Intermediate Regional flood (IF) would crest at 473 feet msl. All six of the bridges in the study area would be affected by the IRF flow. The Abbeville Sewage Treatment Plant operations have been stopped three times since March 1960. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. The report recommends no structural flood control works, stressing non-structural measures. (Nessa-NC)
W78-11469

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: REPORT.
Army Engineer Div. North Atlantic, New York.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-A029 533, Price codes: A08 in paper copy, A01 in microfiche. November 1972, 150 p, 98 tab, 49 fig. One of 6 volumes.

Descriptors: *Water supply, *Water supply development, *Regional analysis, *District of Columbia, *Water resources development, *Water management(Applied), Water shortage, Groundwater resources, Groundwater potential, Estuaries, Envionment effects, Low-flow frequency, Low-flow augmentation, Methodology, Aquatic habitats, Water use, Planning, Water demand, Water resources, *Potomac River(DC), *Washington(DC) Metropolitan Area, Upstream storage, Peak demand.

The NEWS study is a response to the mid-'60s water shortages of the Northeast. Its purpose is to prepare a coordinated water supply development and management program for that region. The WMA is one of the first regional metropolitan areas identified for urgent action by the NEWS study. The purposes of the NEWS-WMA study are to provide comprehensive analysis of water supply problems; to generate alternatives; to provide necessary information for agreement on the first step for a survey of a certain project, and if possible, the direction of the next step. Planning objectives are low risk, low cost, flexibility, limited environmental impact, social and economic equity, and growth control. The study finds that water supply for the WMA's water supply system is river-oriented with little storage capacity, a time series approach to deficit analysis is adopted. The baseload component is described in terms of monthly deficits and the peak components are described as 7-day and 1-day deficit increments. Water supply deficits of one month duration or longer are found to be unacceptable; further study of deficits is urged. Efficiency in water usage should be considered of prime importance. Projects are available in the region for early implementation that can meet monthly deficits, and 7-day and 1-day deficit increments. There is an imminent need to select and implement reliable and flexible steps to meet water supply needs; early-action alternatives are specified. Studies involving groundwater yield. The possibility of supply from the Potomac Estuary, continuing evaluation of upstream storage sites, and a refined predicting methodology are suggested. Low flow augmentation to enhance the aquatic habitat of the estuary would be too costly and would constitute an inefficient use of resources. (See W78-11471 thru W78-11474) (Zayac-NC)
W78-11470

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX B--WATER SUPPLY, DEMAND AND DEFICIT.
Army Engineer Div. North Atlantic, New York.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A029 535, Price codes: A05 in paper copy, A01 in microfiche. Nove mber 1975, 75 p, 17 tab, 16 fig. One of 6 volumes.

Descriptors: *Water resources, *Water supply, *Water demand, *District of Columbia, Projects, Programs, Planning, Water supply development, Population, Regional analysis, Water sources, Temporal distribution, Analysis, Water consumption, *Washington(DC) Metropolitan Area, *Water deficits, Potomac River, Annual analysis, 7-day demands, 1-day demands, Demand projections.

This annex describes the assumptions and procedures upon which water supply and demand conditions are based for the WMA as described in Chapter 3 of the main report. The annex is intended as an aid both to the technician and the non-technician in their efforts at technical analysis and basic comprehension, respectively. The first four sections of this Annex present the four main components of supply/demand analysis: a definition of the study area; demand projections; supply base inventories; and supply/demand relations over time. Study area boundaries are first delineated, along with existing water supply systems. Demand projections first review population and water demand projections in order to derive per capita consumptions. Annual and regional demands are then projected in aggregating the data base; calculations of 7-day and 1-day pak demands follow. The supply base is then assembled through an inventory of existing water supply sources and assumed future Potomac River supplies. The final component--supply/demand co-occurrence assumptions--is then discussed after a study of hydrologic element, basic planning criteria, reservoir systems and river systems. The Annex then turns to dealing with the results of the above mentioned supply/demand analysis (i.e., water deficits) and the impacts of project solutions that relate to costs and energy consumption. The deficit analysis looks at temporal distributions of both demand/supply and deficits, and then assays the effects of projects--including upstream rserv oirs, local impoundments, raw water interconnections, groundwater withdrawal projects, estuarine water supply, land treatment and indirect use of effluents--on projected deficits. Finally, a procedure for the analysis of programs is outlined. (See also W78-11470) (Zayac-NC)
W78-11471

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX C--ENGINEERING FEASIBILITY OF ALTERNATIVE WATER SUPPLY PROJECTS.
Army Engineer Div. North Atlantic, New York.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A029 536, Price codes: A14 in paper copy, A01 in microfiche. November 1975, 230 p, 26 ref, 70 tab, 79 fig, 5 append. One of 6 volumes.

Descriptors: *Water supply, *Engineering structures, *Project planning, *Economic feasibility, *Groundwater resources, *District of Columbia, Water supply development, Projects, Programs, Alternative costs, Engineer estimates, Reservoirs, Impoundments, Estuaries, Water quality, Effluents, Construction costs, Land treatment, Alternative planning, *Washington (DC) Metropolitan Area, *Potomac River, Raw water interconnections, Waste water reuse, environmental considerations, Water quality objectives.

The purpose fo this Annex is to show 'the engineering feasibility, costs, and certain (environmental and socio-economic) impact information of all water supply projects and alternative programs' for the WMA. Siting, design, and operational characterization of projects were based solely on engineering considerations; to facilitate future review of programs, design and costing of each project were developed to a comparable level of detal. The Annex first studies project types, including upstream reservoirs, local impoundments, raw water interconnections, groundwater withdrawal, indirect wastewater reuse, estuarine water supply and land treatment. Each project type and the associated example project are studied in a format including an introductory discussion of the project type, a description of the specific proposed projects, and a summary evaluation of the project type and/or projects. The Annex then turns to program evaluation as each NEWS program is described and analyzed in terms of the ability of the above mentioned component projects to meet program objectives. Costs noted are present day costs and their use should be restricted to a comparative utility. Bases for construction cost estimates, project components and construction costs and operation and maintenance, standby maintenance, and start-up and shut-down costs for the projects are presented in individual appendices. Basic design criteria such a expected influent or source water quality objectives are presented separately as well. (See also W78-11470) (Zayac-NC)
W78-11472

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME I--EFFECTS OF WATER SUPPLY DEFICITS IN THE WASHINGTON METROPOLITAN AREA.
Army Engineer Div. North Atlantic, New York.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A029 537, Price codes: A07 in paper copy, A01 in microfiche. November 1975, 127 p, 6 fig, 10 tab, 16 ref. One of 6 volumes.

Descriptors: *Water supply, *Water shortage, *District of Columbia, *Water use, *Water management(Applied), Aesthetics, Economics, Distribution patterns, Distribution systems, Methodology, Tourism, Water sources, Water supply development, Water resources, Planning, *Potomac River, *Water supply deficit, *Washington(DC), Metropolitan Area, Physical effects, Commercial enterprise, Light industry, Low flow allocation.

This first volume of Annex D defines probable short-run socio-physical, aesthetic and other effects of water supply deficits of 10, 20 and 30 percent in the WMA. It then analyzes the information needed to estimate adequately the probable aggregate effects of intermittent water shortages on the water supply and distribution systems of the WMA. Lastly, a methodology to determine losses in the WMA for actual and potential water shortage conditions is developed. This volume is intended to serve as a planning guide for the various water suppliers in the WMA, both in estimating future needs and in allocating short supplies

during emergency conditions. The volume's four major areas of emphasis are: evaluatin of the Metropolitan Washington Council of Governments Emergency Plan; determination of the effects of deficits on water supply systems; estimation of the economic impact of water supply deficits; and a description of social impacts. Projections indicate a 2-week survival of the WMA without serious economic damage for a water supply deficit of up to 30% in the summer, especially in the tourist industry, commercial enterprises and light industries which use large quantities of water. At water supply deficits greater than 30%, rapid money losses would build up. People with the least mobility and resources are found to suffer most from large deficits. Also indicated are interconnections among water supply systems and uniform standby ordinances on restriction of commercial and outside water use. (See also W78-11470) (Zayac-NC)
W78-11473

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHWESTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME II--SOCIO-ECONOMIC IMPACT STUDY OF ALTERNATIVE WATER SUPPLY SYSTEMS,
Army Engineer Div. North Atlantic, New York.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A029 538, Price codes: A13 in paper copy, A01 in microfiche. November 1975, 227 p, 3 append. One of 6 volumes.

Descriptors: *Social aspects, *Economic impact, *Social impacts, *Projects, *Programs, *Water supply, *District of Columbia, *Water demand, *Water requirements, Environmental effects, Economics, Population, Employment, Income analysis, Income distribution, Regional analysis, Planning, Land use, Recreation, Counties, Cities, Water resources, *Primary impacts, *Secondary impacts, *Washington(DC), Metropolitan Area, Tax base, Potomac River.

This second volume of Annex D of the NEWS-WMA study presents the socio-economic impact of alternative water supply systems considered for the Washington, DC SMSA. five basic programs comprised of combinations of 13 basic projects are discussed. The Annex first develops a statistical base for the SMSA. These data are then used to analyze specific trends for each county (including the District of Columbia) within the area. In those areas where a project is sited, more detailed planning information--derived especially from county planning officials--is presented. This analysis of socio-economic trends is then used as the data base against which project and program impacts are measured. Impacts are measured at the county level; no concerted effort is made to redefine impacts at the local level. The impact analysis presumes that adequate water will be available. The project or program itself is the focus of the impact analysis; the effects of the increased water supply are not studied. Population, employment and personal income are primary indices used to measure these impacts; also used are land use, tax base and recreational opportunities. Each project is considered independently and not in conjunction with others. No attempt is made to measure the impact of water shortage. (See also W78-11470) (Zayac-NC)
W78-11474

HYDROLOGIC INVENTORY AND EVALUATION OF NEVADA PLAYAS,
Nevada System Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2H.
W78-11573

RESEARCH NEEDS RELATING TO WATER/LAND PROBLEMS IN URBANIZING AREAS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-11578

FEDERAL-STATE WATER USE RELATIONS IN THE AMERICAN WEST: AN EVOLUTIONARY GUIDE TO FUTURE EQUILIBRIUM,
Arizona. Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6E.
W78-11579

ENVIRONMENTAL IMPACTS OF MECHANICAL HARVESTING OF SUBMERSED VASCULAR PLANTS,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5G.
W78-11586

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 19-22 OCTOBER 1976, ATLANTIC BEACH, FLORIDA.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5G.
W78-11591

OVERVIEW OF THE U.S. ARMY CORPS OF ENGINEERS AQUATIC PLANT CONTROL RESEARCH PROGRAM,
Army Engineers Waterways Experiment Station, Vicksburg, MS.
J. L. Decell.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 8-15, 2 tab.

Descriptors: *Research and development, *Army Engineers, *Aquatic weed control, *Research priorities, *Technology, *Aquatic Plant Control Program, Water hyacinth, Alligatorweed, Hydrilla verticillata, Water lettuce, Eichhornia crassipes, Alternanthera philoxeroides, Pistia stratioties, Chemcontrol, Mechanical control, Biocontrol, Insects, White amur, Ctenopharyngodon idella, Classification, Methodology, Water management, Eutrophication, Water pollution effects.

Research of the U.S. Army Corps of Engineers' Aquatic Plant Control Program provides technology for economical and environmentally acceptable control of aquatic plant infestations in U.S. navigable waters. In 1975 the research program was assigned to the U.S. Army Engineer Waterways Experiment Station (WES) in Vicksburgh, Mississippi, and emphasis was shifted more to operational needs, especially techniques for proper use of control agents. The program was segmented into: (1) identification, assessment, and classification; (2) development of mechanical, biological, chemical, and integrated control technology; (3) development and optimization of application methods; (4) development of management capabilities; and (5) transfer of technology. An objective of each program element is publication of a manual for assessment and classification of aquatic plant problems by field staff, selection of control methods, and predicting probable degree of control. A table is included in this overview listing aquatic plant target species. Problem species most prevalent in high-use areas at present are water hyacinth, alligatorweed, hydrilla, and water lettuce. Research projects include testing of mechanical equipment; evaluation of such biological control agents as white amur (an herbivorous fish), the alligatorweed flea beetle, various water hyacinth endemic pathogens, insect enemies of Eurasian water milfoil and hydrilla; chemical control agents, including slow-release herbicides; and integrated control measures. (See also W78-11591) (Lynch-Wisconsin)
W78-11592

CURRENT STATUS OF THE AQUATIC PLANT CONTROL PROGRAM IN TEXAS,
Army Engineer District, Galveston, TX.
For primary bibliographic entry see Field 5G.
W78-11593

STATUS OF RECONNAISSANCE SURVEY REPORT AND REVIEW OF AQUATIC PLANT PROBLEMS IN THE STATE OF OKLAHOMA,
Army Engineers District, Tulsa, OK.
For primary bibliographic entry see Field 5G.
W78-11594

EAST TEXAS RESERVOIRS--AQUATIC PLANT CONTROL,
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 5G.
W78-11595

AQUATIC PLANT CONTROL PROGRAM IN THE ST. PAUL DISTRICT,
Army Engineer District, St. Paul, MN.
For primary bibliographic entry see Field 5G.
W78-11596

AQUATIC PLANT CONTROL ACTIVITIES--OHIO RIVER DIVISION,
Army Engineer district, Nashville, TN.
For primary bibliographic entry see Field 5G.
W78-11597

AQUATIC PLANT CONTROL PROGRAM--MOBILE DISTRICT--1976,
Army Engineer District, Mobile, AL.
For primary bibliographic entry see Field 5C.
W78-11598

AQUATIC PLANT PROBLEMS, LAKE SEMINOLE, U.S. ARMY CORPS OF ENGINEERS,
Army Engineer District, Mobile, AL.
For primary bibliographic entry see Field 5G.
W78-11599

SELECTIVE MAINTENANCE CONTROL PLAN, ST. JOHNS RIVER, FLORIDA,
Army Engineer District, Jacksonville, FL.
For primary bibliographic entry see Field 5G.
W78-11600

RESUME--AQUATIC PLANT CONTROL PROGRAM, WILMINGTON DISTRICT,
Army Engineer District, Wilmington, NC.
For primary bibliographic entry see Field 5C.
W78-11601

AQUATIC PLANT CONTROL IN THE CHARLESTON DISTRICT,
Army Engineer District, Charleston, SC.
For primary bibliographic entry see Field 5C.
W78-11602

CONTROL OF WATERCHESTNUT IN NEW YORK STATE,
Army Engineer District, New York.
For primary bibliographic entry see Field 5G.
W78-11603

UTOMATED PROCESSING OF APC FIELD PERATIONS DATA,
my Engineer District, Jacksonville, FL.
or primary bibliographic entry see Field 5G.
78-11604

HE PROJECTED IMPACT OF WATER YACINTH INFESTATION IN TEXAS,
xas A and M Univ., College Station. Remote nsing Center.
R. Benton, Jr.
: Miscellaneous Paper A-77-3, August 1977. oceedings, Research Planning Conference on e Aquatic Plant Control Program, 19-22 October 76, Atlantic Beach, Florida. p 75-86, 1 fig, 4 tab, ref.

escriptors: *Texas, *Water hyacinth, *Aquatic eed control, *Evapotranspiration, *Water loss, Reservoirs, *Aquatic Plant Control Program, Water conservation, Economic impact, Florida, exico, Eichhornia crassipes, Lakes, Reservoirs, ranspiration, Watersheds(Basins), Water sources development, Arid lands, River basins.

otential water losses from water hyacinth vapotranspiration in 12 watersheds in east and outheast Texas are estimated at 256,000 ha-m/yr, 19.5% of the planned yield of all of the reser-oirs in the watersheds. Economic valuation of the ater loss is $83 million per year. The estimate for ater losses is based on the expected future level infestation. Various factors were considered in etermining the potential spread of water hyacinth Eichhornia crassipes): (1) relative effectiveness ongoing control programs, (2) high nutrient vels in most watersheds, (3) reservoir construc-on/infestation relationships, (4) boat trailers, (5) imatic difference, and (6) economic and legisla-ve constraints on plant control. The Texas situa-on was also compared with trends in Florida and lexico. Water hyacinth coverage on Texas lakes ill reach 20% if the current level of effectiveness nd effort per ha. is maintained, or up to 36% if overage increases without a commensurate in-rease in control effort or effectiveness. Two ajor mechanisms account for water loss caused y aquatic plants: (1) transpiration losses in reser-oirs, and (2) flow retardance losses in canals. The ormer has greater relevance to hyacinth infesta-ons. Timmer and Weldon's model of the relation-hip between solar radiation and transpiration was dopted for prediction in Texas. Tables present vapotranspiration data and water losses for the 12 exas watersheds in east and southeast Texas. See also W78-11591) (Lynch-Wisconsin)
78-11605

HE LARGE-SCALE OPERATIONS MANAGE-IENT TEST (LSOMT) WITH THE WHITE AMUR AT LAKE CONWAY, ORLANDO, LORIDA,
rmy Engineer Waterways Experiment Station, icksburg, MS.
or primary bibliographic entry see Field 5G.
78-11606

ASELINE DATA REPORT--LAKE CONWAY RASS CARP PROJECT,
lorida State Game and Fresh Water Fish Com-ission, Orlando.
or primary bibliographic entry see Field 5G.
78-11607

QUATIC MACROPHYTE SAMPLING IN AKE CONWAY,
lorida Dept. of Natural Resources, Orlando. Bu-eau of Aquatic Plant Research and Control.
or primary bibliographic entry see Field 5G.
78-11608

BIOLOGICAL BASELINE STUDIES OF THE LAKE CONWAY, FLORIDA, SYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5G.
W78-11609

BACKGROUND WATER-QUALITY ANALYSIS OF LAKE CONWAY,
Orange County Pollution Control Dept. Orlando, FL.
For primary bibliographic entry see Field 5G.
W78-11610

PROPOSED RELATIONSHIPS BETWEEN WHITE AMUR AND THE AQUATIC ECOSYSTEM AT LAKE CONWAY, FLORIDA,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5G.
W78-11611

CULTURE TECHNIQUES FOR THE PRODUCTION OF MONOSEX WHITE AMUR,
Fish Farming Experimental Station, Stuttgart, AR.
For primary bibliographic entry see Field 5G.
W78-11612

RESPONSE OF HYDRILLA TO VARIOUS HERBICIDES,
Texas Parks and Wildlife Dept., San Antonio. State Wide Noxious Vegetation Control Program.
For primary bibliographic entry see Field 5G.
W78-11613

UPTAKE AND METABOLISM OF DIMETHYLAMINE SALT OF 2,4-D BY FISH,
Syracuse Research Corp., New York.
For primary bibliographic entry see Field 5C.
W78-11614

CHARACTERIZATION AND EVALUATION OF POLYMERS CONTAINING HERBICIDES AS PENDENT SIDE CHAINS,
Wright State Univ., Dayton, OH. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-11615

DEVELOPMENT AND EVALUATION OF CONTROLLED RELEASE HERBICIDES,
Creative Biology Lab., Inc., Barberton, OH.
For primary bibliographic entry see Field 5G.
W78-11616

EFFICACY EVALUATION OF CONTROLLED-RELEASE HERBICIDES,
University of Southwestern Louisiana, Lafayette. Dept. of Plant Industry.
For primary bibliographic entry see Field 5G.
W78-11617

PROGRESS IN THE USE OF PLANT PARTHOGENS AS BIOLOGICAL CONTROLS FOR AQUATIC WEEDS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W78-11618

PRELIMINARY RESULTS OF INTEGRATING CHEMICAL AND BIOLOGICAL CONTROLS TO COMBAT WATER HYACINTH,
Agricultural Research Service, Fort Lauderdale, FL.
For primary bibliographic entry see Field 5G.
W78-11619

CONTROLLED FIELD TESTS OF SELECTED INSECTS AND PATHOGENS IN COMBINATION ON WATER HYACINTHS,
Army Engineers Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-11620

REMOTE SENSING OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7B.
W78-11621

DATA MANAGEMENT SYSTEMS IN THE AQUATIC PLANT CONTROL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7C.
W78-11622

SIMULATION AND DESIGN OF PUMPED STORMWATER SYSTEMS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
E. H. Imam, J. A. McCorquodale, and J. K. Bewtra.
Advances in Water Resources, Vol. 1, No. 3, p 157-160, March 1978. 2 fig, 1 tab, 8 ref.

Descriptors: *Storm water, *Urban drainage, *Model studies, Hyetographs, Hydrographs, Energy gradient, Flooding, Damages, Optimization, *Pumped stormwater systems, Surcharge flow, Basements.

Flow and damage in pumped storm water systems were simulated, taking into consideration surcharged flow and basement and street storage. The simulation model was used in a design model to obtain practical global optimum values for the sewer depth, slope, and diameter, as well as sump and pump sizes. (Singh-ISWS)
W78-11878

AN APPLICATION OF THE RUTTER MODEL TO THE ESTIMATION OF THE INTERCEPTION LOSS FROM THETFORD FOREST,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2A.
W78-11887

SEQUENTIAL GENERATION OF MONTHLY STREAMFLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11889

COMPARISON OF EAST FRACTIONAL GAUSSIAN NOISE AND BROKEN LINE MODELS FOR GENERATING ANNUAL FLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-11890

FIRM OUTFLOW FROM MULTIANNUAL RESERVOIRS WITH SKEW AND AUTOCORRELATED INFLOWS,
Technical Univ. of Lisbon (Portugal). Dept. of Civil Engineering.
L. Valadares Tavares.
Journal of Hydrology, Vol 38, No 1/2, p 93-112, July 1978. 6 fig, 1 tab, 22 ref.

Descriptors: *Reservoirs, *Inflow, *Discharge(Water), *Model studies, Mathematical models, Storage, Storage capacity, Reservoir storage, Markov processes, Monte Carlo method, Mathematics, Equations, Analytical techniques.

Similarity analysis was used to generalize the simulation results on the risk associated with firm outflow from multiannual reservoirs with skew and auto-correlated inflows. General conclusions on the relationship of this risk with the guaranteed outflow, the reservoir capacity and the inflow features (mean, dispersion, skewness and autocorrelation) were obtained and presented. (Sims-ISWS)
W78-11891

MICRO-RELIEF SURFACE DEPRESSION STORAGE: CHANGES DURING RAINFALL EVENTS AND THEIR APPLICATION TO RAINFALL-RUNOFF MODELS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-11934

FLOODS IN WESTERN NORTH CAROLINA, NOVEMBER 1977 - A LESSON FOR THE FUTURE,
North Carolina Water Resources Research Inst., Raleigh; Geological Survey, Raleigh. Water Resources Div.; and North Carolina Dept. of Natural Resources and Community Development, Raleigh.
For primary bibliographic entry see Field 2E.
W78-11973

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3A: SOUTHWEST FLORIDA - SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11974

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3B: SOUTHWEST FLORIDA - GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11975

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 4: NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11976

SELECTED HYDROLOGIC DATA, CAMAS PRAIRIE, SOUTH-CENTRAL IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11982

SOURCE, USE, AND DISPOSITION OF WATER IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-11983

FLOOD PROFILES FOR CYPRESS CREEK, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11987

PROGRESS REPORT ON HYDROLOGIC INVESTIGATIONS OF SMALL DRAINAGE AREAS IN NEW HAMPSHIRE--PRELIMINARY RELATIONS FOR ESTIMATING PEAK DISCHARGES ON RURAL, UNREGULATED STREAMS,
Geological Survey, Boston, MA. Water Resources Div.
D. R. LeBlanc.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 127, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 78-47, 1978. 9 p, 2 fig, 1 tab, 4 ref.

Descriptors: *Floods, *Peak discharge, *Estimating, *Small watersheds, *New Hampshire, Analytical techniques, Regression analysis, Equations, Drainage area, Topography, Streamflow, Flood forecasting, Frequency analysis, Flood recurrence interval.

The magnitude and frequency of floods on rural, unregulated streams in New Hampshire with drainage areas between 0.27 and 622 square miles may be estimated from drainage area, main-channel slope, and a precipitation intensity index. Based on multiple-regression analyses of data from 59 gaged sites in New Hampshire and adjacent areas of bordering states, peak discharges for recurrence intervals of 2, 5, 10, 25, 50, and 100 years can be estimated equations. The estimating relations can be applied to streams where flows are not significantly affected by regulation, diversion, or urbanization; where usable manmade storage does not exceed 4.5 million cubic feet per square mile; or where the basin characteristics are within a specified range. The average standard error of the estimate ranged from 35 percent for the 2-year flood to 58 percent for the 100-year flood. (Woodard-USGS)
W78-11988

AN ANALYSIS OF STREAM TEMPERATURES, GREEN RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-11989

REGIONAL ANALYSIS OF THE EFFECTS OF LAND USE ON STREAM-WATER QUALITY, METHODOLOGY AND APPLICATION IN THE SUSQUEHANNA RIVER BASIN, PENNSYLVANIA AND NEW YORK,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-11990

INTEGRATING ECOLOGICAL AND SOCIAL CONSIDERATIONS INTO URBAN FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W78-12014

NONCOMPUTER OPTIMIZATION OF SINGLE-SOURCE NETWORKS,
Visvesvaraya Region Coll. of Engineering, Nagpur (India).
P.R. Bhave.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 700-814, August 1978. 5 fig, 3 tab, 18 ref.

Descriptors: *Water supply, *Water distribution(Applied), *Networks, *Optimization, *Computation, *Cost minimization, Design, Hydraulics, Pipelines, Economic efficiency, Iterative procedure, Pip diameter, Constraints, Capital costs, Equations, Systems analysis.

A procedure, suitable even for hand calculation, is presented for the optimization of single-source water supply systems. The method assumes that all nodal demands are known and that minimal hydraulic gradient level requirements at the nodes are specified. The cost minimization problem is solved through use of an iterative procedure in which the nodal hydraulic gradient levels are initially assumed and successively corrected to satisfy the cost-head-loss ratio optimality criteria developed herein. The diameter is treated as a continous dependent variable and the odd diameter links are replaced by equivalent commercially available pipes. The procedure, illustrated by a design example, is applicable to branched, looping, and combined networks and is found to compare favorably with computer-oriented design procedures. (Bell-Cornell)
W78-12050

4B. Groundwater Management

GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI,
Forest Service (USDA), Rolla, Missouri, National Forests in Missouri.
For primary bibliographic entry see Field 5B.
W78-11307

INTERNATIONAL AQUIFER MANAGEMENT: THE HUECO BOLSON ON THE RIO GRANDE RIVER,
Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 6E.
W78-11309

GROUNDWATER PROTECTION IN THE CHRISTINA BASIN,
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
J. Tourbier.
Water and Sewage Works, Vol. 125, No. 1. p. 68-71 (January, 1978). 14 fig.

Descriptors: *Groundwater, *Surface-groundwater relationships, *Infiltration, *Water supply, Delaware, Water resources, Surface waters, Water quality, Runoff, Overland flow, Groundwater resources, Aquifer management.

A water shortage is inevitable if present trends of water consumption without conservation continue. The recent shift of emphasis to the maintenance of groundwater quality ignores the interrelationship and periodic exchanges of water between streams and aquifers. In order to implement groundwater resources protection, solutions acceptable to local governments must be found since most decision-making occurs on the local level. This article examines the adoption of a surface and groundwater drainage code in the Christina (Delaware) Basin. Where the percentage of impermeable surfaces is high, runoff increases and infiltration decreases drastically. Unless the natural processes of purification and infiltration are maintained, water resource problems will continue. The most lucrative solution is to allow development, providing protection measures are taken to keep infiltration o at its natural level. This may be accomplished through several methods including: (1) overland flow; (2) prous asphalt; (3) lattice blocks; (4) dutch drains; (5) seepage areas and (6) recharge basins. Pertinent federal and local regulations are examined. It is recommended that municipalities develop policies regulating nonpoint source pollution abatement and attempt to induce infiltration. (Quarles-Florida)
W78-11315

CHANGES IN SEEPAGE RATE FROM AN UNLINED CATTLE WASTE DIGESTION POND,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-11335

THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMAL WASTE IN BOISE VALLEY, IDAHO,
Boise State Univ., ID.
For primary bibliographic entry see Field 5G.
W78-11340

TOXIC METAL CONCENTRATION OF THE WATER TABLE AS AFFECTED BY POULTRY MANURE,
Delaware Univ., Newark. Dept. of Plant Science.
For primary bibliographic entry see Field 5B.
W78-11370

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA, REPORT,
Colorado School of Mines, Golden, Dept. of Geology.
For primary bibliographic entry see Field 7C.
W78-11439

HYDROLOGY AND GROUND WATER SUPPLY OF THE BOISE AREA,
Boise Center for Urban Research, ID.
L. L. Mink, and M. LeBaron.
Available from the National Technical Information Services, Springfield, VA 22161 as PB-268 865, Price codes: A03 in paper copy, A01 in microfiche. Report No UO-LCCM-B01-76-006, 1976. 38 p, 11 fig, 1 tab, 21 ref, 2 append. HUD H-2196R.

Descriptors: *Groundwater resources, *Idaho, *Water supply, *Aquifers, Groundwater recharge, Pumping, Irrigation, Infiltration, Water table, Groundwater availability, Hydrology, Domestic water, *Boise(Idaho).

Use of groundwater as a source for domestic water supplies has risen sharply. The quality of such waters, the relative ease with which groundwater can be developed, and its seemingly endless supply of groundwater have attracted increased municipal use. Boise uses groundwater exclusively for domestic water supply. However, little is known about the aquifer or the effects of high volume production on the groundwater system. The aquifer appears capable of meeting Boise's domestic water needs, but questions remain concerning aquifer capacity and how long it will be capable of supplying Boise's domestic water needs. This report provided answers to those questions. (Visocky-ISWS)
W78-11444

FEDERAL-STATE WATER USE RELATIONS IN THE AMERICAN WEST: AN EVOLUTIONARY GUIDE TO FUTURE EQUILIBRIUM,
Arizona. Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6E.
W78-11579

NATURAL SOIL NITRATE: THE CAUSE OF THE NITRATE CONTAMINATION OF GROUND WATER IN RUNNELS COUNTY, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 5B.
W78-11733

SURVEY OF HUMAN VIRUS OCCURRENCE IN WASTEWATER-RECHARGED GROUNDWATER ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Energy and Environment.
For primary bibliographic entry see Field 5B.
W78-11785

SUBSIDENCE OVER MINES AND CAVERNS, MOISTURE AND FROST ACTIONS, AND CLASSIFICATION.
Available from the National Technical Information Services, Springfield, VA 22161, as PB-272 844, Price codes: A00 in paper copy, A01 in microfiche. Transportation Research Record 612, 1976. 86 p. Zwanig, F.R., editor. $3.60.

Descriptors: *Land subsidence, +Soil science, *Rfost action, *Foundations, *Reviews, *Geologic investigations, Soil investigations, Subsidence, Construction, Highways, Drainage effects, Collapse, Karst, Sinks, Mathematical models, Exploration, Soil classification, Subsurface drains, Surveys, Soil water movement, Frost heaving, On-site investigations, On-site tests, Geologic formations, Weathering.

The 12 papers in this report deal with the following areas: mechanisms of subsidence due to underground openings: induced and natural sinkholes in Alabama--a continuing problem along highway corridors; subsidence control for structures above abandoned coal mines; ground subsubsidence associated with dewatering of a depressed highway section; geologic indicators of catastrophic collapse in karst terrain in Missouri; subsurface cavity detection: field evaluation of radar, gravity, and earth resistivity methods; mathematical model for predicting moisture movement in pavement systems; unsaturated transient and steady-state flow of moisture in subgrade soil; evaluation of freeze-thaw durability of stabilized materials; designations of excavation characteristics for materials identified in field investigations; pore structure of selected Hawaiian Soils; and insulated road study. (Humphreys-ISWS) (See also W78-11866 thru W78-11877)
W78-11865

MECHANISMS OF SUBSIDENCE DUE TO UNDERGROUND OPENINGS,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
G. F. Sowers.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 2-8, 1976. 5 fig, 8 ref.

Descriptors: *Subsidence, *Land subsidence, *Reviews, *Geologic formations, Faults(Geologic), Aquifers, Porous media, Tunnels, Geology, Groundwater movement, Karst, Drawdown, Dranage effects, Underground openings, Solution channels, Erosion caves, Mines.

Subsidence from underground defects is an increasing problem, and effective preventive or corrective measures depend on knowing the mechanism causing the failure. Too often, however the mechanism is ignored or diagnosed from the appearance of the ground surface, leading to routine indiscriminate treatment such as filling the depression or draining any water, which can be successful, ineffective, or harmful, depending on the mechanism involved. A number of types of openings are involved: open excavations, leaking sewers and culverts, solution channels in limestones, enlarged joints, faults, mines, tunnels, porous lava, erosion caves, voids between boulders, and voids between large debris. The mechanisms responsible include stratum thinning (including consolidation, collapse, or plastic flow), chemical and biochemical action (including burning), lateral strain, loss of lateral support, collapse of an opening, and raveling or erosion. Various combinations of openings and mechanisms can produce similar effects, but the necessary corrective measures are often different. Moreover, subsidences due to other mechanisms ofter resemble those from openings. The evaluation of the causes of subsidence requires a clear understanding of the geology of the soil and rock formations involved, a knowledge of the character of the openings, both natural and man-made, and an awareness of the different mechanisms that can lead to subsidence. (See also W78-11865) (Humphreys-ISWS).
W78-11866

INDUCED AND NATURAL SINKHOLES IN ALABAMA CONTINUING PROBLEM ALONG HIGHWAY CORRIDORS,
Geological Survey, Tuscaloosa, Al., Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-11867

SUBSIDENCE CONTROL FOR STRUCTURES ABOVE ABANDONED COAL MINES,
GAI Consultants, Inc., Monroeville, PA.
R. E. Gray, H. A. Salver, and J. C. Gamble.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classifiction; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 17-24, 1976. 7 fig, 2 ref.

Descriptors: *Subsidence, *Pennsylvania, *Coal mines, *On-site investigations, Foundations, Explorations, Mining, Geology, Subsurface investigations, Construction, Grouting, Sinks, Roads, Soil stabilization, Land subsidence.

Subsidence of the ground surface above abandoned coal mines can cause serious damage to highways, buildings and other facilities. Two categories of techniques used in controlling subsidence are selective support for structures and filling of voids caused by past mining operations. The particular method used must be dapted to the local geologic setting and the mining methods that were employed in extracting the coal as well as the support requirements of the structure, because these factors vary within any given site and from one locality to another. This paper presented a case history of subsidence control for an electric substation. The subsurface stabilization techniqus used included drilled piers and piling for support of the structures, and grout columns and dry fly as injection for support of the roadways. During construction, a few small sinkholes formed at the ground surface, indicating the serious subsidence potential. Since the costruction has been completed, no additional sinkholes have formed in the stabilized area. (See also W78-11865) (Humphreys-ISWS).
W78-11868

GROUND SUBSIDENCE ASSOCIATED WITH DEWATERING OF A DEPRESSED HIGHWAY SECTION,
California Dept. of Transportation, Sacramento. Office of Transportation Lab.
J. B. Hannon, and B. E. McGee.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 25-30, 1976. 8 fig, 2 ref.

Descriptors: *Land subsidence, *California, *Dewatering, *Highways, Groundwater, Drawdown, Pumping, Excavation, On-site tests, Consolidation, Water levels, Analysis, On-site Investigation, Data collections, Settlement(Structural), Foundations.

Subsidence of land areas adjacent to construction of an interstate highway was reported. Foundation settlements of structures adjacent to a depressed section occurred as a result of pumping groundwater during construction dewatering operations. Preliminary recommendations and actual construction dewatering operations were discussed. The stability of the Sacramento River level and the possibility of piping during high water were significant factors in planning the dewatering operation.

Records of groundwater drawdown for various pumping rates were presented with data from a Ranney well pumping system located in downtown Sacramento; foundation settlement studies for buildings in the adjacent are and specifications for dewatering of the depressed highway section were described. The need for comprehensive laboratory and field tests were discussed. Unforeseen circumstances that developed during the dewatering process required deviation from the scheduled construction operations and continuous monitoring of groundwater and ground surface elevations. It was concluded that the settlement problem could have been minimized had its probability been more fully realized. Groundwater levels should have been monitored more closely during the initial stages of dewatering. Valuable information could have been developed early in the planning stages of this project from drawdown studies using deep wells pumping from a lower, more permeable stratum. (See also W78-11865) (Humphreys-ISWS).
W78-11869

GEOLOGIC INDICATORS OF CATASTROPHIC COLLAPSE IN KARST TERRAIN IN MISSOURI,
Missouri Dept. of Natural Resources, Rolla. Div. of Geology and Land Survey.
For primary bibliographic entry see Field 2F.
W78-11870

SUBSURFACE CAVITY DETECTION: FIELD EVALUATION OF RADAR, GRAVITY, AND EARTH RESISTIVITY METHODS,
Southwest Research Inst., San Antonio, TX.
For primary bibliographic entry see Field 7B.
W78-11871

MATHEMATICAL MODEL FOR PREDICTING MOISTURE MOVEMENT IN PAVEMENT SYSTEMS,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-11872

UNSATURATED TRANSIENT AND STEADY-STATE FLOW OF MOISTURE IN SUBGRADE SOIL,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-11873

DESIGNATIONS OF EXCAVATION CHARACTERISTICS FOR MATERIALS IDENTIFIED IN FIELD INVESTIGATIONS,
Tennessee State Dept. of Transportation, Nashville. Div. of Soils and Geologic Engineering.
D. L. Royster.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 71-75, 1976. 2 fig, 2 ref.

Descriptors: *On-site investigations, *Soil investigations, *Soil classification, *Earth materials, Subsurface investigations, Excavation, Materials, Geologic investigations, Costs, Soil mechanics, Earthworks, Construction.

A system is described whereby geologic materials could be categorized according to their excavation difficulty during preconstruction field investigations and defines designations of excavation characteristics for each of the types of materials. The system as based on the premise that geologic formations, by their very nature, have rippability characteristics that are traceable, and thus predictable, from one locality to the next. The information obtained within right-of-way limits as a part of geologic mapping would be supplemented by numerous closely spaced auger borings. Examples of road and drainage excavation costs in various geologic environments and of costs of field investigations relative to total project costs were given. (See also W78-11865)(Humphreys-ISWS)
W78-11875

GROUNDWATER POLLUTANTS FROM UNDERGROUND COAL GASIFICATION,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-11884

ANALYTICAL SOLUTIONS FOR TWO-REGIME WELL FLOW PROBLEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-11893

EFFECT OF INTRAGRANULAR POROSITY OF COMPACTION,
Illinois Inst. of Tech. Chicago.
For primary bibliographic entry see Field 8E.
W78-11895

WELL STIMULATION AND SYSTEMS FOR RECOVERING GEOTHERMAL HEAT,
For primary bibliographic entry see Field 8B.
W78-11948

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WILLCOX AREA, COCHISE AND GRAHAM COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11967

MAPS SHOWING GROUND-WATER CONDITIONS IN THE YUMA AREA, YUMA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11968

MAPS SHOWING GROUND-WATER CONDITIONS IN THE EASTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA AND PINAL COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11969

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WESTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA COUNTY, ARIZONA--1977,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11970

AVAILABILITY OF GROUND WATER IN THE PISCATAQUA AND OTHER COASTAL RIVER BASINS, SOUTHEASTERN NEW HAMPSHIRE,
Geological Survey, Concord, NH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11971

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3A: SOUTHWEST FLORIDA - SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11974

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3B: SOUTHWEST FLORIDA - GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11975

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 4: NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11976

GROUND WATER-SURFACE WATER RELATIONS IN THE SILVER CREEK AREA, BLAINE COUNTY, IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
J. A. Moreland.
Idaho Department of Water Resources, Boise, Water Information Bulletin No 45, November 1977. 42 p, 13 fig, 3 tab, 4 ref.

Descriptors: *Surface-groundwater relationships, *Aquifer characteristics, *Water wells, *Water yield, *Springs, Hydrogeology, Groundwater movement, Transmissivity, Withdrawal, Groundwater recharge, Water level fluctuations, Idaho, *Blaine County, *Silver Creek area.

The U.S. Geological Survey studied ground water-surface water relations in the Silver Creek area, Blaine County, Idaho, as part of a comprehensive investigation of the area's water resources. Ground-water withdrawals calculated for 1975 totaled about 16,000 acre-feet of pumped ground water and 12,000 acre-feet of ground water extracted through flowing wells. Nineteen shallow test holes were drilled and cased to define the extent and effectiveness of confining layers in the southern part of the valley. Numerous stream-discharge measurements were made to define areal and temporal distribution of ground-water discharge. Most of the flow in Silver Creek rises from springs discharging from the shallow aquifer near the edge of the confining member. Only a small amount of discharge to the creek is attributable to upward movement of water through the confining member. Discharge from the artesian aquifer near Stanton Crossing may contribute a significant part of the spring flow which feeds the Big Wood River. Seasonal fluctuations in spring discharges are directly related to fluctuations in ground-water levels. (Woodard-USGS)
W78-11978

CHEMISTRY OF WATERS IN THE GEOPRESSURED ZONE FROM COASTAL LOUISIANA -- IMPLICATIONS FOR THE GEOTHERMAL DEVELOPMENT,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-11980

SELECTED HYDROLOGIC DATA, CAMAS PRAIRIE, SOUTH-CENTRAL IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11982

GROUND-WATER STORAGE IN THE JOHNSON VALLEY AREA, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.

J. J. French.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 244, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-130, April 1978. 35 p, 8 fig, 5 tab, 18 ref.

Descriptors: *Groundwater resources, *Alluvial aquifers, *Water quality, *Water storage, *Groundwater recharge, Artificial recharge, Groundwater potential, *California, *Johnson Valley(Calif), San Bernardino County(Calif).

The Mojave Water Agency includes several desert basins where ground water in storage is many times as great as the average annual recharge. The Johnson Valley area in San Bernardino County, Calif., was evaluated for (1) the quantity of ground water in storage, (2) the chemical quality of the ground water, and (3) the potential for storage of recharge water in the unsaturated zone. Johnson Valley contains about 250,000 acre-feet of water in storage, of which about half can be considered recoverable. About 250,000 acre-feet of void space in the unsaturated alluvium is available for storage of imported water, but not all of the recharged water could be recovered. The quality of the water in storage is satisfactory for public consumption, although water from some areas has high floride concentrations and should be mixed with water of low fluoride concentration. (Woodard-USGS)
W78-11984

APPRAISAL OF SHALLOW GROUND-WATER RESOURCES AND MANAGEMENT ALTERNATIVES IN THE UPPER PEACE AND EASTERN ALAFIA RIVER BASINS, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
C. B. Hutchinson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 245, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-124, February 1978. 57 p, 14 fig, 8 tab, 34 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water resources development, *Well spacing, *Hydrologic budget, Groundwater recharge, Florida, *West-central Florida, *Eastern Alafia River basin, *Upper Peace River basin, Connector wells.

In southwest Florida, the shallow aquifer system underlying the 1,250-square-mile upper Peace and eastern Alafia River basins is a relatively untapped source of supply. The aquifer system ranges between 50 and 300 feet thick and is composed of a surficial sand unit underlain by a limestone unit. Sand and clay confining beds separate the shallow aquifer system from the highly productive, extensively developed deep aquifer system. The hydrologic budget of the area indicates that annual leakage of water from the shallow to the deep aquifer system is 2.6 inches while annual pumpage from the deep aquifer system averages 5.5 inches. Management alternatives to be considered for efficient use of the shallow ground-water resources include development by withdrawal wells or connector wells for recharge. One solution for a gridded network of wells consists of 540 wells spaced 7,000 feet apart, each producing 453 gallons per minute. The network would derive water to meet demand by capturing water that would normally have run off evapotranspired. (Woodard-USGS)
W78-11985

GEOHYDROLOGIC DATA FROM THE JEMEZ MOUNTAINS AND VICINITY, NORTH-CENTRAL NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11986

NITRATE POLLUTION OF GROUNDWATER FROM NITROGEN FERTILIZERS AND ANIMAL WASTES IN THE PUNJAB, INDIA,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
For primary bibliographic entry see Field 5B.
W78-12076

CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5E.
W78-12092

NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION.
For primary bibliographic entry see Field 5B.
W78-12096

4C. Effects On Water Of Man's Non-Water Activities

BIBLIOGRAPHY ON THE EFFECTS OF PRESCRIBED BURNING AND MAMMAL AND WATERFOWL UTILIZATION OF WETLANDS: ANNOTATED LITERATURE SEARCH WITH SELECTED ABSTRACTS,
Fish and Wildlife Service, Annapolis, MD. Div of Ecological Services.
For primary bibliographic entry see Field 10C.
W78-11385

A 'PEOPLE-COUNTER' FOR UNSURFACED WETLAND FOOTPATHS,
Glasgow Univ., (Scotland). Dept. Geography.
J. R. Rees.
Environmental Conservation, Vol 5, No 1, p 66-68, Spring, 1978. 4 fig, 1 tab, 3 ref.

Descriptors: *Methodology, *Census, Use rate, Wetlands, *Footpaths, Pressure pads.

Wetlands are vulnerable to recreational pressure, and in view of the usually wet substratum bare footpaths will develop and be maintained as a result of visitor pressures that may be considerably lower than those required to produce bare footpaths in drier grass or woodlands areas. A low-cost, battery-operated, pressure-pad people counter was devised to monitor the numbers of people using selected pathways. It is composed of a stout board with a length of rubber tubing pinned to its upper surface. This surface is then covered with the thin rubber sheeting. A length of plastic tubing connects the rubber tubing to the counting meter. The pressure-pad operates satisfactorily when buried just below the soft muddy surface of the footpath. (Stihler-Mass)
W78-11754

EFFECTS OF GRAZING ON A SALT MARSH,
Georgia Univ., Sapelo Island. Marine Inst.
R. J. Reimold, R. A. Linthurst, and P. L. Wolf.
Biological Conservation, Vol 8, No 2, p 105-125, September, 1975. 9 fig, 5 tab, 23 ref.

Descriptors: *Salt marshes, *Primary productivity, *Grazing, *Effects, Georgia, Standing crops, Crabs, Detritus, Livestock, Coastal marshes, Wetlands, Economics, Spartina alterniflora.

Changes in the quantity of plant material in three Georgia salt marsh systems: (1) pristine unaltered marsh, (2) marsh grazed by ungulates, and (3) marsh formerly grazed by ungulates, were measured periodically over two years. All three systems had a mixture of Spartina alterniflora and Salicornia virginica while the latter two also contained Distichlis spicata. Annual production, potential detritus contribution, percent dry weight, mineral concentration, plant species composition, and fiddler crab populations were examined for comparative purposes. Effects of simulated grazing were evaluated at three times of the year in a pure stand of S. alterniflora. An economic assessment and comparison of the three systems was also considered. Average yearly standing crop increments indicated that the aerial plant production for the ungrazed system (583.4 g/sq.m/yr exceeded the production of formerly grazed marsh (221.9 g/sq.m/yr). Detritus production and the number of fiddler crabs were reduced by grazing. Greatest density of plant stems occurred in the area where simulated grazing had occurred in the area where simulated grazing had occurred most recently; lowest stem density was found in the central area. (Stihler-Mass)
W78-11758

EFFECT OF OVERSTORY REMOVAL ON PRODUCTION OF SHRUBS AND SEDGE IN A NORTHERN MINNESOTA BOG,
Forest Service (USDA), Grand Rapids, MN. North Central Forest Experiment Station.
J. M. Brown.
Journal of the Minnesota Academy of Science, Vol. 38, No. 2, 3, p 96-97, 1972. 1 fig, 2 tab, 4 ref.

Descriptors: *Bogs, *Clearcutting, *Vegetations, Effects, Wetlands, *Minnesota, Productivity, *Primary productivity, Shrubs, Sedges.

A vegetation survey three years after the removal of portions of the overstorey showed a decrease in total shrub cover from 9% in forested strips to 7% in clearcut strips. This decrease was accompanied by an increase in frequency of ericaceous shrubs. Sedges increased in both frequency and coverage. Dry weight sedge production was approximately five times greater in clearcut areas than under the original black spruce canopy. (Stihler-Mass)
W78-11760

SUBSIDENCE OVER MINES AND CAVERNS, MOISTURE AND FROST ACTIONS, AND CLASSIFICATION.
For primary bibliographic entry see Field 4B.
W78-11865

MECHANISMS OF SUBSIDENCE DUE TO UNDERGROUND OPENINGS,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W78-11866

INDUCED AND NATURAL SINKHOLES IN ALABAMA CONTINUING PROBLEM ALONG HIGHWAY CORRIDORS,
Geological Survey, Tuscaloosa, Al., Water Resources Div.
J. G. Newton.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, andlassification; Transportation Research Record 612, Transportation Research board, National Academy of Sciences, Washington D.C., p 9-16, 1976. 5 fig, 22 ref.

Descriptors: *Sinks, *Alabama, *Highways, *Subsidence, Geologic formations, Land subsidence, Porous media, Collapse, Dewatering, Groundwater, Subsurface drainsm Geology, Carbonate rocks, Karst.Natural sinkholes, Induced sinkholes.

Sinkholes are divided into two categories, induced (man-related) and natural. Since 1900, an estimated 4,000 induced sinkholes or related features have formed in Alabama; fewer than 50 natural sinkholes have been reported. Most induced sinkholes are caused by water-level declines due to pumpage; others result from factors associated with construction. Almost all sinkholes occur

where cavities develop in unconsolidated deposits overlying openings in bedrock. The downward migration of the deposits overlying openings in bedrock. The downward migration of the deposits and the development of the cavities are caused or accelerated by a water-level decline that results in the loss of buoyant support and increases the velocity of water movement, the magnitude of water-level fluctuations, and the induced recharge. Most sinkholes caused by construction are due to the diversion of drainage over openings in bedrock. Many natural sinkholes are caused by the collapse or downard migration of unconsolidated deposits into openings in bedrock. The downward migration that sometimes creates cavities in the deposits results from natural declines in the water table, progressive enlargement by solution of openings in the top of bedrock, or a combination of both. The failure of bedrock roofs over solutionally enlarged openings is a rare occurrence. The time required for the development of natural sinkholes is far greater than that associated with induced sinkholes. (See also W78-11865) (Humphreys-ISWS)
W78-11867

SUBSIDENCE CONTROL FOR STRUCTURES ABOVE ABANDONED COAL MINES,
GAI Consultants, Inc., Monroeville, PA.
For primary bibliographic entry see Field 4B.
W78-11868

GROUND SUBSIDENCE ASSOCIATED WITH DEWATERING OF A DEPRESSED HIGHWAY SECTION,
California Dept. of Transportation, Sacramento. Office of Transportation Lab.
For primary bibliographic entry see Field 4B.
W78-11869

EVALUATION OF FREEZE-THAW DURABILITY OF STABILIZED MATERIALS.
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W78-11874

PORE STRUCTURE OF SELECTED HAWAIIAN SOILS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State. Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 2G.
W78-11876

INSULATED ROAD STUDY,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
For primary bibliographic entry see Field 2C.
W78-11877

LITTORAL ENVIRONMENT OBSERVATIONS AND BEACH CHANGES ALONG THE SOUTHEAST FLORIDA COAST,
Coastal Engineering Research Center, Fort Belvoir.
For primary bibliographic entry see Field 2L.
W78-11962

SURFICIAL SEDIMENTS AND SEAGRASSES OF EASTERN GREAT SOUTH BAY, N.Y.,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W78-11963

REGIONAL ANALYSIS OF THE EFFECTS OF LAND USE ON STREAM-WATER QUALITY, METHODOLOGY AND APPLICATION IN THE SUSQUEHANNA RIVER BASIN, PENNSYLVANIA AND NEW YORK,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-11990

FLUVIAL SEDIMENT STUDY OF FISHTRAP AND DEWEY LAKES DRAINAGE BASINS, KENTUCKY - VIRGINIA,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-11991

SURFACE MINING AND THE FLOOD OF APRIL 1977,
Northeastern Forest Experiment Station, Berea, KY.
W. R. Curtis.
Research Note NE-248, 1977. 4 p, 2 fig, 1 tab, 6 ref.

Descriptors: *Strip mines, Streams, Storms, *Flash floods, Appalachian Mountain region.

Data from experimental sites in Breathitt County, Kentucky, and Raleigh County, West Virginia, showed that during a major rainstorm on 4 April 1977 streamflow from surface mined watersheds peaked lower than that from adjacent or nearby unmined watersheds. (Forest Service)
W78-12034

EFFECT OF STRIP MINING ON WATER QUALITY IN SMALL STREAMS IN EASTERN KENTUCKY, 1967-1975,
Northeastern Forest Experiment Station, Berea, KY.
For primary bibliographic entry see Field 5B.
W78-12035

RECOVERY OF A DEFORESTED ECOSYSTEM,
Cornell Univ., Ithaca, NY.
G. E. Likens, F. H. Bormann, R. S. Pierce, and W. A. Reiners.
Science Vol. 199, No. 4328, February 3, 1978, p 492-496.

Descriptors: Geochemistry, *Soil chemistry, *Water chemistry, *Forest soils, Deciduous forests, *Clear-cutting, *Vegetation regrowth, Hubbard Brook Experimental Forest, Nutrient cycling, Soil nutrients.

Clearcutting of hardwood forests in New Hampshire causes loss of nutrients from the site both by leaching to streams and by removal of forest products. This raises questions about how fast the site recovers the nutrient loss, and whether repeated cuttings lead to progressive loss of nutrients and reduced site productivity. Studies of the rapid revegetation following the classic experiment on Hubbard Brook Watershed 2, and of other sites in New Hampshire, indicate that nutrient losses from stem-only harvests should be recovered in at most 100 years. Whole tree harvests and short rotations increase the possibility of nutrient depletion. But more rapid recovery cannot yet be counted on because of inadequate knowledge of the nitrogen cycle and mineral weathering and how these are affected by cutting and regrowth. (Forest Service)
W78-12071

4D. Watershed Protection

THE INVENTORY AND DISTRIBUTION OF WATER AND ASSOCIATED LAND RESOURCES IN THE GARRISON/DEVILS LAKE REGION OF ND: AN APPLICATION OF RESOURCE DATA ACQUIRED BY ERTS,
North Dakota Univ., Grand Forks. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W78-11373

IMPACT OF URBAN RUNOFF ON WATER QUALITY IN THE OCCOQUAN WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11383

MANAGING FARMLAND TO IMPROVE WATER QUALITY,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Information.
For primary bibliographic entry see Field 5G.
W78-11523

WINTER APPLIED MANURE: EFFECTS OF ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT,
Agricultural Research Service, Morris, MN.
For primary bibliographic entry see Field 5G.
W78-11524

STUDIES OF THE LAKE WINGRA WATERSHED: AN INTERIM REPORT,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-11532

STREAMFLOW MODELING OF UPPER INDUS RIVER CATCHMENTS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
For primary bibliographic entry see Field 2A.
W78-11881

A QUASI-LINEAR SPATIALLY DISTRIBUTED CELL MODEL FOR THE SURFACE RUNOFF SYSTEM,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-11882

FLOW GENERATION BY CATCHMENT MODELS OF DIFFERING COMPLEXITY - A COMPARISON OF PERFORMANCE,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
For primary bibliographic entry see Field 2E.
W78-11888

PROCEEDINGS OF THE FEDERAL INTERAGENCY SEDIMENTATION CONFERENCE, 1963.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 2J.
W78-11898

WATER-QUALITY RECORDS FOR THE HUBBARD CREEK WATERSHED, TEXAS, OCTOBER 1974 - SEPTEMBER 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11981

FLUVIAL SEDIMENT STUDY OF FISHTRAP AND DEWEY LAKES DRAINAGE BASINS, KENTUCKY - VIRGINIA,
Geological Survey, Louisville, KY. Water Resources Div.

W. F. Curtis, R. F. Flint, F. H. George, and J. F. Santos.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A056 573, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 77-123, March 1978. 92 p, 28 fig, 9 tab, 50 ref.

Descriptors: *Fluvial sediments, *Sediment transport, *Erosion, *Strip mines, *Sediment yield, River basins, Kentucky, Virginia, Sediment load, Environmental effects, Water quality, Water pollution sources, Bicarbonates, Sulfates, Hardness(Water), Strip mine wastes, Data collections.

Fourteen drainage basins above Fishtrap and Dewey Lakes in the Levisa Fork and Johns Creek drainage basins of eastern Kentucky and southwestern Virginia were studied to determine sedimentation rates and origin of sediment entering the two lakes. The basins ranged in size from 1.68 to 297 square miles. Sediment yields ranged from 2,890 to 21,000 tons per square mile where surface-mining techniques predominated, and from 732 to 3,470 tons per square mile where underground mining methods predominated. Yields, in terms of tons per acre-foot of runoff, ranged from 2.2 to 15 for surface-mined areas, and from 0.5 to 2.7 for underground-mined areas. Water and sediment discharges from direct runoff during storms were compared for selected surface-mined and underground-mined areas. Data points of two extensively surface-mined areas, one from the current project and one from a previous project in Beaver Creek basin, McCreary County, Kentucky, grouped similarly in magnitude and by season. Disturbed areas from mining activities determined from aerial photographs reached 17 percent in one study area where extensive surface mining was being practiced. For most areas where underground mining was practiced, percentage disturbed area was almost negligible. Trap efficiency of Fishtrap Lake was 89 percent, and was 62 percent for Dewey Lake. Average annual deposition rates were 464 and 146 acre-feet for Fishtrap and Dewey Lakes, respectively. The chemical quality of water in the Levisa Fork basin has been altered by man's activities. (Woodard-USGS)
W78-11991

PESTICIDE RUNOFF LOSSES FROM SMALL WATERSHEDS IN GREAT LAKES BASIN,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5B.
W78-12009

EROSION OF SURFACE-MINE SPOILS,
Northeastern Forest Experiment Station, Berea, KY.
W. R. Curtis, and M. J. Superfesky.
In: Proceedings of the 32nd Annual Meeting of the Soil Conservation Society of America, 'New Directions in Century Three: Strategies for Land and Water Use', August 7-10, 1977. Richmond, Virginia, p 154-158, (1977), 8 fig, 5 ref.

Descriptors: *Strip mines, *Bank erosion, *Soil profiles, *Topography, Appalachian Mountain region.

Erosion from head-of-hollow fills and from sites reclaimed to their original contour was studied. The effects of time, precipitation, and slope position were considered. Erosion on back-to-contour totaled 32.93 mm over twenty months. Erosion from the hollow fill over twenty-six months totaled 23.83 mm. Long uninterrupted spoil slopes were conducive to formation of rills and gullies. (Forest Service)
W78-12033

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

POLYCHLORINATED BIPHENYLS TOXIC POLLUTANT EFFLUENT STANDARDS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11319

FATE OF TRACE ELEMENTS IN SEWAGE SLUDGE-AMENDED SOILS,
Dayton Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-11363

INTERACTING ENVIRONMENTAL FACTORS WHICH CONTROL THE SINKING RATE OF PLANKTONIC ALGAE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-11365

CHARACTERIZATION OF NUTRIENTS AND ALGAL BLOOMS AT ABIQUIU AND COCHITI RESERVOIRS,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11367

SELENIUM IN SOUTH DAKOTA GROUND AND SURFACE WATER,
Geological Survey, Vermillion, SD.
R. L. Stach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 051, Price codes: A04 in paper copy, A01 in microfiche. South Dakota Water Resources Inst., Brookings, Completion Report, May 1978. 68 p, 1 fig, 23 tab, 9 ref, append. OWRT A-066-SDAK(1), 14-34-0001-7088.

Descriptors: *Selenium, *Groundwater, Standards, Pollutants, Surface water, Public health hazards, *South Dakota, Water quality standards, Nitrates, *Water analysis, *Pollutant identification, Sampling.

The South Dakota Geological Survey in conjunction with the South Dakoka Agricultural Experiment Station collected and analyzed 586 water samples for selenium. Of these samples 47 or 8 percent of the samples exceeded the drinking water standard of 10 parts per billion. Over ninety percent of the selenium in solution was in the form of selenate. A significant correspondence was found between high nitrate levels and high selenium levels. The current hypothesis is that oxidizing conditions control the distribution of both selenium and nitrate. This hypothesis explains why 79 percent of the samples having anomalous nitrate levels also have anomalous selenium levels. The main source of selenium appears to be the Pierre Shale. The high selenium concentrations are found in shallow aquifers which are usually unconfined. (Wiersma-So Dak St).
W78-11371

PREPARATION AND ANALYSIS OF WATER SEDIMENT AND PLANT SAMPLES FOR METALS,
South Dakota State Univ., Brookings. Dept. of Chemistry.
D. C. Hilderbrand.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 123, Price codes: A02 in paper copy, A01 in microfiche. South Dakota Water Resources Institute, Brookings, Completion Report, May 1978, 6 p. OWRT A-057-SDAK(1), 14-34-0001-7087.

Descriptors: *Trace elements, Spectroscopy, Sediments, Plant tissues, Analysis, *Metals, *Pollutant identification, Potable water, *Bottom sediments, Chromium, Cadmium, Lead.

Two aspects of analysis of water systems for metals were investigated: (1) Analysis of drinking water supplies for potentially toxic materials with the objective of developing suggested procedures for these elements, and (2) sampling bottom sediments for metal analysis. The three elements studied in detail were chromium, cadmium and lead. Arsenic was less thoroughly investigated. The recommended methods give satisfactory results. All procedures studied to obtain a representative bottom sediment sample failed. Poor reproducibility is due to the inhomogeneity of the sample and incomplete dissolution of the metal content of the sample. (Wiesma-So Dak St).
W78-11372

HYDROSPHERIC TRACE ELEMENTS AND THEIR APPLICATION IN TRACING WATER POLLUTANTS,
Oregon State Univ., Corvallis. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-11375

AN IMPROVED SOIL-SAMPLING PROCEDURE FOR THE PREDICTION OF DISSOLVED INORGANIC PHOSPHATE CONCENTRATIONS IN SURFACE RUNOFF FROM PASTURE,
Massey Univ., Palmerston North (New Zealand). Agricultural and Horticultural Sciences.
A. N. Sharpley, J. K. Syers, and R. W. Tillman.
Journal of Environmental Quality, Vol 7, No 3, p 455-456, 1978. 3 fig, 1 tab, 3 ref.

Descriptors: *Phosphates, *Agricultural runoff, *Soil analysis, *Sampling, *Phosphorus compounds, Fertilizers, Water pollution sources, Leaching, Phosphorus, Nutrient removal, Water pollution, Runoff, Chemical analysis, Storm runoff, Leachate, Pastures, Analytical techniques, Surface runoff, *Dissolved inorganic phosphates, *Phosphate transport, *Soil sampling procedure, *Surface-runoff plots, Soil sampling.

Linear relationships were obtained between the mean concentration of dissolved inorganic phosphate (DIP) in each of several surface-runoff events and the amounts of inorganic P extracted by 0.1M NaCl from the top 1 cm of soil sampled prior to the event. These relationships were similar for both unfertilized and fertilized, undrained pasture. This contrasted with the data obtained in the previous year for the same surface-runoff plots, receiving the same treatments, where markedly different linear relationships were obtained using a 0-5 cm soil-sampling depth. The modified soil-sampling procedure provides more generally applicable method of predicting the concentration of DIP in surface runoff from pastures of widely differing P status. (Henley-ISWS)
W78-11432

EARTH RESOURCES DATA ACQUISITION SENSOR STUDY, PERIOD: DECEMBER 1, 1974-MAY 31, 1975,
Alabama Univ., Huntsville. School of Graduate Studies and Research.
E. W. Grohse.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-30637, Price codes: A04 in paper copy, A01 in microfiche. Final Report, July 1975. 54 p, 1 fig, 3 tab, 46 ref, 5 append. NASA NAS8-31169.

Descriptors: *Monitoring, *Water quality, *Rivers, *Streams, Remote sensing, Satellites(Artificial), On-site data collections, Equipment, Sampling, Air pollution, Sulfur compounds, Pollutants, Water pollution, Water chemistry, Turbidity, Dissolved oxygen, Biochemical oxygen demand, Hydrogen ion concentration, Hardness(Water), Water temperature.

This preliminary study concerned itself with the investigation of the minimum data collection and data processing requirements for the development of 'smart' water monitoring systems, which disregard redundant and irrelevant data and process only those data predictive of the onset of significant pollution events. Two approaches were immediately suggested: (1) adaptation of a presently available 'smart' ambient air monitoring system developed by TVA, and (2) consideration of a 'smart' air, water, and radiological monitoring system developed by the Georgia Tech Experiment Station. In order to apply 'smart' monitoring systems, threshold values and maximum allowable rates of change of critical parameters such as dissolved oxygen and temperature are required. Hopefully, these will be determinable through STORET and other sources of water quality data, which are presently being investigated. (Sims-ISWS)
W78-11443

WATER QUALITY ASSESSMENT YAKIMA RIVER BASIN,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5B.
W78-11450

USE OF BIOLOGICAL INDICATOR ORGANISMS TO QUANTITATE ORGANOCHLORINE POLLUTANTS IN AQUATIC ENVIRONMENTS - A REVIEW,
Uppsala Univ. (Sweden). Dept. of Zoology.
D. J. H. Phillips.
Environmental Pollution, Vol. 16, p 167-229, 1978. 12 fig, 6 tab, 188 ref.

Descriptors: *Bioindicators, *Chlorinated hydrocarbon pesticides, *Polychlorinated biphenyls, *Chemical analysis, Pollutant identification, Bioassay, Pesticide residues, Water analysis, Analytical techniques, Path of pollutants, Organic compounds, Pesticides, Insecticides, Teleosts, Mollusks, Marine mammals, Crustaceans.

The use of biological indicator organisms to monitor the comparative pollution of aquatic areas by organochlorine compounds (the organochlorine insecticides and the polychlorinated biphenyls) by means of their organochlorine content is reviewed. The results of surveys using such indicator organisms may be affected by parameters other than the comparative abundance of organochlorine pollutants at each location studied. These interfering parameters include those concerning the organisms sampled (body lipid, age, size, or weight, sex, and the sexual cycle interactions of accumulated organochlorines affecting retention and storage of these compounds, and diet) and those concerned with the environments from which the organisms were sampled (chemical interactions or metabolism of organochlorines before uptake by the chosen indicator organisms, salinity and water temperature). Each parameter may, in some instances, influence survey results by differentially affecting organisms sampled at different locations. In addition, each parameter may interact in a complex fashion with one or more of the other interfering variables. It is concluded that the use of any biological organism to elucidate the comparative pollution of different locations by organochlorines, or even to monitor changes in the available organochlorine concentration at any one location with time, is open to criticism. The effects of the interfering parameters cited above may be far more important in determining the concentrations of organochlorines in the chosen indicator organisms than is the relative aboslute abundance of organochlorines in the ambient surroundings. (EIS-Deal)
W78-11540

THE EFFECTS OF INTERMITTENT CHLORINATION ON TEN SPECIES OF WARM-WATER FISH,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5C.
W78-11544

STRESS RESPONSE OF COHO SALMON (ONCORHYNCHUS KISUTCH) ELICITED BY CADMIUM AND COPPER AND POTENTIAL USE OF CORTISOL AS AN INDICATOR OF STRESS,
Oregon Cooperative Fishery Research Unit, Corvallis.
For primary bibliographic entry see Field 5C.
W78-11546

DETERMINATION OF VOLATILITY AND CHEMICAL PERSISTENCE OF LIPID-SOLUBLE HALOGENATED ORGANIC SUBSTANCES IN MARINE ORGANISMS,
Central Inst. for Industrial Research, Oslo (Norway).
G. Lunde, J. Gether, and E. Steinnes.
Ambio, Vol. 5, No. 4, p 180-182, 1976. 2 tab., 15 ref.

Descriptors: *Pollutant identification, *Pesticide residues, *Chlorine, *Bromine, *Iodine, *Methodology, *Lipids, Path of pollutants, Halogens, Organic compounds, Chemical analysis, Chlorinated hydrocarbon pesticides, Stability, Polychlorinated biphenyls, *Chemical persistence, Lipid soluble halogenated compounds.

This paper describes an application of a new method for determination of total levels of organic bound halogens in biological material. The total content of organic bound chlorine, bromine, and iodine was determined prior to and after treatments of lipids from marine organisms with hexane/sulfuric acid. They were similarly measured in volatiles isolated from the same organisms by cyclohexane/steam codestillation. The results obtained were compared to the level of polychlorinated biphenyls (PCB) for these organisms. In both untreated and sulfuric-acid-treated lipids, most of the chlorine could not be accounted for as known compounds. (EIS-Katz)
W78-11548

DAPHNIA MAGNA AS A BIOASSAY SYSTEM FOR HISTAMINE IN TUNA EXTRACTS,
California Univ., Davis. Inst. of Marine Resources.
E. R. Blonz, and H. S. Olcott.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 44, No. 5, p 517-519, 1978. 1 fig, 1 tab, 19 ref.

Descriptors: *Bioassay, *Daphnia, *Fish physiology, Animal metabolism, Biochemistry, Organic compounds, Public health, Human diseases, Human pathology, Biodegradation, Toxicity, Quality Control, *Tuna, *Histamine.

Live Daphnia were subjected to varying concentrations of aqueous extracts from three lots of commercially canned tuna. Two of the lots had been identified as causing 'scombroid poisoning', and contained high histamine (Hm) levels. The third was a control lot of store-bought tuna. The extract of the control fish was used either alone or with the addition of Hm at levels equalling or exceeding the Hm concentrations in the other two lots. Twenty Daphnia per group were exposed for 60 minutes: response (loss of activity or infrequent twitching) were recorded at ten minute intervals. The response increased with time, and was dependent upon the concentration of Hm present-regardless of source. LD50's for the various time and concentration gradients are shown. The method might be useful in quality control testing. (EIS-Deal)
W78-11551

EXPERIMENTAL STUDIES ON THE ACCUMULATION OF COPPER AND ZINC IN THE GREEN MUSSEL,
National Institute of Oceanography, Panjim (India).
For primary bibliographic entry see Field 5C.
W78-11564

PERIPHYTON BIOMASS OF ATTACHED ALGAE AND BIOLOGICAL ESTIMATION OF WATER POLLUTION LEVEL USING ATTACHED DIATOMS IN THE CHIKUMA RIVER AND ITS TRIBUTARY, NAGANO PREFECTURE (IN JAPANESE),
Freshwater Fisheries Research Lab. Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W78-11571

WISCONSIN TRIBUTARY LOADINGS TO THE UPPER GREAT LAKES,
Wisconsin Dept. of Natural Resources, Madison. Div. of Environmental Protection.
For primary bibliographic entry see Field 5B.
W78-11628

COMPARISON OF MANUAL (GRAB) AND VACUUM TYPE AUTOMATIC SAMPLING TECHNIQUES ON AN INDIVIDUAL AND COMPOSITE SAMPLE BASIS.
National Fielld Investigations Center-Denver, CO.
For primary bibliographic entry see Field 7B.
W78-11630

COHERENT MICROSCOPY AND MATCHED SPATIAL FILTERING FOR REAL-TIME RECOGNITION OF DIATOM SPECIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Physics.
S. K. Case.
Environmental Science and Technology, Vol 12(8), 1978, p 940-946. 17 fig, 16 ref.

Descriptors: *Methodology, *Monitoring, Water pollution effects, Phytoplankton, Algae, *Diatoms, *Microscopy, Plant grouping, Plant morphology, Plant populations, *Pollutant identification, Matched spatial filtering.

A method of image enhancement and real-time input of diatoms into an optical pattern recognition system is described. The system is designed to identify and count diatoms as a means of water pollution assessment. The method consists of directing a low-power laser beam into a microscope to produce a magnified coherent image of the specimen. (EIS-Katz)
W78-11641

A RAPID METHOD OF DETERMINING MAXIMUM PERMISSIBLE CONCENTRATIONS OF TOXICANTS IN LAKE AND STREAM FISHERIES,
Moscow State Univ. (USSR).
N. S. Stroganov.
Hydrobiological Journal, Vol 12(4), 1976, p. 83-86, 5 ref. (translated from Russian).

Descriptors: *Toxicology, *Daphnia, *Bioassays, Mortality, *Methodology, Commercial fisheries, Freshwater fish, *Monitoring, Laboratory tests, Laboratory equipment, Statistical methods.

The author describes a method of determining the maximum permissible concentration of toxic substances in lake and stream fisheries, based on their toxicity for D. magna, the organisms most sensitive to toxic agents. The survival rate and fecundity of the daphnids in a 30-day experiment are the tests for toxicity. The method is 40 to 80 times more economical of time and money than the comprehensive method previously suggested by the author. It also speeds up the process of setting preliminary fishery MPC. (EIS-Katz)
W78-11642

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF POLLUTION BY ZINC, CADMIUM, LEAD AND COPPER. I. EFFECTS OF ENVIRONMENTAL VARIABLES ON UPTAKE OF METALS,
Melbourne Univ., Parkville (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11644

DER QUEEKSILBERGEHALT IN MUSKELN DES KARPFENCYPRINUS CARPIO L. - ALS INDIKATOR DER WASSERVERUNREINIGUNG (THE MERCURY CONTENT OF CARP (CYPRINUS CAPRIO L.) MUSCLES AS AN INDICATOR OF WATER PURIFICATION,
Institut fuer Meereslebensmittel Technologie, Szezecin (Poland).
A. Chodyniecki, and M. Protaswicki.
Acta Hydrochimica et Hydrobiologica, 1978, Vol. 6, p 175-179, 1 tab, 1 fig, 12 ref. (German).

Descriptors: Metals, *Mercury, *Carp, Fresh water fish, Path of pollutants, Water pollution effects, *Commercial fish, Commercial fisheries, Public health, Aquiculture, Bioassay, Methodology.

A laboratory bioassay with carp showed a positive correlation between the mercury content of the water and in the fish flesh. No strong evidence was observed that the mercury content of the fish muscle was dependent on the weight of the fish. (EIS-Katz)
W78-11657

A FLOW-THROUGH TESTING PROCEDURE WITH DUCKWEED (LEMNA MINOR L.),
Environmental Research Lab.-Duluth, MN.
C. T. Walbridge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 586, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-108, September 1977. 20 p, 5 fig, 27 ref.

Descriptors: *Bioassay, *Aquatic plants, *Methodology, Plant nutrition, Growth regulators, Toxicity, Water pollution effects, Plant regulators, Growth rates, Testing, Pollutants, Lemna minor, *Plant responses, Laboratory plant, *Proportional dilutors.

Lemna minor is one of the smallest flowering plants. Because of its floating habit, ease of culture, and small size it is well adapted for laboratory investigations. Procedures for flow-through tests were developed. Testing procedures were developed with this apparatus. By using the techniques described here, the effects of nutrients or toxicants, singly or in combination, can be determined in several concentrations with several replicates of each. Responses which can be measured include changes in growth rate, changes in death rate, changes in timing of division of colonies, color, changes, changes in variability, and modification of the flowering response. Emphasis here is on changes in growth rate determined either by daily frond counts or by final frond numbers. (EIS-Katz)
W78-11660

USE OF FRESHWATER MUSSELS TO MONITOR POINT SOURCE INDUSTRIAL DISCHARGES,
Eastern Michigan Univ., Ypsilanti. Center for Aquatic Biology.
For primary bibliographic entry see Field 5B.
W78-11670

EFFECTS OF ORGANIC FRACTIONS FROM SECONDARY EFFLUENT ON SELENASTRUM CAPRICORNUTUM (KUTZ),
Rensselaer Polytechnic Inst., Troy, NY.
For primary bibliographic entry see Field 5C.
W78-11678

EFFECTIVENESS OF AN ARTIFICIAL SUBSTRATE FOR SAMPLING MACROINVERTEBRATES IN SMALL STREAMS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
K. B. Roby, J. D. Newbold, and D. C. Erman.
Freshwater Biology, Vol 18, p 1-8, 1978. 4 fig, 2 tab, 28 ref.

Descriptors: *Sampling, *Benthic fauna, *Invertebrates, *Artificial substrates, Streambeds, *On-site data collections, Equipment, Aquatic habitats, Biological communities, *Spatial distribution, Benthos, Methodology, Bottom sampling, On-site investigations, Larvae, *Surber sampler, Colonization, *San Leandro Creek(California).

Factors affecting invertebrate colonization of samplers consisting of twenty-five 5-cm diameter porcelain balls were studied in small northern California streams. Peaks in diversity, in number of individuals and in taxa, occurred after 2-4 weeks in each of four 10-week colonization runs. Most variation in number of organisms was correlated with increases in organic detritus. Time was the second most important variable. The average coefficient of variation in total numbers collected from the artificial sampler was 0.40, slightly less than the average 0.56 for the Surber sampler. Published coefficients of variation for artificial substrates range from 0.109 to 0.849, which are similar to values reported from work with the Surber sampler. The authors had several practical difficulties with the artificial substrates. Samplers were lost, became clogged or buried, supported vertebrate predators and were costly. The samplers also collected some organisms in greater proportions than their occurrences in the natural substrate. In sampling small streams these disadvantages (compared to a Surber sampler) outweigh the slight reduction in sampling variability. (EIS-Katz)
W78-11679

ABSENCE OF ARYL HYDROCARBON HYDROXYLASE (AHH) IN THREE MARINE BIVALVES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
J. H. Vandermeulen, and W. R. Penrose.
Journal of the Fisheries Research Board of Canada, Vol 35, p 643-647, 1978. 1 fig, 3 tab, 17 ref.

Descriptors: *Oil, *Enzymes, *Animal metabolism, *Animal physiology, *Clams, *Brook trout, *Brown trout, *Food chains, Oil pollution, Path of pollutants, Oil spills, Metabolism, Organic compounds, Water pollution effects, Aromatic compounds, *Crude oil, Tissue analysis, Bivalves, Bioaccumulation, *Depuration.

Bivalves exposed to short-term (4d) and long-term (6 y) oil pollution were assayed for aryl hydrocarbon hydroxylase (AHH) and N-demethylase activity. None of the bivalves showed any basal or petroleum-hydrocarbon-induced aryl hydrocarbon hydroylase or N-demethylase activity, as shown by their inability to metabolize benzopyrene or imipramine. In contrast, oil-free control trout and trout taken from a polluted lake readily metabolized both these compounds. The inability of the bivalves to degrade petroleum aromatic hydrocarbons and the tendency of these compounds to accumulate in their tissues present an opportunity for transfer of unaltered hydrocarbons into the food chain. (EIS-Deal)
W78-11692

EFFECTS OF AROCLOR 1248 AND 1260 ON THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-11695

THE LEVELS OF METALS IN DOCK-YARD SEDIMENTS WITH PARTICULAR REFERENCE TO THE CONTRIBUTIONS FROM SHIP-BOTTOM PAINTS,
University of Manchester Inst. of Science and Technology (England). Pollution Research Unit.
E. G. Bellinger, and B. R. Benham.
Environmental Pollution, Vol. 15, p. 71-81, 1978. 1 fig., 4 tab., 18 ref.

Descriptors: *Metals, *Copper, *Lead, *Tin, *Zinc, Methodology, Chemical analysis, Chemical wastes, Fouling, Paints, Ships, Docks, Sediments, Water pollution effects, Toxicity, Genetics, Marine algae, *Marine animals, Dock-yard sediments, *Ship-bottom paints, England, Liverpool, Tilbury, Manchester.

Levels of the metals copper, lead, tin and zinc have been determined in a range of ship-bottom paints by atomic absorption spectrophotemetry. Copper, lead and zinc have been similarly determined in sediments taken from enclosed dock-basins at Liverpool, Tilbury and Manchester. At each of the dock-yards concentrations of all the metals were elevated in the vicinity of dry-docks. These elevations are believed to be due to the presence of residues from the ship-bottom paints. The amount of copper and zinc, which are major components of antifoulant paints, in the amount aostate extracts correlate closely with the levels in the nitric acid digests; lead, which is found mainly in anticorresive and primar paints, does not. Direct toxic effects of the metals to marine organisms are considered, but are not thought to be important in view of the large dilution and dispersal capacities usually available. The possibility of organisms developing genetic resistance to heavy metals in enclosed dock-basins is discussed. It is noted that many of the dock-yard organisms are components of the ship-fouling ecosystem, so that the premature exposure to the toxins of antifoulant paints may result in the development of toxin resistance of considerable economic importance. (EIS-Katz).
W78-11708

CONTROL OF CHIRONOMIDS IN MILKFISH (CHANOS CHANOS) PONDS WITH ABATE (TEMEPHES) INSECTICIDE,
Taiwan Fisheries Research Inst., Tainan. Fish Culture Station.
For primary bibliographic entry see Field 5G.
W78-11711

INTERACTION OF CHEMICAL POLLUTANTS AND VIRUS IN A CRUSTACEAN: A NOVEL BIOASSAY SYSTEM,
Environmental Protection Agency, Gulf Breeze, FL. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W78-11712

BIOCHEMICAL CORRELATES OF DISSOLVED MERCURY UPTAKE BY THE OYSTER OSTREA EDULIS,
Southampton Univ. (England). Dept. of Oceanography.

For primary bibliographic entry see Field 5C.
W78-11716

METABOLISM OF AROMATIC HYDROCARBONS IN MARINE ORGANISMS,
National Marine Fisheries Service, Seattle, WA.
For primary bibliographic entry see Field 5C.
W78-11717

EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd.
Journal of Environmental Quality, V. 7, No. 1, p. 59-62, Jan.-Mar., 1978. 2 fig., 2 tab., 13 ref.

Descriptors: *Fish farming, *Catfishes, Chemical properties, Nitrates, Chemical oxygen demand, Biochemical oxygen demand, Phosphorus, *Water pollution, *Effluent quality, Settleable solids, Seining, Draining.

Data on effluent quality during catfish harvest were obtained from ponds on Fisheries Research Unit, Auburn University Agricultural Experiment Station, Auburn, Alabama, during the fill of 1976. Settleable matter concentrations never exceeded the suggested instant-aneous maximum level (3.3 ml/liter) during the draining phase of fish harvest. Concentrations of other water quality parameters in effluents during this time were typical of those found in catfish ponds in autumn, BOD, COD, and total phosphorus levels were lower in waters of catfish ponds during the fall than the summer, but concentrations of most measured parameters, including settleable matter, in effluents were higher than corresponding levels in small streams draining agricultural or forested watersheds near Auburn, Alabama. Although water quality is poor in catfish ponds during summer months, Alabama ponds seldom lose appreciable quantities of overflow water during the summer. It was found that water quality deteriorated greatly during the seining phase of fish harvest. Settleable matter values usually exceeded the suggested maximum. Rates of discharge of pollutants other than nitrates were proportionally greater during the seining phase. Considerable reduction of pollutants could be implemented by not releasing water during the seining phase. (Merryman-East Central).
W78-11719

ACUTE TOXICITY OF NITRITE TO LARVAE OF THE GIANT MALAYSIAN PRAWN, MACROBRACHIUM ROSENBERGII,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5C.
W78-11723

IMPROVED PLANKTON NET BUCKET,
Nalco Environmental Sciences, Northbrook, IL.
For primary bibliographic entry see Field 7B.
W78-11727

SUBMERGED PERIPHYTON SAMPLER,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 7B.
W78-11728

FUNNEL TRAP FOR COLLECTING LITTORAL AQUATIC INVERTEBRATES,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 7B.
W78-11734

LOW-COST, LARGE-VOLUME AIR SUPPLY FOR EXPERIMENTAL TANKS,
Ohio State Univ., Columbus. Museum of Zoology.
For primary bibliographic entry see Field 7B.
W78-11736

THE EFFECTS OF OIL ON LOBSTERS,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W78-11739

INSTRUMENTATION FOR BIOLOGICAL MONITORING OF INDUSTRIAL WASTES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, K. L. Dickson, and G. F. Westlake.
In: Proceedings of the International Seminar and Exposition on Water Resources Instrumentation. R.S. Krizek and E. F. Mosonyi, eds. 1975, p. 538-547, Ann Arbor Scientific Publishers, Inc. Ann Arbor, Mich. 6 fig, 13 ref.

Descriptors: *Methodology, *Monitoring, Laboratory tests, Laboratory equipment, Aquatic environment, *Laboratories, *Instrumentation, Environmental control, Fish physiology, Fish behavior, Toxicity, Algae, Diatoms, *Biological monitoring, *Biological techniques, In-plant monitoring.

Two biological monitoring systems have been developed to generate information rapidly. One system measures changes in the movement and breathing of fish in order to provide an early warning of developing toxicity in the wastes of an industrial plant. The other system measures changes in the diversity of algal (diatom) communities in streams by means of laser holography. The instrumentation, incorporation, properly used, will enable management to match waste discharges to nondegrading environmental assimilative capacity for the site specific conditions then in existence and to respond to daily and seasonal changes in assimilative capacity. (EIS-Katz)
W78-11740

A TECHNIQUE FOR PREDICTING IN-STREAM FLOW REQUIREMENTS OF BENTHIC MACROINVERTEBRATES,
Montana Univ., Missoula. Dept. of Zoology.
J. A. Gore.
Freshwater Biology, Vol 3, p. 141-151, 1978. 5 fig, 4 tab, 27 ref.

Descriptors: *Benthic fauna, *Streamflow, Velocity, Currents(Water), Streams, Invertebrates, Coals, Strip mines, Habitats, Water utilization, Water demand, Water requirements, *Riffles.

A total of 225 benthic samples was taken at various riffles along the Tongue River in Montana during three separate weekly intervals in 1975. For each sample, depth, current velocity, substrate microprofile, turbulence (Froude number), and the number and kind of species present were considered. The conditions of highest faunal diversity were 75-125 cm/s current velocity at 20-40 cm depth. The optimum condition appeared to 76 cm/s at a depth of 28 cm over medium cobble substrates. The centroids for optimum conditions of depth and current velocity for thirty-six common macroinvertebrates are also presented. Representative diagrams of the tolerance ranges of some common vertebrates are presented. A method for applying these data to produce a minimum flow recommendation is discussed. If the optimum conditions can be plotted on composite hydrologic maps of depth and velocity in riffle areas at various discharges, one can predict the discharge at which the optimum conditions are eliminated and, thus, the recommeded minimum discharge. (EIS-Katz)
W78-11744

FLOW-THROUGH COLLECTION BUCKET FOR LARVAL FISH,
Tennessee Valley Authority, Norris. Div. of Forestry, Fish and Wildlife Development.
For primary bibliographic entry see Field 7B.
W78-11746

SAND DOLLAR EMBRYOS AS MONITORS OF ENVIRONMENTAL POLLUTANTS,
Trinity Coll., Hartford, CT.
R. B. Crawford, and A. M. Guarino.
The Bulletin, Mount Desert Island Biological Laboratory, Vol 16, p. 17, 1976.

Descriptors: *Bioassay, *Toxicity, Mortality, *DDT, Marine animals, Benthos, Invertebrates, *Phenol, Juvenile stages, Eggs, Growth stages, Embryonic growth stage, Laboratory tests, Water pollution effects, *Bioindicators, *Pentachlorophenol, *Malathion, *Aminotriazole, *Sevin, *Toxiphene.

Embryos of the sand dollar Echinarachnius parma were used to determine the toxicity of pentachlorophenol, malathion, aminotriazole, phenol, Sevin, toxaphene and DDT. Gametes of sand dollars are suitable for determining toxicity. (EIS-Katz)
W78-11747

ORGANIC CONTAMINANTS IN WATER.
Effluent and Water Treatment Journal, Vol 18, No 7, p 311, July, 1978.

Descriptors: *Analytical techniques, *Sampling, *Tertiary treatment, *Potable water, *Gas chromatography, Mass spectrometry, Polychlorinated biphenyls, Pollutant identification, Toxins, Computers, Municipal wastes.

The EPA has retained Battelle Columbus Laboratories in Ohio for a 3-yr $1.5 million survey of contaminants in drinking water and tertiary effluents. The water analysis will focus upon a number of toxic substances, such as 2,3,7,8-tetrachlorodibenzo-p-dioxin and polychlorinated biphenyls. Toxic organic compounds will be identified by gas chromatography-mass spectrometry; a computer will be used to match unidentified spectra with reference sample spectra. An integration of the specific ion current system will be employed to quantify the compounds. Drinking water and tertiary effluent samples from six regional areas in Texas, California, and the District of Columbia will be tested, as well as samples from Miami, Florida; New Orleans, Louisiana; Ottumwa, Iowa; Philadelphia, Pennsylvania; and Seattle, Washington. (Lisk-FIRL)
W78-11757

CONTINUOUS FLOW DOSAGE OF FLUORINE: COMPARISON OF COLORIMETRIC AND POTENTIOMETRIC METHODS (DOSAGE EN 'FLOW CONTINU' DU FLUOR: COMPARISON DE METHODES COLORIMETRIQUE ET POTENTIOMETRIQUE),
Institut d'Hygiene, Geneva (Switzerland).
J-C. Landry, and F. Cupelin.
Mitteilungen aus dem Gebiete der Lebensmitte luntersuchung und Hygiene, Vol. 60, No. 1, p 56-73, 1978. 10 fig, 1 tab, 21 ref.

Descriptors: *Fluorides, *Fluorine, *Aluminum, *Colorimetry, Pollutant identification, Electrodes, Cations, Analytical techniques, Beryllium, Fallout, Sodium compounds, Silicates, Chemical analysis, Salts, Industrial wastes.

Colorimetric and potentiometric methods were developed for the continuous-flow quantification of fluoride in fall-out from aluminum factories. Fluorine fall-out from these factories has been successfully controlled by solid captors bearing sodium silicate. The colorimetric technique complexes fluoride ions in two main flow circuits with

the salt of lanthanum (III) alizarine-3-methyl-N,N-diacetic acid, buffered at pH 4.6. The detection limit for fluoride in the first circuit ranges over 0.5-10.0 micrograms/ml; dilution of an aliquot from the first circuit permits the linear representation of fluoride concentrations in the range from 0.5-60.0 micrograms. The potentiometric technique utilizes a fluoride ion selective electrode. Of the complexing agents tested for fluoride ion selective electrode. Of the complexing agents tested for fluoride ions adsorbed on the electrode's crystal surface, a 0.1 M solution of beryllium cations was preferred. Following contact with the continuous flow, the crystal surface of the electrode is rinsed rapidly by a dual delivery system on the electrode and a retarding circuit. Close correlation was observed between the colorimetric and the potentiometric data. (Lisk-FIRL)
W78-11768

CHARACTERIZATION, TREATMENT, AND DISPOSAL OF WASTEWATER FROM MARYLAND SEAFOOD PLANTS,
Maryland Univ., College Park. Center for Environmental and Estuarine Studies.
For primary bibliographic entry see Field 5D.
W78-11770

CUPRIC-ION MONITOR USING ION-SELECTIVE ELECTRODE FOR INDUSTRIAL EFFLUENT, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Engineering.
K. Nakajima, T. Ishizuka, K. Tanaka, and H. Sunahara.
Reports of the Government Industrial Research Institute, Nagoya, Vol 27, No 5, p 151-156, May, 1978. 9 fig, 2 tab, 6 ref.

Descriptors: *Electrodes, *Copper, *Ions, *Metals, *Selectivity, Spectrometry, Theoretical analysis, Acidity, Absorption, Chlorides, Temperature, Waste water treatment, Chemical analysis, Analytical techniques, Industrial wastes, Water analysis.

A cupric-ion selective electrode was incorporated into a monitor designed to measure the copper concentration of industrial effluents. Using a dilute standard solution containing 0.1-0.0000001 M of copper, the electrode potential measurements exhibited little deviation over a 17-day period. In solutions where the ionic strength was held constant, the measured potential was directly proportional to copper concentration in the solution. Values obtained with the monitor were closely correlated with theoretical predictions. While the measured electode potentials appeared proportional to the temperature of the sample solution, the values did not correspond with theoretical calculations. The measured potential decreased with increasing pH, indicating an optimum sample solution pH range of 1-3. Electrode performance was adversely affected by the presence of chloride ions; interference was not extensive in the presence of dilute solutions containing various concentrations of surfactants. The electrode performance with industrial effluents was evaluated by comparison with atomic absorption spectrometry. (Lisk-FIRL)
W78-11775

HYDROCARBON EMISSIONS FROM REFINERY WASTEWATER AERATION,
For primary bibliographic entry see Field 5D.
W78-11779

TMP EFFLUENTS: A REVIEW,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, D. Breck, and J. Costantino.
Tappi, Vol. 61, No. 8, p 19-22, August, 1978. 3 fig, 3 tab, 14 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Toxicity, *Mortality, *Biochemical oxygen demand, Wood wastes, Hardwood, Softwood, Steam, Vapor pressure, Aerated lagoons, Pollutant identification, Water pollution sources, Waste water treatment, Industrial wastes.

Pollutants in thermomechanical pulping effluent were measured and compared to those of stone groundwood pulping effluent. Refined pulp samples were washed in a one-step laboratory procedure for quantification of BOD, COD, toxicity emission factor (TEF) and 50% fish mortality values over 96 hrs. Full-scale and pilot plant samples of spruce/balsam pulp effluents contained 13-34 kg BOD/ton pulp and had a FEF range of 115-540; Jack pine pulp effluents ranged from 12-28 kg BOD/ton pulp and had a FEF from 835-4160. Southern pine effluent was characterized by a BOD of 20 kg/ton and a TEF of 1950; aspen pulping effluent had a BOD of 8 kg/ton and a FEF of 150 while southern hardwoods contained 25 kg BOD/ton and 220 TEF. Both thermomechanical pulping and stone groundwood pulping effluents had the same toxicity in the case of spruce/balsam; stone groundwood effluent had A slightly higher average BOD. At high steaming pressures of about 690 kiloPascals, the resulting loss of wood materials produced a higher BOD loading; the BOD content of thermomechanical effluent was not dependent upon the wood species. Most of the toxicity and BOD load was released during the first stage of the two-stage pulping operation; little toxicity or BOD loading was associated with chip washing. Effluent from the plug screw feeder, pulp cyclone condensates, and pulp bleaching contributed little to the pollutant load. Aerated lagoons with a 5-day retention time were found to reduce BOD in the effluent by 70-75% and adequately detoxify the wastes. (Lisk-FIRL)
W78-11780

AIR-POLLUTING EFFECT OF ACTIVATED-SLUDGE WASTEWATER TREATMENT PLANTS (ELEVENISZAPOS SZENNYVIZTISZTITOK LEVEGOSZENNYEZO HATASA),
M. Szabo, L. Csatai, and L. Nemedi.
Budapesti Kozegeszsegugy, Vol. 65, No. 2, p 49-51, 1978. 5 tab, 14 ref.

Descriptors: *Activated sludge, *Air pollution, *Clostridium, *Streptococcus, *Pseudomonas, Treatment facilities, Salmonella, E. coli, Movement, Wind, Aerobic bacteria, Sewage bacteria, Waste water treatment, Pollutant identification, Municipal wastes.

The emission of airborne microorganisms was measured at two activated sludge waste water treatment plants in Budapest, Hungary. Aerosol samples were taken by the sedimentation method at several distances from the plants. The number of bacteria growing in cultures at 20C was found to be 5,000,000/ml; at 37C, the bacteria count was 2,000,000/ml. Occurrences of specific bacteria identified included: a Clostridium count of 3,000/40 ml, fecal coliform of 3,000,000/100 ml. Tests for Salmonella were positive for 70-100% of the 100 ml samples. The maximum distance from the treatment plants at which microorganisms were found increased with increasing wind speed. At a wind velocity of 7 m/sec, E. coli was detected at distances of up to 20 m, Staphylococcus aureus and Klebsiella at up to 5 m, and Pseudomonas aeruginosa at up to 10 m from the treatment plant. The results of the study implied that the air space above biological waste water treatment plants may be a potential source of bacterial infection. (Takacs-FIRL)
W78-11822

OZONATION IN A WASTEWATER REUSE SYSTEM: EXAMINATION OF PRODUCTS FORMED,
Cincinnati Univ., OH. Environmental Health Engineering.
For primary bibliographic entry see Field 5D.
W78-11828

BIOCHEMICAL OXYGEN DEMAND PROGRESSION IN MIXED SUBSTRATES,
California Univ., Davis. Dept. of Civil Engineering.
J. P. Parisod, and E. D. Schroeder.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1827-1834, July, 1978. 6 fig, 4 tab, 13 ref.

Descriptors: *Biochemical oxygen demand, *Respiration, *Analytical techniques, *Forecasting, *Measurement, Solubility, Organic loading, Acids, Activated sludge, Bacteria, Model studies, Waste water treatment, Municipal wastes.

The kinetics and the plateau BOD values for mixed substrate systems were analyzed with glucose, glutamic acid, succinate acid, and sorbitol and the existence of stoichiomtric end points for substrate conversion reactions was investigated. Plateau BOD valus were obtained for individual and mixtures of soluble substrates seeded with bacteria from primary sedimentation tank effluent or from activated sludge reactors; a Gilson differential respirometer was employed to measure oxygen uptake. The net cell growth in the substrates was calculated by subtracting the initial cell mass concentration from the plateau cell mass concentration. Single substrate plateau values obtained in these experiments correlated closely with previously reported values. In 34 mixed substrate plateau tests, the maximum variation between predicted and actual plateau values was 10.1%; the standard deviation was 4.0%. The study concluded that the calculation of ultimate BOD from the sum of the plateau BOD and the theoretical BOD of the cells produced up to the plateau was a feasible and valid technique. (Lisk-FIRL).
W78-11833

BIOASSAYS-PROCEDURES AND RESULTS,
Research Triangle Inst., Research Triangle Park, NC.
L. W. Little.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1852-1868, July, 1978. 179 ref.

Descriptors: *Bioassay, *Bioindicators, *Chemical analysis, *Reviews, Publications, Analytical techniques, *Pollutant identification, Soil analysis, Water analysis, Algae, Fish, Invertebrates, Trophic level, *Bibliographies.

Literature on bioassay procedures and their applications to a variety of aquatic flora and fauna was reviewed. The design and interpretation of bioassay testing has been applied to individual chemicals and metals in laboratory procedures; in-depth studies have examined the impact of naturally occurring complex chemical compounds on bioindicators. Experimental equipment has been designed to closely simulate conditions in water bodies and soils; structures have been improved to provide realistic dosing procedures, to maintain proper oxygen concentrations, to quantify microbial populations, and to record patterns of movement. The results of bioassay procedures were reviewed for microorganisms , algae, invertebrates, and fish; results of comparative testing with several trophic levels and the effect of the health status of the test organisms on the results of bioassay interpretations were also examined. (Lisk-FIRL)
W78-11834

A NOMOGRAM FOR THE DETERMINATION OF AMMONIA IN WASTEWATER BY A KNOWN ADDITION TECHNIQUE,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Applied Chemistry Labs.
S. Y. Ip, and N. H. Pilkington.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1869-1870, July, 1978. 4 ref.

Descriptors: *Analytical techniques, *Graphical analysis, *Ammonia, *Chemical analysis, *Electrodes, Sodium compounds, Equations, Mathematical models, Aqueous solutions, Pollutant identification, Water analysis, Waste water treatment, Municipal wastes.

A nomogram incorporating a known addition technique is presented for calculating the concentration of NH3-N in waste water. The technique is designed to compensate for random drifts in the calibration lines of an ammonia gas sensing electrode. A 1,000 mg/liter NH3-N solution is prepared by adding 3.819 g of NH4Cl to one liter of water, followed by dilutions to 1, 5, 10, 25, 50, and 100 mg/liter. To a 100 ml 10M NaOG; the initial electrode potential is then calculated as a function of the electrode slope and the solution concentration. The Nernstian slope is calculated from a semi-log plot of the millivolts in relation to a series of standard NH3-N solutions. A 2.0 ml sample of a 1,000 mg/liter NH3-N solution is added to the sample and the new equilibrium potential of the electrode is calculated to provide the change in electrode potential. The decrease in potential is then calculated as a function of the electrode slope and the various solution concentrations and volume. The nomogram is developed by aligning the Nernstian slope with the decrease in electrode potential; the concentration of NH3-N is then calculated by extrapolating the line to the intersection with the NH3-N concentration axis. (Lisk-FIRL)
W78-11835

DIRECT ANALYTICAL PROCEDURE FOR DETERMINATION OF VOLATILE ORGANIC ACIDS IN RAW MUNICIPAL WASTEWATER,
Technion-Israel Inst. of Tech., Haifa. Environmental Engineering Lab.
N. Narkis, and S. Henfeld-Furie.
Water Research, Vol. 12, No. 7, p 437-446, 1978. 15 fig, 3 tab, 22 ref.

Descriptors: *Organic acids, *Analytical techniques, *Gas chromatography, *Acidity, *Columns, Volatility, Centrifugation, Chemical analysis, Instrumentation, Phosphorus compounds, Waste water treatment, Water analysis, Municipal wastes.

A technique for analyzing volatile organic acids in raw or chemically treated sewage permits direct injection of the sewage sample into a gas chromatograph without extensive pretreatment. Less than 1 g of crystallized metaphosphoric acid is added to a 10 ml sample of raw sewage to adjust the pH to 2-3. The mixture is then centrifuged at 14,000 rpm for 20 min at 5C to remove suspended solids and proteins; the sample is injected directly into a gas chromatography equipped with a hydrogen flame ionization detector. An 8 ft glass column with a 0.125 inch diametcr is packed with 60-80 mesh Chromosorb W which has been washed with phosphoric acid and coated with 20% Carbowax 20 M dissolved in chloroform; the packing is washed again after vacuum drying with 3% H3PO4. Acetic and propionic acid analysis requires 5-10 microliter samples; 20-40 microliter samples are used for analysis of butyric, isovaleric, valeric, and hexanoic acids. The appearance of volatile acids after 4-7 min of retention follows the order: acetic, propionic, isobutyric, butyric, isovaleric, valeric, and hexanoic acid; formic acid is not detectable by flame ionization. The gas chromatography direct injection technique can detect and quantify 70.0-97.5% of the volatile acids identified according to standard methods. (Lisk-FIRL)
W78-11836

THE OCCURRENCE OF AEROMONADS IN ACTIVATED SLUDGE: ISOLATION OF AEROMONAS SOBRIA AND ITS POSSIBLE CONFUSION WITH ESCHERICHIA COLI,
Swedish Water and Air Pollution Research Lab., Stockholm.
A. H. Neilson.
Journal of Applied Bacteriology, Vol. 44, No. 2, p 259-264, 1978. 1 tab, 26 ref.

Descriptors: *Aerobic bacteria, *Analytical techniques, *Isolation, *Acid bacteria, *Activated sludge, Antibiotics(Pesticides), Viricides, Cultures, Biological properties, Chemical analysis, Sewage bacteria, Nitrogen fixing bacteria, E. coli, Waste water treatment, Municipal wastes.

Strains of Aeromonas sobria, isolated from activated sludge, paper mill effluent, and biologically-treated food processing effluent, exhibited characteristics very similar to E. coli when analyzed according to standard methods. Between 100,000 and 10,000,000 aeromonads/g wet weight were isolated on Endo Agar, Tergitol-7 Agar, galactitol peptone agar, Shotts and Rinler medium, and analine blue agar. All of the isolated populations produced acid in stabs of triple sugar iron medium but demonstrated weak or negligible oxidase activity in freshly isolated strains. A. sobria produced gas more readily from lactose and formed metallic colonies on Endo and EMB agars; A. hyydrophila more readily hydrolyzed aesculin, formed acid from arabinose and salicin, and exhibited aerobic growth in arabinose, L-histidine, and L-arginine. None of the isolates produced gas from lactose in EC medium at 44.5C. About 95% of the strains were resistant to ampicillin and sensitive to gentamycin; al were resistant to penicillin and sensitive to tetracycline and chloramphenicol. None of the strains exhibited nitrogenase activity comparable to the nitrogen-fixing capacity of Enterobacteriaceae. Other characteristis distinguishing A. sobria strains from E. coli included positive DNase, lipase, gelatinase, and arginine decarboxylase activities. The strains are unable to produce acid from xylose and arabinose or grow in L-glutamate; about 67% of all strains were beta-hemolytic. (Lisk-FIRL)
W78-11838

DEVELOPMENT OF QUANTITATIVE METHODS FOR THE DETECTION OF ENTEROVIRUSES IN SEWAGE SLUDGES DURING ACTIVATION AND FOLLOWING LAND DISPOSAL,
Baylor Coll. of Medicine, TX. Dept. of Virology and Epidemiology.
C. J. Hurst, S. R. Farrah, C. P. Gerba, and J. L. Melnick.
Applied and Environmental Microbiology, Vol. 36, No. 1, p 81-89, July, 1978. 3 fig, 9 tab, 16 ref.

Descriptors: *Viruses, *Analytical techniques, *Activated sludge, *Alkalinity, *Adsorption, Centrifugation, Filtration, Application methods, Sludge disposal, Disinfection, Waste water treatment, Human diseases, Municipal wastes.

Enteroviruses were eluted from sewage sludge by : suspension of the solids in o.05 M glycine buffer at pH 11.5 M glycine buffer at pH 2.0 to form organic flocs; filtration through 3.0, 0.45, and 0.25 miron filters; and elution for bioassay. The described procedure recovered about 80% of poliovirus tupe 1, 68% of echovirus type 7, and 75% of coxsackievirus B3 from seeded activated sludge. The technique required about 3 hrs to complete and recoverd more viruses than elution with 3% beef extract and sonification. analysis of activated sludge after land application concluded that a linear semilograithmic relationship exists between viral inactivation and duration on land. After 7 days of drying in the field, 0.5-3.0% of the viruses were recovered from the sludge; no viuruses were apparent in the sludge 3 mos after land application. Sludge solis content increased up to 30 days, levelled at about 65% solids, and subsequently decreased; a direct correlation was observed between moiture loss in the sludge and viral inactivation. (Lisk-FIRL)
W78-11839

A MORE ECONOMICAL METHOD FOR THE DETERMINATION OF CHEMICAL OXYGEN DEMAND,
Canada Centre for Inland Waters, Burlington (Ontario).
J. R. Knechtel.
Water Pollution Control, Vol. 116, No. 5, p 25-29, May-June, 1978. 1 fig, 5 tab, 9 ref.

Descriptors: *Chemical oxygen demand, *Analytical technique, *Chemical analysis, *Spectrophotometry, *Digestion, Absorption, Catalysts, Chemical reactions, Laboratory equipment, Laboratory tests, Chemical properties, Waste water treatment, Municipal wastes.

An alternative technique for COD analysis of waste water, employing spectrophotometric measurement, utilizes smaller sample and reagent volumes. A 10 ml waste water sample, standard, or blank solution is placed in a screw cap culture tube which is of a size suitable for direct placement in the adapter of the spectrometer. The sample is mixed with 6 ml of a digestion solution; the digestion solution is prepared by mixing 167 ml concentrated sulfuric acid, 500 ml distilled water, 17.0 g mercuric sulfate, and 10.216 g potassium dichromate; cooling the mixture; and diluting it to 1.00 liter. A 14 ml aliquot of catalyst solution, prepared by mixing 22 g of reagent grade silver sulfate in a 19.8 kg bottle of concentrated sulfuric acid, is added to the sample. The solution is digested for two hours with the teflon-lined bakelite cap closed at 150C in a forced-air oven. After the aliquot has cooled, absorbance is measured at 600 nm; the blank is adjusted to 100% transmittance and the sample optical densities are plotted against COD to form a calibration curve. Value of tests using the described procedure have been slightly higher than those obtained by standard COD techniques; this difference is attributed to more complete digestion and retention of volatile matter in the culture tube. The detection limit of the test is reported to be double the optical density variation at the blank level; samples containing more than 1,000 mg/liter COD must be diluted before testing. (Lisk-FIRL).
W78-11840

REGULAR TESTING CAN CONTROL HYDROGEN SULFIDE,
FMC Corp., San Jose, CA.
E. J. Keating.
Water and Sewage Works, Vol. 125, No. 7, p 68-70, July 1978. 3 fig, 1 tab.

Descriptors: *Analytical techniques, *Hydrogen sulfide, *Sulfides, *Sewers, *Odor, Corrosion control, Colorimetry, Volumetic analysis, Titanium, Oxidation, Toxicity, Acidity, Waste water treatment, Municipal wastes.

Procedures to quantify and control hydrogen sulfide in waste water can reduce the gas's potential toxic effect on treatment plant workers and alleviate sewer corrosion from sulfuric acid generation. Monitoring the pH of the waste water is important in calculating the amount of dissolved sulfide present as hydrogen sulfide, associated with the odor and corrosion problems, or as hydrosulfide ions; hydroen sulfide predominates in acidic wastes and equals the quantity of hydrosulfide ions at pH 7. The methylene blue colorimetric test, with a detection limit of 20 mg sulfide/liter, has several variations: the titrimetric iodine test for oxidizing sulfides to sulfur; the LaMitte-Pomeroy test with dual test tube analysis; the Hach Alka-Seltzer technique which effervesces hydrogen sulfide onto a chemically treated disc; and gas detector tubes. A T-I-Y Kit developed by FMC Corp. can be used for analysis when hydrogen peroxide is used to control hydrogen sulfide. Hydrogen peroxide may be detected with titanium sulfate or test strips. A laboratory analysis of three waste water samples, untreated, treated with a small quantity of H202, and treated with a larger H202 dose, provides data on the optimum H202 dosage

to control sulfide in waste water. From this information, field tests can be conducted at problem sites to determine specifc treatment needs. (Lisk-FIRL).
W78-11841

ANTIBIOTIC RESISTANCE PATTERN OF SALMONELLA WELTEVERDEN STRAINS ISOLATED FROM MAN, ANIMALS, SEWAGE AND WATER,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Coll. of Veterinary Medicine.
K. N. Upadhyay, and D. S. Misra.
Indian Journal of Medical Research, Vol. 67, p 212-216, February, 1978. 2 tab, 9 ref.

Descriptors: *Salmonella, *Antibiotics(Pesticides), *Bactericides, *Resistance, *Diseases, Sewage, Human diseases, Animal diseases, Analytical techniques, Isolation, Waste water treatment, Municipal wastes.

Strains of Salmonella welteverden isolated from humans, animals, sewage, and water were examined for resistance or sensitivity to antibiotics. Of the 127 strains isolated, all were completely resistant to bacitracin and erythromycin. Strains isolated from humans exhibited resistance to eight other antibiotics, including: sulfathiozole, viomycin, polymyxin B, nalidixic acid, tetracycline, oxytetracycline, chlortetracycline and kanamycin; human isolates were the only strains resistant to the three latter antibiotics. The higher resistance of human strains was attributed to the frequent medical use of antibiotics. Animal strains were resistant to four antibiotics while sewage isolated strains were resistant to three. Minimum inhibitory concentration (MIC) levels of 60 strains against polymyxin B sulfate, tetracycline, and chloramphenicol were high for human strains exposed to tetracycline and chloramphenicol and high for sewage strains in contact with polymyxin B sulfate. Low MIC level sensitive strains from humans were recorded for polymyxin B and tetracycline. Low MIC level sensitivity to chloramphenicol was absent in human strains but present in animal and sewage strains. (Lisk-FIRL).
W78-11842

DETERMINATION OF ORGANOSILICONE IN SEWAGE SLUDGE BY ATOMIC ABSORPTION SPECTROMETRY, (IN JAPANESE).
Ajinomoto Co., Inc., Kanagawa (Japan). Central Research Labs.
Y. Tsuchitani, K. Harada, K. Saito, N. Muramatsu, and K. Uematsu.
Buseki Kagaku, Vol 27, No 6, p 343-347, 1978. 4 fig, 6 tab, 6 ref.

Descriptors: *Organic wastes, *Analytical techniques, *Absorption, *Separation techniques, *Sewage sludge, Solvent extractions, Activated carbon, Dehydration, Vacuum drying, Spectrometry, Spectroscopy, Chromatography, Waste water treatment, Municipal wastes.

Organosilicone was separated from sewage sludge by solvent extraction, dehydration, and activated carbon filtration before analysis by atomic absorption spectrometry. A 10-20 g sample of sludge was neutralized to pH 6-7 and placed in an extraction apparatus with 100-150 ml of toluene. The sludge was azeotropically dehydrated; the organosilicone was extracted in 70-100 ml of toluene. After vacuum evaporation of the toluene, the organosilicone-bearing residue was dissolved in methyl isobutyl ketone; the solution was filtered through an activated carbon column and concentrated to 20 ml. The organosilicone concentration was determined by atomic absorption spectrometry at 251.6 nm; the oil was primarily in the form of dimethylpolysiloxane. The extraction process recovered about 88% of the organosilicone at a variance coefficient of 12%. The technique was considered more practical than liquid-liquid extraction by a separation funnel or extraction by a Soxleht unit; results of the atomic absorption spectrometry analysis were comparable to those of proton nuclear magnetic resonance or gel permeation chromatography. (Lisk-FIRL)
W78-11844

TOXICITY-TEST ON FISH CARASSIUS AURATUS IN WATERS AND SEWAGES CONTAINING PHENOL, TREATED WITH NACLO OR WITH CLO2 (IL TEST DI ITTIOTOSSICITA' SU ACQUE E LIQUAMI DEPURATI CON IPOCLORITO E BIOSSIDO DI CLORO, IN PRESENZA DI FENOLO),
Naples Univ. (Italy). Dept. of Hygiene and Science.
A. Paoletti, A. Parrella, F. Aliberti, and E. Gargiulo.
Igiene Moderna, Vol 71, No 1, p 86-116, 1978. 8 fig, 3 tab, 27 ref.

Descriptors: *Phenols, *Chlorination, *Potable water, *Sewage effluents, *Oxidation, Toxicity, Coliforms, Lethal limit, Mortality, Fish, Disinfection, Biochemical oxygen demand, Chemical oxygen demand, Waste water treatment, Water treatment, Municipal wastes.

Goldfish (Carassius auratus) were used in 50% median mortality (TLM50) tests performed on phenolated sewage and potable water disinfected with chlorine dioxide or sodium hypochlorite. Samples of phenol-bearing spring, mineral, and tap water were treated with 40 ppm of ClO2 or NaClO for a contact time of 30 min; oxidized waste water, containing 30-70 ppm BOD, 60-95 ppm COD, and 400,000-700,000 coliforms/100 ml, and graywater having 95-280 ppm BOD, 280-400 ppm COD, and 8,000,000-50,000,000 coliforms/100 ml were similarly treated. The potable and sewage waters acquired a 'secondary induced toxicity' after treatment with either disinfectant; phenolated potable water was more toxic than sewage wastes after treatment. The greater toxicity of the disinfected potable waters was attributed to the lack of organic matter, especially fecal coliforms, to consume the chlorinated phenolic compounds. The TLM50 for goldfish sustained in mineral, spring, and tap water treated with NaClO ranged over 1.22-2.92 hrs; in water treated with ClO2, the TLM5O covered 2.85-4.85 hrs. The TLM5O of oxidized waste water was 7.35 hrs after NaClO treatment and 9.05 hrs after ClO2 disinfection; graywater yield TLM5O values of 7.16 hrs and 8.46 hrs after treatment with NaClO and ClO2, respectively. Graywater was more toxic to fish before disinfection; untreated phenolated tap water was more toxic to fish than the other potable waters tested. (Lisk-FIRL)
W78-11845

SIGN-OF-CHARGE OF SPECIES OF CU, CD AND ZN EXTRACTED FROM SEWAGE SLUDGE, AND EFFECT OF PLANTS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
J. V. Lagerwerff, and R. P. Milberg.
Plant and Soil, Vol 49, No 1, p 117-125, 1978. 2 fig, 2 tab, 18 ref.

Descriptors: *Heavy metals, *Cations, *Anions, *Sewage sludge, *Resins, Soybeans, Copper, Zinc, Cadmium, Moisture content, Separation techniques, Analytical techniques, Chelation, Leachate, Municipal wastes.

Laboratory studies measured the sign of charge and the concentration of Cu, Cd, and Zn leached from moist or air-dried 5-yr-old sewage sludge passed through columns bearing cationic, anionic, or mixed resins; the sewage sludge had been obtained from the Black River waste water treatment plant in Baltimore, Maryland. The sludge had an initial moisture content of 38.4% which was reduced to 1.9% by air drying. Aliquots of sludge, extracted by equilibration, were adjusted to pH 3.2, 5.2, and 6.6 before filtration through the resins. For air-dried sludge, the Cd extract yielded 87% cationic species; the Cu extract contained 16% cationic and 72% amphoteric species. Moist storage extracts contained 83% amphoteric Cd, 50% cationic Cu, and 30% amphoteric Cu. Increasing the pH of the extracts caused an increase in neutral and anionic Cu species. Zn extracts, regardless of storage conditions, yielded 84-92% cationic species. The Cu uptake from sludge extracts by plants was analyzed by growing soybean seedlings for 48 hrs in aqueous extracts of Cu-enriched sludge. Extracts sampled after the growth period demonstrated that 68% of the amphoteric, 55% of cationic, 83% of anionic, and 100% of neutral Cu species remained in the extract. (Lisk-FIRL)
W78-11846

H2-PRODUCING BACTERIA IN DIGESTING SEWAGE SLUDGE ISOLATED ON SIMPLE, DEFINED MEDIA,
North Dakota State Univ., Fargo. Dept. of Bacteriology.
P. Holmes, and M. R. Freischel.
Applied and Environmental Microbiology, Vol 36, No 2, p 394-395, August, 1978. 2 tab, 10 ref.

Descriptors: *Enteric bacteria, *Hydrogen, *Sludge digestion, *Carbohydrates, *Cultures, Analytical techniques, Sewage bacteria, Anaerobic bacteria, Nutrient requirements, Iron, Selenium, Methane, Waste water treatment, Anaerobic digestion, Municipal wastes.

Five genera of H2-producing Enterobacteriaceae were isolated from digested sewage sludge on a modified anaerobic basal salts medium, supplemented with various carbohydrate substrates. The basal salts medium received additions of 0.0000001 M sodium selenite, 4 mg/liter ferrous chloride, a vitamin mixture, 1.5% wt/vol agar, and one of the test substrates. The supplemental substrates included: glucose, fructose, sucrose, maltose, cellobiose, glutamate, histidine, glycine, serine, threonine, stearic and oleic acids, phenol, nicotine, tryptophan, benzoate, and olive oil. Glucose yielded the highest number of H2-producing isolates; carbohydrate substrates produced more H2-producing bacteria than non-carbohydrate media. About 69% of the isolates recovered on glucose were H2-producing species; 58% of the isolated Enterobacteriaceae were identified as Citrobacter, 28% as Enterobacter, 0.3% as Escherichia, and 13% as two unidentified genera. Of all the H2-generating bacteria produced, 85% were isolated on glucose and consisted of 65% Citrobacter and 25% Enterobacter; about 2% of the isolates were found on non-carbohydrate media. The average H2-producing bacterial count in digested sewage sludge was about 14,000,000/ml sludge; it was concluded that H2-producing Enterobacteriaceae contribute in some way to the eventual production of methane. (Lisk-FIRL)
W78-11847

A RAPID AUTOMATED SYSTEM FOR THE ANALYSIS OF DISSOLVED TOTAL ORGANIC NITROGEN IN AQUEOUS SOLUTIONS,
Michigan Univ., Ann Arbor. Environmental Chemistry Lab.
J. H. Lowry, and K. H. Mancy.
Water Research, Vol 12, No 7, p 471-475, 1978. 1 fig, 6 tab, 7 ref.

Descriptors: *Chemical analysis, *Nitrogen, *Automation, *Equipment, Monitoring, Sampling, Surveys, Irradiation, Ultraviolet radiation, Chemistry, Water chemistry, Aqueous solutions, Nitrogen compounds, Inorganic compounds, Organic compounds, Analytical techniques.

An automated system for the analysis of dissolved organic nitrogen was developed and applied to natural was developed and applied to natural waters. It was based on subjecting sample to ul-

traviolet irradiation followed by a heterogeneous reduction of the nitrogen containing irradiation products to ammonia which is detected by an ammonia gas sensing probe. Quantitative recoveries of different organic nitrogen compounds common to natural waters were obtained after 17 min of irradiation. Determination with and without irradiation makes possible the separate determination of total and inorganic nitrogen, respectively. (Sims-ISWS)
W78-11885

LIGNIN OF EFFLUENTS FROM THE SEGEZHA PULP AND PAPER MILL IN NATURAL RESERVOIRS (LIGNIN STOCHNYKH VOD SEGEZHSKOGO TSBK V PRIRODNOM VODOEME),
Adademiya Nauk SSSR, Petrozavodsk. Inst. Lesa.
For primary bibliographic entry see Field 5B.
W78-11912

CHARACTERIZATION OF DISPERSED RESIDUAL SOLIDS IN BIOLOGICALLY TREATED PULP AND PAPER MILL EFFLUENTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W78-11913

AN INVESTIGATION OF THE EXTENT OF RESIDUAL BIOSOLIDS DEPOSITION IN QUIESCENT RECEIVING WATERS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5C.
W78-11914

A TEST AND A TECHNIQUE FOR PREDICTING FIVE DAY BOD VALUES OF KRAFT MILL WASTE,
Federal paper Board Co., Riegelwood, NC.
T. B. Douglas.
Tappi, Vol. 61, No. 4, p 53-56, April, 1978. 4 fig, 24 ref, 1 tab.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, Testing procedures, Wastes, Industrial wastes, Pulp and paper industry, Chemical oxygen demand, Chemical analysis, Dissolved oxygen, Temperature, Hydrogen ion concentration, Toxicity, Testing, Kraft mills, Effluents, Water pollution sources, Water analysis.

Studies carried out at Federal Paper Board Co. (Riegelwood, North Carolina) show that a COD test for treated kraft mill effluents using NaOI (as opposed to permanganic and dichromic acids) closely approaches the oxidative power of microorganisms in the 5-day BOD test. Used in conjunction with described techniques of calculation and daily plots, this predictive BOD (PBOD) test has made possible accuate forecasts of 5-day BOD for over 4 years. Incubation of a solution containing 500 ml effluent, 50 ml of 0.1 normal iodine, and 1 ml of 50% NaOH for 1 hr at 20C and pH 12 or more gave a correlation coefficient of 0.953 and a standard deviation of 9.56 ppm in the ragne of 9-100 ppm for the PBOD test as compaed with the standard 5-day BOD values. The test is sensitive to temperature and pH changes. Further studies are needed to determine the effects on PBOD of materials which have a toxic effect on 5-day BOD tests, e.g., turpentine. (Switchenberg-IPC)
W78-11920

CONTROL OF HYDROGEN SULFIDE AND METHYL MERCAPTAN CONTENT IN WASTE WATERS AND CONDENSATES (KONTROL'ZA SODERZHANIEM SEROVODORODA I METILMERKAPTANA V STOCHNYKH VODAKH I KONDENSATAKH),
Kotlasskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
H. V. Balakshina, R. I. Kishik, T. M. Vasil'eva, and K. I. Vlasova.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 22, p 5, August, 1977. 2 tab.

Descriptors: *Pulp wastes, *Condensates, *Hydrogen sulfide, *Methyl mercaptan, *Pollutant identification, Waste identification, Volumetric analysis, Aeration, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Chemical analysis, Effluents, Pulp and paper industry, Soviet Union(USSR).

Kraft pulp mill effluents and condensates of the Kotlas pulp and paper Mill (USSR) were analyzed by aeration and two instrumental titration methods. Hydrogen sulfide cocnetnrations determined by potentiometric titration (with a silver ammoniate solution, pH 13-14) and by high-frequency titration (at pH 4) deviated from each other by not more than 5%. These instrumental metods proved superior to aeration which showed consistently lower values of hydrogen sulfide and methyl mercaptan due to the loss of sulfur compounds duringcompounds analysis. In addition the titration methods take 30 min (with an automated setup only 5 min) while aeration requires at least 1.5 hr. (DuVall-IPC)
W78-11922

RAPID METHOD FOR DETERMINING FIVE-DAY BOD (EKSPRESSMETOD OPREDELENIYA BPK5),
Kotlasskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
G. N. Zimina, and G. M. Zaleshina.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 23, p 4, August, 1977. 1 fig.

Descriptors: *Waste identification, *Biochemical oxygen demand, Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Oxidation, Optical properties, Biological properties, Liquid wastes, Chemical analysis, Water analysis.

The method described involves oxidation of a sample of liquid waste during heating in the presence of a mixture of strong acids and subsequent determination of optical density of the solution. A calibration curve depicting the relationship of optical density to 5-day BOD is given. A particular feature of the analysis is that not more than 20 ml of waste water sample is used. The same is boiled in a 150 mlflat-bottom flask with a reflux condenser for 1 hr. It is then cooled 30 min and filtered. Optical density is determined at 597 nm. The amount of acid added depends on the determined amount of BOD. For BOD values of 200-600 mg oxygen/liter the method uses about 200 ml of potassium dichromate plus 1800 ml of concentrated sulfuric acid and 10 g of silver sulfate. For BOD of 5-40 mg oxygen/liter the chemicals consumed include 20 ml of potassium dichromate plus 1800 ml of concentrated sulfuric acid, 180 ml of water, and 5 g of silver sulfate. (DuVall-IPC)
W78-11923

ANALYSIS OF LIGNIN IN BLACK LIQUOR AND WASTE WATERS (OPREDELENIE LIGNINA V CHERNYKH I STOCHNYKH VODAKH),
Vsesoyuznyi Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost, Moscow (USSR).
L. A. Semakova, A. A. Sokolova, and D. P. Moseeva.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 24, p 10-11, August, 1977. 2 tab.

Descriptors: *Pulp wastes, *Black liquor, *Lignins, *Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Spectrophotometry, Analytical techniques, Chemical analysis, Pulp and paper industry, Effluents, Organic compounds.

Ultraviolet spctrohotometry and anode voltamperometer (AVA) method, and Klason's sulfuric acid method (a modification of Komarov's method) are evaluated as to their ability to determine the lignin content in kraft black liquor and other pulp mill effluents. Ultraviolet spectrophotometry most accruately measures lignin content, because it accounts for the total lignin content as well as degradtion products and the effects f resinous materials, whereas in the AVA method all volatile materials are eliminated from the sample. Using UV spectrophotometery, the lignin content is determined from the concentration of resinous materials, their unit absorpting at 280 nm, and a correction factor. This is a simple sensitive method that requires 5-10 min. Results of the sulfuric acid method are lower than those of UV spectrophotometry, because they do not account for lignin in acidic solution, in the filtrate after the extraction of the precipitate, or in the hydrolyzate after hydrolysis. A combination of Komarov's sulfuric acid and UV spectrophotometry method does account for total lignin and is recommended for most accurate lignin content determination. (DuVall-IPC).
W78-11924

APPLICATION OF AUTOMATED ANALYSIS IN THE ESTIMATION OF SULFITE WASTE LIQUOR CONCENTRATION IN WATERS,
Washington Univ., Seattle. Dept. of Ecology.
R. G. Orquiola.
Water quality report, Vol. 74-20, 26 p, 1974. 5 fig, 15 ref, 4 tab.

Descriptors: *Sulfite liquors, *Waste identification, *Analytical techniques, Wastes, Industrial waste, Pulp wastes, Water pollution sources, Pulp and paper industry, Effluents, Lignins, Water analysis, Spent sulfite liquor.

The automated procedure described is based on the original Pearl-Benson method of estimating the concentration of lignosulfonates in water; cf. Paper Trade Journal, Vol. 111, No. 18, p 35-36 (October 31, 1940). The Auto Analyzer II two-channel system used in this investigation is capable of analyzing 40 spent sulfite liquor samples/hr compared with 12/hr compared with 12/hr by the originial method. Results obtained with this automated procedure are in agreement with those from the original method. (Witt-IPC).
W78-11931

VACUUM OPERATED SAMPLER,
H. D. Brailsford.
U.S. Patent No. 4,077,263, 5 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 968, no 1, p 74, March 7, 1978.

Descriptors: *Patents, *Water pollution, *Sampling, *Water sampling, On-site investigations, On-site data collection, Equipment.

A vacuum pump controlled by a timer periodically evacuates a metering chamber to draw water samples into the chamber from a source. A switch is actuated when the water level reaches a predetermined point and causes the motor to stop. An electrically controlled valve is connected to the metering chamber above the level of the intake nozzle of the pump and is closed when the pump is operating and open when the pump is stopped, thereby allowing air to enter the upper part of the chamber to relieve the vacuum and allow the metered sample to flow out through an outlet tube to a sample receptable. The outlet tube is controlled by a vacuum opeating pinch valve to be closed during sample intake so that the pump will not have to evacuate the sample container before starting to draw into the metering chamber. (Sinha - OEIS)
W78-11935

AQUATIC PESTICIDAL COMPOSITIONS AND METHOD,
Sandoz Ltd., Basel (Switzerland). (Assignee).
J. C. Harvey.
U.S. Patent No. 4,080,191, 6 p, 2 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 1065, March 21, 1978.

Descriptors: *Patents, *Pesticides, Insect control, Aquatic weed control, Films, Thin films, Channels.

Pesticidal formulations suitable for combating insects or undesired plant growth in a water locus is described. The presence of aquatic weeds in waters such as rivers, canals, lakes and drainage channels present serious problems in view of obstructed water flow. Many insects at some stage of their development e.g. the larval stage, live on or directly beneath the water surface. The combating of such pests residing on or directly beneath the water surface poses serious difficulties. This invention provides a pesticidal 'slick' formulation which comprises 5 to 60% by weight of a pesticidal agent, 0.2 to 4% by weight of an anionic or non-ionic surfactant having an HLB (Hydrophilic/lipophilic balance) value of less than 12.5, and the balance to 100% by weight being a water-immiscible solvent/diluent having a mean specific gravity of less than 1. The term 'slick' as used here is meant a film, evenly formed on the surface of water. The pesticidal formulation is adapted to distribute itself evenly over the surface of water as a film. The type of pesticide employed in the formulations can very within wide limits. (Sinha - OEIS)
W78-11950

THE MUSSEL WATCH,
Scripps Institution of Oceanography, La Jolla, CA.
E. D. Goldberg, V. T. Bowen, and J. W. Farrington.
Environmental Conservation, Vol 5, No 2, p 101-125, Summer 1978. 10 fig, 13 tab, 24 ref.

Descriptors: *Water pollution effects, *Bioindicators, *Pollutant identification, Monitoring, Mussels, Oil pollution, Outer Continental Shelf, Ocean pollution, Indicator species, Bivalves, 'Mussel Watch', Mytilus, Ostrea, Crassostrea.

The Mussel Watch concept involves surveillance of U.S. coastal regions for their pollutant contents utilizing species of mussels (Mytilus) and oysters (Ostrea or Crassostrea) as surveillance organisms. The programme was coordinated by the Scripps Institution of Oceanography under contract with the U.S. Environmental Protection Agency, the analysis being performed by five participating laboratories. The procedures for the monitoring programme were formulated by a guidance committee composed of the scientists whose facilities would be involved in the analytical work. A meeting of the Mussel Watch Guidance Committee, held at Block Island, RI, during 11-13 July 1977, evaluated the results of the first year and this provided a basis for formulating more effective tactics. Tactics to implement the following changes will be considered at the next meeting: (1) inclusion of sampling sites near areas of high pollutant discharge; (2) Mercury will be added to the list of heavy-metals analyzed; and (3) the number of Mytilus edulis and M. californianus collected from the same West Coast sites will be increased to establish more adequately than heretofore the species differences in bioaccumulation of the pollutants under study. (Sinha - OEIS)
W78-11957

QUANTITATION OF SULFUR CONTAINING OIL COMPOUNDS AND POLYCHLORINATED BIPHENYLS (PCB) IN MARINE SAMPLES,
Osaka Prefecture Inst. of Public Health (Japan). Lab. of Food Chemistry.
A. Nakamura, and T. Kashimoto.
Bull Environm Contam Toxicol, Vol 20, No 2, p 248-254, August 1978. 4 fig, 2 tab, 13 ref.

Descriptors: *Pollutant identification, *Oil spills, *Industrial wastes, *Water pollution, Sulfur, Gas chromatography, Polychlorinated biphenyls, Outer Continental Shelf, Ocean dumping.

Oil spillage by causal boat accidents and/or discharge from boats and industrial sewages presently cause world-wide contamination of coastal sea water, beach and biota in the marine environment. For the fingerprint of oil pollution, n-alkanes, polyaromatic hydrocarbons are widely used in marine biota, sediments and human tissues. The authors selected sulfur containing oil compounds pollution in marine products and reported contamination of sulfur compounds in oysters from the Seto Inland Sea. For the successive analyses of these compounds, gas chromatography on a capillary column and high pressure liquid chromatography (HPLC) technique were also reported. In this paper, levels of contamination of sulfur containing oil compound in shell fishes, other marine samples and sediments are determined by gas chromatography. The evaluation of Polychlorinated biphenyls (PCB) levels in the same samples are also presented. (Sinha-OEIS)
W78-11960

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3A: SOUTHWEST FLORIDA - SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11974

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3B: SOUTHWEST FLORIDA - GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11975

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 4: NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11976

COMPARISON OF THE RADIOACTIVE AND MODIFIED TECHNIQUES FOR MEASUREMENT OF STREAM REAERATION COEFFICIENTS,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Madison, WI. Water Resources Div.
R. E. Rathbun, and R. S. Grant.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 064, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-68, May 1978. 57 p, 23 fig, 12 tab, 22 ref.

Descriptors: *Reaeration, *Tracers, *Radioactivity techniques, *Streamflow, Measurement, Oxygenation, Dissolved oxygen, Water pollution, Analytical techniques, Evaluation, *Reaeration coefficient, *Nonradioactive tracers.

The radioactive and modified tracer techniques were used to measure the reaeration coefficients of two reaches each of Black Earth Creek and the Madison Effluent Channel near Madison, Wis. Coefficients measured with the modified technique were from -8.96 to +3.61 and from +15.7 to +32.2 percent different from the coefficient measured with the radioactive tracer technique on Black Earth Creek. The larger coefficients measured with the modified technique on the second reach were attributed to increased wind conditions during the latter part of the modified-technique experiment. Interpretation of the Madison Effluent Channel study was complicated by an unsteady flow condition during the modified-technique experiment which required estimation of the dye loss and the discharge increase. Using these estimated values, the coefficients measured with the modified technique were from +25.3 to +57.9 and from -4.74 to +2.94 percent different from the coefficient measured with the radioactive technique on the Madison Effluent Channel. Results of this study suggest that the modified technique is a promising alternative to the use of radioactive tracers. (Woodard-USGS)
W78-11977

CHEMISTRY OF WATERS IN THE GEOPRESSURED ZONE FROM COASTAL LOUISIANA -- IMPLICATIONS FOR THE GEOTHERMAL DEVELOPMENT,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-11980

WATER-QUALITY RECORDS FOR THE HUBBARD CREEK WATERSHED, TEXAS, OCTOBER 1974 - SEPTEMBER 1976,
Geological Survey, Austin, TX. Water Resources Div.
H. J. Davidson.
Open-file report 78-98, January 1978. 46 p, 2 fig, 10 tab, 8 ref.

Descriptors: *Water quality, *Watersheds(Basins), *Streams, *Reservoirs, *Discharge(Water), Water analysis, Chemical analysis, Water temperature, Hydrogen ion concentration, Sampling, Sites, Basic data collections, Texas, *Hubbard Creek watershed, Shackelford County, Stephens County.

This report presents a compilation of water-quality data for the Hubbard Creek watershed in Texas collected during October 1974 - September 1976. The tabulated data include discharge, chemical constituents, temperature, and pH. (Woodard-USGS)
W78-11981

SELECTED HYDROLOGIC DATA, CAMAS PRAIRIE, SOUTH-CENTRAL IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11982

ELUTRIATOR/MICROCOSM SYSTEM PILOT MODEL AND TEST,
Naval Ocean Systems Center, Kailua, HI.
For primary bibliographic entry see Field 5C.
W78-12000

PROGRAM AND ABSTRACTS: SYMPOSIUM ON NONBIOLOGICAL TRANSPORT AND TRANSFORMATION OF POLLUTANTS ON LAND AND IN WATER.
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-12015

SOURCES AND CHARACTERISTICS OF SOLUBLE ORGANIC NITROGEN IN ACTIVATED-SLUDGE EFFLUENTS,
Stanford Univ., CA.
G. F. Partin.
PhD Thesis, 1978. 258 p.

Descriptors: *Nitrogen, *Activated sludge, *Organic wastes, *Nutrient removal, *Amino

acids, Oxidation, Biological treatment, Biodegradation, Chemical oxygen demand, Activated carbon, Adsorption, Anion exchange, Cation exchange, Waste water treatment, Municipal wastes.

The sources and characteristics of soluble organic nitrogen (SON) in activated sludge effluents and raw sewage were investigated. From 20-50% of the biologically produced SON originates from excreted materials; another 20-50% results from organism decay, while a much smaller percentage is produced by substrate oxidation. About 20-40% of the SON is produced biologically during the activated sludge process. When operated with 6 hours of aeration and 4-10 days of solids retention, the activated sludge can reduce SON by 60-70% and soluble COD by 70-80%. SON concentrations of 0.2-0.8 mg/liter can result from semi-continuous operation; these concentrations increase to 1.5-5.0 mg/liter during start-up and system imbalance. SON consists of about 15-30% nucleic acid and 10% free or combined amino acids. About 50-60% of the effluent SON and soluble COD has a molecular weight below 1,800; higher molecular weights are observed in the excess SON produced during start-up. Activated carbon adsorption reduces SON by about 72% and soluble COD by about 78%. Cationic exchange at pH 2.0 reduced SON by 33-56%; at pH 9.5, anionic exchange reduces SON by about 10-24%. (Lisk-FIRL)
W78-12039

LEAST-SQUARES ESTIMATOR FOR POLLUTED STREAM VARIABLES IN A DISTRIBUTED PARAMETER MODEL,
Tampere Univ. of Tech. (Finland).
For primary bibliographic entry see Field 5B.
W78-12042

TRIHALOMETHANES AND VIRUSES IN A WATER SUPPLY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
R. C. Hoehn, C. W. Randall, F. A. Bell, Jr., and P. T. B. Shaffer.
Journal of the Environmental Engineering Division, Vol 103, No EE5, Proceedings of the American Society of Civil Engineers, p 803-814, October 1977. 5 fig, 5 tab, 12 ref.

Descriptors: *Halogens, *Organic compounds, *Water pollution, *Water supply, *Water treatment, *Viruses, Chlorination, Chloroform, Humic acids, Volatility.

In June 1975, a program was established for monitoring viruses and volatile organics in the Occoquan Reservoir and water service area supplying approximately 600,000 residents of northern Virgina. Of interest were: (1) the magnitude of and variations in total trihalomethanes (TTHM) during the year; and (2) whether viruses could be recovered. Discharges of chlorinated sewage did not appreciably alter TTHM concentrations in one of the reservoir tribuaries, but as others have shown, chlorination of water from the reservoir during routine treatment produced high TTHM concentrations, principally chloroform, in finished water. The highest concentrations were observed in summer when the finished water was approximately 275 micrograms/l. Polio 1 was recovered on seven occasions, four times from finished water. This report has stimulated much interest and has resulted in further monitoring to try to verify the reported findings and in a joint experimental project to test methods of virus sampling and analysis.
W78-12045

TWO-TEMPERATURE MEMBRANE FILTER METHOD FOR ENUMERATION OF FECAL COLIFORM BACTERIA FROM CHLORINATED EFFLUENTS,
Massachusetts Univ., Amherst.
B. L. Green.
pH D Thesis, 1978. 146 p.

Descriptors: *Coliforms, *Membrane processes, *Filtration, *Chlorination, *Analytical techniques, Incubation, Temperature, Laboratory tests, Sewage bacteria, Sewage treatment, Microbiology, Numerical analysis, Waste water treatment, Municipal wastes.

The incubation procedure required for the membrane filtration enumeration of fecal coliform bacteria in chlorinated effluents was modified to permit more accurate analysis. Incubation of chlorinated effluent samples at 44.5C prior to standard membrane filter enumeration of coliforms was found to critically affect the recovery of sublethally injured coliforms. Chlorinated primary and secondary effluents were preincubated at 35C for 5 hrs, followed by incubation for about 18 hrs at 44.5C, prior to membrane filtration of the effluents for coliform quantification. Results of the modified and standard methods were compared to those obtained by multiple-tube most probable number (MPN) procedures; the standard membrane filter technique recovered only 15% of the coliforms obtained by the MPN procedure. The modified incubation technique yielded 68% of the fecal coliforms recovered by the MPN procedure. Correlation of results obtained from the modified technique and the MPN procedure was highest in tests with secondary effluents. (Lisk-FIRL)
W78-12052

ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS,
Southwestern Great Plains Research Center, Bushland, TX.
For primary bibliographic entry see Field 5B.
W78-12075

METHODS FOR MEASURING THE ACUTE TOXICITY OF EFFLUENTS TO AQUATIC ORGANISMS,
Environmental Research Lab., Athens, GA.
W. Peltier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 690, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 600/4-78-012, 7 tab, 14 fig, 34 ref, append.

Descriptors: *Bioassay, Toxicity, Mortality, Fishes, Invertebrates, *Laboratory tests, *Laboratory equipment, Effluents, Sewage, *Methodology, Laboratory animals, Acute toxicity, Macroinvertebrates.

This report describes methods for the measurement of the acute toxicity of effluents to macroinvertebrates and fish. The methods include a preliminary short-term (8-24 hr.), range-finding test and a long-term (96 hr.), or alternate static definitive test for use in determining the LC50 or EC50 of the waste. The report includes guidelines on effluent sampling and holding, facilities and equipment, dilution water, test species selection and handling, and data interpretation. (EIS-Katz)
W78-12099

5B. Sources Of Pollution

GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI,
Forest Service (USDA), Rolla, Missouri, National Forests in Missouri.
C. P. Tryon.
Ground Water, V. 14, No. 4, p. 214-223, July-Aug., 1976. 10 fig., 2 tab., 17 ref.

Descriptors: *Groundwater quality, *Missouri, Nitrates, Coliforms, Wells, Fertilizers, *Agricultural runoff, Leaching, Sewage, Farm wastes, Pasture land.

Information from 675 water wells in and around Phelps County, Missouri shows that discrete areas of differing ground-water quality can be identified and mapped. The best quality groundwater, as judged by its low nitrate content and coliform bacteria density, is found in areas of relatively little agricultural (pasture and livestock) land use. The adverse effect of agricultural land use on groundwater quality is more severe in the intensely developed karst than in the less intensely developed. Rural population density and soil association variations have no readily discernible effects on ground-water quality. Nitrate concent varies seasonally and in response to rainfall, and decreases with increasing well depth. Coliform bacteria density is positively correlated with nitrate content. (East Central)
W78-11307

A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS,
Agricultural Research Service, Watkinsville, GA.
R. R. Bruce, L. A. Harper, R. A. Leonard, W. M. Snyder, and A. W. Thomas.
Journal of Environmental Quality, V. 4, p. 541-548, Oct.-Dec., 1975. 8 fig, 1 tab, 18 ref.

Descriptors: *Model studies, *Agricultural runoff, Erosion, Sediments, *Pesticides, Rainfall-runoff relationships, Water quality, Water Pollution sources.

A mathematical model was developed which describes the rate and quantity of runoff water from separate rainfall events on a watershed and the rate and quantity of sediment and pesticides transported. The experimental site used in the model testing was a 2.71-ha watershed in the upper Piedmont plain near Watkinsville, Georgia. instruments were installed to measure rainfall and surface runoff in addition to providing runoff samples for sdiment and chemical analysis. The watershed was planted to soybeans with rows roughly perpendicular to the main drainage channel. Trifluralin was applied before planting at a rate of 1.12 kg/ha and incorporated to a depth of approximately 7.5 cm. Diphenamid at 3.36 kg/ha, and paraquat at 11.2 kg/ha, were surface-applied at a rate 20 times the normal rate for weed control to serve as a tracer for strongly absorbed chemicals. The model was tested for 4 storms which occurred during summers of 1972 and 1973. These storms were short duration and were characterized by relatively high intensities where most of the rain fell in 10 minutes or less. The model adequately simulated the runoff of paraquat, trifluralin, and diphenamid during the runoff events. However, the model's capability, extensibility, and utility should be put in perspective. Another version of the current model is contemlated to simulate runoff of mobile chemicals, like NO(3)- of C1-. A vital component of this model must be subsurface water transport. The current model provides a conceptual base for extension and refinement to include runoff of mobile chemicals. (Rowe-East Central)
W78-11308

PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED: QUANTITIES, PROCESSES, AND SOURCES,
Pennsylvania Univ., Philadelphia.
A. H. Johnson, D. R. Bouldin, E. A. Goyette, and A. M. Hedges.

Descriptors: *Water pollution sources, Sampling, *Phosphorus, Watersheds, *Suspended solids, Runoff, Sewage, Agriculture, Fertilizers, *Nonpoint pollution sources, Manure, *Dissolved phosphorus, Particulate phosphorus.

Phosphorus losses by stream transport in Fall Creek, which drains a rural watershed in central New York, were studied during a 20-month period. Fall Creek was sampled at several locations over a range of discharge conditions. Sampling efforts were concentrated during storm runoff periods. Estimates of phosphorus loss were obtained, and estimates of the standard errors were calculated.

Phosphorus loss associated with suspended solids accounted for 78% of the total exported. Dissolved inorganic fractions accounted for 14%. Dissolved organic fractions accounted for 8%. Approximately 22% of the dissolved phosphorus lost from the watershed was derived from diffuse sources associated with farming, 44% was derived from natural geochemical processes, and 34% from point source inputs. Less than 1% of the phosphorus applied to the landscape in chemical fertilizer and manure was lost from the watershed in dissolved form. (Merryman-East Central)
W78-11341

FATE OF TRACE ELEMENTS IN SEWAGE SLUDGE-AMENDED SOILS,
Dayton Univ., Ohio. Dept. of Geology.
C. J. Ritter, C. R. Cothern, and E. E. Zamierowski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 053, Price codes: A10 in paper copy, A01 in microfiche. Ohio State University, Columbus, Water Resources Center, Completion Report No 519X, 1978. 200 p. OWRT B-065-OHIO(1).

Descriptors: *Sewage sludge, Soils, *Trace elements, Chemical analysis, *Plant growth, *Translocation, *Percolation, *Heavy metals, Growth chambers, Cadmium radioisotopes, Phosphates, Phytotoxicity, Organic matter, Inorganic compounds, Groundwater, Mineralogy, X-ray diffraction, Optical properties, Cadmium, Copper, Nickel, Lead, Zinc, Ohio, *Pollutant identification, *Dayton(Ohio), *Atomic absorption spectroscopy, Zonal centrifugation, Compound identification, Electron spectroscopy, DTPA-extraction, Spinach, Sugar beet, Radioautography, Heavy liquid density gradient.

Uptake of trace amounts of Cd, Cu, Ni, Pb and Zn by plants grown in sewage sludge-amended soil from the Dayton, Ohio, area was determined. Sludge from the industrialized city of Dayton contains substantial amounts of trace elements, whereas that from non-industrialized Englewood has considerably smaller amounts. Zonal centrifugation was used to fractionate sludge and soil. Up to 75 weight percent of sludge has low density and is mostlyorganic material. Seventy-five weight percent of the total trace elements in sludge are in organic-rich fractions and are believed to be in organic compounds. Data from electron spectroscopy for chemical analysis (ESCA) indicates that Zn and Cu are bonded to O in sludge. Compounds of the carboxyl group are the most likely hosts. Sugar beet and spinach were grown in conrolled growth chambers. Addition of any amount of Dayton sludge reduced plant yield, whereas addition of Englewood sludge increased plant shoot dry weight. Heavy metal uptake by plants grown in soil amended with Dayton sludge was greater than by plants grown in Englewood sludge-amended soil, particularly for Cd, Cu, and Zn. Percolation studies of heavy metals in soil columns show that they do not move below 15 cm in high clay soil, nor below 40 cm in high sand soil.
W78-11363

TOXIC METAL CONCENTRATION OF THE WATER TABLE AS AFFECTED BY POULTRY MANURE,
Delaware Univ., Newark. Dept. of Plant Science.
W. C. Liebhardt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 121, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, October 1977. 17 p, 10 tab. OWRT A-035-DEL(1), 14-34-0001-7016.

Descriptors: *Heavy metals, *Zinc, Soils, Groundwater, *Farm wastes, *Poultry, Water wells, Sampling.

One acre plots received annual applications of poultry litter from 1972 to 1975 at rate of 0, 6, 12, 24, and 80 tons per acre. Water samples from well points indicated a high concentration of zinc in the water table. However, soil samples taken at one foot intervals in both 1975 and 1976 showed there was no indication of any downward movement of zinc. During the summer of 1976 samples of water from borings to the water table and well point samples conclusively showed that the previous high concentration of zinc in the water table was an artifact of the well points. The well point samples were high whereas the water samples taken from the borings were relatively low. Analysis of soil also showed that there was no indication of downward movement of arsenic, copper and manganese. Extraction of soil with several extractants from an experiment consisting of eight poultry litter treatments and four replications showed that 0.05 M EDTA is an acceptable single extractant for copper, manganese and zinc with respect to this extractant being able to detect addition of these heavy metals from poultry litter.
W78-11370

PHOTOCHEMICAL DEGRADATION OF MALATHION,
Alaska Univ., College. Inst. of Water Resources.
M. Schneider, and G. W. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 115, Price codes: A02 in paper copy, A01 in microfiche. Fairbanks. Report No. IWR-91, March 1978. 11 p, 1 fig, 2 tab, 10 ref. OWRT A-057-ALAS(1), 14-34-0001-6002.

Descriptors: *Pesticide residues, *Insecticides, *Degradation(Decomposition), Phosphates, Organic compounds, Triphosphates, *Malathion, *Photodecomposition.

The objective was to extend the qualitative and quantitative knowledge about the persistence and photodecomposition of malathion, a thiophosphate insecticide. Test plots were sprayed with malathion in aqueous solution and cores were taken periodically to determine the insecticide's persistence. The malathion was removed from the samples by acetone extraction. Analysis of the samples taken two days after spraying indicated that virtually all the malathion sprayed on the plots was still there.
W78-11374

HYDROSPHERIC TRACE ELEMENTS AND THEIR APPLICATION IN TRACING WATER POLLUTANTS,
Oregon State Univ., Corvallis. Dept. of Chemistry.
W. D. Loveland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 114, Price codes: A05 in paper copy, A01 in microfiche. Oregon State University, Water Resources Research Institute, Completion Report WRRI-59, July 1978. 86 p, 14 fig, 41 tab, 32 ref, append. OWRT A-043-ORE(1).

Descriptors: *Tracing techniques, Pollutant detectors, *Trace elements, *Pollution monitoring, Rare earth elements, *Pollutant identification, *Path of pollutants, *Neutron activation analysis, *Willamette River(Ore), *Oregon.

In recent years, there has been interest in attempts to develop tracer technologies which will be attractive alternatives to conventional radiotracer, chemical tracer, and fluorescent dye technologies. Principal findilngs are summarized of a research project to develop certain rare earth elements with short-lived activation products as stable activable tracers for fluid-bound pollutants in fresh waters. The rare earths are easily detected by instrumental neutron activation analysis allowing long range pollutant tracing and the use of environmentally insignificant tracer levels. The use of short-lived activation products allows rapid sample analysis and thus makes the tracers more cost competitive. (Buckley-Oregon St).
W78-11375

FRESHWATER INFLOW AND ITS EFFECT ON THE SALINITY AND BIOTA OF SHALLOW LAGOONS, (PARTS I AND II),
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2L.
W78-11381

IMPACT OF URBAN RUNOFF ON WATER QUALITY IN THE OCCOQUAN WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11383

POLYCHLORINATED BIPHENYL (PCB) DEGRADING BACTERIA AND PCB IN ESTUARINE AND MARINE ENVIRONMENTS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-11430

SURFACE CIRCULATION AND REPLACEMENT OF WATER IN MONTEREY BAY,
San Jose State Univ. CA.; and Moss Landing Marine Labs., CA.
W. W. Broenkow, and W. M. Smethie, Jr.
Estuarine and Coastal Marine Science, Vol 6, No 6, p 583-603, June 1978. 11 fig, 4 tab, 50 ref. NOAA 2-35137, 04-5-158-20.

Descriptors: *Water circulation, *Bays, *California, *Tidal waters, Pollutants, Path of pollutants, Water pollution, Currents(Water), Coasts, Winds, Salinity, Temperature, Water temperature, Discharge(Water), Rivers, Nitrates, Ammonia, Sewage, Upwelling, Estuaries, *Monterey Bay(Calif).

Observations in Monterey Bay for 27 months were used to describe net surface circulation and nutrient distributions. Surface water characteristics are modified slightly in the northern and southern bay compared to mid-bay. Local winds correlate well with upwelling episodes. The data suggested that upwelling occurs predominantly along the coast south of the bay, and the effects of recent upwelling are observed within the bay due to a general northerly flow. Internal tidal mixing promotes a net upward transport of cool, nutrient-rich water at the head of Monterey Submarine Canyon. A nearshore residence time of 6 days (2- to 12-day range) was determined by temperature, nutrients, and sewage-derived ammonia spring and summer) and by freshwater replacement (during winter). These residence times agree with direct current meter observations. The predominatly northward flow through the bay suggested by the distributions agrees with current meter measurements, the alignment of the canyon axis, and offshore geostophic observations. (Sims-ISWS)
W78-11431

AN IMPROVED SOIL-SAMPLING PROCEDURE FOR THE PREDICTION OF DISSOLVED INORGANIC PHOSPHATE CONCENTRATIONS IN SURFACE RUNOFF FROM PASTURE,
Massey Univ., Palmerston North (New Zealand). Agricultural and Horticultural Sciences.
For primary bibliographic entry see Field 5A.
W78-11432

EARTH RESOURCES DATA ACQUISITION SENSOR STUDY, PERIOD: DECEMBER 1, 1974-MAY 31, 1975,
Alabama Univ., Huntsville. School of Graduate Studies and Research.
For primary bibliographic entry see Field 5A.
W78-11443

WATER QUALITY ASSESSMENT YAKIMA RIVER BASIN,
Washington State Dept. of Ecology, Olympia.
P. Lee, D. Glantz, and R. Pine.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 053, Price codes: A09 in paper copy, A01 in microfiche. Report 76-17, October 1976. 188 p, 66 fig, 73 tab, 12 ref, 3 append.

Descriptors: *Water quality, *Rivers, *Washington, Water pollution, Water pollution sources, Dams, Irrigation, Wastes, Pollutants, Path of pollutants, Farm wastes, Domestic wastes, Industrial wastes, Sediments, Flow, Flow control, Precipitation(Atmospheric), Rainfall, *Yakima River(Wash).

The water quality of the Yakima Basin is affected by man's activity probably more than any other basin in the state. Analysis of the chemical and bacteriological parameters, routinely monitored by the Department of Ecology (DOE) and others, indicated that the Yakima River water quality deteriorates significantly as it flows toward the Columbia River. The classic 'fishability' and 'swimmability' uses are minimal, especially in the reaches of the river below Sunnyside Dam. This water quality deterioration is attributed primarily to the intensive use of the river for various agricultural needs. The flow of the Yakim, Naches, and Cle Elum rivers is altered to maximize the amount of available water for agricultural use during the dry summer and fall months. The release of water impounded in upstream storage reservoirs impacts water quality in the upper Yakima. The increased flow then becomes part of the intricate use and reuse of water through the complex system of dams, diversions, irrigation drains, and canals that proliferate the study area. Large volumes of surface runoff with high concentrations of suspended sediments, nutrients and coliform bacteria are the result of these irrigation activities. The above factors emphasize the 'artificiality' of the basin and how difficult it is to define water quality in terms of natural causes or as a result of any single human activity. (Sims-ISWS)
W78-11450

NONPOINT SOURCE POLLUTION FROM AGRICULTURAL RUNOFF,
Cornell Univ., Ithaca, NY. Dept. of Civil and Agricultural Engineering.
D. A. Haith, and J. V. Dougherty.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Chemical Engineers, V. 102, No. EE5, p. 1055-1069, 1976. 1 fig, 7 tab, 39 ref.

Descriptors: *Water pollution sources, *Agricultural runoff, Nitrogen, Phosphorus, Agricultural watersheds, *Nonpoint pollution sources, Snowmelt runoff.

An operational procedure has been developed which is suitable for estimating nonpoint source water pollution due to runoff from agricultural land and is sensitive to regional variations in weather, soils, and crop management. Although not presently applicable to snowmelt runoff, the procedure could be extended to winter runoff by use of suitable snowmelt estimating methods. Nitrogen and phosphorus in agricultural runoff were estimated for a five-watershed area totaling 578 sq km in Broome and Tioga Counties, N.Y., for the years 1971 and 1972. Comparison was made with two other estimates which were obtained using areal loading factors (losses of nutrients per unit area). Although the three different estimates were of comparable orders of magnitude, the loading factor estimates were not sensitive to the soils, weather, and crop distributions of the study region, and may overestimate losses of nitrogen in agricultural runoff. (East Central)
W78-11460

THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS,
Southeast Environmental Research Lab., Athens, GA.
H. P. Nicholson.
Journal of Environmental Quality, V. 4, No. 1, p 21-23, Jan.-March, 1975. 6 ref.

Descriptors: *Model studies, *Water pollution control, Agriculture, Municipal wastes, Industrial wastes, Watersheds, Sediments, Agricultural chemicals, Pathogenic bacteria, Heavy metals, Mathematical models, Farm wastes, *Non-point pollution sources, Pollution abatement, Crop residues.

The Federal Water Pollution Control Act Amendments of 1972 emphasize the need to control pollution associated with agricultural activities as well as pollution associated with cities and industries. The full significance of agricultural pollution is from non-point sources, something more than the application of standard collection and treatment systems is needed for pollution control. Management of such pollution will depend heavily upon mathematical models now under development. Management programs should be planned and implemented for complete drainage basins. The potential agricultural pollutants that must be managed include sediments, agricultural chemicals, animal wastes, crop residues, pathogens, and possibly heavy metals. (Merryman-East Central)
W78-11505

THE ROLES OF NUTRIENT CYCLING AND RADIANT ENERGY IN AQUATIC COMMUNITIES,
For primary bibliographic entry see Field 5C.
W78-11508

PRODUCTION OF VOLATILE SULFUR COMPOUNDS DURING THE DECOMPOSITION OF ALGAL MATS,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W78-11510

EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5C.
W78-11513

ATTENUATION OF LIGHT IN NATURAL WATERS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 5C.
W78-11516

FACTORS AFFECTING NUTRIENT LOADS IN SOME IOWA STREAMS,
Iowa State Univ., Ames. Dept. of Animal Ecology.
J. R. Jones, B. P. Borofka, and R. W. Bachmann.
Water Research, V. 10, No. 2, p. 117-122, 1976. 2 fig., 7 tab., 42 ref.

Descriptors: *Watersheds(Basins), *Iowa, *Water pollution sources, Nitrogen, Phosphorus, Nutrient, Runoff, Feedlots, Croplands.

The export and concentration of inorganic nitrogen and total phosphorus from 34 watersheds in a northwestern Iowa lake district were measured during March 1971-August 1973. Annual nutrient losses were appriximately 0.35 kg ha-1 P, 6.7 kg ha-1 NO -N, and 1.0 kg ha-1 NH3-N. A statistical analysis of the relationship between land-use and plant nutrients was used to determine differences among streams. Animal units in feedlots were significantly correlated with phosphorus and ammonia nitrogen (mg 1-1 and kg ha-1 yr-1). Nitrate nitrogen was negatively correlated with the percentage of watershed in marshland. Tile drainage and surface runoff from grasslands, feedlots, cornfields, and soybean fields were analyzed for nitrogen and phosphorus in spring 1974; mean values are given. (East Central)
W78-11525

MERCURY AND CHLORINATED HYDROCARBONS IN PLANKTON OF LAKE PAIJANNE, FINLAND,
Jyvaskyla Univ. (Finland). Dept. of Biology.
J. Sarkka, M. Hattula, J. Janatuinen, and J. Paasivirta.
Environmental Pollution, Vol. 16, No. 1, p. 41-49, 1978. 1 fig, 5 tab, 20 ref.

Descriptors: *Lake Paijanne(Finalnd), *Plankton, *Mercury, *Polychlorinated biphenyls, *DDT, *Food chain, *Finland, *Pulp wastes, Bioaccumulation, Lakes, Phytoplankton, Zooplankton, Chlorinated hydrocarbons, DDE, Industrial wastes, Sewage, Pulp and paper industry, Pesticide residues, Path of pollutants, Water pollution sources.

Residues of mercury and chlorinated hydrocarbons were determined for plankton collected in Lake Paijanne, Finland during 1972-74. Polychlorinated biphenyls (PCBs) were the greatest contaminants, with an average dry weight content of 290 micrograms/kg, followed by mercury with 178 and DDE + DDT with 91 micrograms/kg. Spatial and temporal sampling differences were generally small. The DDE + DDT content of the largest size fraction (350 micrometers) wasmostly higher than in the smaller fractions (100, 50, and 25 micrometers). Correlation between BCB and DDE + DDT content was highly significant. Mercury content was similar to marine areas, but lower than in other polluted regions. PCB and DDE + DDT content was generally lower than in marine plankton. Lake Paijanne receives its waste loading principally from sulfite and sulfate mill wastes, sewage and paper mill effluents. DDD and dieldrin were not found, and aldrin was found only at one station. DDT was almost totally prohibited in 1971 and PCBs have not been used in very great amounts in the lake's drainage basin (240 tons were used in Finland in 1969). While bioaccumulation from phytoplankton to zooplankton appears to occur for DDE and total DDT, none was indicated for PCBs and mercury. None of the residue levels correlated significantly with the fat content of the sample. (Lynch-Wisconsin)
W78-11526

POLLUTANTS FROM LAND-BASED SOURCES IN THE MEDITERRANEAN,
World Health Organization, Geneva (Switzerland).
R. Helmer.
AMBIO, Vol. 6, No. 6, p 312-316, 1977. 6 fig, 1 tab, 2 ref.

Descriptors: *Mediterranean Sea, *Water pollution sources, *Waste disposal, *Pollutants, *United Nations, Seas, Rivers, Municipal wastes, Industrial wastes, Sewage, Agricultural runoff, Nutrients, Radioactive wastes, Nuclear powerplants, Organic matter, Phosphorus, Nitrogen, Metals, Pesticide residues, Fallout.

The first comprehensive compilation of major land-based pollution sources to the Mediterranean Sea was made by the United Nations Environment Program (UNEP). Data are presented in a consolidated table. Conclusions: (1) domestic sources largely contribute organic matter,nutrients, and detergents; (2) industrial waste discharges are responsible for considerable amounts of organic matter, in addition to phenol, metla, and mineral oils; (3) agricultural runoff accounts for some o the nutrient input, and suspended solids and pesticide

discharges are largely due to soil erosion; (4) Major rivers transpot an integrated load of domestic, industrial, and agricultural pollutants from entire drainage basins, and contribute great amounts of suspended solids, nutrients, metla,s andpesticides; and (5) total radioactive discharge from nuclear installations may be rather low compared with radioactive contaminants in other discharged materials and due to earlier weapon tests. Load assessment was made for each pollutant individually, and geographical distribution of pollution loads was based on 10 regional subdivisions of the Mediterranean basin. In estimating annual loads, a distinction was made between pollution originating in the coastal zone, and substances carried by rivers into the sea; an attempt was made to distinguish background and pollution loads in the rivers. (Lynch-Wisconsin)
W78-11534

A SUMMARY OF THE BIOGEOCHEMISTRY OF NITROGEN COMPOUNDS IN GROUND WATER,
California State Univ., Chico.
J. Behnke.
Journal of Hydrology, V. 27, No. 1/2, p. 155-167, Oct., 1975. 4 fig., 55 ref.

Descriptors: *Nitrates, *Nitrogen compounds, Leaching, Groundwater pollution, *Water pollutant sources.

This article attempts to briefly summarize the history of nitrogen compounds in the bioshell and to relate nitrates to the biogeochemistry of other nitrogen compounds involed in the nitrogen cycle. The article summarizes groundwater nitrate occurrences and provides the reader with an updated bibliography concerning such occurrences. Most reported cases of excessive nitrate build-ups in shallow groundwaters seem to be related to the downward leaching of nitrogen by surface water. Such leaching requires a relatively open geologic profile between the ground surface and the water table. Reported sources for groundwater nitrate contamination include decaying plant and animal material, organic sediments, agricultural fertilizers, domestic sewage, and areas of high density animal confinement. (Bates-East Central)
W78-11535

NUTRIENTS AND PRODUCTIVITY AS INDICATORS OF THERMAL EFFLUENT UPWELLING INTERACTIONS IN LAKE MICHIGAN,
Argonne National Lab., IL.
E. M. Yaguchi.
Journal of Great Lakes Research, vol. 3, no. 1-2, p57-64, 1977. 3 fig., 2 tab., 42 ref.

Descriptors: *Thermal pollution, *Lake Michigan, Productivity, Great Lakes, Nutrients, Phytoplankton, Growth rates, Water pollution sources, Water temperature, Currents(Water), Population, Powerplants, Thermal stratification, Nuclear powerplants, Diversity.

During the summer of 1975, a field study was undertaken to examine separate and combined effects of upwelling and a thermal discharge on nutrients, productivity quotients, and phytoplankton populations in an inshore region of southwestern Lake Michigan. Reactive silicat concentrations were more than doubled during the upwelling (compared to those during stable hydrological conditions); chlorophyll a concentrations, phytoplankton diversity, and cell numbers per milliliter were also significantly greater. Productivity quotients were lower by nearly one-half during upwelling. The Zion Nuclear Plant discharges water warmed an average of 10 C to the lake via a submerged high-velocity discharge. Few significant differences in chemical and biological parameters were attributable to the resulting warm-water plume. Phytoplankton spcific growth rates in the plume were increased over those at control stationsonly during upwelling. Nutrient limitation is implicated as one of several factors in the response of phytoplankton to locally increased temperature. (EIS-Katz)
W78-11537

LONG-TERM VARIATION OF ORGANOCHLORINE RESIDUES AND ASSEMBLAGES OF EPIBENTHIC ORGANISMS IN A SHALLOW NORTH FLORIDA (USA) ESTUARY,
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 5C.
W78-11538

WATER POLLUTION FROM NONPOINT SOURCES,
Midwest Research Inst., Kansas City.
A. D. McElroy, S. Y. Chiu, J. S. Nebgen, A. Aleti, and A. E. Vandegrift.
Water Research, V. 9, No. 7, p 675-681, July, 1975. 3 tab, 18 ref.

Descriptors: *Water pollution, *Nonpoint pollution sources, Public health, Agriculture, Silviculture, Runoff, Mining, Construction, Return flow, Erosion, Sediment, Acid mine drainage, Salinity, Heavy metals, Nutrients, Pesticides, Thermal discharges, Radioactivity, Microbial pollution, *Industrial wastes.

The aim of this study was to assess the nature and extent of non-point source pollution in the United States from 4 major industrial activities: agriculture, silviculture, mining and construction. In agriculture, the major pollutant are sediment, nutrients, pesticides, organic wastes and microbial pollution. Pollutants from silvicultural operations include sediment, nutrients, pesticides and thermal discharges. Erosion sediment, acid mine drainage, salinity and heavy metals are major pollutants from mining. Sediment is the primary pollutant from the construction industry. (Bates-East Central)
W78-11543

DDT AND PCB LEVELS AND REPRODUCTION IN RINGED SEAL FROM THE BOTHNIAN BAY,
Oulu Univ. (Finland). Dept. of Zoology.
E. Helle, M. Olsson, and S. Jensen.
Ambio, Vol. 5, No. 4, p 188-189, 1976. 1 fig, 2 tab, 18 ref.

Descriptors: *Mammals, *Marine animals, *Reproduction, *Water pollution effects, *DDT, *Polychlorinated biphenyls, Pesticides, Residues, Chlorinated hydrocarbon pesticides, Animal physiology, Fertility, Populations, Pesticides, Path of pollutants, *Pusa hispida, *Bothnian Bay(Finland), *Sub-lethal effects, *Baltic Seal.

The serious DDT and PCB contamination of the Baltic might explain the rapid decrease of the Baltic seal populations. In the Bothnian Bay only 27 percent of the Ringed Seal females of reproductive age are pregnant, compared to a normal level of 80-90 percent in areas with low levels of pollution. Significantly higher levels of both DDT and PCB have been found in the non-pregnant females compared to the pregnant ones. In November, about four months before normal pupping, half of the non-pregnant females showed enlarged uteri and scars in the uterine wall. This indicates that implantation occurred, followed by resorption or absorption. Comparing analytical data on California Sea Lions, where similar reproductive disturbances have been reported, it seems probable that PCB and not DDT substances are responsible for the perturbation of reproduction in seals. (EIS-Katz)
W78-11550

IONIZATION OF AMMONIA IN SEAWATER: EFFECTS OF TEMPERATURE, PH, AND SALINITY,
Sea Research Foundation, West Hartford, CT. Inst. for Aquarium Studies.
For primary bibliographic entry see Field 5C.
W78-11553

LEAD ENRICHMENT IN SHELLS OF MYTILUS EDULIS,
Uppsala Univ. (Sweden). Dept. of Paleontology.
For primary bibliographic entry see Field 5C.
W78-11554

PCB LEVELS CORRELATED WITH PATHOLOGICAL CHANGES IN SEAL UTERI,
Oulu Univ. (Finland). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11555

ANTHROPOGENIC SUBSTANCES IN SEAL FROM THE BALTIC: METHYL SULFONE METABOLITES OF PCB AND DDE,
Stockholm Univ. (Sweden). Wallenberg Lab.
For primary bibliographic entry see Field 5C.
W78-11559

IN SITU UPTAKE OF MERCURY BY THE INTERTIDAL MUSSEL, MYTILUS CALIFORNIANUS,
Southern California Coastal Water Research Project, El Segundo.
R. P. Eganhouse, and D. R. Young.
Marine Pollution Bulletin, Vol. 9, p 214-217, 1978. 2 fig., 2 tab., 13 ref.

Descriptors: *Mercury, *Absorption, *Mussels, Waste water(Pollution), Waste water disposal, Animal physiology, Animal metabolism, Path of pollutants, Chemical analysis, Heavy metals, Bottom sediments, Municipal wastes, Industrial wastes, *Tissue analysis, *Bioaccumulation, *Mytilus.

The in situ uptake of mercury in tissues of Mytilus californianus was studied by exposing control specimens to waters at four depths near a submarine wastewater discharge for a period of 24 weeks. The response patterns observed for digestive gland, adductor muscle and gonadal tissues were strikingly different. Digestive gland concentrations increased rapidly to the heightened levels found for indigenous specimens. On the other hand, changes in the mercury content of adductor muscle were not statistically significant, and gonadal tissues generally exhibited a low rate of increase. No correlation with depth was observed. (EIS-Katz)
W78-11565

CONCENTRATION OF IODINE AND BROMINE BY PLANTS IN THE SEAS OF JAPAN AND OKHOTSK,
Akademiya Nauk SSSR, Vladivostok. Inst. of Chemistry.
G. N. Saenko, Y. Y. Kravtsova, V. V. Ivaneneko, and S. I. Sheludko.
Marine Biology, Vol. 47, 1978, p 243-250. 4 tab., 1 fig., 29 ref.

Descriptors: *Iodine, *Bromine, *Halides, *Marine algae, Algal, Rhodophyta, Phaeophyta, Chlorophyta, Pacific Ocean, Bioindicators, Methodology, Chemical analysis, Laboratory tests, *Iodine concentrations, *Bromine concentrations, Seaweed, *Sea of Japan, *Sea of Okhotsk.

Iodine and bromine content were measured in 24 species of red (Rhodophyta), brown (Phaeophyta) and green (Chlorophyta) seaweeds and 2 species of higher water plants (Embryophta) from the Sea of Japan, as well as in 12 species of the above-

cited taxa and 1 species of flowering plant from the Sea of Okhotsk. Phaeophyta and Rhodophyta were richest in iodine and bromine content. Representatives of the order Ceramiales (Rhodophyta) had high iodine and bromine contents. Thus, iodine concentrations in Ptilota filicina, Campylaephora hypnaeoides and Myriogramme yezoensis, a new iodine concentrator discovered by us, amount to 0.42, 0.094 and 0.75%, respectively. Bromine content in representatives of the family Rhodomelaceae was 3.36 and 3.74% in Japan Sea and Okhotsk Sea Rhodomela larix, respectively. Polysiphonia japonica (Rhodomelaceae) is a newly discovered concentrator of bromine (3.20%). Many species of the order of Laminaria japonica, L. cichoriodes, L. inclinatorhiza, Cymathaere japonica and Alaria marginata. The Br:I ratio for all the species except those that concentrated iodine, was more than 1. Seaweeds that grow at greater depths showed increased iodine and bromine contents. A tendency toward increased iodine content was observed in speices growing further to the North. Iodine and bromine were accumulated selectively by various organs of Sargassum pallidum. (EIS-Katz)
W78-11567

MARINE ALGAE AS COLLECTORS OF IRON ORE DUST,
Glasgow Univ. (Scotland). Dept. of Botany.
A. D. Boney.
Marine Pollution Bulletin, Vol 9, No 7, 1978, p 175-180. 3 tab, 6 fig, 10 ref.

Descriptors: Bioindicators, *Marine algae, *Metals, *Sediments, Intertidal areas, Dusts, Mineral industry, Mine wastes, Seawater, Monitoring, Particle shape, Particle size, *Thallus construction, *Iron ore dust, *Plumaria, *Cladophora, *Pelvetia, Ore dust, Retention.

Marine algae from intertidal habitats, when shaken in iron ore dust suspensions in seawater, take up appreciable quantities of the dust load. The quantities taken up vary with the modes of thallus construction. Considerable quantities of ore dust are retained by the plants after shaking for periods of up to 15 h in dust free seawater. Marine algae can be used as a monitoring system for ore dust loading of seawater due to accidental spillages in the vicinity of ore unloading terminals. (EIS-Katz)
W78-11569

HEAVY METALS IN THE BURROWING BIVALVE SCROBICULARIA PLANA FROM CONTAMINATED AND UNCONTAMINATED ESTUARIES,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W78-11570

A SEASONAL STUDY OF THE DISTRIBUTIONS OF SURFACE STATE VARIABLES IN LIVERPOOL BAY. I. WINTER DATA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, D. T. E. Hunt, K. B. Pugh, G. M. Foster, and G. Savidge.
Journal of Experimental Marine Biology, Vol. 29, No. 3, p 303-313, 1977. 5 fig, 3 tab, 17 ref.

Descriptors: *Liverpool Bay(United Kingdom), Chemical properties, *Winter, *Surface waters, *Physical properties, *Biological properties, *Distribution, *Saline water-freshwater interfaces, *Water pollution effects, Seasonal, Bays, United Kingdom, Spatial distribution, Temporal distribution, Parameters, Baseline studies, Eutrophication, Salinity, Nutrients, Regression analysis, Winds, Effluents.

Physical, chemical, and biological characteristics of Liverpool Bay (United Kingdom) surface waters were studied during six cruises in 1975; winer data (January and December) are presented in this report. The remaining cruises were in April, May, June, and September. Criteria are provided for judging subsequent spatial and temporal changes among the variables. Surface distribution maps were markedly different in January and December, attributed to the influence of wind. Despite the visual spatial dissimilarity, principal component analysis revealed a general homogeneity dominated by conservative physical mixing of sea and fresh waters. No internal sources or sinks, either man-made or nautral, were encountered. Biological influences upon chemical distribution were assumed to be minimal during the midwinter crusises. Surface variability of salinity, temperature, transparency, and dissolved concentrations of nitrate, nitrite, ammonia, silicate, and phosphate was continuously recorded. Linear regression analysis showed highly significat correlations among all characteristics except transparency. Freshwater-seawater interactions predominant in influcencing overall relationships, and observed distribution were apparently physically induced. (Lynch-Wisconsin).
W78-11585

TOTAL PHOSPHORUS MODEL FOR THE GREAT LAKES, (DISCUSSION),
Cleveland State Univ., OH.
For primary bibliographic entry see Field 5C.
W78-11623

WISCONSIN TRIBUTARY LOADINGS TO THE UPPER GREAT LAKES,
Wisconsin Dept. of Natural Resources, Madison. Div. of Environmental Protection.
D. Ryan, and M. Stokstad.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 488, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-905/4-75-003, August 1975. 57 p, 8 fig, 11 tab, 4 ref, 3 append. C-2, ULRG-IJC, 68-01-1875.

Descriptors: *Wisconsin, *Tributaries, *Lake Superior, *Bois Brule River(WI), *Bad River(WI), *Montreal River(WI MI), *Nemadji River(WI MN), *Water pollution sources, Rivers, Great Lakes, Data collections, Benthic fauna, Red clay area, Nitrogen, Phosphorus, Silica, Hardness(Water), Turbidity, Secchi disks, Suspended solids, Metals.

Results of intensified water quality sampling in 1973-74 on four Wisconsin tributaries to Lake Superior--the Nemadji, Bois Brule, Bad, and Montreal Rivers--indicate excellent water quality (with local exceptions) supporting diverse and abundant populations of aquatic life. Primary sampling stations were established on the Bois Brule, Bad, and Montreal Rivers during July 1973, and a station on the Nemadji was added in January 1974. The three phases of the program were: (1) chemical analysis of monthly samples (which will be continued following completion of the current study); (2) supplementary sampling during spring runoff and for additional parameters three times during the year; and (3) a study of local effects by means of more intensive surveys twice on each river during summer 1974. Data are included in appendices and in the text. Benthological data are presented in map-graphs. A striking characteristic of the Nemadji (and the Bois Brule and Bad Rivers to a lesser extent) is a high solids load during spring runoff, due to abundance of red clay in the watershed. Total benthic community in the Nemadji was varied but relatively sparse, while the Bad River supported a rich and relatively abundant benthic fauna. The reputation of the Bois Brule as an excellent clean-water trout stream is borne out by the survey. The Montreal River experiences bacteriological contamination in the Hurley vicinity from sewage treatment plant effluents from Hurley and Ironwood, Michigan. (Lynch-Wisconsin)
W78-11628

HYDROCARBONS OF OYSTERS AND SHO NECKED CLAMS IN HIROSHIMA BAY,
Hiroshima Univ. (Japan). Faculty of Integra Arts and Sciences.
For primary bibliographic entry see Field 5C.
W78-11635

TRANSFER OF COBALT-60 FR PHYTOPLANKTON TO THE CL (MERCENARIA MERCENARIA),
National Inst. of Radiological Scienc Nakaminato (Japan). Marine Radio-Ecolog Research Station.
For primary bibliographic entry see Field 5C.
W78-11636

THE WEST FALMOUTH SPILL - FLORI 1969,
Woods Hole Oceanographic Institution, M Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11638

FATE AND EFFECTS OF OIL IN MARI ANIMALS,
Woods Hole Oceanographic Institution, M Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11639

A GENETIC LOOK AT FISH EGGS AND OIL,
National Marine Fisheries Service, Milford, C Milford Lab.
For primary bibliographic entry see Field 5C.
W78-11640

SEASONAL DYNAMICS OF THE H MATOLOGICAL PARAMETERS IN SOM BLACK SEA FISHES AND CHANGES THERE AFTER EXPERIMENTAL POISONING WI PETROLEUM PRODUCTS,
All-Union Inst. of Marine Fisheries and Oceano raphy, Batumi (USSR), Georgian Div.
For primary bibliographic entry see Field 5C.
W78-11643

THE CHEDABUCTO BAY SPILL - ARRO 1970,
Bedford Inst. of Oceanography, Dartmouth (No Scotia).
J. H. Vandermeulen.
Oceanus, Vol 20(4), 1977, p. 31-39 3 tab, 8 fig, ref.

Descriptors: *Oil wastes, *Oil pollution, Wat pollution effects, Marine benthos, Sediment Animal physiology, Pathology, Biochemistry, A lantic ocean, Path of pollutants, Degrad tion(Decomposition), *Aquatic fauna, Aquat flora, Marine environment, *Clams, Methodolog Canada, *Chedabucto Bay, *Nova Scotia, Bunk C Oil, Arrow Oil Spill.

A study was made of the biological damage an recovery of Chedabucto Bay following the wrec of the Florida. The Bunker C petroleum hydroca bons still resident on or in the shoreline sedimen are measured. Also measured are the rates hydrocarbon movement between water colum and sediment, the degradation rates and the tissu oil load and physiological responses of oiled o ganisms.
W78-11648

ORGANOCHLORINE AND MERCUR RESIDUES IN THE HARP SEAL (PAGOPHILU GROENLANDICUS),
Guelph Univ. (Ontario). Dept. of Biomedica Sciences.
For primary bibliographic entry see Field 5C.
W78-11658

USE OF FRESHWATER MUSSELS TO MONITOR POINT SOURCE INDUSTRIAL DISCHARGES,
Eastern Michigan Univ., Ypsilanti. Center for Aquatic Biology.
R. B. Foster, and J. M. Bales.
Environmental Science and Technology, Vol. 12(8), 1978, p 958-962. 2 tab, 2 fig, 17 ref.

Descriptors: *Monitoring, *Benthos, *Industrial effluents, Mussels, Metals, Copper bioassay, Mortality, Toxicity, On-site investigations, Ohio, Water pollution effects, Path of pollutants, Animal physiology, Pathology, *Copper, *Muskingum River, *Copper electroplating wastes, Freshwater mussels, Quadrula quadrula, Tissue content, Accumulated body burden.

In-stream monitoring techniques were used to evaluate the effects of copper electroplating wastes on the mussel fauna of the Muskingum River. Laboratory effluent bioaccumulation tests were conducted to determine the potential of freshwater mussels to accumulate copper, which was the major effluent constituent. Mussels were also exposed in cages at various distances from the electroplating plant outfall and analyzed for copper content after 14, 30, and 45 days. The indigenous mussel fauna was also analyzed for copper content. Copper accumulation in the species tested was inversely related to body weight. Mortalities during effluent exposures occurred after 11 days and were associated with body burdens approaching 20 micrograms copper per gram of wet tissue weight. Analysis of caged mussel specimens when correlated with Muskingum River population surveys and natural background content of copper in freshwater mussels demonstrated an adverse impact of the electroplating plant within 21 km of the outfall. Mussels caged 0.1 km from the outfall accumulated 20.64 microgram Cu g-1 in 14 days, ten times the normal body burden of mussels at control stations upstream. The copper content of caged mussels at stations located further downstream, 5-53 km, declined as the distance from outfall increased. (EIS-Katz)
W78-11670

HEAVY METAL POLLUTION OF THE RIVER IRWELL (LANCASHIRE, UK) DEMONSTRATED BY ANALYSIS OF SUBSTRATE MATERIALS AND MACROINVERTEBRATE TISSUE,
Salford Univ. (England). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11672

DEHP IN THE VICINITY OF AN INDUSTRIAL AREA IN FINLAND,
Helsinki Univ. (Finland). Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W78-11673

METAL CONCENTRATIONS IN SOME SEAWEEDS OF GOA (INDIA),
National Inst. of Oceanography, Panjim (India).
V. V. Agadi, N. B. Bhosle, and A. G. Untawale.
Botanica Marina, Vol. 21, p 247-250, 1978. 1 fig, 2 tab, 14 ref.

Descriptors: *Monitoring, *Copper, *Cobalt, *Lead, *Zinc, *Absorption, *Marine algae, Bioindicators, Manganese, Nickel, Algae, Path of pollutants, Primary productivity, Food chains, Aquatic plants, On-site investigations, Chlorohyta, Phaeophyta, Rhodophyta, Bioaccumulation, GOA, India.

Seventeen species of marine algae collected from five localities of Goa, were analysed for Co, Fe, Mn, Ni, PB, and Zn, using atomic absorption spectrophotomerer. All the seven metals showed considerable variations in their concentration. The role of different seaweeds as indicators of metal pollution is discussed in relation to the degree of accumulation of metals. (EIS-Katz)
W78-11674

CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS,
Agricultural Research Service, Chickasha, OK.
For primary bibliographic entry see Field 5G.
W78-11681

UPTAKE, METABOLISM, AND EXCRETION OF DDT BY THE FRESH WATER SNAIL, VIVIPARA HELICIFORMIS,
Delhi Univ. (India). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11686

PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS AND ANIMALS FROM THE ISLAND OF MALTA,
Bristol Univ. (England). Dept. of Inorganic Chemistry.
M. Sammut, and G. Nickless.
Environmental Pollution, 1978, Vol 16, p 17-30. 4 tab, 7 fig, 38 ref.

Descriptors: *Oil, *Oil pollution, Sediments, *Marine fish, Marine biology, Sediments, Water pollution effects, Chemical analysis, *Path of pollutants, Methodology, Gas chromatography, Mediterranean, *Malta, Fossil fuels, *Fossil fuel hydrocarbons, Mullet, *Polynuclear aromatic hydrocarbons.

Marine sediments and animals from the coastal waters of the Mediterranean island of Malta were found to be contaminated with hydrocarbons of fossil fuel origin probably in the form of minute pelagic tar particulates. However, fossil fuels of local origin such as those used in pleasure craft may also be a contributing factor. Polynuclear aromatic hydrocarbons were identified in some of the sediments. These compounds were not detected in the marine animals, but PAH's were present in the gut contents of grey mullet (Mugil caphalus), a bottom feeder. (EIS-Katz)
W78-11691

ABSENCE OF ARYL HYDROCARBON HYDROXYLASE (AHH) IN THREE MARINE BIVALVES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5A.
W78-11692

PRUDHOE CRUDE OIL IN ARCTIC MARINE ICE, WATER, AND SEDIMENT ECOSYSTEMS: DEGRADATION AND INTERACTIONS WITH MICROBIAL AND BENTHIC COMMUNITIES,
Louisville Univ., KY. Dept. of Biology.
R. M. Atlas, A. Horowitz, and M. Busdosh.
Journal of the Fisheries Research Board of Canada, vol. 35, p585-590, 1978. 5 fig., 2 tab., 7 ref.

Descriptors: *Oil, *Microbial degradation, Ecosystems, *Model studies, *Bottom sediments, *Arctic, Oil pollution, Oil spills, Organic compounds, Mortality, Benthic fauna, Biological communities, Biodegradation, Population, Gas chromatography, Prudhoe Crude Oil.

A variety of in situ models were used to simulate oil spills in different arctic ecosystems. Numbers of oil-degrading microorganisms were found to increase after oil contamination. Oil contamination of sediment resulted in mortality of indigenous invertebrates. Recolonization of oil-contaminated sediments began shortly after oil contamination but benthic communities were significantly different in oil-contaminated sediment compared with the control, 2 mo after the oil contamination. Petroleum hydrocarbons were degraded slowly. Ice greatly restricted losses of light hydrocarbons. Following initial abiotic losses, biodegradation of oil was limited and did not significantly alter the relative percentages of hydrocarbons in the residual oil. We concluded that petroleum hydrocarbons will remain in arctic ecosystems for prolonged priods after oil contamination. (EIS-Deal)
W78-11693

DISTRIBUTION AND ABUNDANCE OF HYDROCARBON-UTILIZING BACTERIA IN SEDIMENTS OF CHEDABUCTO BAY, NOVA SCOTIA, IN 1976,
Fisheries and Marine Service, Halifax (Nova Scotia).
J. E. Stewart, and L. J. Marks.
Journal of the Fisheries Research Board of Canada, Vol 35, p 581-584, 1978. 3 fig, 15 ref.

Descriptors: *Bottom sediments, *Oil, *Microbial degradation, *Bacteria, *Marine bacteria, *Bottom sampling, Oil pollution, Oil spills, Sediments, Biodegradation, Cytological studies, Microorganisms, Fuels, Water pollution effects, *Chedabucto Bay(NS), Canada.

An extensive reexamination of Chedabucto Bay, Nova Scotia, sediments was carried out in the summer of 1976 for comparison with data obtained shortly after the major oil spill in 1970. Only 2 of the 79 sediment samples examined microbiologically had large numbers of hydrocarbon-utilizing bacteria. The bulk of the sediments were, with regard to bacterial populations, comparable to areas described as 'clean', ie. no apparent or known contamination with oil. (EIS-Deal)
W78-11694

AROMATIC HYDROCARBONS IN BENTHIC ORGANISMS FROM COASTAL AREAS POLLUTED BY IRANIAN CRUDE OIL,
Institute of Marine Research, Bergen (Norway).
O. Grahl-Nielson, J. T. Staveland, and S. Wilhelmsen.
Journal of the Fisheries Research Board of Canada, vol. 35, p615-623, 1978. 6 fig., 2 tab., 12 ref.

Descriptors: *Oil, *Oil spills, *Aromatic compounds, *Benthic fauna, Oil pollution, Organic compounds, Beaches, Coasts, Water pollution effects, Gas chromatography, Crabs, Sediments, Animal physiology, *Crude oil, *Naphthalenes, Tissue analysis, Bioaccumulation, Mass fragmentographys.

This investigation was begun 1 mo after a spill of 2000 tons of Iranian crude oil polluted shores along the west coast of Norway in February 1976. It is based on mass-fragmentographic analysis of naphthalene, methyl-, dimethyl-, and trimethylnaphthalenes, phenanthrene, methyl- and dimethylphenanthrenes, dibenzothiophene, methyl-, dimethyl-, and trimethyldibenzothiophenes. Samples of stranded oil, water, and seven species of benthic organisms were collected periodically during the following year. During the lst mo of weathering the total amount of these aromatic compounds had decreased from 1.22% in the original oil to 0.76%, with a further decreasse to 0.2-0.3% during the next 3-4 mo. In the water the contentration of these compounds was approximately 2 micrograms/L (ppb) at the start of the sampling. At one of the investigated locations a chemical dispersant was used in cleaning the shores. This resulted in higher concentrations of the aromatic compounds in the water, up to 12 micrograms/L. The organisms studied had accumulated aromatic hydrocarbons up to an excess of 20 micrograms/g wet weight, 1 mo after the spill. Although seasonal and individual differences were large, the dibenzothiophenes appeared to be retained to a larger extent relative to the naphthalenes and phenanthrenes. (EIS-Deal)

W78-11696

TRACE ELEMENTS IN THE FLESH AND LIVER OF TWO FISH SPECIES FROM POLLUTED AND UNPOLLUTED AREAS OF THE AEGEAN SEA,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
A. P. Grimanis, D. Zafiropoulos, and M. Vassilaki-Grimani.
Environmental Science and Technology, vol. 12, no. 6, p723-726, 1978. 1 fig., 4 tab., 19 ref.

Descriptors: *Trace elements, *Metals, *Mercury, *Arsenic, *Domestic wastes, Neutron activation analysis, Cadmium, Cobalt, Copper, Lead, Iron, Zinc, Path of pollutants, Municipal wastes, Animal metabolism, Tissue analysis, Bioaccumulation, *Rubidium, *Selenium, *Antimony.

Ten trace elements (As, Cd, Co, Cu, Fe, Hg, Rb, Sb, Se, and Zn) were determined by neutron activation analysis in the flesh and liver of the two edible fishes Sargus annularis and Gobius niger caught from polluted and unpolluted areas of the Aegean Sea. Increased levels of arsenic were found in the flesh of S. annularis from the polluted areas studied. Arsenic levels were also increased in the flesh and liver of G. niger from the Athens sewage outfall area. Elevated concentrations of mercury were fund in the flesh of S. annularis and in the flesh and liver of G. niger from a sea area close to Mytelene Harbor in the island of Lesvos. No significant differences were found for all the other elements determined. Elevated levels or arsenic and mercury found in these two species of edible fish from polluted areas were not high enough to render them dangerous for human consumption. (EIS-Deal)
W78-11697

BEHAVIOR OF DDT, POLYCHLORINATED BIPHENYLS (PCB'S), AND DIELDRIN AT VARIOUS STAGES OF REFINING OF MARINE OILS FOR EDIBLE USE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W78-11699

UPTAKE OF HYDROCARBONS FROM MARINE SEDIMENTS CONTAMINATED WITH PRUDHOE BAY CRUDE OIL: INFLUENCE OF FEEDING TYPE OF TEST SPECIES AND AVAILABILITY OF POLYCYCLIC AROMATIC HYDROCARBONS,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-11702

IMPORTANCE OF SEDIMENT WORKING BY THE DEPOSIT-FEEDING POLYCHAETE ARENICOLA MARINA ON THE WEATHERING RATE OF SEDIMENT-BOUND OIL,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W78-11703

DISRUPTION OF PRECOPULATORY BEHAVIOR IN THE AMPHIPED ANISOGAMMARUS PUGETTENSIS UPON EXPOSURE TO BLEACHED KRAFT PULPMILL EFFLUENT,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W78-11707

THE LEVELS OF METALS IN DOCK-YARD SEDIMENTS WITH PARTICULAR REFERENCE TO THE CONTRIBUTIONS FROM SHIP-BOTTOM PAINTS,
University of Manchester Inst. of Science and Technology (England). Pollution Research Unit.
For primary bibliographic entry see Field 5A.
W78-11708

DISTRIBUTION OF NEOPLASMS AND OTHER DISEASES IN MARINE FISHES RELATIVE TO THE DISCHARGE OF WASTE WATER,
Southern California Coastal Water Research Project El Segundo.
For primary bibliographic entry see Field 5C.
W78-11713

PREDICTING EARLY MORNING DISSOLVED OXYGEN CONCENTRATIONS IN CHANNEL CATFISH PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd, R. P. Romaire, and E. Johnston.
Transactions of the American Fisheries Society, Vol. 107, No. 3, p. 484-492, 1978. 6 tab, 5 fig, 17 ref.

Descriptors: *Channel catfish, *Aquiculture, *Dissolved oxygen, Phytoplankton, Respiration, Oxygen demand, *Oxygen sag, Oxygenation, Fish establishment, *Fish farming, Fish hatcheries, Commercial fishing, Methodology.

A computer simulation model for nightime decline in dissolved oxygen (DO) concentrations was developed for channel catfish ponds. This model incorporated data on plankton respiration from the present study, data form the literature on respiration by fish, respiration by organisms in the mud, and O(2) diffusion. The validity of the model was tested for two catfish ponds. Measured and calculated DO concentrations usually agreed within plus or minus 10%. Secchi disk visibility determination should be used in the computer simulation to estimate O(2) consumption by plankton whenever possible. However, COD values may be used when ponds contain appreciable clay turbidity. Series of tables were prepared which the minimum acceptable Secchi disk visibility and the maximum permissible COD when may be tolerated in a particular pond without danger of DO depletion during the night. These tables will be useful to fish pond managers. (EIS-Katz)
W78-11714

THE FATE AND EFFECT OF PETROLEUM IN CONTROLLED ECOSYSTEM ENCLOSURES,
Skidaway Inst. of Oceanography, Savannah, GA.
R. E. Lee, and M. Takahashi.
Rapports et Proces-Verbaux des RReunion, Conseil International Pour L'Explorations de la Mer, Vol. 171, p. 150-156, 1977. 1 tab., 2 fig., 29 ref.

Descriptors: *Oil, *Path of pollutants, *Water pollution effects, *Biological communities, *Phytoplankton, *Zooplankton, *Diatoms, *Degradation(Decomposition), *Primary productivity, *Carbon radioisotopes, Aquatic microorganisms, Productivity, Aquatic bacteria, Chemical analysis, Organic compounds, Chlorophyll, Biomass, Adsorption, Chrysochromulina, Cerataulina, Naphthalene.

Water extracts of No. 2 fuel oil were added to CEPEX enclosures during August, 1974 and June 1975. The approximate initial concentrations of nonvolatile hydrocarbons in 1974 were 10 and 20 micogr/liter in two inclosures. At the lower concentration no major effects on phytoplankton or zooplankton were apparent. The 20 microgr. liter enclosure has a small bloom of a microflagellate and the growth of a labortory culture of this flagellate was stimulated by water extracts of fuel oil. The 1975 experiments had an initial concentration of 40 microgr/liter nonvolative petroleum hydrocarbon which dropped to 20 microgr. liter after 3 days. The losses appreared to be due primarily to microbial degradation and adsorption to sinking particles. The microbial degradation rate of parraffins and low molecular aromatics, but the degradation rate of high molecular weight aromatics such as fluorene and benzprene, increased markedly in the petroleum treated enclosure within one day. Three days after petroleum addition naphthalene degradation rate increased from 0.2 to 2.5 microgr/liter/day. The major changes in populations seen in 1975 after treatment with petroleum were a drastic decline in diatoms followed by a bloom of a microflagellate, which replaced diatoms as the dominant phytoplankter. This in turn was followed by an increase in tintinnids and rotifers, presumably feeding on the microflagellates. The control enclosure was dominated by a diatom, during the course of the experiment (19 days) although for 3 days a small flagellate bloom was also observed. Thus as a result of the addition of fuel oil there was a major change in the ecosystem of the enclosure in term of type of primary and secondary products. (EIS-Katz).
W78-11718

NATURAL SOIL NITRATE: THE CAUSE OF THE NITRATE CONTAMINATION OF GROUND WATER IN RUNNELS COUNTY, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
C. W. Kreitler, and D. C. Jones.
Ground Water, Vol 13, No 1, p. 53-62, Jan.-Feb., 1975. 11 fig, 1 tab, 13 ref.

Descriptors: *Groundwater pollution, *Nitrates, Leaching, *Water pollutant sources, *Path of pollutants.

The ground waters of Runnels County, Texas, are highly contaminated with nitrate. The average nitrate concentration of 230 water samples was 250 mg/l NO3. The natural variations of the stable nitrogen isotopes N14 and N15 identified natural soil nitrate as the predominant source. Nitrate from animal wastes was of minor importance. The 8 N15 range of natural soil nitrate was +2 to +8 0/00, whereas the 8 N15 range of animal waste nitrate was +10 to + 20 0/00. (Atmospheric nitrogen was used as a standard for mass spectrometric analysis. Experimental error for sample preparation and isotopic analysis was +0/00.) More than 66 percent of the ground-water nitrates analyzed were in the 8 N15 range of natural soil nitrates. Dryland farming since 1900 has caused the oxidation of the organic nitrogen in the soil to nitrate. Minimal fertilizer has been used because of the lack of suitable water for irrigation. During the period 1900-1950, nitrate was leached below the root zone but not to the water table. Extensive terracing after the drought in the early 1950's has raised the water table approximately 6 meters and has leached the nitrate into the ground water. Tritium dates indicate that the ground water is less than 20 years old. (East Central)
W78-11733

ACID PRECIPITATION IN NORWAY: EFFECTS ON AQUATIC FAUNA,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5C.
W78-11737

INSTRUMENTATION FOR BIOLOGICAL MONITORING OF INDUSTRIAL WASTES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-11740

DISTRIBUTION OF 1-14C-HEXADECANE IN THE LOBSTER, HOMARUS AMERICANUS, AT

VARIOUS TIMES AFTER INJECTION INTO THE PERICARDIAL SINUS,
National Inst. of Environmental Health Sciences, Research Triangle Park, NC.
H. L. Foureman, P. Hall, and J. R. Bend.
The Bulletin, Mount Desert Island Biological Laboratory, Salsbury Cove, Maine, Vol 16, p. 43-45, 1976. 1 tab.

Descriptors: *Oil, *Oil pollution, Animal behavior, Animal pathology, *Animal physiology, *Lobsters, Commercial shellfish, Crustaceans, Methodology, Radioactivity techniques, Radioisotopes, Path of pollutants, Hepatopancreas, Hexadecane.

In a laboratory study the distribution of hexadecane, a nonvolatile alkane crude oil constituent, in the lobster following intracardial administration, was determined. The hepatopancreas contained higher count ratios of radioactive hexadecane than any other tissue analyzed. The feces appear to be a major sity for excretion of hexadecane and its metabolites. (EIS-Katz)
W78-11741

NEOPLASMS IN ESTUARINE MOLLUSKS AND APPROACHES TO ASCERTAIN CAUSES,
National Marine Fisheries Service, Oxford, MD.
For primary bibliographic entry see Field 5C.
W78-11743

TOXICITY, BOD AND COLOR OF EFFLUENTS FROM NOVEL BLEACHING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
For primary bibliographic entry see Field 5C.
W78-11782

ASSESSMENT OF MODELS FOR STORM AND COMBINED SEWER MANAGEMENT.
For primary bibliographic entry see Field 5D.
W78-11783

SURVEY OF HUMAN VIRUS OCCURRENCE IN WASTEWATER-RECHARGED GROUNDWATER ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Energy and Environment.
J. M. Vaughn, E. F. Landry, L. J. Baranosky, C. A. Beckwith, and M. C. Dahl.
Applied and Environmental Microbiology, Vol. 36, No. 1, p 47-51, July, 1978. 9 tab, 22 ref.

Descriptors: *Viruses, *Coliforms, *Groundwater recharge, *Recharge ponds, *Aquifers, Isolation, Tertiary treatment, Chlorination, Sampling, Groundwater, Diseases, Water pollution sources, Waste water treatment, Ultimate disposal, Municipal wastes.

Three waste water recharge facilities on Long Island, New York, were monitored in a 1-yr study to assess the transfer of human enteriviruses and coliforms into groundwater. Effluent samples from all three plants were collected monthly and observaton wells were drilled below the recharge sites. Total coliform counts in groundwater near a facility recharging chlorinated trickling filter effluent 30 ft above the aquifer ranged over 15-23,000/100 ml; enterovirus isolation ranged over 0-3.6 plaque-forming units/gal. Viruses isolated in the effluent indluced echo-, coxsackie-, and poliovirus types; the groundwater contaned cchovirus type 12 and other unidentified viruses. Chlorinated effluent was recharged 80 ft above the water table in another facility; groundwater samples yielded no viruses and 4-23,000 coliforms/100 ml. The results indicated that viruses were unable to reach the depth of the aquifer. Total coliforms in groundwater from a facility discharging teritary effluent to a basin 18 ft above the aquifer ranged over 4-930 coliforms/100 ml; virus levels ranged over 0-10.6 plaque-forming units/gal. Viruses isolated in groundwater at this site included echoviruses types 6, 21, 24, 25, and several unidentified types; both vertical penetration and horizontal movement of the viruses through the aquifer were indicated by their presence in the observation well located 50 yds from the recharge site. (Lisk-FIRL)
W78-11785

NITRIFICATION AND OTHER FACTORS AFFECTING NITROGEN IN THE HOLSTON RIVER,
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 5C.
W78-11786

COMPUTER CONTROL SYSTEM FOR WATER AND WASTEWATER TREATMENT PLANTS,
Hitachi Ltd. (Japan).
For primary bibliographic entry see Field 7B.
W78-11843

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME I, PRESERVING THE STATISTICAL STRUCTURE IN LAKE TRANSPORT CALCULATIONS,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11863

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME II, COMPARATIVE STUDY OF THE MATHEMATICAL FORMULATIONS FOR PRIMARY PRODUCTIVITY IN STRATIFIED LAKES,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11864

A SIMPLE METHOD TO STUDY PESTICIDE SORPTION IN SOILS AT SHORT TIME INTERVALS,
Central Rice Research Inst., Cuttack (India). Lab. of Soil Microbiology.
P. A. Wahid, and N. Sethunathan.
Soil Science, Vol 126, No 1, p 56-58, July 1978. 2 fig, 1 tab, 4 ref.

Descriptors: *Soils, *Pesticides, *Sorption, Laboratory tests, Aqueous solutions, Radioactivity techniques, Analytical techniques, Filters, Filtration, Chemical analysis, Soil science, Pesticide sorption.

A simple, rapid, and reproducible method which essentially involves filtration, rather than centrifugation, as in the conventional method, for a soil-pesticide solution system uses a hypodermic syringe fitted with a filter paper disc and permits quantification of parathion and gamma-BHC sorbed at extremely short time intervals down to 5 sec. (Sims-ISWS)
W78-11880

GROUNDWATER POLLUTANTS FROM UNDERGROUND COAL GASIFICATION,
Texas Univ. at Austin. Dept. of Civil Engineering.
M. J. Humenick, and C. F. Mattox.
Water Research, Vol 12, No 7, p 463-469, 1978. 9 fig, 4 tab, 12 ref.

Descriptors: *Groundwater, *Pollutants, *Coals, *On-site investigations, Laboratory tests, Gases, Leachate, Ions, Cations, Anions, Organic compounds, Calcium, Sulfates, Ammonia, Water pollution, Water pollution sources, Coal gasification, Ashes.

The purpose of this study was to determine the contaminants released to groundwaters as a result of the underground gasification of lignite and to determine the ability of the surrounding strata to moderate their impact. Groundwater pollutants principally arise from ash leachate and condensed vapors in surrounding strata. Ash was found to yield sulfate, calcium, and hydroxide, while condensed vapors contributed organics and ammonia as major changes to water quality. The organics consisted of mostly polynuclear aromatic hydrocarbons. Phenols were not major organic components. Lignite and clay strata were studied to determine their ability to sorb the groundwater contaminants. Both types of strata were effective in sorbing organics and ammonia. The behavior could be described by Freundlich isotherms. Divalent cations were released by ion exchange with monovalent cations. Anions had little affinity for the strata. Relatively little migration of ammonia and most of the organics was predicted as compared with calcium, sulfate, and some nonsorbable organics. (Sims-ISWS)
W78-11884

OXYGEN AND PH FLUCTUATIONS IN RIVERS,
Technical Univ. of Denmark, Lyngby. Dept. of Sanitary Engineering.
J. F. Simonsen, and P. Harremoes.
Water Research, Vol 12, No 7, p 477-489, 1978. 8 fig, 2 tab, 18 ref.

Descriptors: *Oxygen, *Dissolved oxygen, *Hydrogen ion concentration, *Model studies, Mathematical models, Rivers, Streams, Fluctuations, Diurnal, Seasonal, Solar radiation, Weather, Water quality, Vegetation, Vegetation effects, On-site investigations, *Denmark.

A mathematical model for oxygen fluctuations in a river reach, involving photosynthesis, total community respiration, and reaeration, was presented. Analogy was established between diurnal oxygen fluctuations and diurnal pH-fluctuations. Comparison was made between oxygen production and respiration and carbon dioxide consumption and production. Twin curve analysis of diurnal oxygen fluctuations was made of measurements on a single river reach in Denmark. The measurements were carried out about once a month for a little more than one year. The analysis revealed seasonal variations of the river parameters: total daily gross production of oxygen, total community respiration, and reaeration coefficient. These parameters are important for river modelling. (Sims-ISWS)
W78-11886

LIGNIN OF EFFLUENTS FROM THE SEGEZHA PULP AND PAPER MILL IN NATURAL RESERVOIRS (LIGNIN STOCHNYKH VOD SEGEZHSKOGO TSBK V PRIRODNOM VODOEME),
Adademiya Nauk SSSR, Petrozavodsk. Inst. Lesa.
V. B. Litvinova, and N. F. Komshilov.
Khimiya Drevesiny, No 6, p 85-87, November/December, 1977. 1 fig, 4 ref, 2 tab.

Descriptors: *Lignins, *Water pollution, *Pulp wastes, Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Rivers, Lakes, Sediments, Foreign countries, Colorimetry, Bottom sediments, Surface waters, Waste dilution, Sedimentation, Reservoirs, Segezha River(USSR), Lake Vygozero(USSR), Soviet Union(USSR).

In order to study the behavior of lignin in natural reservoirs more accurately, a seasonal analysis was made of dissolved and precipitated kraft lignin in the Segezha River and Lake Vygozero(USSR). A modified clorimetric method was used for the dissolved lignin, while in the sediment was analyzed by methoxyl group determination. Samples from the surface of the water, mid-depth, and

the bottom were taken at the discharge site and as far away as 16 km from the mill. The lignin content in the lake varied from 80 to 100 mg/liter at the discharge site and from 2.5 to 3.0 mg/liter in open water. The lignin content was higher in winter than in summer. At a distance of 3 km from the mill the lignin content occurred as a result than at the discharge site. Decreases in the lignin content occurred as a result of sedimentation or dilution. The concentration of lignin in the bottom sediments was proportional to the concentration of lignin in the water, and was approximately 8,000 times greater. (Chern-IPC)
W78-11912

AMMONIA DISTRIBUTIONS IN THE SURFACE WATERS OF LIVERPOOL BAY,
University Coll. of North Wales, Menai Bridge. Marine Sciences Labs.
P. Foster, K. B. Pugh, and D. T. E. Hunt.
Estuarine and Coastal Marine Science, Vol 7, No 1, p 71-78, July 1978. 3 fig, 2 tab, 9 ref.

Descriptors: *Ammonia, Water quality, *Nutrients, Surface water, Water pollution, Distribution, *Path of pollutants, Outer Continental Shelf, Wind stress, Seasonal variations, Wales.

Distributions of dissolved ammonia concentrations in the surface waters of Liverpool Bay observed during 6 seasonal cruises in 1975 are presented. A clockwise surface residual circulation, sustained by northerly components of wind stress, led to a marked deterioration in the water quality along the North Wales coast during December, and to a lesser extent in April. In contrast an anticlockwise circulation induced by south to west winds, led to low ammonia concentrations along the North Wales coast and a northerly transport of Mersey effluents along the Lancashire coast during January. During the summer months the ammonia distributions were predominantly biologically rather than physically dependent. (Sinha - OEIS)
W78-11958

A STUDY OF COPPER, LEAD AND CADMIUM SPECIATION IN SOME ESTUARINE AND COASTAL MARINE WATERS,
Australian Atomic Energy Commission, Lucas Heights.
For primary bibliographic entry see Field 2L.
W78-11959

QUANTITATION OF SULFUR CONTAINING OIL COMPOUNDS AND POLYCHLORINATED BIPHENYLS (PCB) IN MARINE SAMPLES,
Osaka Prefecture Inst. of Public Health (Japan). Lab. of Food Chemistry.
For primary bibliographic entry see Field 5A.
W78-11960

DESORPTION OF RADIOACTIVITY FROM NEARSHORE SEDIMENT,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
B. Patel, S. Patel, and S. Pawar.
Estuarine and Coastal Marine Science, Vol 7, No 1, p 49-58, July 1978. 4 fig, 1 tab, 28 ref.

Descriptors: *Sediments, *Harbors, *Radioactivity, *Water pollution, Sorption, Outer Continental Shelf, India, Radionuclides, Desorption, Nearshore sediments.

Cesium-137, cerium-144 and ruthenium-106 discharged into the nearshore environment of the Bombay harbour, have been found to be readily sorbed by the sedimentary particles. On reaching peak sorption levels, however, the levels of all the three radionuclides in the sediment were found to drop exponentially with time (1971-76) under environmental conditions, despite the continued discharged at low levels. From the distribution patterns of radioactivity in the harbour, the rate of decline of 137Cs (the sedimentary half-life) was found to be 1.86 years, significantly lower than its radioactive decay time (30 years). In contrast, those of 144Ce (0.59 year) and 106Ru (0.87 year) were found to be practically the same as their radiological half-lives. The difference between the sedimentary and radiological half-live of both cerium and ruthenium suggests about 20% influx of fresh sediment following monsoon runoff. The effective sedimentary half-life (1.86 years) of 137 Cs was found to be significantly affected by other environmental parameters, in addition to that caused by the influx of fresh material. Of the various environmental factors, salinity was found to affect the desorption of cesium significantly. The possible sorption-desorption mechanicam of cesium, cerium, ruthenium and cobalt radionuclides both under laboratory and field conditions are discussed. (Sinha-OEIS)
W78-11961

ENTRAPMENT OF SUSPENDED MATERIALS IN THE SAN FRANCISCO BAY-DELTA ESTUARY,
Bureau of Reclamation, Sacramento, CA. Water Quality Branch.
For primary bibliographic entry see Field 2L.
W78-11964

BRINE DRAINAGE AND CONVECTION IN YOUNG SEA ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2C.
W78-11965

THE DYNAMICS OF AN ESTUARY AS A NATURAL ECOSYSTEM,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 5C.
W78-11966

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-11972

WATER-QUALITY CHARACTERISTICS OF THE RED RIVER IN LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
R. F. Martien.
Louisiana Department of Public Works, Baton Rouge, Water Resources Technical Report No 16, 1978. 32 p, 17 fig, 3 tab, 23 ref.

Descriptors: *Water quality, *Louisiana, *Streams, *Path of pollutants, *Water pollution sources, Sewage effluents, Bacteria, Chlorides, Sulfates, Dissolved solids, Heavy metals, Pesticides, Brines, Biochemical oxygen demand, Dissolved oxygen, Phytoplankton, Streamflow, Sediment discharge, Tracking techniques, Tracers, Data collections, *Red River(LA).

The average discharge of the Red River for the period 1928-75 was 24,900 cubic feet per second (cfs) at Shreveport and 31,900 cfs at Alexandria. The mean daily sediment discharge at Alexandria (1964-75) was 103,000 tons per day. Statistical analysis shows a 30-percent reduction in the concentration of dissolved solids, chloride, and sulfate measured at Hosston in the past years. Bacterial pollution is a problem in the entire reach of the river in Louisiana. Dissolved-oxygen concentrations are usually near saturation despite the addition of large amounts of oxygen-consuming wastes. Light-bottle dark-bottle studies revealed that in October 1975, under low-flow conditions, oxygenation due to photosynthesis was about 1 times greater than reaeration due to mechanic diffusion. Water-tracer studies show that when th river is flowing at 6,000 cfs, a spill of 1,000 pound of contaminant at Shreveport (river mile 27 would have a peak concentration of 117 micr grams per liter when the contaminant reache Coushatta (river mile 219) 50 hours late (Woodard-USGS)
W78-11979

REGIONAL ANALYSIS OF THE EFFECTS O LAND USE ON STREAM-WATER QUALITY METHODOLOGY AND APPLICATION IN TH SUSQUEHANNA RIVER BASIN, PENNSYL VANIA AND NEW YORK,
Geological Survey, Portland, OR. Wate Resources Div.
D. J. Lystrom, F. A. Rinella, D. A. Rickert, and L Zimmermann.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-284 18 Price codes: A04 in paper copy, A01 in microfich Water-Resources Investigations 78-12, May 197 60 p, 9 fig, 4 tab, 78 ref, 4 append.

Descriptors: *Water quality, *Regional analysis *Streams, *Pennsylvania, *New York, Water po lution sources, Data collections, Forecastin Statistical models, Land use, Sediment yiel Water analysis, Dissolved solids, Nitroge Phosphorus, Climatic data, Urbanization, Agricu ture, Fertilizers, Soil properties, *Susquehann River basin.

A framework is presented for compiling availabl data for assessing statistical relationships betwee water quality and climate, physiography and lan use. Seventeen water-quality characteristics stu died represent annual mean concentrations or ca culated annual yields of suspended sediment, dis solved solids and various chemical species o nitrogen and phosphorus. Usable multiple-linea regressions were developed relating water-qualit characteristics to basin characteristics for 14 o the 17 water-quality characteristics with standar errors of estimate ranging from 17 to 75 percen These models can be used to estimate water qual ty at specific stream sites or to simulate th generalized effect of land-use characteristics o water quality. For example, observed nitrat yields were up to 20 times greater than the simu lated background yields. This increase is indicate to be the result of chemical fertilizers, anima wastes, and urbanization. It was concluded tha this was a viable method of assessing the relation ships between water quality and basin charac teristics on a regional basis. (Woodard-USGS)
W78-11990

DISTRIBUTION OF PHYTOPLANKTON I SOUTH CAROLINA LAKES,
Nevada Univ., Las Vegas. Dept. of Biologica Sciences.
For primary bibliographic entry see Field 5C.
W78-11995

DISTRIBUTION OF PHYTOPLANKTON I MISSISSIPPI LAKES,
Nevada Univ., Las Vegas. Dept. of Biologica Sciences.
For primary bibliographic entry see Field 5C.
W78-11996

ASSESSMENT OF THE EFFECTS O NUTRIENT LOADINGS ON LAKE ONTARIO USING A MATHEMATICAL MODEL OF THE PHYTOPLANKTON.
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5C.
W78-11998

DISTRIBUTION OF PHYTOPLANKTON IN WEST VIRGINIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12002

THE TROPHIC STATUS AND PHOSPHORUS LOADINGS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington.
For primary bibliographic entry see Field 5C.
W78-12003

PESTICIDE RUNOFF LOSSES FROM SMALL WATERSHEDS IN GREAT LAKES BASIN,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
B. G. Ellis, A. E. Erickson, A. R. Wolcott, M. Zabik, and R. Leavitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 084, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/3-77-112, October 1977. 77 p, 8 fig, 24 tab, 5 ref, 1 append. R-800483.

Descriptors: *Pesticides, *Agricultural runoff, *Small watersheds, *Soil erosion, *Model studies, *Soil conservation, *Erosion control, Path of pollutants, Great Lakes, Watersheds(Basins), Agriculture, Cultivation, Sedimentation, Weather patterns, Winter, Soils, Topography, Instrumentation, Operation and maintenance, Methodology, Nonpoint pollution, Paraquat, Leaching, Michigan, Percolation, Ice cover, Snowmelt.

Movement and losses of pesticides were studied May 1973-September 1974 in two small watersheds at Michigan State University, East Lansing, Michigan, as part of an effort to model pesticide transport. Soils, topography, instrumentation, operational procedures, and management are described, and runoff and sedimentation patterns are related to seasonal weather conditions. The study also included a nutrients component, not reported here. Conclusions: (1) Weather sequences preceeding a runoff event can influence or even determine the ratio of runoff to infiltration and percolation. (2) Distribution of surface ice or frost often controls infiltration and deep percolation during winter thaws in the Great Lakes basin. (3) Visible sedimentation patterns are not reliable for determining redistribution of chemicals in runoff. (4) Planter rows, roots, and stubble tend to control runoff direction on short slopes and contribute to impoundment in level areas. (5) Contour planting, no-till, and soil conservation practices are most important for controlling nonpoint pollution from cultivated areas. (6) Pesticide mobility is mainly due to the pesticide's solubility and absorption onto suspended sediments. (7) Paraquat, although cationic, is the most mobile chemical in this study, but its phytotoxicity is destroyed by soil contact. Runoff data for major events in April and August 1975 illustrate effects of crop cover on runoff volumes, sediment yields, and chemical losses. (Lynch-Wisconsin)
W78-12009

EFFECTS OF SOIL MOISTURE ON THE DIFFUSION COEFFICIENTS AND ACTIVATION ENERGIES OF TRITIATED WATER, CHLORIDE, AND METRIBUZIN,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-12013

PROGRAM AND ABSTRACTS: SYMPOSIUM ON NONBIOLOGICAL TRANSPORT AND TRANSFORMATION OF POLLUTANTS ON LAND AND IN WATER.
National Bureau of Standards, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 347, Price codes: A09 in paper copy, A01 in microfiche. Report NBSIR-76-1130, Held May 11-13, 1976. 178 p, 25 tab, 16 fig, 25 ref. Gevantman, L.H., editor.

Descriptors: *Metals, Pollution, *Water pollution effects, *Path of pollutants, *Soils, Soil analysis, Soil chemistry, Soil contamination, Soil contamination effects, Soil environment, *Soil investigations, Soil management, Soil properties, Soil, Types, Soil, Water, Hydrolysis, Adsorption, Water pollution, *Pollutant photochemistry, Mathematical models, Nonbiological transformation, Nonbiological transport, Pollutant photochemistry, *Soil pollution, Solar spectrum.

Program, abstracts and extended abstracts of 21 papers presented at a symposium on nonbiological transport and transformation of pollutants on land and in water are documented. Most of the extended abstracts are detailed and contain figures and references to pertinent literature on the subject matter discussed at the symposium. The subject matter reviewed deals with the physical and chemical behavior of pollutants including pollutant photochemistry, adsorptive behavior of pollutants, hydrolysis, rates of pollutants and mathematical models for documenting pollutant behavior in soils and water. (See W78-12016 thru W78-12032) (EIS-Katz)
W78-12015

HYDROLOGIC TRANSPORT PROCESSES FOR POLLUTANTS IN WATER AND ON SEDIMENTS,
Hydrocomp, Inc., Palo Alto, CA.
N. H. Crawford, and G. Bailey.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and In Water, 1976, p 18-23. 4 fig, 1 ref.

Descriptors: *Hydrologic aspects, Hydrologic data, *Hydrology, *Hydrologic systems, Groundwater, Mathematical models, *Methodology, Sediments, Iowa, Hydrologic cycle, *Hydrologic transport processes, Data requirements.

Hydrologic transport processes are described in both surface and groundwater. The variability of hydrologic transport from point to point in a field, and in different climatic zones is described. The development of computer based models for hydrologic transport is discussed, and the current and expected future applications of these models are outlined. The data requirements for analysis of hydrologic transport are discussed. (See also W78-12015) (EIS-Katz)
W78-12016

THE PHOTOCHEMISTRY OF XENOBIOTICS,
California Univ., Davis.
D. G. Crosby.
In: Symposium on Nonbiological Transport and Transformation of Pollutants On Land and In Water, May 1976, p 24-27. 7 fig, 13 ref.

Descriptors: *Herbicides, Water pollution sources, *Water pollution effects, Water treatment, *Degradation, *Light, Light intensity, *Light quality, Environmental effects, Oxidation, Reduction, Hydrogen ion concentration, Xenobiotics, *Photosensitivity.

For centuries, chemists have observed the effects of light on chemicals in the laboratory. However, it is only recently that investigation has extended to the sunlight-mediated transformations of foreign compounds - xenobiotics - under environmental conditions. Several characteristic reaction types now are recognized including oxidation, reduction, photonucleophilic displacements, elimination, and isomerization. In addition to the chemical properties of the xenobiotic, the chemical nature of the surrounding microenvironment is an important determinant of its environmental fate. pH and photosensitizers in aquatic environments, interaction with air- and water-borne particles, and atmospheric composition all exert significant influence under laboratory conditions, but more emphasis on field investigations is needed. (See also W78-12015) (EIS-Katz)
W78-12017

VERTICAL MOVEMENT AND DISTRIBUTION OF ORGANICS IN SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
J. M. Davidson.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p 28-31. 1 fig, 17 ref.

Descriptors: *Soils, *Soil analysis, Soil chemical properties, Soil classification, *Soil contamination, *Soil environment, Soil microbiology, Soil water, Soil temperature, Chromatography, Adsorption, *Organic solutes, Solute mobility, Solute distribution, Adsorption-desorption.

The mobility and distribution of organic solutes in soils are dependent upon the physical and chemical characteristics of the soil, microbial degradation rate, and interactions between the solute and soil matrix. Chromatography theory has been used to describe solute movement and concentration distributions in soils. The adsorption-desorption of an organic solute in a soil-water system has been shown to follow a Freundlich equation. The velocity at which an adsorbed solute moves through soil is independent of solute concentration for linear adsorption isotherms (N-1) and concentration dependent for nonlinear adsorption isotherms (1.0 less than N less than 1.0). Adsorbed solutes have greater velocities at high solute concentrations (C greater than 1.0 microgr/cm3) when N is less than 1.0. The concentration distribution of an adsorption isotherm is nonlinear (N less than 1.0). The microbial degradation rate and solute velocity determine the depth to which an adsorbed solute front or pulse will move. (See also W78-12015) (EIS-Katz)
W78-12018

PATTERNS OF DEPOSITION OF RADIONUCLIDES IN SEDIMENTS,
Argonne National Lab., IL.
D. N. Edgington, and J. A. Robbins.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p 32-38. 2 tab, 8 fig, 16 ref.

Descriptors: *Lake Michigan, *Sediments, *Sedimentation, *Radioactivity, Methodology, Radiochemical analysis, Radioecology, Sediment distribution, Sediment load, Sediment transport, Sedimentation rates, *Lead, Concentration profiles, Southern Lake Michigan, *137Cs, *210Pb, *239,240Pu.

Concentration profiles of 137Cs, 210Pb, and 239,240Pu have been measured in sediment cores taken mainly from the southern end of Lake Michigan. Their measurement provides an accurate method for determining the rate of accumulation of sediments. The results indicate that the rate of accumulation of sediments in the lake is highly variable. They also indicate that there is a general redistribution of radioactivity in surface sediments from areas where there has been no significant deposition during the last 7000 years to areas where there is considerable sedimentation. Mechanisms such as these will be important in terms of understanding the effects of long-term fate of radionuclides (and other heavy metals) discharged into the lake. The differences in the shapes of the various profiles can be explained in terms of a constant (210Pb) or a variable (137Cs, 239,240Pu) flux to the air-water interface with time, sedimentation rate, homogenous mixing due to physical or biological processes, and massive erosion or deposition due to storm activity. (See also W78-12015) (EIS-Katz)
W78-12019

REACTION RATES OF ELECTRON PAIR DONOR MOLECULES WITH POLLUTANTS IN WATER,
Brown Univ., Providence, RI. Dept. of Chemistry.
J. O. Edwards.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976. p. 45-47, 14 ref.

Descriptors: *Water pollution, *Water pollution effects, *Path of pollutants, Insecticides, *Organophosphorus pesticides, Toxicity, *Chemical degradation, Chemical reaction, Organic compounds, Donor reactions, Electron pair donor molecules, Electrode potential.

Many pollutants (including phosphorus insecticides and sulfur dioxide) react with electron pair donors (also termed nuclophiles, and in most instances these are reductants) to form new compounds less harmful to living systems and to the environment. For example, the anticholinesterases are converted to different chemical compounds which are not poisonous although there remains an oxygen demand in the organo-phosphorus product. A general introduction into the chemistry of donors' interactions with substrates will be presented along with some aspects of reaction mechanism. The relative rates of donor reactions with several varieties of organic compounds, tetrahedral phosphorus species, compounds with cyano-groups, and metal complexes will be presented. Correlations of donor reactivity with basicity, electrode potential, polarizability, bonding nature, and the 'alpha-effect' will be discussed on an empirical basis. Some generalizations that may be used for prediction of rates with new systems are now possible. The importance and value of hydrogen peroxide for treatment of polluted water will be detailed. (See also W78-12015) (EIS-Katz)
W78-12020

CHEMICAL DEGRADATION OF ORGANIC POLLUTANTS IN SOIL,
Oregon State Univ., Corvallis.
V. H. Freed.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 55-56. 2 fig.

Descriptors: *Pesticide kinetics, *Pesticide removal, Pesticides, Organic pesticides, Organic compounds, *Chemical degradation, Chemical reaction, Chemical wastes, Enzymes, Oxidation, Reduction, Hydrolysis, Hydrogen ion concentration, Catalysts, Clays, *Soil, Soil chemistry.

A number of reaction paths for organic pollutants in soil is theoretically possible. They may be categoriezed in the two major groups, namely biologically (including extracellular enzyme) mediated reactions, and 'chemical' reactions. The focus of this presentation is on chemical or nonbiological reactions exclusive of the oxidation-reduction reactions. These include such things as hydrolysis, complexation, and physical interactions. Much of the work on degradation of organic pollutants in soil has focused on pesticides. Since these compounds represent a number of classes of organic chemicals, they serve quite adequately as models for many of the organic pollutants. For many compounds, e.g. esters, amides, halogen substituted open-chain compounds, and others subject to nucleophilic attack, hydrolysis is much more rapid in soil than in aqueous solution. This has been attributed to catalytic influences of clay and organic matter, alkaline and aldaline earth ionic species, and overally pH. Other reactions leading to chemical degradation include complexation with some of the transition elements or sorption at specific loci on clay surfaces. (See also W78-12015) (EIS-Katz)
W78-12021

ADSORPTION AND TRANSPORT OF POLLUTANTS ON SUSPENDED PARTICLES,
Bedford Inst. of Oceanography Dartmouth (Nova Scotia). Marine Ecology Lab.
B. T. Hargrave, and K. Kranck.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 68-78. 1 tab, 3 fig, 38 ref.

Descriptors: *Adsorption, *Sediments, *Suspended load, *Suspended solids, Pollutants, Water pollution effects, Path of pollutants, Solubility, Environmental effects, Organic pesticides, *Desorptive hydrocarbons, *Flocculation processes, Transport processes.

Many pollutants entering water, particularly those of low solubility, become associated with natural suspended material. Particle size and concentration detemine the surface area available for adsorption and flocculation into units determined by inorganic grain size. Prediction of transport and dispersal of many aquatic pollutants is thus equivalent to prediction of the dynamics of fine-grained suspended material. (See also W78-12015) (EIS-Katz)
W78-12022

PHOTOLYSIS OF PESTICIDES ON SOIL SURFACES,
Georgia Univ., Savannah. Dept. of Chemistry.
R. Hautala.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 79-83. 4 tab, 1 fig, 3 ref.

Descriptors: *Pesticides, *Insecticides, *Herbicides, Detergents, *Soils, Soil chemistry, Surfactants, Soil surfaces, *Degradation(Decomposition), Soil water, Soil types, Organophosphorus insecticides, *Sevin, *Parathion, *2,4-D, Anionic detergents, Cationic detergents, Photolysis, Photodecomposition.

We have examined the photochemical decomposition of Sevin, Parathion, and 2,4-D on three different types of soil surfaces. The effects of anionic and cationic surfactant additives on the 'rates' of photodecomposition have been studied. The moisture content of the soils' was found to be a critical variable. Crude estimates of the quantum efficiency for photodecomposition indicate that photochemistry in aqueous solution for all cases, but the variables described above exert strikingly different effects for each of the pesticides. (See also W78-12015) (EIS-Katz)
W78-12023

PREDICTIVE MODELING OF THE BEHAVIOR OF POLLUTANTS IN THE AQUATIC ENVIRONMENT,
Environmental Research Lab., Athens, GA.
R. R. Lassiter, G. L. Baughman, and J. L. Malachuk.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 85-98. 8 fig, 6 ref.

Descriptors: Metals, *Mercury, Water pollution effects, *Path of pollutants, Modeling, Environmental effects, *Sediments, Laboratory tests, Methodology, Sorption, Volatility, Suspended solids, *Aquatic environment, *Methyl mercury, Evaluative models, Suspended particulates, Metallic mercury.

A prototype model was constructed to classify the behavior and fate of substances with respect to specified environment conditions, and to evaluate factors and processes important in their behavior and fate. Such models can be called evaluative models. The substance chosen for the prototype was mercury. Forms of mercury represented are mercuric, elemental, and methyl mercury. These forms are assumed to exist in both water and sediment. The water is assumed to be moving over stationary sediments. Factors represented whic potentially affect the fate of mercury are flow water, and sediment depths, suspended particu lates, and hydrogen ion concentration. Sorptio and volatilization were found to be importan processes affecting the fate of mercury a protrayed by the model. The need for measure ment of parameters such as the partion coefficien for mercury forms bound to sediments is stressed (See also W78-12015) (EIS-Katz)
W78-12024

PREDICTION OF SOLUBILIZATION O HYDROPHOBIC ORGANIC COMPOUNDS I WATER,
Pomona Coll., Claremont, CA.
A. J. Leo.
In: Symposium on Nonbiological Transport an Transformation of Pollutants on Land and Wate May 1976, p. 99-109, 1 tab, 5 fig, 15 ref.

Descriptors: Pollutants, *Path of polutants, Wate chemistry, *Solubility, Solutes, *Solvation, En vironment, Lipids, Adsorption, *Molecular struc ture, mathematical modeling, *Partition coeff cient, Availability, *Alkane solutes, Environmen tal subsystems, Hydrophobic organic compounds

The mechanisms by which organic chemicals ar dispersed into the environment as pollutants nee a great deal of further study. In all environments subsystems - land, atmosphere, inland waterways or oceans - water appears to be a major carrier so pollutants water solubility and the manner i which it partitions between water and some lipi phase are important parameters to consider whe constructing model systems and establishing quan titative relationships. The partition coefficient may have greater significance in these studies tha water solubility per se. For organic liquids, th solution process can be considered as one of self paritioning. Normally, most organic solids do no become pollutants until they become dissolved Once this has occurred, they are rarely remove from solution by recrystallization but their availa bility and mobility may be altered by adsorption t a surface or by solution in an immisible phase These latter occurrences can often be modeled b use of the compounds' partition coefficien between octanol/water. The theoretical basis fo the partitioning process is discussed and method by which the log P(oct) can be predicted fron molecular structures are given. (See also W78 12015) (EIS-Katz)
W78-12025

THE ENVIRONMENTAL PHOTODEGRADA TION OF SELECTED ORGANOMETALI COMPLEXES,
Eastman Kodak Co., Rochester, NY. Health Safety and Human Factors Lab.
For primary bibliographic entry see Field 5C.
W78-12026

KINETICS OF HYDROLYSIS AND OXIDATION OF ORGANIC POLLUTANTS IN THE AQUATIC ENVIRONMENT,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5C.
W78-12027

PREDICTION OF VOLATILIZATION RATE OF POLLUTANTS IN AQUEOUS SYSTEMS,
Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry.
For primary bibliographic entry see Field 5C.
W78-12028

COMPLEXATION, PRECIPITATION AND AD SORPTION OF TRACE METALS IN WATER,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Engineering Science.
J. J. Morgan, and J. Vuceta.

Symposium on Nonbiological Transport and nsformation of Pollutants on Land and Water, y 1976, p. 130-135. 20 ref.

scriptors: *Metals, *Hydrogen ion concentra-, Trace elements, Water quality, Water pollu- effects, *Adsorption, *Acid base equilibrium, thematical models, Water temperature, Silica, pper, *Cadmium, *Zinc, *Nickel, *Lead, cipitation, *Chelating agents, EDTA, mplexation, Complexing ligands, Redox, Sur- e complex formation.

tals introduced to natural waters are removed precipitation, adsorption, and incorporation biotic matter. Distributions of various metals ween particulate and aqueous phases depend n: pH, chemical and physical properties of dif- nt adsorbing surfaces, nature and abundance complexing ligands in the solution phase, com- ition between metals for available ligands and face sites, ionic strength of the redox environ- nt, and temperature. Predictive models must ultaneously consider all significant acid-base, ubility, complexation, redox, and adsorption cesses. Adsorption models are briefly con- ered with respect to their treatment of chemical electrostatic influences on metal ion distribu- ns. Two models, the adsorption-hydrolysis, ion- vent (AHIS) interaction model and the surface nplex formation (SCF) model are considered in ail and applied to the description of complex influence of other solution composition varia- s on the distribution coefficient is examined. ee equilibrium multimetal, multi-ligand system dels are presented in which either AHIS or SCF criptions of adsorption are employed. These tems models illustrate quantitatively the in- nces of pH, surface area, organic ligands, and cipitation processes on trace-metal distribu- ns in water. (See also W78-12015) (EIS-Katz) 78-12029

VIRONMENTAL PHYSICS AND CHEMIS- Y OF AQUATIC POLLUTANTS,
rvard Univ., Cambridge, MA. Div. of Engineer- and Applied Physics.
C. Morris.
Symposium on Nonbiological Transport and nsformation of Pollutants on Land and Water, y 1976, p. 136-141. 25 ref.

scriptors: Pollutants, Water pollution effects, th of pollutants, Precipitation, Adsorption, ysical chemistry, Water quality, *Oxidation, lychlorinated biphenyls, *Oxidation, ydrolysis, *Photolysis, *Catalyzed oxidation, olatilization.

r those aquatic pollutants that are not readily idized or degraded biologically the ultimate es are determined by their physical and chemi- properties in the aqueous medium. Some physi- properties of significance are volatility, aque- s solubility, and adsorptive tendency, for these termine the likelihood that a pollutant will trans- ate into the air or the sediments. The chemical nsformations by which organic pollutants are noved are generally either hydrolytic or oxida- e, so that the susceptibilities of pollutants to drolysis or oxidation are chemical properties of jor interest. Oxidation, in particular, may be her direct reaction with 02, catalyzed oxidation, otooxidation or photosensitized oxidation. (See o W78-12015) (EIS-Katz) 78-12030

XIDATION AND REDUCTION OF PESTI- DES IN SOILS AND SEDIMENTS,
partment of Agriculture Beltsville, MD.
r primary bibliographic entry see Field 5C. 78-12032

EFFECT OF STRIP MINING ON WATER QUALITY IN SMALL STREAMS IN EASTERN KENTUCKY, 1967-1975,
Northeastern Forest Experiment Station, Berea, KY.
K. L. Dyer, and W. R. Curtis.
Research Paper NE-372, 1977. 13 p, 8 fig, 2 tab, 12 ref.

Descriptors: *Strip mines, *Water quality, *Streams, Water chemistry, Appalachian Mountain region.

Eight years of streamflow data are analyzed to show the effects of strip mining on chemical quality of water in six first-order streams in Breathitt County, Kentucky. All these watersheds were unmined in August, 1967, but five have since been strip mining causes large increases in the concentration of most major dissolved constituents in the runoff waters, the concentration of most of these reaching a maximum some time after mining has ceased, then holding steady for several years. The maximum concentration of dissolved salts occurred during the low flow of the dormant season, whereas maximum salt loads occurred during the high flow of the early part of the growing season. (Forest Service)
W78-12035

LEAST-SQUARES ESTIMATOR FOR POLLUTED STREAM VARIABLES IN A DISTRIBUTED PARAMETER MODEL,
Tampere Univ. of Tech. (Finland).
H. N. Koivo, and A. J. Koivo.
Advances in Water Resources, Vol 1, No 4, p 191-194, June 1978. 1 fig, 10 ref.

Descriptors: *Least squares method, *Streams, *Water pollution, *Simulation analysis, Dissolved oxygen, Biological oxygen demand, Streeter-Phelps model, Computer models, Equations, Systems analysis.

An optimal estimator is constructed to determine the concentrations of dissolved oxygen and biological oxygen demand. The mathematical model used is a set of modified Streeter-Phelps equations specified by partial differential equations. The noise-corrupted measurements of the dissolved oxygen concentration are continuous in time but discrete in space. The optimal estimation is obtained by the application of the innovations approach. The resulting estimator equations (partial differential equations) are presented and their solution discussed. The solution presented provides a more direct derivation of the estimator. The choice of computational solution depends on the computer available; hybrid computers are advantageous in solving partial differential equations. (Bell-Cornell)
W78-12042

MODELING SEWER FLOWS USING TIME SERIES ANALYSIS,
Texas Univ. at Austin. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5D.
W78-12051

ANIMAL WASTES AND NON-POINT POLLUTION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12053

RUNOFF AS A FACTOR IN EUTROPHICATION OF SURFACE WATERS IN RELATION TO PHOSPHORUS MANURING,
Institute for Soil Fertility, Groningen (Netherlands).
For primary bibliographic entry see Field 5E.
W78-12056

PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL,
Institute for Soil Fertility, Groningen (Netherlands).
For primary bibliographic entry see Field 5E.
W78-12057

WATER POLLUTION BY LIVESTOCK EFFLUENTS,
Institut de Recherches Chimques, Tervuren (Belgium).
R. De Borger, and K. Meeus-Verdinne.
Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research on Effluents, organized by the 'Instituo Sperimentale Agronomico,' Modena, Italy, Sept. 20-24, 1976, p. 313-328. (1976), 4 fig, 5 tab, 5 ref.

Descriptors: Water pollution sources, Eutrophication, Nutrients, Belgium, Farm wastes, *River Ijzer(Belgium), Fish kills, *Livestock wastes, Direct discharge, Land spreading.

About 20 years ago the River Ijzer was a healthy river abounding in fish. In the last few years, fish mortality has recurred frequently. Entering Belgium from France, where it covers 37 of the 78 km of its course, the River Ijzer flows slowly through a predominantly agricultural, sparsely populated (180 inhabitants/km2), poorly industrialized region, the altitude of which does not exceed 5 m. Though the exact contribution of livestock breeding farms have a significant influence on the eutrophication of the River. While the problem of eutrophication of rivers flowing through a mainly agricultural region cannot be solved immediately, direct discharging of livestock effluents in surface waters cannot be allowed. Of the 2 solutions offered (a waste water treatment plant or land-spreading of livestock effluents), only land spreading seemed acceptable. Expense, location selection, and inefficiency made waste water treatment impractical. While land spreading seems to be the answer, even this solution may have its problems. The direct influence on the soil, the crops and indirectly on the surface water through runoff and infiltration cannot yet be foreseen. (Merryman - East Central)
W78-12058

OPTIMIZATION OF RUNOFF DETENTION FOR NONPOINT POLLUTION CONTROL,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12064

PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT NUTRIENT, SEDIMENT, AND PATHOGEN SOURCES,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12069

ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS,
Southwestern Great Plains Research Center, Bushland, TX.
R. N. Clark, A. D. Schneider, and B. A. Stewart.
Transactions of the ASAE, Vol. 18, No. 2, p 319-322, March-April, 1975. 6 fig, 7 ref.

Descriptors: *Feedlots, *Agricultural runoff, Salts, Irrigation, Playas, Watersheds(Basins), Water quality, *Farm wastes, Pollutant identification, *Great Plains, Holding ponds.

Runoff amounts and chemical quality have been measured from a Southern Great Plains cattle feedlot at Bushland, Texas. The rainfall-runoff relationship for runoff-producing storms was

linear, with about one-third of the rainfall in excess of 10 mm ending up as runoff. Other researchers in the Great Plains obtained similar results except that the amount of rainfall ending up as runoff was lower at Bushland. Concentrations of various runoff constitutents were higher than those found for cattle feedlots elsewhere. Low rainfall, high evaporation rates, and high stocking rates cause the manure pack in the feedlots to contain more salts, thus allowing increased concentrations in runoff. A dilution ratio of about five parts well water to one part feedlot runoff would reduce the salinity hazard for irrigation from very high to medium for most holding ponds in the Southern Great Plains. Runoff caught in playas where the area of the feedlot is one-fifth or less of the total watershed area could be considered as having a low or medium salinity hazard. Any use of feedlot runoff for irrigation requires close watch on salts in the water and soil. (East Central Univ)
W78-12075

NITRATE POLLUTION OF GROUNDWATER FROM NITROGEN FERTILIZERS AND ANIMAL WASTES IN THE PUNJAB, INDIA,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
B. Singh, and G. S. Sekhon.
Agriculture and Environment, Vol. 3, No. 1, p 57-67, Dec., 1976. 4 fig, 2 tab, 15 ref.

Descriptors: *Nitrates, Fertilizers, *Farm wastes, Sampling, Electrical conductivity, *Groundwater pollution, *India.

An investigation was made of the effect of N-fertilization on nitrate concentration in soil and groundwater under cultivated areas of the Ludhiana district where N-application rates are the highest in the Punjab (India). Water samples were collected from 57 wells and analyzed for nitrates. Nitrate content of well water near villages was significantly higher than in the cultivated areas. The major contributor to high nitrate levels in the groundwater under villages appeared to be animal wastes. Although farm-yard manure is added along with chemical fertilizers in the cultivated areas, crop plants absorb most of the applied nutrients from both of these sources, leaving only a small amount which can be leached beyond the potential rooting zone. However, while nitrate content was markedly higher in groundwater near villages, the mean electrical conductivity of the groundwater was only slightly higher than under cultivation. Both arithemtic and geometric means increased slightly in the villages just after the monsoon season, but no significant increase was observed in the cultivated areas. These observations indicated that groundwater in the study area was recharged during the rainy season and that salts were leached to the water table. These data indirectly confirm the role of animal wastes in increasing the nitrate concentration of well water near the villages. It is felt that in cultivated areas, nitrate concentration of well water is not now in equilibrium with present day agriculture. If that is so, a mean (geometric) nitrate concentration as high as 35 ppm in groundwater can be expected in future years. These hypotheses can only be confirmed by further investigations. (Rowe-East Central)
W78-12076

NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 5G.
W78-12080

WATER QUALITY AND THE FARM POND,
Department of Agriculture, Lethbridge (Alberta).
For primary bibliographic entry see Field 5G.
W78-12082

CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WASTES: I. NITROGEN TRANSFORMATIONS,
North Carolina State Univ. at Raleigh.
K. R. Reddy, R. Khaleel, M. R. Overcash, and P. W. Westerman.
Paper No. 77-4046, Presented at American Society of Agricultural Engineers, 1977 Summer Meeting, North Carolina State University, June 26-29, 1977, 43 p, 12 fig, 6 tab, 57 ref.

Descriptors: *Model studies, *Agricultural runoff, *Water pollution sources, Waste disposal, *Land application, *Nonpoint pollution, Nitrogen transformations, Poultry wastes, Swine wastes, Cattle wastes, Volatilization.

Pollution of lakes and streams through surface runoff from land areas receiving animal wastes are considered as one major nonpoint source pollution. N as a pollutant from these areas is discussed. The objective of the conceptual modelling was to describe the availability of N compounds in the surface soil layers of soil-manure system between rainfall events, during the rainfall event, and N species to be transported in the surface runoff. Emphasis was placed on the effect of N transformation (major ones considered were mineralization of organic N and NH3 volatilization in the soil manure system) on the availability of N compounds at the soil surfaces. The model presented is based on a state-of-the-art approach, which describes the transformations and transport of the N compounds during the rainfall events and between the rainfall events. The model considers the C/N ratio approach to describe the availability of the potentially mineralizable N in different manures. From the results presented it can be concluded that 50% of the potentially mineralizable N present in the poultry and swine manures after the application to the soil, is made available (converted to inorganic forms) during first 3 weeks after application, whereas it took 4 months after application of beef manure to decompose 50% of the potentially mineralizable nitrogen. Manures were also characterized based on their initial ammonium N concentration. At least 90% of ammonium N initially present in manures is lost through volatilization during first week after application. The factors influencing these two processes, namely, mineralization of organic N and NH3 volatilization were also presented. (Reddy-North Carolina State University)
W78-12083

CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
For primary bibliographic entry see Field 5D.
W78-12086

ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12090

MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS,
Hydrocomp, Inc., Palo Alto, CA.
A. S. Donigian, Jr., and N. H. Crawford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 566, Price codes: A15 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-76-043, Feb. 1976, 318 p. 52 fig, 36 tab, 54 ref.

Descriptors: Watersheds(Basins), *Agricultural runoff, Nitrogen, Phosphorus, *Pesticides, *Path of pollutants, *Model studies, *Nutrients, Agricultural Runoff Management Model, Hydrologic modeling, Simulation analysis, Soil erosion.

Modifications, testing, and further development of the Pesticide Transport and Runoff (PTR) Model have produced the Agricultural Runoff Management (ARM) Model. The ARM Model simulates runoff, snow accumulation and melt, sediment loss, pesticide-soil interactions, and soil nutrient transformations on small agricultural watersheds. Major modifications to and differences between the PTR and ARM Models are discussed. An energy-balance method of snow simulation, and a first-order transformation approach to nutrient modeling are included. Due to lack of data, the nutrient model was not tested with observed data; testing and refinement are expected to begin in the near future. Instrumented watersheds in Georgia provided data for testing and refinement of the runoff, sediment and pesticide portions of the ARM Model. Comparison of simulated and recorded values indicated good agreement for runoff and sediment loss, and fair to good agreement for pesticide loss. Pesticides transported only by sediment particles were simulated considerably better than pesticides that move both in solution and on sediment. A sensitivity analysis of the ARM Model parameters demonstrated that soil moisture and infiltration, land surface sediment transport, pesticide-soil interactions, and pesticide degradation are the critical mechanisms in simulating pesticide loss from agricultural watersheds. (East Central)
W78-12094

NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION.
California Agricultural Experiment Station, Bulletin 861, 1973, 59 p. 30 fig, 20 tab, 112 ref. R. S. Ayers and R. L. Branson, editors.

Descriptors: *Groundwater pollution, *Nitrates, Public health, Pollutants, Fertilizers, Water pollution, *Agricultural runoff, Leaching, *Farm wastes, *Santa Ana River Basin(Calif), California.

The extensive groundwater supplies in the Santa Ana Basin constitute a valuable resource which must be protected from excessive degradation if long-term beneficial use is to be realized. Nitrate in some of the Basin's well waters is already in excess of drinking-water standards of the U.S. Public Health Service. A 3-month study was made of the nitrate problem in the Basin. The study was restricted for the most part to the Upper Basin (above Prado Dam), where preliminary work indicated that nitrate degradation of waters was most serious. A multidisciplinary approach was used for analyzing problem areas of high nitrate concentrations in the groundwaters, determining the probable cause of each problem area (agricultural fertilizers, manure disposal, wastewater disposal, etc.), and developing recommendations for prevention of future problems of a similar nature in the watershed. University staff involved in this study represented the fields of surface and groundwater hydrology, soil and water chemistry, soil microbiology, sanitary and agricultural engineering, water science, and plant science. Special objectives included: a review of available data in order to identify and quantify existing high nitrate concentrations in groundwater; a review of the history of land and water use, waste disposal, and other practices in each problem area to form judgements on causes of high nitrate concentrations; development of guidelines for rates of fertilization, water application, and animal waste disposal which will appreciably reduce the potential for nitrogen pollution of surface and groundwaters of the Basin consistent with reasonable levels of agricultural production; identification of areas of potential pollution related to nitrogen but not of primary concern in this study; and identification of problems needing further study. (East Central Univ)
W78-12096

STRIBUTION OF PHYTOPLANKTON IN ARYLAND LAKES,
evada Univ., Las Vegas. Dept. of Biological iences.
or primary bibliographic entry see Field 5C.
78-12100

C. Effects Of Pollution

ITERACTING ENVIRONMENTAL FACTORS HICH CONTROL THE SINKING RATE OF LANKTONIC ALGAE,
ichigan State Univ., East Lansing. Dept. of sheries and Wildlife.
. L. King, and M. T. Hill.
vailable from the National Technical Informaon Service, Springfield, VA 22161 as PB-286 070, rice codes: A03 in paper copy, A01 in microfiche. ompletion Report July, 1978. 40 p, 12 fig, 1 tab, 5 ref, append. OWRT A-090-MICH(1), 14-31-001-7048.

escriptors: *Algae, *Light, *Alkalinity, Carbon ioxide, Sinking rate(Algae), Growth rates, iomass, Bioassay, Eutrophication, Lakes, ewage lagoons, Aquiculture, *Chlorella.

ight and carbon dioxide limits interact in a mulplicative fashion to control the specific growth ate, the specific sink rate and the specific plankon biomass accumulation rate of Chlorella vularis. Ug decreases, Us increases and Uab ecreases as functions of increased stress on the lga induced by interactions between carbon and ght. The effect of the decrease in Uab as a funcion of the interacting limits is to limit the ability of Chlorella vulgaris to compete in natural systems at ree carbon dioxide concentrations three orders of nagnitude greater than those required to sustain hotosynthetic carbon fixation. This suggests that pplication of results from chemostat studies of lankton algal kinetic response to environmental imits incorporates a significant error associated vith the sinking of algae in natural systems. Applcation of these results to algal bioassays, lake utrophication, sewage lagoons and aquaculture re discussed.
W78-11365

CHARACTERIZATION OF NUTRIENTS AND ALGAL BLOOMS AT ABIQUIU AND COCHITI RESERVOIRS,
New Mexico Univ., Albuquerque. Dept. of Biology.
L. L. Barton, and G. V. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 144, Price codes: A06 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 094, May 1978, 105 p, 18 fig, 40 tab., 19 ref. OWRT A-058-NMEX (1), 14-34-0001-7066.

Descriptors: Reservoirs, *Eutrophication, *Cyanophyta, *Nutrients, Mesotrophy, Primary productivity, Water pollution effects, *Algae, *Bioassay, Pollutant identification, Nutrient concentrations, *New Mexico, Cochiti Reservoir(N Mex), Abiquiu Reservoir(N Mex), *Anabeana, *Aphanizomenon.

The objective was to characterize the proliferation of algae in Abiquiu Cochiti Reservoirs by determining the chemical characteristics and the limnological conditions prior to, during, and following algal blooms as well as throughout the year. Microbial studies were employed to determine the possible health hazards due to contamination from human sewage. A bloom of blue-green algae of nuisance proportions occurred at Cochiti Reservoir in the summer of 1976. The bloom was characterized as predominately Aphanizomenon with a smaller biomass of Anabaena. Bioassays of extracts prepared from this Aphanizome bloom indicated that the bloom was toxic to vertebrate organisms. In the summer of 1977 in surface bloom of Aphanizomenon was reducted by an oder of magnitude and Anabeaena was approximately equal in abundance to Aphanizomenon. Because of increased light penetration and enhanced photosynthetic activity at greater depths, phytoplankton primary productivity decreased only to half the 1976 values. The decrease in blue-green algae in 1977 was associated with lower levels of total nitrogen and phosphorus in reservoir water. Cochiti Reservoir was characterized as eutrophic in the summer of 1976 and mesotrophic in 1977. At Abiquiu Reservoir the blue-green algal population and primary productivity was considerably lower than at Cohiti Reservoir. In the summer of 1976 Aphanizomenon was abundant in algal samples while Anabeaena was rarely observed. In 1977 smaller populations of Aphanizomenon occurred with an increased diversity of diatoms and green algae. Primary productivity and nutrient concentrations in Abiquiu Reservoir were characteristic of mesotrophic conditions in 1976-77. (Stockton-N Mex SN).
W78-11367

MODELING PHOSPHORUS CYCLING IN LAKE SEBASTICOOK NEWPORT, MAINE,
Maine Univ. at Orono. Dept. of Mathematics.
T. A. Hannula.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 066, Price codes: A06 in paper copy, A01 in microfiche. Land and Water Resources Institute, Orono, Completion Report, June 1975. 96 p, 44 fig, 8 tab, 10 ref, 2 append. OWRT A-039-ME(1).

Descriptors: Drawdown, Input-output analysis, Lakes, *Phosphorus, Lake sediments, *Computer models, *Simulation analysis, Eutrophication, Maine, *Lake Sebasticook(ME), Anaerobic conditions, Hypolimnetic discharge, *Model studies.

A computer simulation model to investigate the internal cycling of phosphorus has been constructed for Lake Sebasticook, a shallow eutrophic lake in central Maine. The model divides the lake into 'n' uniformly mixed horizontal layers and superimposes a time-varying anaerobic zone on the layer structure. Using seasonally varing rate coefficients for sedimentation losses, eddy diffusion, external hydraulic and phosphorus loading, and phosphorus release from aerobic and anaerobic sediments, the model produces phosphorus profiles similar to those observed in Lake Sebasticook. Lake Sebasticook has a peak phosphorus content of 9500 kg in September due to the apparent release of 6000 - 9000 kg p from the sediments during the summer. Model runs suggest that the reduction of the external P loading by 45% to about 5000 kg/year through removal of the known point sources will have little impact on the lake until the magnitude of the summer sediment release is reduced. An extended fall drawdown significantly increases the export of phosphorus from the lake and appears to be a feasible means of reducing the phosphorus pool at the top of the sediment. A hypolimnetic discharge appears to be more effective in discharging phosphorus than a fall drawdown, but requires the discharge of large volumes of anaerobic water.
W78-11368

VIRAL CONTROL OF NUISANCE BLUE-GREEN ALGAE,
California Univ., Riverside. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W78-11369

DETERMINATION OF THE SECONDARY PRODUCTION AND POPULATION DYNAMICS OF THE ZOOPLANKTON OF THE LAKE CHAMPLAIN ECOSYSTEM,
Vermont Univ., Burlington. Dept. of Zoology.
R. Keen, and M. Potash.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 094, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, June 1978. 77 p, 14 fig, 23 tab, 18 ref, 7 append. OWRT A-028-Vt(1), 14-34-0001-7096.

Descriptors: Lakes, *Zooplankton, *Diurnal distributions, *Productivity, Vermont, Canada, Oligotraphy, Crustaceans, *Lake Champlain, Limnology, Plankton, *Daphnia, Mysis, Fluctuations, *Vertical migration, Aquatic population abundance, Distribution patterns.

The zooplankton of Lake Champlain were virtually unknown before this study. The main basin of the lake was sampled intensely July 1976-August 1977. Four other different water masses of the lake were sampled less intensely to provide a picture of the zooplankton of the whole lake. In general, the species present in the main lake were characteristic of deep, oligotrophic lakes. Populaton densities were maximal in the summer months at about 17,000 per cubic meter, and lower than this in the spring and fall. Diaptomid copepods generally dominated the crustacean plankton, while Daphnia spp. dominated the cladoceran component of the crustacea. Rotifers were 10-50 times more abundant numberically than the crustacea. Zooplankton populations in the lake's other basins for the most part followed the patterns of the main basin in species composition and abundance. One shallow basin was different, with much lower abundances, except for a strong spring occurrence of Daphnia. Series of samples to study daily vertical migration showed copepos and Mysis to be following the classic pattern. Daphnia did not show a strong migration. The two species of Bosmina were separated vertically in the water column.
W78-11376

COMPARISON OF RESIDUAL BIOTOXICITY OF CHLORINE AND BROMINE CHLORIDE TO COPEPODS,
Maryland Univ., Baltimore County, Baltimore. Dept. of Biological Sciences.
B. P. Bradley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 113, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Research Center, University of Maryland, College Park, Technical Report No. 47, (1978). 15 p, 7 tab, 15 ref. OWRT A-040-Md(1), 14-34-0001-7044.

Descriptors: Zooplankton, Powerplants, *Biocides, Survival, *Reproduction, *Copepoda, Toxicity, *Chlorine, *Bromine chloride, Mortality, *Eurytemora, *Acartia, Water pollution effects.

The copepod species Eurytemora affinis and Acartia tonsa showed 50 to 60% mortality in cooling water with 0.5ppm C12 or BrC1 (applied dosage) when entrained in the cooling system. However, after 5 min contact time, the biotoxicity was reduced to insignificant levels, hence mortalities in the mixing zone, given the applied dosage would be negligible. There were no significant differences between residual biotoxicities of chlorinated and chlorobrominated cooling waters at either the low applied dose rates or at higher rates. The LC50 values were 362-26ppb and 403-46ppb at 24 hrs for bromine chloride and chlorine, respectively. Reproduction of Eurytemora was only affected at dosage rates well above those used in practice.
W78-11378

IMPACT OF URBAN RUNOFF ON WATER QUALITY IN THE OCCOQUAN WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
C. W. Randall, T. J. Grizzard, and R. C. Hoehn.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 046, Price codes: A05 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 80, May 1978. 77 p, 21 tab, 27 fig, 11 ref. OWRT C-5341(4239)(11).

Descriptors: *Storm runoff, *Urban runoff, Water pollution sources, Biochemical oxygen demand, Coliforms, Heavy metals, Nutrients, Suspended solids, Hydrographs, *Virginia, *Occoquan watershed(Va), *Total organic carbon.

The continued growth of the Washington, DC urban areas has prompted concern over the impact of unrecorded sources of pollution on the Occoquan Resevoir, which serves an estimated 600,000 customers. This research identified and characterized runoff pollution loads from the principal urban areas in the Occoquan Watershed, and assessed their probable impact on the downstream impoundment. It also studied the biochemical oxygen demand (BOD) exertion kinetics of urban runoff. The two principal sampling periods were June-mid-Sept. 1974 and April-July 1975. Total hydrograph hand-sampling techniques were used for data collection purposes at all stations in or near the urban area. Samples were analyzed for all nitrogen and phosphorus forms, suspended solids, total organic carbon (TOC), and pH; some were measured for BOD5, heavy metals, and coliform content, both total and fecal. Using hydrographs, total runoff loads were calculated for each storm and each pollutant measured. Results were compared on the basis of land use and point source contributions. Results show that suspended solids, orgaic matter, and heavy metals were the most significant parameters of urban runoff. Urban runoff is a significant source of pollution and should be included in all watershed-wide pollution abatement programs.
W78-11383

EUTROPHICATION MODELS FOR LAKES,
Vandkvalitetsinstitut, Hoersholm (Denmark).
J. F. Simonsen, and K. In. Dahl-Madsen.
Nordic Hydrology, Vol 9, No 2, p 131-142, 1978. 5 fig, 2 tab, 20 ref.

Descriptors: *Eutrophication, *Lakes, *Model studies, *Mathematical models, Nutrients, Detritus, Sediments, Nitrogen, Phosphorus, Algae, Foreign research, Water temperature, Biomass, Chlorophyll, Inflow, Discharge(Water), Retention, Limnology.

In the years 1970-1977, eutrophication models were developed and applied for about 15 shallow Danish Lakes. The structures of these models were discussed. An example of the calibration of the model on data from Lake Gyrstinge in the Susa catchment area was shown, and the use of the model for calculating ecological consequences of changed hydraulic retention times was demonstrated. The dynamic eutrophication model was compared to the Dillon-Rigler version of the input-output model. Limitations of both types of models were discussed. (Sims-ISWS)
W78-11429

POLYCHLORINATED BIPHENYL (PCB) DEGRADING BACTERIA AND PCB IN ESTUARINE AND MARINE ENVIRONMENTS,
Maryland Univ., College Park. Dept. of Microbiology.
G. S. Sayler, R. Thomas, and R. R. Colwell.
Estuarine and Coastal Marine Science, Vol 6, No 6, p 553-567, June 1978. 2 fig, 9 tab, 27 ref. NOAA 04-5-15811, NSF GD-31207.

Descriptors: *Polychlorinated biphenyls, *Bacteria, *Estuaries, *Oceans, *Chesapeake Bay, *Atlantic Ocean, Marine bacteria, Marine microorganisms, Water pollution, Pollutants, Path of pollutants, Surveys, Sampling, Chemical analysis, Sediments, Sea water, PCB-degrading bacteria.

Surface water and sediment samples collected throughout the Chesapeake Bay and along the southeast Atlantic Coast, extending from Miami, Florida, to Cape Hatteras, North Carolina, were analyzed for the presence of polychlorinated biphenyl (PCB)-degrading bacteria and PCB. PCB-degrading bacteria were recovered from all samples for which enumeration was attempted. In Addition, the occurrence of PCB was detected in all samples analyzed for PCB. Compared with marine samples, both PCB-degrading bacteria and PCB were found in higher concentrations in estuarine waters and sediment. The data obtained indicated a greater correlation between PCB concentrations and numbers of PCB degrading bacteria in areas of urbanization as opposed to areas distant from land. These results suggest that assessment of existing PCB-degrading bacteria provides a potential indicator of PCB contamination. Because PCB-degrading bacterial populations were correlated much more highly with nutritional factors governing microbial growth, the extent of microbial PCB degradation by natural microbial populations remains undetermined. (Sims-ISWS)
W78-11430

THE ROLES OF NUTRIENT CYCLING AND RADIANT ENERGY IN AQUATIC COMMUNITIES,
D. W. Schindler, and E. J. Fee.
In: Photosynthesis and Productivity in Different Environments, Cooper, J.P., Ed., Cambridge University Press, London, 1975, p 323-343. 6 fig, 61 ref.

Descriptors: *Cycling nutrients, *Light intensity, *Photosynthesis, *Phytoplankton, *Methodology, *Eutrophication, Nutrients, Plant growth, Primary productivity, Algae, Lakes, Canada, Experimental Lakes Area(Ontario-Canada), Phosphorus, Carbon, Sedimentation, Model studies, Water management, Analytical techniques, Solar radiation, Measurement, Limiting factors.

Traditional field methods of limnological observation, designed to monitor rather than predict changes in photoplankton growth and production related to nutrient and light regimes, have been unsatisfactory for investigating causal relationships; data collected by such methods contain intolerable amounts of environmentally-spuridus information. Controlled laboratory experiments likewise have proven unsatisfactory for unraveling underlying changes in function of the aquatic ecosystem, as algae may give one response in the laboratory and an entirely different one under natural conditions. This paper discusses and evaluates methods suitable for studying the dynamics of causal factors, based on extensive field work largely conducted in the Experimental Lakes Area of northwestern Ontario. Areas covered are: (1) measuring the relationship between phytoplankton production and light; (2) limiting nutrients and phytoplankton production; (3) combined effects of light and nutrients; (4) relationships between inorganic nutrients and phytoplankton production; (5) input and output of nutrients from lakes; (6) utilization of organic substrates by phytoplankton; (7) interpreting applied production problems in terms of nutrients and radiant energy; and (8) modelling relationships between phytoplankton, nutrients, and light. A concluding section assesses the implication for water management. Poor knowledge of the phytoplankton-nutrient-light system could result in useless, expensive, and potentially harmful management schemes. (Lynch-Wisconsin)
W78-11508

THE PHOSPHORUS STATUS OF EUTROPHIC LAKE SEDIMENTS AS RELATED TO CHANGES IN LIMNOLOGICAL CONDITIONS-PHOSPHORUS MINERAL COMPONENTS,
Battelle Pacific Northwest Labs., Richland, WA.
R. E. Wildung, R. L. Schmidt, and R. C. Routson.
Journal of Environmental Quality, Vol. 6, No. 1, p 100-104, 1977. 1 fig, 3 tab, 21 ref. EPA Water Quality Office 14-12-508.

Descriptors: *Phosphorus, *Eutrophicatio
*Sediments, *Phytoplankton, *Upper Klama
Lake(OR), *Inorganic compounds, Lakes, Lin
nology, Iron, Aluminum, Carbon, Mineralizatio
Nutrients, Nutrient flux, Algae, Oregon, Sed
ment-water interfaces, Serial extractio
procedure.

Fractionation techniques were used to identify i
organic phosphorus components in sedimen
eutrophic Upper Klamath Lake, Oregon, respons
ble for changes observed in phytoplankton growt
Sediment phosphorus was earlier found
decrease with phytoplankton growth and increas
with their decline. In this study, release
phosphorus from sediments during periods
maximal biological productivity in the shallow ba
waters was due primarily to reductions in ino
ganic phosphorus mineral components soluble
sodium hydroxide (0.1 M) and citrate-dithionit
this suggests that phosphorus associated wi
hydrated iron oxides was the principle source
phosphorus to the overlying waters and to th
biota. Increases in sediment inorganic phosphoru
which occurred when phytoplankton growt
diminished, were due principally to increase
phosphorus mineral components soluble in NH4
indicating that resorbed phosphorus was fluorin
exchangeable and/or associated with crystallin
and amorphous aluminum-phosphorus con
ponents. Changes in the form of sedime
phosphorus which occurred in the lake and
laboratory equilibrium studies indicated that co
version of resorbed NH4F soluble-phosphorus
sodium hydroxide (0.1 M) and citrate-dithioni
soluble-phosphorus must be a relatively long-ter
(> two years) process. Taken together, the NH4
the sodium hydroxide (0.1 M), and citrat
dithionite fractions accounted for about 85%
the seasonal variance in total inorgan
phosphorus which occurred at all stations. (Lynch
Wisconsin)
W78-11509

**PRODUCTION OF VOLATILE SULFUR COM
POUNDS DURING THE DECOMPOSITION O
ALGAL MATS,**
Wisconsin Univ., Madison. Dept. of Bacteriology
S. H. Zinder, W. N. Doemel, and T. D. Brock.
Applied and Environmental Microbiology, Vo
34, No. 6, P 859-860, December 1977. 1 fig, 1 tab,
ref.

Descriptors: *Cyanophyta, *Algal mat
*Degradation(Decomposition), *Sulfur, Volatility
Algae, Anaerobic conditions, Hydrogen sulfid
Methyl mercaptan, Dimethyl sulfide, Light, Dark
ness, Shading, Yellowstone National Park, Oc
topus Spring(WY), Wyoming.

Cores of blue-green algal mat collected from a ho
spring effluent (Octopus Spring) in Yellowston
National Park, placed under anaerobic condition
and incubated in the dark, rapidly produced larg
amounts of volatile sulfur compounds. These com
pounds included hydrogen sulfide, methyl mercap
tan, and dimethyl sulfide. The major organic sulfu
compound was methyl mercaptan, in contrast t
previous experimental results with marine eu
caryotic algae. When cores were incubated in th
light instead of the dark, production of all volatil
organic compounds was much lower, presumabl
due to conversion of the system to aerobic as
result of algal oxygen production. In the natura
environment, because of intense self-shading i
the compact mats, net photosynthesis occurs onl
in the top three mm of mat, and beneath this zon
decomposition is the primary process occurring
As the mat grows upward the algae beneath go int
darkness and decompose. In preliminary anaero
bic experiments it was found that decompositio
was most rapid in the top three mm, apparentl
because breakdown of easily decomposabl
proteinaceous materials had already occurred. I
the current experiments the major product formed
was hydrogen sulfide. Addition of five mg o
methionine to a top layer of mat strongly inhibited

roduction of hydrogen sulfide, but a large amount of dimethyl disulfide was formed. Hydrogen sulide, methyl mercaptan, and dimethyl sulfide robably arise directly during the decomposition f algal protein constituents. (Lynch-Wisconsin)
W78-11510

EFFECT OF NUTRIENT ENRICHMENT ON GROWTH OF THE EELGRASS ZOSTERA MARINA IN THE CHESAPEAKE BAY, VIRGINIA, USA,
Virginia Inst. of Marine Science, Gloucester Point.
R. J. Orth.
Marine Biology, Vol. 44, No. 2, p 187-194, 1977. 3 fig, 5 tab, 28 ref.

Descriptors: *Chesapeake Bay, *Nutrients, *Eelgrass, *Zostera marina, *Fertilizers, *Plant growth, Water pollution effects, Limiting factors, Sediments, Ruppia maritima, Virginia, Delmarva Peninsula, Turions, Biomass, Length, Shading, Ecosystems, Sea grasses, Bays, Intertidal areas, Depth.

Experimental addition of two commercial fertilizers to a bed of eelgrass (Zostera marina) in Chesapeake Bay off Church Neck, Delmarva Peninsula, Virginia, greatly increased the length, biomass, and total number of turions over controls at both shallow and deep stations during a two to three month period. Results suggest: (1) Z. marina beds in Chesapeake Bay are nutrient-limited, (2) growth form of Z. marina may be related to sediment nutrient supply, and (3) Z. marina may competitively exclude Ruppia maritima by light-shading. Fertilizers used were: (1) 5% ammonium nitrate, 10% phosphoric anhydride, 10% potassium oxide; and (2) 10% ammonium nitrate, 10% phosphoric anhydride, 10% potassium oxide. The area is characterized by an extensive intertidal sand flat populated by patchy widgeon grass (R. maritima) and grading into a mixed subtidal seagrass bed of Z. marina and R. maritima, and then into a monospecific bed of Z. marina in deeper portions. Two stations were established, Station A in 0.3 m of water, and Station B in 0.6 m of water (mean low water). No significant difference was found between the two fertilizers for any of the parameters monitored. There were significantly more turions in both fertilized plots and controls in the shallow area than in the deeper area, but turions in deep plots were significantly longer than those in shallow plots. (Lynch-Wisconsin)
W78-11512

EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF,
Utah State Univ., Logan.
D. S. Filip, and E. J. Middlebrooks.
Water Research, V. 10, No. 1, p. 89-93, Dec., 1976. 6 fig., 13 ref.

Descriptors: Nutrients, *Eutrophication, Water pollution, Toxicity, Nitrogen, Phosphorus, *Farm wastes, *Agricultural runoff, *Cattle wastes, Dairy wastes, *Feedlot runoff, Algal growth.

Utilizing standard bottle test algal bioassays correlated with chemical analyses for growth limiting nutrients, the biostimulatory and chemical characteristics of dairy cattle waste runoff were evaluated. Comparisons were made between this very concentrated runoff collected could only be sampled after much dilution by spring and stream waters. The dairy feedlot runoff was extremely rich in nutrients, and in very dilute concentrations it stimulated prolonged algal growth, indicating a strong pollution potential. In more concentrated solutions biostimulation was inhibited by toxicity which seemed indigenous to concentrated runoff water. Toxicity was found in beef cattle runoff in earlier studies. Topography and animal numbers differed between the dairy feedlot and the beef cattle lots precluding exacting comparisons. However, the chemical nature of the more concentrated dairy cattle runoff was consistent; whereas, the water chemistry of the more dilute beef runoff changed suddenly in response to changes in cattle density near the streams. (East Central)
W78-11513

SOME ASPECTS OF THE ECOLOGY OF PARATYA AUSTRALIENSIS (CRUSTACEA: DECAPODA: ATYIDAE),
Adelaide Univ. (Australia). Dept. of Zoology.
W. D. Williams.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 4, p 403-415, August 1977. 5 fig, 5 tab, 24 ref.

Descriptors: *Crustaceans, *Paratya australiensis, *Australia, *Ecology, *Life history studies, *Prawns, Decapods, Hatching, Plankton, Larvae, Breeding, Running waters, Rivers, Lakes, Atyidae, Victoria(Australia), Classification, Habitats.

The life cycle and habitat of the crustacean decapod Paratya australiensis in running waters of southern Victoria, Australia, were investigated. Atyid prawns, the most common in southeastern Australia, are unusual in havng a planktonic larval stage, and yet are ubiquitous in rivers and slowly flowing waters. While three Australian species of Paratya have been described, only P. australiensis can be accepted pending further revision of the genus. The species occurs in Australia in a broad southeastern arc in a variety of permanent inland waters, including coastal streams, rivers, lakes, farm dams, and ponds. New records clearly extend the known range into southeastern South Australia, southwestern New South Wales, and further north into Queensland. Vegetated areas are favored. Young prawns hatch as free-floating larvae and hatching occurs mainly in early summer in southern Australia, the breeding season appears adapted to the hydrological regime of running waters. Sampling for this study was concentrated on Cardinia Creek, sampled September 1961-January 1964, supplemented by data for November 1962 from Toomuc Creek, Bunyip Creek, Glenmaggie Reservoir, and Latrobe River; all are in southern Victoria. A series of monthly samples during the breeding season was obtained from Toomuc Creek, a ditch, and Lysterfield Reservoir. (Lynch-Wisconsin)
W78-11514

STUDIES ON THE ECOLOGY OF SOME TEMPORARY FRESHWATER POOLS IN VICTORIA WITH SPECIAL REFERENCE TO MICROCRUSTACEANS,
Monash Univ., Clayton (Australia). Dept. of Zoology.
D. W. Morton, and I. A. E. Bayly.
Australian Journal of Marine and Freshwater Research, Vol 28, No 4, p 439-454, August 1977. 6 fig, 6 tab, 40 ref.

Descriptors: *Crustaceans, *Victoria(Australia), *Temporary ponds, *Zooplankton, *Ecology, *Species composition, Copepods, Cladocerans, Conductivity, Dissolved oxygen, Hydrogen ion concentration, Turbidity, Arid lands, Faunal lists, Ostracods, Succession, Saycia cooki, Ponds, Australia.

Microcrustaceans and chemical parameters of 53 temporary pools mainly located in eastern Victoria, Australia, were studied February-September 1973. In the pools, with a mean depth of 23 cm, pH ranged from 5.7-8.2 (mean 6.9), conductivity (K18) from 55-5500 microS/cm (mean 340), dissolved oxygen 23-170% saturation (mean 72%), and turbidity 2-310 Formazin turbidity units (mean 50). A total of 60 microcrustacean species was recorded: 22 Cladocera, 20 Copepods, 13 Ostracoda, two Conchostraca, two Anostraca, and one Notostraca. Most localities were sampled for biota only once, but eight were selected for repeated sampling. Saycia cooki was the most frequently occurring cladoceran (in 22 of 38 pools sampled June-August); it was not recorded before May 24 with one exception. The fact that S. cooki reaches peak numbers early in the life of a pool probably relates to the production of large numbers of ephippial eggs. Cladocera producing only 1-2 ephippial eggs, such as Chydorus, Moina, and Simocephalus, tend to appear later in succession. Benthic Simocephalus expinosus and planktonic Daphnia carinata, with mutually exclusive distributions, appear unable to coexist in shallow waters. Endemic cyclopoid copepods encountered included three new species of Microcyclops, M. arnaudi, Acanthocyclops australis, and Acanthocyclops sp. nov. Computer analysis showed four species groups with a high probability of co-occurrence. These pools, although common in Australia, have attracted little previous research attention. (Lynch-Wisconsin)
W78-11515

ATTENUATION OF LIGHT IN NATURAL WATERS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. T. O. Kirk.
Australian Journal of Marine and Freshwater Research, Vol 28, No 1, p 497-508, 1977. 10 fig, 1 tab, 8 ref.

Descriptors: *Attenuation, *Light intensity, *Light penetration, *Photosynthesis, *Solar radiation, *Optical properties, *Water, Limnology, Absorption coefficient, Scattering coefficient, Volume scattering function, Algae, Phytoplankton, Chlorophyll, Plant growth, Coasts, Australia, Light, Irradiation, Primary productivity, Lakes, Oceans.

The paper discusses and defines: (1) properties of light incident upon water; (2) inherent optical properties of water, which determine the way in which water interacts with light; and (3) attentuation effects on light as it penetrates water. The general principles involved are illustrated with published data and from studies conducted by the author; examples cited are the Tasman Sea, Lake Burley Griffin (Canberra, Australia), Burrinjack Dam, Batemans Bay, and Lake George. Light, or photosynthetically active radiation (PAR), is defined as that waveband of solar radiation which can be used by plants for photosynthesis, and covers the waveband between 350 or 400 and 700 nm. Properties of incident light include: (1) intensity, (2) spectral distribution, and (3) angular distribution. Three inherent optical properties of water are defined: (1) absorption coefficient, (2) scattering coefficient, and (3) volume scattering function. When light penetrates water, there is a diminution in intensity and change in spectral quality (attenuation) with increasing depth and according to the different types of water. The characteristic pattern of attenuation of total PAR in inland and coastal waters is discussed. The most suitable instrument for studying underwater light is a submersible quanta meter. (Lynch-Wisconsin)
W78-11516

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN, VI. ECOLOGY OF THE EUPHAUSIACEA,
Sydney Univ. (Australia). Dept. of Zoology.
P. S. McWilliam.
Australian Journal of Marine and Freshwater Research, Vol 28, No 5, p 627-644, 1977. 3 fig, 8 tab, 46 ref.

Descriptors: *Euphausiacea, *Indian Ocean, *Zooplankton, *Ecology, *Distribution patterns, Oceans, MULTICLAS, Seasonal, Latitudinal studies, Ephausia mutica, Ephausia tenera, Ephausia brevis, Stylocheiron carinatum, Stylocheiron suhmii, Stylocheiron affine.

Examination of 26,427 euphausiids from 82 night and 93 day station samples taken by vertical hauls in the upper 200-m stratum along the 110 degree E. meridian in the eastern Indian Ocean during 1962-63 indicated day samples contained mainly larvae and juveniles, and night samples contained more adults. Six small euphausiid species were the most abundant and ubiquitous: Euphausia mutica, E. tenera, E. brevis, Stylocheiron carinatum, S. suhmii, and S. affine. Their distribution overlapped according to distribution of the tropical and subtropical water masses and their mixtures in the upper 150 m. These species were commonly observed in breeding condition; their larval distribution was related to distribution of the breeding adults. Rare and less ubiquitous species (mainly younger stages and deeper living species) showed more pronounced relationships with seasonal water movements. Food appeared more important than temperature or salinity in influencing distribution, abundance, and species associations. Although the sampler used (Indian Ocean Standard net, mesh size 0.33 mm), probably did not adequately sample all size ranges, and sampling depth probably excluded levels of concentration of adults and juveniles of many species, the data permitted characterization of night distribution of euphausiid species in the upper 200 m, an investigation of their relationships with the environment, and comparisons of results with previous descriptions. (Lynch-Wisconsin)
W78-11517

UTILIZATION OF BLUE-GREEN ALGAE BY LARVAE OF SHORE FLIES,
Kent State Univ., OH. Dept. of Biological Sciences.
B. A. Foote.
Environmental Entomology, Vol 6, No 6, p 812-814, December 1977. 1 tab, 15 ref. NSF DEB 75-21352.

Descriptors: *Shore flies, *Ephydridae, *Cyanophyta, *Larvae, *Insects, Algae, Invertebrates, Feeding, Foods, Eutrophication, Setacera atrovirens, Setacera pacifica, Scatella stagnalis, Hyadina, Lytogaster, Pelina truncatula, Axysta cesta, Cylindrospermum, Nostoc, Anabaena, Lyngbya.

Larvae of 12 species of shore flies (Ephydridae) have been found capable of ingesting and assimilating blue-green algae, a discovery which may have practical significance to the study of eutrophication. Setacera atrovirens was reared from Nostoc, and S. pacifica from Anabaena. Scatella stagnalis was obtained from Nostoc colonies. Larvae of three species of Hyadina (H. binotata, H. neglecta, and H. subnitida), four species of Lytogaster (L. abdominalis, L. excavata, L. flavipes, and L. furva), and Pelina truncatula were reared from colonies of soil-inhabiting species of Cylindrospermum. Larvae of Axysta cesta were found in a colony of Lyngbya growing on moist tree leaves near a shaded pond. Species of Hyadina, Lytogaster, and Axysta appear to be trophic specialists, as they have been reared only from colonies of cyanophytes. By contrast, the two Setacera species and S. stagnalis are polyphagous, ingesting a wide mix of cells belonging to several algal classes. Field observations, laboratory rearings, and gut analyses were used along with published material in this report. It is probable that some cyanophytes possess nutritional, chemical, or morphological traits that protect them from most grazing herbivores. The few invertebrates that can ingest, degest, and assimilate blue-green algae apparently have either overcome the algal defense mechanisms, or possibly a few groups of cyanophytes (such as Cylindrospermum or Lyngbya) lack defenses--at least against certain grazers. (Lynch-Wisconsin)
W78-11518

PHYTOPLANKTON STUDIES IN THE WATER COLUMN AND IN THE PACK ICE OF THE WEDDELL SEA,
Texas A and M Univ., College Station. Dept. of Oceanography.
S. Z. El-Sayed, and S. Taguchi.
Antarctic Journal of the U.S., Vol 12, No 4, p 35-37, October 1977. 2 fig, 1 tab, 2 ref.

Descriptors: *Weddell Sea, *Phytoplankton, *Antarctic Ocean, *Primary productivity, *Ice algae, *Ice cover, *Cold regions, Krill, Oceans, Chlorophyll, Salinity, Eutrophication, Pack ice, Algae, Zooplankton, Adenosine triphosphate, Metabolites, Copepods, Euphausiids, Light penetration, Fluorescence, Nannoplankton, Pigments.

Various studies of phytoplankton, fluorescence, primary productivity, and other oceanographic biological parameters made during a cruise in the Weddell Sea near Antarctica February 10-March 15, 1977 are reviewed. Special emphasis was placed on the ecology and metabolism of ice algae in the pack ice, and on assessment of their contribution to organic production of antarctic waters. Preliminary results of salinity experiments showed ice algae growth was highest in 100% seawater. The ice mantle is important in the study of the krill (planktonic crustaceans and larvae), because distribution of krill generally corresponds to the area seasonally covered by pack ice. In vivo fluorescence was determined on ice core samples taken at six stations. Maximum fluorescence was usually much higher in the ice cores than in surface water except at stations south of latitude 75. Maximum fluorescence at a sample station was observed at a depth of 60-70 cm (189 units), which corresponded to the maximum salinity in the ice core. The contributions of nannoplankton to primary production were studied, and feeding experiments were conducted with euphausiids and copepods. Estimates were made of the standing crop of phytoplankton and concentrations of extracellular metabolites, adenosine triphosphate, chlorophyll-a, -b, and -c, carotenoids, phaeopigments, particulate organic carbon, particulate organic nitrogen, and dissolved organic carbon. The relation of light penetration to several parameters was studied. (Lynch-Wisconsin)
W78-11519

MACROPHYTIC VEGETATION OF THE RIVER SWALE, YORKSHIRE,
Durham Univ. (England). Dept. of Botany.
N. T. H. Holmes, and B. A. Whitton.
Freshwater Biology, Vol. 7, No. 6, p 545-558, 1977. 4 fig, 6 tab, 27 ref.

Descriptors: *Swale River(England), *Macrophytes, *Aquatic plants, *Water transfer, *Distribution, England, Rivers, Tees River(England), Bryophytes, Angiosperms, Baseline studies, Floral lists, Riparian plants, Banks, Submerged plants, Habitats, Environmental effects.

The River Swale (Yorkshire, England) is likely to receive water from the River Tees as part of a future water transfer scheme, and a description is given here of the macrophytic vegetation of the River Swale in 1976 as a baseline for later comparison. The survey, made in July 1976 by recording the presence or absence of macrophytes within selected 0.5-km sections of the river, with subjective estimates of relative abundance, resulted in identification of 132 species of photosynthetic plants. A total of 14 sites, with four consecutive 0.5-km lengths at each site, were investigated. The river can be divided into three zones on the basis of physical features and vegetation: (1) Upper zone--rocky substrata, fast flows, and a macrophytic vegetation composed largely of bryophytes. (2) Middle zone--unconsolidated substrata, and a relatively sparse macrophytic vegetation. (3) Lower zone--silted, with a macrophytic vegetation consisting mostly of angiosperms. Of the 132 macrophytes, 33 were restricted to river habitats (submerged at least 85% of the year), 50 to bank habitats (submerged 40-85% of the year), and 49 occurred in both habitats. Comparison of the flora of the Swale and the Tees shows that 11 species of river angiosperms present in the Tees above the projected abstraction point are absent from the Swale above the Future inflow point. No species of the Tees are likely to spread rapidly in the Swale upstream from the inflow point, unless the Swale were to become regulated by an upstream reservoir. (Lynch-Wisconsin)
W78-11520

THE TEMPORAL AND SPATIAL DISTRIBUTION OF THE VALVES OF THE DIATOM RHOICOSPHENIA CURVATA IN THE RIVER WEY,
Surrey Univ., Guilford (England). Dept. of Microbiology.
M. O. Moss.
Freshwater Biology, Vol. 7, No. 6, p 573-577, 1977. 3 fig, 6 ref.

Descriptors: *Wey River(England), *Farnham Wey(England), *Rhoicosphenia curvata, *Diatoms, *Indicators, *Mixing, Valves, Phytoplankton, Rivers, Tributaries, England, Algae, Seasonal, Distribution, Spatial distribution.

Valves of the diatom Rhoicosphenia curvata found in the River Wey (Surrey, England) primarily at its confluence with its tributary, Farnham Wey, are a convenient bioindicator for the boundary of the mixing zone of the two bodies of water. Farnham Wey was found to be the source of R. curvata valves, which were not found in significant numbers either upstream or downstream of the confluence. The valves were most numerous in suspension in the river in summer, although the living organism is an epiphyte growing and dividing vigorously during early spring and even late winter. It is suggested that dead cells and detached valves are released into the river from its tributary during the summer, there being no evidence that R. curvata can actively divide or survive as a member of the river plankton. The unique shape of the valves makes it particularly easy to recognize in both valve and girdle views. For this study samples were collected with one-liter bottles during 1972-74 fortnightly at five stations for seasonal changes and annually (in May) at 26 stations for spatial distribution. Qualitative observations made on a small stream overflowing from a lake at the University of Surrey, in which R. curvata is a regular component of the epiphytic diatom flora, show that the diatom reproduces most vigorously on Cladophora early in the year. The decrease in numbers of valves downstream from Farnham Wey is due to sedimentation and dilution. (Lynch-Wisconsin)
W78-11521

POPULATION STRUCTURE, LIFE HISTORIES AND ABUNDANCE OF COPEPODS IN TJEUKEMEER, THE NETHERLANDS,
Limnological Inst., Oosterzee (Netherlands). Tjeukemeer Field Station.
J. Vijverberg.
Freshwater Biology, Vol. 7, No. 6, p 579-597, 1977. 9 fig, 4 tab, 53 ref.

Descriptors: *Tjeukemeer(Netherlands), *Copepods, *Life history studies, *Population, *Diapause, Netherlands, Zooplankton, Acanthocyclops robustus, Mesocyclops leuckarti, Cyclops vicinus, Eurytemore affinis, Fecundity, Reservoirs, Polders, Size, Mortality, Species composition, Seasonal, Resting stages, Water temperature, Classification.

Sampling in 1969-71 of the copepod zooplankton of Tjeukemeer, a polder reservoir in the north of the Netherlands, resulted in identification of 10 species, and revealed that all cyclopoid species go into diapause. Seasonal variation in population

cture, fecundity, and sex ratio are described. species made up more than 99% of all in- duals collected: Acanthocyclops robustus, ; Mesocyclops leuckarti, 13%; Cyclops us, 11%; Eurytemora affinis, 9%; and Dia- ops bicuspidatus, 1%. The ecology of the A. stus population differs from that in other s in that it dominates the open water zone. sonal periodicity in abundance of each species consistent during the three years of the study. cyclopoid species A. robustus and M. ckarti go into diapause during the winter, e D. bicuspidatus and C. vicinus vicinus go diapause during summer. Most species un- go diapause in a particular copepodite stage. n population structure and sex ratio are in- nced by diapause and size dependent mortali- Fecundity is more influenced by water tem- ture and age structure of the female popula- than by food conditions or size of females. epods represent 15-20% of mean annual plankton biomass. They are dominant over oceans in winter and early spring and often ng autumn, but reach highest densities in late ng and summer. (Lynch-Wisconsin)
8-11522

NTER APPLIED MANURE: EFFECTS OF NUAL RUNOFF, EROSION, AND NUTRIENT VEMENT,
icultural Research Service, Morris, MN.
primary bibliographic entry see Field 5G.
8-11524

RCURY AND CHLORINATED HYDROCAR- NS IN PLANKTON OF LAKE PAIJANNE, LAND,
askyla Univ. (Finland). Dept. of Biology.
primary bibliographic entry see Field 5B.
8-11526

FICACY OF COPPER SULPHATE IN THE PRESSION OF APHANIZOMENON FLOS- UE BLOOMS IN PRAIRIE LAKES,
heries and Marine, Winnipeg (Manitoba). shwater Inst.
primary bibliographic entry see Field 5G.
8-11527

SPONSE TO POLYCHLORINATED BIPHEN- S OF MARINE PHYTOPLANKTON ISO- TES CULTURED UNDER NATURAL CONDI- ONS,
te Univ. of New York at Stony Brook. Marine ences Research Center.
D. Powers, R. G. Rowland, H. B. O'Connors, and C. F. Wurster.
plied and Environmental Microbiology Vol. 34, . 6, p 760-764, December 1977. 3 fig, 2 tab, 25 .

scriptors: *Polychlorinated biphenyls, hytoplankton, *Thalassiosira, *Plant growth, hotosynthesis, *Water pollution effects, stuarine environment, Long Island Sound, Flax nd(NY), New York, Dialysis, Tidal marshes, rbon cycle, Nutrient flux, Aroclors, lorophyll, Algae, Size, Biomass, Dinoflagel- es.

concentration of 10 micrograms/liter of lychloriated biphenyls (PCBs) substantially but nporarily suppressed growth rate and otosynthesis of two species of the marine noflagellate Thalassiosira, isolated from Long and Sound and grown in dialysis membrane gs suspended in the tidal channel of Flax Pond, estuarine marsh. Inhibition of carbon fixation peared due to reduced levels of chlorophyll-a in PCB-treated cells, but no significant loss of nction per unit of existing chlorophyll-a was ob- rved. Cell concentrations in all size classes from -18.6 microgram-equivalent spherical diameters re markedly lower in PCB-treated cultures, with total biomass equalling only 30% of control-cultures. Aroclor 1254 was the PCB used in the experiments. The growth rate of PCB-treated cells (based on optical counts) was lower than that of controls for four days in one experiment and for at least two days in the other. In the second experiment total particle concentration increased by a factor of 3.3 in control cultures during the first 24 hrs while remaining unchanged in PCB-treated cultures. Although after two days the rate of increase in particle concentration of treated cultures overtook the control rate, at four days total particle concentration of treated cultures was 46.5 ppm, compared with 143.8 ppm in controls. This study represents the first analysis of the response of recently isolated phytoplankters to PCBs under conditions of natural light, temperature, and nutrient flux. (Lynch-Wisconsin)
W78-11528

SURVEY OF THE SELENIUM CONTENT IN THE AQUATIC BIOTA OF WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
W. J. Adams, and H. E. Johnson.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 10-14, October 1977. 2 fig, 4 tab, 19 ref.

Descriptors: *Water pollution effects, *Lake Erie, *Selenium, *Zooplankton, *Fish, *Sediments, *Pollutants, *Bioaccumulation, *Food chain, Water pollution sources, Great Lakes, Lakes, Industrial wastes, Powerplants, Waste disposal, Trophic level, Size, Fallout.

A comparison of water samples from various trophic levels in the western basin of Lake Erie showed significant progressive increases in mean selenium concentrations from water to sediment, and from water to zooplankton to fish. The difference in concentrations between fish and zooplankton may, however, simply reflect relative rates of accumulation of the organisms rather than biological magnification, Average selenium content in water samples was 0.003 + or - 0.001 ppm for filtered samples and 0.023 + or - 0.004 ppm for unfiltered; higher values for the latter are attributed to suspended solids and plankton. In sediment, the mean concentration was 0.36 + or - 0.07 ppm dry wt, and in zooplankton 2.54 + or - 0.15 ppm dry wt. Ten fish species were analyzed: yellow perch (Perca flavoscens), common shiner (Notropis comutus), spottail shiner (N. hudsonius), sheepshead (Alplodinotus grunniens), carp (Cyprinus carpio), white bass (Roccus chrysops), goldfish (Carassius auratus), gizzard shad (Dorosoma cepedianum), walleye (Stizostedion vitreum), and white sucker (Catastomus commersoni). Mean dry wt concentration for all fish combined was 3.59 + or - 0.17, with a range of 1.80 (common shiner) to 8.12 (sheepshead). Average content of yellow perch was 3.32. Concentration in yellow perch was directly related to size, but no such relationship was found for other species or between sexes. Selenium values in this study were somewhat higher than for other Great Lakes areas, possibly due to heavy industrialization and the presence of many fossil fuel power plants. (Lynch-Wisconsin)
W78-11529

PHYTOPLANKTON OF AN INSHORE AREA OF GEORGIAN BAY, LAKE HURON, PRIOR TO REDUCTIONS IN PHOSPHORUS LOADING,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
K. G. Nicholls, E. C. Carney, and G. W. Robinson.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 79-92, October 1977. 10 fig, 43 ref, 1 append.

Descriptors: *Georgian Bay(Ontario Canada), *Penetang Bay(Ontario Canada), *Phytoplankton, *Phosphorus, *Nutrient removal, Ontario(Canada), Canada, Species composition, Nearshore zones, Sturgeon Bay(Ontario Canada), Floral lists, Chrysophyceae, Diatoms, Eutrophication, Lake Huron, Great Lakes, Bays, Baseline studies, Sewage treatment, Algae, Cryptomonas erosa, Biomass.

Phytoplankton were collected in Georgian Bay (Lake Huron) during ice-free periods (May-October) of 1973-74 prior to implementation of a 1974-75 phosphorus removal program at local municipal sewage works, which discharge into Penetang Bay and adjacent inshore areas. A 50% reduction in total phytoplankton biomass is predicted for Penetang Bay following reduced total phosphorus loading and certain Chrysophyceae may become more important. Diatoms (Bacillariophyceae) dominated throughout the study area, mainly Stephanodiscus astraea, S. invistitatus, Fragilaria crotonensis, F. capucina, Asterionella formosa, Tabellaria fenestrata, and Rhizosolenia longiseta. The cryptomonad Cryptomonas erosa was very abundant in Penetang Bay and constituted 20-60% of total biomass during most of the study period. Ice-free period mean biomass of total phytoplankton ranged from 1.6 cu mm/1 in Sturgeon Bay to 6.3 cu mm/1 in Penetang Bay. Predictions were based on relationships between average total phosphorus concentration, total phytoplankton density, and species composition in other Great Lakes waters and inland lakes of Ontario, Canada. Phytoplankton, chlorophyll, ad nutrient samples from Georgian Bay were collected biweekly as composite samples through the euphotic zone (twice the Secchi disk visibility). Some 150 algal taxa are listed in an appendix. (Lynch-Wisconsin)
W78-11530

DECLINES IN THE NEAR-SHORE PHYTOPLANKTON OF LAKE ERIE'S WESTERN BASIN SINCE 1971,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
K. H. Nicholls, D. W. Standen, G. J. Hopkins, and E. C. Carney.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 72-78, October 1977. 6 fig, 12 ref.

Descriptors: Phytoplankton, *Lake Erie, *Phosphorus, *Nutrient removal, *Diatoms, *Eutrophication, Algae, Great Lakes, Lakes, Nearshore zones, Canada, Ontario(Canada), Kingsville(Ontario Canada), Biomass, Water pollution control, Waste water treatment, Detergent, Phosphates, Legislation, Regulation.

A series of reductions in phosphorus inputs to Lake Erie have decreased phytoplankton density 42% in the lake's western basin, from an average biomass of 5010 Areas Standard Units (A.S.U.)/ml in 1967-70 to 2900 A.S.U./ml in 1975. Although all classes of algae have decreased, diatoms account for most of the decline in total phytoplankton since they constituted 65-80% of the total during the study period. For the study, samples of Lake Erie water were taken at approximately weekly intervals during 1967-75 from the Union water treatment plant intake at Kingsville, Ontario, Canada and analyzed for phytoplankton species composition and density. The intake, which extends 450 m offshore, draws water at a depth of 3 m. One A.S.U. is equivalent to the area of algal material subtended by 400 sq micrometers. total phosphorus loading to the western basin has been greatly reduced in recent years, particularly during 1970-71 when the average daily input from the Detroit River declined from 71.2 to 41.6 metric tons. In 1970 the Canada Water Act reduced laundry detergent phosphate content to 20%, which decreased detergent phosphate discharges to Canadian Great Lakes waters by 25-30%. In 1973 detergent phosphate content was further reduced to 5%. Michigan limited detergent phosphate content to 8.7% in 1971. Prior to such legislation, detergent phosphates contributed about 40% of total phosphorus loading to Lake Erie. (Lynch-Wisconsin)
W78-11531

STUDIES OF THE LAKE WINGRA WATERSHED: AN INTERIM REPORT,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
O. L. Loucks, R. T. Prentki, V. J. Watson, B. J. Reynolds, and P. R. Weller.
Environmental Newsletter, Vol.7 No. 8, November 18, 1977. 45 p, 9 fig, 8 tab, 37 ref, 1 append.

Descriptors: *Lake Wingra(WI), *Watersheds(Basins), *Model studies, *Ecosystems, *Eutrophication, *Aquatic weed control, Wisconsin, Madison(WI), Simulation analysis, Lakes, Land use, Urban runoff, Nutrients, Nutrient flux, Littoral, Harvesting, Water pollution control, Systems analysis, Cycling nutrients, Water pollution sources, Algae, Phytoplankton, Limiting factors, Phosphorus.

An integrated series of interdisciplinary studies was begun in 1969 at eutrophic Lake Wingra, Madison, Wisconsin, to investigate several aspects of lake processes and management problems. Initial goals were to: (1) develop hydrologic, biologic, and nutrient cycle models for a man-modified drainage basin and quantify parameters; (2) conduct simulation studies for predicting human impact on land-water interactions; and (3) determine scientific bases for water quality improvement strategies in an urban watershed. By 1974 process models for phytoplankton, macrophyte, and fish growth were developed, and three related studies were initiated: (1) littoral zone model development, (2) role of consumers in aquatic phosphorus cycling, and (3) land-water interactions. In 1975 another study, 'littoral zone primary production, decomposition, and role in land-water interactions,' was begun; overall study emphasis shifted to synthesis of the separate process models and analysis through simulation of the total lake ecosystem. Results from such studies as 'analysis of nutrient dynamics in eutrophic and oligotrophic lake ecosystems' have established the validity of the systems approach. A major six-year study has been proposed to investigate 'efficacy and impact of intensive plant harvesting and nutrient detention in lake management.' The current report summarizes the progress of studies underway and describes the proposed harvesting study. (Lynch-Wisconsin)
W78-11532

THE LITTORAL AND PROFUNDAL BENTHIC NEMATODES OF LAKES WITH DIFFERENT TROPHY,
Warsaw Univ. (Poland). Zoological Inst. and Warsaw Univ. (Poland). Dept. of Hydrobiology.
K. Prejs.
Ekologia Polska, Vol. 25, No. 1, p 21-30, 1977. 1 fig, 4 tab, 23 ref.

Descriptors: *Zarnowieckie Lake(Poland), *Mikolajskie Lake(Poland), *Char Lake(Canada), *Trophic level, *Species diversity, *Nematodes, *Lakes, *Depth, *Dissolved oxygen, Abundance, Species composition, Poland, Canada, Littoral, Profundal zone, Benthic fauna, Eutrophication, Oligotrophy, Mesotrophy, Faunal list, Summer, Bioindicators.

Investigation of spcies composition, diversity, and abundance of nematudes in three lakes of different trophic levels showed the highest number of species (52) in the littoral of eutrophic Lake Mikolajskie (Poland), and the greatest number of individuals (about 700,000/sq m) in the profundal zone of oligotrophic, arctic, Char Lake (Cornwallis Island, Canada). The third lake studies was b-mesotrophic Lake Zarnowieckie, Poland. Samples were collected during the summers of 1972-74. The high species diversity in Lake Mikolajskie's littoral was particularly notable in parts overgrown by vegetation; in the profundal zone 12 species were found. In the littoral of Lake Zarnowieckie there were 16 species and in that of Char Lake 17 spcies. In contrast to the two Polish lakes, the most numerous and qualitatively-differentiated grouping of nematodes in Char Lake occurred in the profundal zone (19-26 m in depth). In Lakes Mikolajskie and Zarnowieckie the number of individuals and species gradually decreased with increasing depth. In Lake Mikolajskie the highest number of nematodes was 538,000/sq m in the littoral at a depth of 0.5 m. Usually lower numbers of nematodes and species in the profundal of eutrophic lakes compared with the littoral is due to reduced oxygen at greater depths. In Mikolajskie Lake oxygen content in near-bottom waters o the profundal zone varied from 9 mg 01/liter at 8 m to 0.3 at 22 m. In Char Lake oxygen below 24 m was 13-14 mg 01/l during summer near the bottom. (Lynch-Wisconsin)
W78-11533

POLLUTANTS FROM LAND-BASED SOURCES IN THE MEDITERRANEAN,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5B.
W78-11534

INFLUENCE OF EXTRACELLULAR POLYSACCHARIDES ON THE TOXICITY OF COPPER AND CADMIUM TO KLEBSIELLA AEROGENES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
G. Bitton, and V. Freihofer.
Microbial Ecology, vol. 4, p119-125, 1978. 4 fig., 1 tab., 30 ref.

Descriptors: *Chelation, *Cadmium, *Copper, Cytological studies, Toxicity, Mortality, Biological membranes, Heavy metals, Metals, *Bacteria, Water pollution effects, Path of pollutants, Biochemistry, Polymers, Organic compounds, *Klebsiella.

Capsular and non-capsular Klebsiella aerogenes were exposed to several levels of copper and cadmium in a series of experiments. It was found that the capsular strains were more resistant to the toxic effects of the metals. The authors concluded that the increased survival of encapsulated organisms was due to chelation of the metals by polysaccharides present in the capsule. (EIS-Deal).
W78-11536

NUTRIENTS AND PRODUCTIVITY AS INDICATORS OF THERMAL EFFLUENT UPWELLING INTERACTIONS IN LAKE MICHIGAN,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5B.
W78-11537

LONG-TERM VARIATION OF ORGANOCHLORINE RESIDUES AND ASSEMBLAGES OF EPIBENTHIC ORGANISMS IN A SHALLOW NORTH FLORIDA (USA) ESTUARY,
Florida State Univ., Tallahassee. Dept. of Biological Science.
R. J. Livingston, N. P. Thompson, and D. A. Meeter.
Marine Biology, Vol 46, p 355-372, 1978. 9 fig, 7 tab, 60 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *DDT, *Polychlorinated biphenyls, *Estuaries, *Environmental effects, *Water quality, *Path of pollutants, *Biological communities, DDD, DDE, Pesticide residues, Estuarine environment, Turbidity, Salinity, Stress, Nutrients, Nitrogen compounds, Chlorophyll, Succession, Sediments, Fish, Spatial distribution, Dominant organisms, *Apalachicola Bay(Florida), *Mirex, Anchoa.

A 4-year study determined long-term trends of organochlorine residues (DDT, DDE, DDD, PCB's, mirex) and trawl-susceptible organisms in a shallow, river dominated estuary in North Florida (Apalachicola Bay, USA). Moderate levels of such compounds were found in various species prior to the restricted use of DDT in 1972. A subsequent precipitous decline in organochlorine residues was attributable to decreased upland usage, major flushing of the river basin in early 1973, and various factors associated with estuarine function. No mirex was found in sediments or aquatic organisms. Apparently the half-life of organochlorines is relatively short in this bay system. During the study period, seasonal river flow fluctuations dominated water color, turbidity, salinity, nutrients (NO3), chlorophyll a, and the temporal succession of fishes in the bay. Relative dominance of key fish species declined and stabilized while bay-wide species richness and diversity increased with time. Population and community trends appeared consistent with other studies showing similar patterns of dominance of stress-resistant fish populations and related changes in community parameters. In this case, the relatively predictable annual succession of fish associations allowed an appraisal of key forcing functions. Although the long-term trend of relative species representation is useful as an index of stress, new techniques are needed to analyze extensive field data so that functions such as trophic interactions are included in the estimation of causal relationships. There are indications that such effects could be related to the impact of organochlorine compounds on estuarine systems. (EIS-Deal)
W78-11538

THE EFFECTS OF SIMAZINE ON THE MOLLUSCAN FAUNA OF MORIANE LAKE, NEW YORK,
State Univ. of New York Coll. at Oneonta. Dept. of Biology.
W. N. Harman.
The Nautilus, Vol 92, No 3, p 129-134, 1978. 7 fig, 1 tab, 3 ref.

Descriptors: *Mollusks, *Algacides, *Pesticide toxicity, Cyanophyta, Benthic fauna, Copper sulfate, Diquat, Toxicity, Pesticide residues, Biological communities, Epilimnion, Mortality, Lakes, Algae, Gastropods, *Simazine, Moriane Lake, New York.

The CIBA-Geigy Chemical Company treated Moriane Lake with Simazine to control undesirable blue-green algal populations in 1974 and 1975. The author was to determine the effects of these treatments on the benthic fauna. The lake was not completely satisfactory for the analysis because typical benthic communities were not present, possibly because of previous applications of copper sulphate, and Diquat. Simazine applications theoretically equalling concentrations of 0.25 and 0.5 ppm after dispersal throughout the epilimnion did not have an important effect on profundal arthropod biomass. However, applications of 0.5 ppm (after dispersal throughout the epilimnion) did have debilitating effects on littoral mollusks. Populations of Goniobasis livescens that normally reproduce throughout the summer, recovered by the spring following treatment. Simazine applications of 0.5 ppm had severely debilitating effects on sublittoral populations of Vivaparus georgianus killing most immature individuals. It is hypothesized that synergistic reactions with dying algal cells were responsible for in situ mortality of these prosobranch gastropods. (EIS-Deal)
W78-11539

PREVENTION AND TREATMENT OF NITRITE TOXICITY IN JUVENILE STEELHEAD TROUT (SALMO GAIRDNERI),
National Fisheries Research Center, Seattle, WA.
G. A. Wedemeyer, and W. T. Yasutake.
Journal of Fisheries Research Board of Canada, Vol. 35, p 822-827, 1978. 3 fig, 6 tab, 14 ref.

Descriptors: *Toxicity, *Nitrites, *Fish physiology, Hydrogen ion concentration, Bioassay, Salmonids, Rainbow trout, Nitrogen compounds, Juvenile growth stage, Growth rates, Water chemistry, Fish diseases, Alkaline water, Hardness(Water), *Methylene Blue.

The efficacy of mineral salts, pH, and tetramethylthianine (methylene blue) treatment in reducing the acute toxicity of nitrite to fingerling steelhead trout was determined using a static bioassay system at 10C. The acute toxicity was reduced by a factor of about 24 for 5-g steelhead and 13 for 10-g fish when the total water hardness was increased from 25 to 300 mg/L (as Ca CO3). NaCl or Ca Cl2 additions (0-200 mg/L) reduced toxicity by a factor of up to 3 for NaCl and 50 for Ca Cl2. Increasing the pH from 6.0 to 8.0 decreased toxicity by a factor of about 8 for the smaller and 3 for the larger fish. Methylene blue at 0.1 or 1.0 mg/L was effective in decreasing acute toxicity. For alleviating methemoglobinemia, removing the fish to freshwater for 48 h was about as effective as 1.0 mg/L methylene blue. Chronic exposure in soft water to 0.3 mg/L NO2-N for 6 mo caused no significant growth reduction, gill histological changes, hematological dyscrasias, or impaired ability of the smolts to adapt to 30o/oo seawater and grow for an additional 2 mo. (EIS-Katz)
W78-11541

EFFECTS OF DL-THYROXINE ON SWIMMING SPEED IN PEARL DANIO BRACHYDANIO ALBOLINEATUS (BLYTH),
Fordham Univ. at Lincoln Center, New York. Div. of Science and Mathematics.
A. H. Katz, and H. M. Katz.
Journal of Fish Biology, Vol. 12, p 527-530, 1978. 1 fig, 3 tab, 6 ref.

Descriptors: *Fish physiology, *Fish behavior, Animal metabolism, Biochemistry, Fish migration, Animal behavior, Food habits, Laboratory tests, Biorhythms, Bioassay, Methodology, *Pearl Danio, *Brachydanio, *Hormone, *Thyroxine.

Pearl Danios were allowed four days for acclimation in river-water filled aquaria maintained at a mean temperature of 27C. A different concentration of DL-thyroxine (T4) was added to each of two aquaria. A third aquarium served as a control and received no hormone. Photoperiod, feeding, aeration, and observer interference were controlled so as not to influence the results of the study. Mean swimming speeds for the fish in each aquarium were calculated. Compared with the control, significant increases in swimming speed were found with concentrations of thyroxine in water of 1:4 x 10 to the 6th power and 1:1 x 10 to the 6th power. The difference in swimming speed between the two hormone-treated groups was not significant. The fact that exogenous thyroxine will increase swimming speed may indicate that endogenous thyroid hormone plays a significant role in such fish behavior as migration. (EIS-Deal)
W78-11542

THE EFFECTS OF INTERMITTENT CHLORINATION ON TEN SPECIES OF WARMWATER FISH,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
A. S. Brooks, and G. L. Seegert.
Special Report No. 35, 1978, 46 p, 11 tab, 12 fig, 35 ref.

Descriptors: Freshwater fish, *Toxicity, Mortality, Bioassay, Methodology, *Chlorine, *Water temperature, Channel catfish, Sunfish, Minnows, Laboratory tests, Carp, Bass, Laboratory equipment, *Lake Michigan, Warmwater fish, *Monochloramine, *Resistant species, *Sensitive species, LC50 values, Safe levels.

Ten warmwater fish species were tested at 10, 20, and 30C to determine their resistance to monochloramine. All species exhibited an inverse relationship between temperature and LC50 values. LC50 values generally decreased by a factor of two as the exposure temperature increased from 10 to 30C. LC50 values ranged from 0.35 mg/l at 30C for the emerald shiner to 3.00 mg/l at 10C for the bluegill. Based on their overall resistance to monochloramine the fish were separated into 'sensitive' and 'resistant' emerald shiner, spotfin shiner, common shiner, channel catfish, white sucker, and sauger had 30C LC50 values ranging from 0.35 to 0.71 mg/l. 'Resistant' species, freshwater drum, white bass, bluegill, and carp, had LC50 values of 1.15-1.50 mg/l at 30C. The time to mortality was species and temperature dependent. Generally sensitive, species died earlier during the exposure regime than did resistant species. Fish also died more rapidly at higher test temperatures. Fish rarely recovered following their initial loss of equilibrium. The concentrations which produced no mortality were used to calculate safe levels for each species. Based on these calculations to protect the most sensitive species average monochloramine exposures should not exceed 0.2 mg/l for a period not to exceed 160 min/day. (EIS-Katz)
W78-11544

NITROGEN TRANSFORMATIONS WITHIN THE TROPHOGENIC ZONE OF LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
C. F.-H. Liao, and D. R. S. Lean.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 1102-1108, 1978. 2 fig., 6 tab., 19 ref.

Descriptors: *Trophic levels, *Nitrogen cycle, *Ammonia, Nitrogen compounds, Nitrogen fixation, Nitrate, Zooplankton, Absorption, Nutrients, Productivity, Plankton, Chemical reactions, Seasonal, Primary productivity, *Limnocorrals, Bay of Quinte, Ontario.

The uptake rates for ammonia and nitrate were measured in limnocorrals and in the adjacent water in the Bay of Quinte, Ontario. Even though the net change of nitrate exceeds that for ammonia over the summer, it is ammonia that is the most significant source of N for the plankton. The uptake rates were light dependent; in the dark uptake of nitrate was reduced 60-95% and ammonia by 40-70%. The uptake of N is not correlated with sedimentation, N release by zooplankton excretion, and N2-fixation. Although N2-fixation provides only a small amount of the daily N requirement compared with ammonia uptake, ammonia is rapidly recycled and the N2-fixation is the vital process controlling the amount of this essential nutrient in systems where it is in short supply (corral II). Zooplankton grazing and sedimentation (decomposition) can account for much of the ammonia regeneration but direct release of ammonia from the plankton appeared to be important. (EIS-Deal)
W78-11545

STRESS RESPONSE OF COHO SALMON (ONCORHYNCHUS KISUTCH) ELICITED BY CADMIUM AND COPPER AND POTENTIAL USE OF CORTISOL AS AN INDICATOR OF STRESS,
Oregon Cooperative Fishery Research Unit, Corvallis.
C. B. Schreck, and H. W. Lorz.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 1124-1129, 1978. 3 fig., 3 tab., 17 ref.

Descriptors: *Fish physiology, *Sockeye salmon, Salmonids, Toxicity, *Copper, *Cadmium, Metals, Heavy metals, Resistance, Fish diseases, Juvenile growth stages, Mortality, Animal metabolism, Stress, *Cortisol, General adaptation syndrome, Coho salmon.

Exposure of juvenile coho salmon to copper (Cu) produced a marked, dose-dependent serum cortisol elevation. Treatment with cadmium (Cd) did not elicit a cortisol elevation, even in moribund fish. Stressing salmon with sublethal levels of Cu or handling plus close confinement resulted in 'ideal' compensation (return to prestress levels) in cortisol titers. Salmon exposed to Cu had depressed serum chloride levels and reduced survival when challenged with salt water. Exposure to Cd did not influence serum chloride or the ability to tolerate salt water. Handling and close confinement produced the same cortisol elevation in controls as in Cu- or Cd-treated fish, but exposure to Cu reduced the ability of the fish to survive the stress of handling and confinement. Cortisol level and other characteristics of the General Adaptation Syndrome of stress should not be universally applied as indicators of stress in salmon. (EIS-Deal)
W78-11546

DETERMINATION OF VOLATILITY AND CHEMICAL PERSISTENCE OF LIPID-SOLUBLE HALOGENATED ORGANIC SUBSTANCES IN MARINE ORGANISMS,
Central Inst. for Industrial Research, Oslo (Norway).
For primary bibliographic entry see Field 5A.
W78-11548

SIX POLLUTED LAKES: A PRELIMINARY EVALUATION OF THE TREATMENT AND RECOVERY PROCESSES,
Uppsala Univ. (Sweden). Algal Assay Lab.
For primary bibliographic entry see Field 5G.
W78-11549

DDT AND PCB LEVELS AND REPRODUCTION IN RINGED SEAL FROM THE BOTHNIAN BAY,
Oulu Univ. (Finland). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-11550

DAPHNIA MAGNA AS A BIOASSAY SYSTEM FOR HISTAMINE IN TUNA EXTRACTS,
California Univ., Davis. Inst. of Marine Resources.
For primary bibliographic entry see Field 5A.
W78-11551

IONIZATION OF AMMONIA IN SEAWATER: EFFECTS OF TEMPERATURE, PH, AND SALINITY,
Sea Research Foundation, West Hartford, CT. Inst. for Aquarium Studies.
C. E. Bower, and J. P. Bidwell.
Journal of the Fisheries Research Board of Canada, vol. 35, p1012-1016, 1978. 5 tab, 19 ref.

Descriptors: *Toxicity, *Ammonia, *Ionization, Chemical reactions, Water temperature, Salinity, Hydrogen ion concentration, Sea water, Marine fish, Water chemistry, Chemical analysis, Nitrogen compounds.

Previous studies have shown that the toxicity of ammonia to freshwater fishes depends on the ambient concentration of the un-ionized fraction (NH(3)) and have quantified the percent NH(3) in solution as a function of temperature and pH. If NH(3) is also toxic to marine fishes, the effect of salinity on the ionization of ammonia must also be considered. The percent NH(3) over ranges of temperature, pH, and salinity common in seawater-culture situations is presented here. (EIS-Deal)
W78-11553

LEAD ENRICHMENT IN SHELLS OF MYTILUS EDULIS,
Uppsala Univ. (Sweden). Dept. of Paleontology.

U. Sturesson.
Ambio, Vol. 5, No. 5-6, p253-256, 1976. 1 tab, 4 fig, 23 ref.

Descriptors: *Mussels, *Lead, *Path of pollutants, *Absorption, *Shellfish, *Bioindicators, Mollusks, Invertebrates, Metals, Heavy metals, Carbonates, Adsorption, Laboratory tests, Analytical techniques, *Bioconcentration, *Periostracum.

The enrichnent of lead in the shells of Mytilus edulis has been studied. The animals were bred in tanks with seawater, spiked with lead at concentrations of 0, 0.02, 0.10, and 0.50 microgram PB/g seawater. The shells were fractioned into periostracum, calcitic/aragonitic calcium carbonate and intercrystalline organic matrix. The samples were analyzed with the differential pulse anodic stripping technique (DPAS). All of the examined fractions were found to concentrate lead; the highest values were found in older parts of the periostracum and in the newly formed calcium carbonate. (EIS-Katz)
W78-11554

PCB LEVELS CORRELATED WITH PATHOLOGICAL CHANGES IN SEAL UTERI,
Oulu Univ. (Finland). Dept. of Zoology.
E. Helle, M. Olsson, and S. Jensen.
Ambio, Vol. 5, No. 5-6, p261-263, 1976. 3 fig, 3 tab, 12 ref.

Descriptors: *Reproduction, *Animal pathology, *Polychlorinated biphenyls, *Pesticides, *Marine animals, *Mammals, *Sterility, Animal physiology, Pathology, Chlorinated hydrocarbon pesticides, Populations, DDT, Water pollution effects, *Baltic Ringed Seals, *Baltic Sea.

About 40 percent of a sample of Baltic ringed seal females of reproductive age showed pathological changes of the uterus. The uterine hormones were closed by stenosis and occlusions, preventing any passage from the ovary out through the horn. This explains their low reproduction rate. Animals showing these changes had significantly higher levels of DDT and PCB substances than normal, pregnant females. These pathological changes were also found aong grey seal from the Baltic area, as well as among harbor seal from the Swedish west coast. It is strongly indicated that PCB is responsible for the reproductive failure of seals in the Baltic area. A significant positive correlation between DDT and PCB levels and age was found in the males but not in the females. The levels of DDT and PCB substances were somewhat lower in fetuses, than in their mothers. (EIS-Katz)
W78-11555

GROWTH OF MYTILUS EDULIS L. IN A WASTE RECYCLING AQUACULTURE SYSTEM,
Woods Hole Oceanographic Institution, MA.
R. Mann.
Aquaculture, vol. 13, p351-354, 1978. 1 fig, 3 ref.

Descriptors: *Aquiculture, *Mussels, *Commercial shellfish, Environmental effects, *Sewage, *Growth rates, Waste water disposal, Mortality, Nutrients, Recycling, Mollusks, Invertebrates, Shellfish, Laboratory tests, Water temperature, Public health, Sewage effluents, *Waste recycling.

The mussel Mytilus edulis was grown in a waste recycling aquaculture system at 14C on a diet of Phaeodactylum tricornutum and Skeletonema costatum cultured in a 15% sewage-seawater mixture. Mussels exhibited a 116% increase in mean live weight (5.5 to 11.9 g), a 718% increase in mean dry weight (0.11 to 0.90 g), and 4% mortality over a 28-week period. (EIS-Katz)
W78-11557

OXYGEN CONSUMPTION BY STICKLEBACKS (GASTEROSTEUS ACULEATUS L.) EXPOSED TO ZINC,
Queen Elizabeth Coll., London (England). Dept. of Biology.
A. E. Brafield, and P. Matthiessen.
Journal of Fish Biology, Vol. 9, No. 3, p 359-370, 1976. 9 fig., 26 ref.

Descriptors: *Respiration, Fish physiology, *Oxygen, *Sticklebacks, *Zinc, *Fish behavior, *Calcium, *Mortality, Environmental effects, Aquatic animals, Laboratory tests, Metabolism, Metals, Water quality, Hardness(Water), Lethal limit, Methodology, *Gasterosteus, *Sublethal effects.

The rate of oxygen consumption by stickle-backs has been studied by long-term continuous-flow respirometry. Exposure to 1 ppm zinc in calcium-free water causes wide variations in individual responses, but oxygen uptake tends to rise and then become extremely erratic, before declining as death approaches. Behavioral abnormalities such as increased ventilation rate, loss of balance, and long periods of inactivity alternating with spasmodic swimming also occur. Exposure to 6.5 ppm zinc in high-calcium water generally causes a rise in oxygen consumption, followed by fluctuations in the rate of uptake, but no behavioral abnormalities occur and deaths are rare even after exposure for 400 h. If restored to zinc-free water after 40 h exposure to zinc, recovery is generally complete, although fluctuating rates of oxygen uptake persist. These results are discussed in relation to previous work on the effects of heavy metals on fish respiration.
W78-11558

ANTHROPOGENIC SUBSTANCES IN SEAL FROM THE BALTIC: METHYL SULFONE METABOLITES OF PCB AND DDE,
Stockholm Univ. (Sweden). Wallenberg Lab.
S. Jensen, and B. Jansson.
Ambio, Vol. 5, No. 5-6, p 257-260, 1976. 4 fig, 16 ref.

Descriptors: *Polychlorinated biphenyls, *DDE, *Pesticide residues, *Mammals, *Marine animals, *Path of pollutants, *Analytical techniques, DDT, Chlorinated hydrocarbon pesticides, Metabolism, Methodology, Mass spectrometry, Reproduction, Water pollution effects, Pesticides, Halichoerus, Pusa, Phoca, Seals.

Methyl sulfone metabolites of PCB and DDE have been found in grey seal from the Baltic. This was accomplished using a new clean-up method in which the substances were extracted from 90 g of isolated fat by the means of acetonitrile. These hitherto unknown metabolites are soluble in concentrated sulfuring acid, which could be used for their isolation. The concentrations of the sulfones of DDE and PCB in seal blubber were estimated to be 4 and 16 ppm, respectively. The metabolic origin of these substances was verified by mink fed with DDE and PCB. (EIS-Katz)
W78-11559

THE EFFECTS OF 1973 SPRING FLOODWATERS ON OYSTER POPULATIONS IN LOUISIANA,
Louisiana Wildlife and Fisheries Commission, New Orleans, LA.
R. J. Dugas, and W. S. Perret.
In: Proceedings of the 29th Annual Conference of the South Eastern Association of Game and Fish Commissioners, October 12-15, 1975. p 208-214. 4 fig, 15 ref.

Descriptors: *Commercial shellfish, *Oysters, Environmental effects, *Floods, *Floodwater, *Mortality, Salinity, Sedimentation, Mollusks, Invertebrates, Water temperature, Public health, Suspended solids, *Louisiana, 1973 Spring Flood.

A total of 122,700 acres of leased oyster bottoms were adversely affected by the floodwaters of 1973. This represented 68 percent of the leased oyster grounds in Louisiana. Additionally, much of the public natural 'Oyster Seed Grounds' were subjected to unusually low salinities, siltation and vegetation overburden. This resulted in loss of a portion of the 1973 seed oyster crop. (EIS-Katz)
W78-11560

THE SALINITY TOLERANCE OF OPHIOTHRIX ANGULATA (SAY) (ECHINODER-MATA: OPHIUROIDEA) IN LATITUDINALLY SEPARATE POPULATIONS,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
S. E. Stancyk, and P. L. Shaffer.
Journal of Experimental Marine Biology and Ecology, Vol. 29, p 35-43, 1977. 2 fig., 20 ref.

Descriptors: *Salinity, *Crustaceans, *Resistance, *Animal populations, Environmental gradients, Environmental effects, South Carolina, Florida, Invertebrates, Populations, Distribution patterns, Animal physiology, Laboratory tests, Animal behavior, *Ophiothrix angulata, *Salinity tolerance.

Ophiothrix angulata from an estuary in South Carolina were less tolerant of reduced salinity than those from an estuary in Florida. Animals from North Inlet, South Carolina, became incapacitated more rapidly after exposure to a reduced salinity, and were less able to recover after return to normal salinity. This difference probably results from the more severe selection for salinity tolerance at Cedar Key, Florida. The Florida estuary has a lower average salinity (25 0/00) than that in South Carolina (30 0/00), and has more frequent extended periods of reduced salinity. The two populations are of different color varieties and size: there may be differences in the breeding seasons as well. The South Carolina and Florida populations of Ophiothrix angulata may represent different races. (EIS-Katz)
W78-11561

THE EFFECT OF HEATED EFFLUENT ON EGG PRODUCTION IN THE ESTUARINE PRAWN UPOGEBIA AFRICANA (ORTMANN),
Rhodes Univ., Grahamstown (South Africa). Dept. of Zoology and Entomology.
B. J. Hill.
Journal of Experimental Marine Biology and Ecology, Vol. 29, p 291-302, 1977. 3 fig., 3 tab., 13 ref.

Descriptors: *Reproduction, *Aquiculture, *Heated water, *Water temperature, *Shellfish, *Fecundity, Environmental effects, Animal behavior, Invertebrates, Crustaceans, Thermal powerplants, Temperature, Populations, Animal physiology, Fertility, Thermal pollution, Upogebia, Prawns.

Egg production of a population of Upogebia africana in a pond containing water heated by a thermal power station at Knysna, South Africa was compared with that of the population in the adjacent estuary and in two other estuaries. The breeding cycle, proportions of ovigerous females, incubation time for eggs at different temperatures, number of eggs produced, sex rations, and size-frequency of males and females were all investigated. The number of eggs produced/100 prawns was found to be nearly twice as high in the population exposed to heated effluent as compared with the population in the adjacent estuary. The increase was due to a combination of a change in sex ration resulting in more females in the population and a greater proportion of larger females in the pond. Since the number of eggs produced/female is positively related to the size of the prawn, large females in warmer water produced more eggs than smaller females in the adjacent estuary. Exposure to heated effluent did

not alter the initiation or duration of the breeding season, nor cause precocious maturity: nor did it alter the number of eggs carried per female at various sizes. (EIS-Katz)
W78-11562

TOXICITY OF POLYNUCLEAR AROMATIC HYDROCARBONS TO THE POLYCHAETE NEANTHES ARENACEODENTATA,
Texas A and M Univ., College Station. Dept. of Biology.
S. S. Rossi, and J. M. Neff.
Marine Pollution Bulletin, Vol 9, p 220-223, 1978. 1 fig, 2 tab, 20 ref.

Descriptors: *Aromatic compounds, *Toxicity, *Worms, Bioassay, Organic compounds, Solubility, Chemical analysis, Chemical reactions, Spectrophotometry, Path of pollutants, Animal physiology, Sea water, Mortality, Marine animals, *Polychaetes, *Neanthes, *Naphthalenes, Polynuclear aromatic hydrocarbons.

The toxicity of ten polynuclear aromatic hydrocarbons (PNAs) was studied in replicate 96 h bioassays with specific hydrocarbons in solution. PNA toxicity and residence time in test solutions were directly related to molecular weight (MW), while relative solubility is inversely related to MW. PNA toxicity appears to be related to both solubility and residence time in test solutions. (EIS-Deal)
W78-11563

EXPERIMENTAL STUDIES ON THE ACCUMULATION OF COPPER AND ZINC IN THE GREEN MUSSEL,
National Institute of Oceanography, Panjim (India).
C. D'Silva, and T. W. Kureishy.
Marine Pollution Bulletin, Vol 9, p 187-190, 1978. 3 fig, 2 tab, 21 ref.

Descriptors: *Copper, *Zinc, *Toxicity, *Mussels, Bioassay, Absorption, Spectrophotometry, Metals, Path of pollutants, Animal physiology, Animal behavior, Animal metabolism, *Bioaccumulation, *Mytilus, *Tissue analysis.

Toxicity of copper and zinc to the green mussel was evaluated by short-term bioassays. The rates of copper and zinc accumulation were determined by analysing the metal content in the soft parts of the mussels at fixed intervals of time by atomic absorption spectrometry. Bioaccumulation was determined as a function of metal concentration in the experimental medium. The correlations for the regression lines (P less than 0.1%) indicate that the uptake of metal is linear at least for the first five weeks. During a more extended experimental period, adjustment to a steady state probably occurs. (EIS-Deal)
W78-11564

IN SITU UPTAKE OF MERCURY BY THE INTERTIDAL MUSSEL, MYTILUS CALIFORNIANUS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-11565

ESTIMATION OF TOXICITY USING CULTURED MAMMALIAN CELLS OF THE ORGANIC POLLUTANTS RECOVERED FROM LAKE BIWA,
Kyoto Inst. of Public Health (Japan).
S. Maruoka.
Water Research Vol. 12, 1978, p 371-375, 1 tab., 4 fig., 17 ref.

Descriptors: *Bioassay, *Toxicity, *Public health, Water pollution effects, *Methodology, Chemical analysis, Organic wastes, *DDT, Laboratory tests, Monitoring, *Lake Biwa(Japan), *Cultured mammalian cells, Organic pollutants, Seasonal variation.

Cultured mammalian cells were used to examine the toxicity of the organic pollutants present in Lake Biwa. The pollutants were adsorbed on activated carbon and extracted respectively with methylene chloride, chloroform, acetone, and ethanol. It was found that the toxicity of the extracted organic pollutants varied markedly with the solvent used. The results herein suggest that substances extractable with methylene chloride are most important for estimating the organic pollution in aquatic environments. The conspicuous seasonal variation in the toxicity, as well as the concentration, of methylene chloride and chloroform extractable substances was marked.
W78-11566

THE EFFECT OF HEATED EFFLUENTS FROM POWERPLANTS ON SEAGRASS (THALASSIA) COMMUNITIES QUANTITATIVELY COMPARING ESTUARIES IN THE SUBTROPICS TO THE TROPICS,
Miami Univ. FL. Dept. of Microbiology.
A. Thorhaug, N. Blake, and P. B. Schroeder.
Marine Pollution Bulletin, Vol. 9, No. 7, p 181-187, 1978. 3 tab., 4 fig., 21 ref.

Descriptors: *Water temperature, Thermal properties, *Estuaries, Effluent streams, *Tropical regions, *Marine algae, Water pollution effects, *Thermal stress, Thermal water, Thermal pollution, Gulf of Mexico, Plant grouping, Florida, Puerto Rico, Caribbean, Guayanilla Bay, Turkey Point, Card Sound, Tampa Bay, Thalassia.

The need for most efficient use of energy is abruptly in conflict with the need to maintain environmental quality in terms of heated effluents released from power plants. This study synthesizes biological results found from four effluent canals from power plants releasing heat on shallow estuaries: tropics, edge of tropics and subtropics. The dominant near-shore community in the Gulf of Mexico and Caribbean is that of Thalassia, rich in animal and plant abundance and biomass. Summer mean temperatures in all three estuaries ranged around 30C. Results show sustained temperatures of +5C in summer denude the area of the Thalassia community. Temperatures +1 and +1.5C were minimally damaging to the studied areas and can be considered rational release temperatures. Insufficient data was available at +2C to make a statement; +4C areas showed intense damage to the biological communities at all locations; +3C effect varied from severe damage in the subtropics to 40% damage in the tropics. Recommended summer heated effluents release for power plants eliminating heat onto Thalassia beds would certainly never be greater than +3C. A trade-off decision must be made by decision-makers as to +3 or +2C as the upper permissable limit. Winter release of effluent temperature in areas where winter temperatures fall below 25C could be above +3C apparently with damage. Tropical and subtropical ecosystems are on the brink of disaster and small increments of change by man's activities can push them beyond tolerance limits. Evidently the marine tropics differ from marine temperate zones in thier capacity to assimilate man's activities. (EIS)-Katz)
W78-11568

HEAVY METALS IN THE BURROWING BIVALVE SCROBICULARIA PLANA FROM CONTAMINATED AND UNCONTAMINATED ESTUARIES,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
G. W. Bryan, and L. G. Hummerstone.
Journal of the Marine Biological Association of the United Kingdom, vol. 58, 1978, p401-419. 6 tab, 7 fig, 9 ref.

Descriptors: *Metals, Silver, Cadmium, Cobalt, Chromium, Copper, Iron, Manganese, Nickel, Lead, Zinc, Molluscs, Benthos, Marine animals, Path of pollutants, Mine wastes, Water pollution, Effects, Bioindicators, Sediments, *Heavy metals, *Scrobicularia, *Gannel estuary, *Camel estuary, England.

Concentrations of ten metals (Ag, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn) have been analysed in the soft tissues of Scrobicularia plana (da Costa) from sites in the Gannel and Camel Estuaries in South-West England. In the Gannel Estuary, which receives wastes from old lead mines, the animals contained about an older of magnitude higher concentrations of lead, cobalt, cadmium, and zinc than in the Camel Estuary and higher concentrations of other metals also. Differences were also observed between the sediments. In both populations, less than 50% of the total silver, copper and iron was found in the digestive gland. For the other metals over 50% occurred in this organ, and in large gannel animals, more then 90% of the lead, cobalt, cadmium and zinc, implying that they are chiefly absorbed from ingested sediment. (EIS-Katz)
W78-11570

PERIPHYTON BIOMASS OF ATTACHED ALGAE AND BIOLOGICAL ESTIMATION OF WATER POLLUTION LEVEL USING ATTACHED DIATOMS IN THE CHIKUMA RIVER AND ITS TRIBUTARY, NAGANO PREFECTURE (IN JAPANESE),
Freshwater Fisheries Research Lab. Tokyo (Japan).
Y. Furuta, K. Tanaka, and T. Ito.
Bulletin of the Freshwater Fisheries Research Laboratory, vol 27, no 2, 1977, p63-73. 4 fig, 2 tab, 5 ref.

Descriptors: *Periphyton, *Algae, *Nutrients, Water pollution effects, Domestic wastes, Sewage, Water quality, *Biomass, Rivers, Path of pollutants, On-site investigations, Diatoms, *Saprobicity, Benthic diatoms, Attached algae, *Japan, *Chikuma River, *Kakuma River, Intolerant species, Tolerant species.

In the Chikuma and Kakuma Rivers, the periphyton biomass of attached algae was observed to be most abundant at stations where domestic sewage was discharged into the rivers. In the Chikuma River, abundant periphyton biomass of the algae was observed also at the mouth of a channel from a small impoundment near the river. The situation was nearly the same with the individual number of attached algae. In the Kakuma River, organic pollution has begun at the placed where domestic sewage is discharged into the river. In the Chikuma River, pollution was observed at the mouth of a canal from an impoundment near the river. At about 6 km downstream however, the water was less polluted, and again, pollution increased further downstream near Ueda City. (EIS-Katz)
W78-11571

CONTROL OF THE BIOLOGICAL AVAILABILITY OF TRACE METALS TO A CALANOID COPEPOD IN A COASTAL FJORD,
British Columbia Univ., Vancouver. Inst. of Oceanography.
P. H. Whitfield, and A. G. Lewis.
Estuarine and Coastal Marine Science, vol. 4, no. 2, p255-266, 1976. 3 tab, 4 fig, 26 ref.

Descriptors: *Trace metals, *Copepods, *Chelation, *Bottom sediments, Environmental effects, *Fjords, *Immature growth stage, Trace elements, Organic matter, Water purification, Pollutants, Path of pollutants, Crustaceans, Invertebrates, Zooplankton, Laboratory tests, Copper, Metals, Zinc, Manganese, Euchaeta, *EDTA, *Photo-oxidation, *Indian Arm(British Columbia).

Organic material present in natural waters and in sediments was found to act in a manner which waters the availability of trace metals to the prefeeding stages of a calanoid copepod (Euchaeta japonica). In the laboratory, survival of the organism was found to decrease with a decrease in the amount of u.v. photo-oxidizable material. Replacement of the material with a known chelation agent (ethylenediaminetetraacetic acid; EDTA) increased survival. Comparison of survival in untreated water with that in different EDTA concentrations provided an EDTA equivalent value which was used to indicate the natural complexing ability fo the water. an EDTA equivalent value was also obtained for salt-water extracts of bottom sediments. Examination of a coastal fjord over a year indicates that the natural complexing ability of the deep water increases after a major intrusion of deep water and decreases with increasing residence time of the water. In contrast, the complexing ability of saltwater extractable material in bottom sediments appears to be dependent upon nearsurface productivity. (EIS-Katz)
W78-11572

AN EVALUATION OF THE EFFECT OF DRAWDOWN ON THE TROPHIC STATUS OF A SMALL RESERVOIR,
Georgia Coll., Milledgeville. Center for Environmental Study and Planning.
For primary bibliographic entry see Field 5G.
W78-11576

DETERGENT PHOSPHATE BAN.
Environmental Protection Agency, Chicago, IL. Phosphorus Committee.
For primary bibliographic entry see Field 5G.
W78-11581

NITROGEN FIXATION WITH PHOTOSYNTHETIC MARINE MICROORGANISMS; SIX MONTHS RESEARCH PROGRESS REPORT,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL. Div. of Biology and Living Resources.
A. Mitsui.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 269, Price codes: A02 in paper copy, A01 in microfiche. Report NSF/RA-770293, 1977. 21 p, 2 fig, 5 tab. AER 76-17159.

Descriptors: *Photosyntheses, *Nitrogen fixation, *Marine microorganisms, *Cyanophyta, *Aquiculture, Tropical regions, Caribbean Sea, Florida, Oceans, Marine algae, Solar radiation, Nitrogen, Algae, Fertilizers, Foods.

Six month's progress is reported for a project to develop a mass culturing system for nitrogen-fixing marine photosynthetic microorganisms, potentially applicable to commercial food and fertilizer production without expenditure of nonrenewable resources. The research plan consists of: (1) collecting marine photosynthetic organisms in the tropical Caribbean and south Florida areas characterized by high species diversity; (2) isolating and culturing individual species, with determination of nitrogen-fixing species; (3) testing selected isolates for growth and nitrogen-fixing capabilities under ideal conditions; (4) biochemical evaluation of the isolates for applicability as a source of food and fertilizer; tests will include measures of protein, carbohydrate, lipid, vitamin, and mineral content; and (5) designing a pilot plant and determining economic feasibility of widespread utilization. Collection of marine blue-green algae has proceeded as scheduled. Photosynthetic nitrogen-fixing cultures have been established which display wide morphological diversity, in many cases coupled with fast growth rates in combined nitrogen-free medium. Dominant algal growths in the nitrogen-free cultures are filamentous and colonial cyanophytes. Each salinity/pH combination tested proved optimal for at least one algal strain. (Lynsh-Wisconsin)
W78-11582

THE QUANTITATIVE STIMULATION OF PHYTOPLANKTON PRODUCTIVITY BY DEEP WATER ADMIXTURE IN A COASTAL INLET,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
T. Platt, D. V. Subba Rao, and K. L. Denman.
Estuarine and Coastal Marine Science, Vol 5, No 5, p 567-573, 1977. 3 fig, 1 tab, 23 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Upwelling, *Eutrophication, *Mixing, *Bottom water, *Laboratory tests, Deep water, Inlets(Waterways), Bedford Basin(Nova Scotia Canada), Nova Scotia(Canada), Canada, Coasts, Biomass, Chlorophyll, Nutrients, Inorganic compounds, Algae, Carbon radioisotopes, Skeletonema costatum, Ultraflagellates, Diatoms, Dinoflagellates, Chelation, Organic compounds.

Surface seawater samples from Bedford Basin (Nova Scotia, Canada) were enriched with bottom water from 65 m depth at concentrations of 0, 0.25, 0.5, 0.75, 1.0, 1.5, and 2.0% to measure effects on surface primary productivity. Optimal enrichment was 0.75%, suggesting that newly upwelled water might not naturally sustain maximum productivity until it is diluted about 100-fold, estimated to require about 10 days. It is hypothesized that newly upwelled water contains some inhibitory factor related to chelation, the effect of which is diminished by dilution. Silicate is known to behave this way under certain circumstances. Inorganic nutrients measured in this study did not constitute the stimulatory factor; the growth factor could be cancelled by shaking with activated charcoal. This and earlier studies indicate that calculation of the potential stimulation of primary production by artificial upwelling is more subtle than has been supposed. It is not sufficient to account for inorganic enrichment only; the effect of added organic compounds may be of equal or greater importance. At 0.75% enrichment a 4-fold increase in carbon-14 uptake rate and a 1.4-fold increase in the productivity-to-biomass ratio occurred. It is likely that stronger stimulation of phytoplankton would have resulted if surface waters were lower in inorganic nutrients. Unidentified ultraflagellates numerically dominated all enriched cultures. (Lynch-Wisconsin)
W78-11583

ASSIMILATION OF CO2 IN THE DARK COMPARED TO PHYTOPLANKTON PRODUCTION IN A SMALL COASTAL INLET,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Fisheries and Marine Service.
S. Taguchi, and T. Platt.
Estuarine and Coastal Marine Science, Vol. 5, No. 5, p 679-684, 1977. 3 fig, 1 tab, 13 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Dark, *Carbon dioxide, *Absorption, *Photosynthesis, *Inlets(Waterways), *Estuarine environments, Coasts, Carbon fixation, Eutrophication, Bedford Basin(Nova Scotia Canada), Nova Scotia(Canada), Canada, Diurnal, Annual, Seasonal, Adenosine triphosphate, Depth, Estuaries.

Photosynthetic production and dark assimilation of carbon dioxide-14 were measured October 1973-December 1974 in Bedford Basin (Nova Scotia, Canada), a small nutrient-enriched coastal inlet, to compare relative magnitudes of light and dark fixation of carbon averaged over a year. Sampling was carried out biweekly at a station with a depth of 70 m. CO2-14 dark assimilation varied from 20% (summer) to 200% (winter) of assimilation in the light. Annual dark CO2 fixation was estimated at 50 g c/sq m/year (with standard deviation of seven g C/sq m/year), or about 25% of the estimated annual photosynthetic production of 200 g C/sq m/year. Maximum dark assimilation was 41.3 mg C/cu m/day (in July at 2.5 m). Differences between dark and light assimilation include: (1) Dark uptake varies much less with depth than does photosynthesis as the former is independent of the vertical gradient of light and responsible organisms are apparently distributed throghout the water column; results for adenosine triphosphate are consistent with this conclusion. (2) Dark uptake in Bedford Basin is less seasonal than photosynthetic production; dark uptake varied five-fold during the year, compared with a ten-fold variation for photosynthetic assimilation. Photosynthetic and dark fixation are not necessarily independent phenomena; organisms from the illuminated zone enclosed in dark bottles may respond with light-initiated dark reactions, which could account for a proportion of the apparent dark uptake. (Lynch-Wisconsin).
W78-11584

A SEASONAL STUDY OF THE DISTRIBUTIONS OF SURFACE STATE VARIABLES IN LIVERPOOL BAY. I. WINTER DATA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W78-11585

ENVIRONMENTAL IMPACTS OF MECHANICAL HARVESTING OF SUBMERSED VASCULAR PLANTS,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5G.
W78-11586

SEASONAL PERIODICITY OF DIATOMS, AND SILICON LIMITATION IN OFFSHORE LAKE MICHIGAN, 1975,
Argonne National Lab., IL. Radiological and Environmental Research Div.
J. I. Parker, H. L. Conway, and E. M. Yaguchi.
Journal of Fisheries Research Board of Canada, Vol. 34, No. p 552-558, 1977. 4 fig, 25 ref.

Descriptors: *Lake Michigan, *Diatoms, *Eutrophication, *Silicon, *Limiting factors, *Seasonal, Periodicity, Lakes, Great Lakes, Algae, Phytoplankton, Biomass, Nutrients, Cycling nutrients, Plant growth, Pigments, Primary productivity, Chlorophyll, Euphotic zone.

A critical silicon concentration of about 6.5 micromols/liter may control the development and timing of offshore diatom populations in Lake Michigan. Samples were collected on monthly cruises January-December 1975. Diatom biomass maxima occurred in spring and fall, producing a bimodal sequence. The May maximum was preceded by rapid growth as indicated by increased values of primary productivity and pigment concentration. As the spring bloom progressed, decreasing nutrient levels apparently slowed diatom growth; the diatom biomass accumulation rate declined, assimilation quotients were minimal, and soluble reactive silicon was reduced from 13 to 6.8 micromols/liter. In summer, following the bloom, diatom biomass and silicon reached seasonal minima of < 250 mg C/sq m and about 1.0 micromols/liter respectively. Diatom biomass increased again in October when silicon supplies were replenished and the concentration exceeded 6.6 micromols/liter, indicating that the fall diatom bloom is regulated by the restoration of dissolved reactive silicon concentrations in the euphotic zone to the level of the limiting concentration. Restoration of available silicon is dependent upon dissolution of amorphous silica and redistribution of dissolved silicon from deeper water into the euphotic zone. (Lynch-Wisconsin)
W78-11587

DISSOLUTION OF DIATOM FRUSTULES AND RECYCLING OF AMORPHOUS SILICON IN LAKE MICHIGAN,
Argonne National Lab., IL. Radiological and Environmental Research Div.
J. I. Parker, H. L. Conway, and E. M. Yaguchi.
Journal of Fisheries Research Board of Canada, Vol. 34, No. p 545-551, 1977. 5 fig, 3 tab, 18 ref.

Descriptors: *Lake Michigan, *Diatoms, *Frustules, *Silicon, *Recycling, *Eutrophication, *Sediments, Algae, Phytoplankton, Great Lakes, Lakes, Sedimentation, Sediment traps, Dissolution, Nutrients, Cycling nutrients.

Use of a sediment core and sediment traps in Lake Michigan southwest of Grand Haven, Michigan, 13.5 km offshore to measure the concentration of diatom frustules and amorphous silicon suggests that recycling of biogenic silicon provides the major source of soluble reactive silicon required for diatom blooms in Lake Michigan. Traps were anchored 37 and 60 m deep; the concentration of frustules and silicon was measured per gram dry sediment at five-m intervals in the upper water column (0-40 m). An average concentration of 314 million frustules per gram of dry suspended sediment in the water column was measured. The average for the 37-m trap sample was 116 million frustules/g dry sediment, and for the 60-m sample, 50.3 million. Subsamples from the sediment core averaged 6.31 million frustules/g dry surficial sediment. The average proportion of amorphous silicon/g dry sediment was 8.6% in the water column, 7.7% in the 37-m traps, 6.0% in the 60-m traps, and < 2.0% in the sediment core subsamples. The major fraction of amorphous silicon produced annually as diatom frustules was decomposed before incorporation in the permanent sediment. Comparison of the annual silicon requirement for diatom production and silicon inputs showed the watershed contributes under 5% of the dissolved reactive silicon required for annual diatom production. (Lynch-Wisconsin)
W78-11588

THE SPECIES DIVERSITY, NUMBERS AND BIOMASS OF BENTHIC NEMATODES IN CENTRAL PART OF LAKES WITH DIFFERENT TROPHY,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
K. Prejs.
Ekologia Polska, Vol. 25, No. 1, p 31-44, 1977. 4 fig, 4 tab, 23 ref.

Descriptors: *Trophic level, *Species diversity, *Abundance, *Biomass, *Nematodes, *Profundal zone, *Lakes, Poland, Canada, Norway, Lake Mikolajskie(Poland), Lake Zarnowieckie(Poland), Char Lake(Canada), Diversity indices, Dissolved oxygen, Oligotrophy, Dystrophy, Eutrophication, Depth, Benthic fauna, Faunal lists, Shannon diversity index.

A study of benthic nematodes in the central parts of 17 Polish, Canadian, and Norwegian lakes of different trophic levels showed greatest abundance, biomass, and number of species in oligotrophic Lakes Zielony Gasienicowy (Poland) and Char (Canada), and lowest in very eutrophic and dystrophic lakes. A correlation (r=0.84) was found between species diversity and lake trophic level; as water quality decreased from oligotrophy to eutrophication, species diversity expressed by the Shannon index (H) decreased. Three groups of lakes with similar species composition were distinguished: (1) oligotrophic Tatra lakes, (2) lowland lakes with advanced eutrophication and dystrophy, and (3) mesotrophic and moderately eutrophic lakes. Tobrilus gracilis and Monhystera paludicola were the most common species in the profundal zone of highly eutrophic and dystrophic lakes. It is assumed that low oxygen concentrations in near-bottom waters is a major factor limiting nematode distribution in the profundal zone of eutrophic lakes. Analysis of nematode groupings showed that species diversity can be used for evaluation of trophic level, and can even constitute an index of the lake degradation process. The study centered on Lakes Mikolajskie, Zarnowieckie, and Char, with Lake Mikolajskie studied most intensively. Field studies were carried out in summer, primarily in July. (Lynch-Wisconsin)
W78-11589

THE NEMATODES OF THE ROOT REGION OF AQUATIC MACROPHYTES, WITH SPECIAL CONSIDERATION OF NEMATODE GROUPINGS PENETRATING THE TISSUES OF ROOTS AND RHIZOMES,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
K. Prejs.
Ekologia Polska, Vol. 25, No. 1, p 5-20, 1977. 3 fig, 8 tab, 24 ref.

Descriptors: *Nematodes, *Roots, *Rhizomes, *Macrophytes, *Lake Mikolajskie(Poland), Lakes, Poland, Littoral, Aquatic plants, Hirschmanniella, Chrysonemoides, Dorylaimoides, Dorylaimus, Mesodorylaimus, Potamogeton perfoliatus, Potamogeton lucens, Sagittaria sagittifola, Nuphar luteum.

Investigation of nematodes in the littoral of Lake Mikolajskie, Poland, during 1972-74, emphasizing those inhabiting and penetrating the roots and rhizomes of aquatic macrophytes, indicated a specific grouping associated with the root region. Nematodes in the genera Hirschmanniella, Chrysonemoides, Dorylaimoides, Dorylaimus, Mesodorylaimus, Plectus, Panagrolaimus, Chronogaster, and Chromadorita are the most numerous and permanent inhabitants of root and rhizome tissues; the first five are apparently the only ones that utilize plant tissues as a direct food. The four plant species studied were Potamogeton perfoliatus, P. lucens, Sagittaria sagittifolia, and Nuphar luteum; the contribution of underground parts to total biomass was estimated. The average number of nematodes penetrating the tissues of roots and rhizomes was 39-413 individuals in 10 g fresh wt of P. perfoliatus, and 54-106 for P. lucens. In decomposing rhizomes and in their fragments with necrotic spots, high numbers of Hirschmanniella gracilis, Chrysonemoides limigenus, Dorylaimoides ditleuseni, and members of the family Dorylaimidae were found, many more than in fresh rhizomes. Nematodes probably invade plants through various surface wounds caused by mechanical destruction of the root and rhizome surfaces, and the animals spread actively inside the rhizomes from older parts to young, growing ones. (Lynch-Wisconsin)
W78-11590

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 19-22 OCTOBER 1976, ATLANTIC BEACH, FLORIDA.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5G.
W78-11591

AQUATIC PLANT CONTROL PROGRAM--MOBILE DISTRICT--1976,
Army Engineer District, Mobile, AL.
M. J. Eubanks.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 39-41, 1 tab.

Descriptors: *Aquatic weed control, *Florida, *Louisiana, *Water hyacinth, Army Engineer South Atlantic Division, U. S. Army Engineer Mobile District, *Aquatic Plant Control Program, Eichhornia crassipes, Eurasian water milfoil, Myriophllum spicatum, Hydrilla, Giant cutgrass, Lake Seminole(FL GA), Eutrophication, Water pollution effects.

Aquatic plant control programs in the Mobile District of the U.S. Army Engineer South Atlantic Division are described. The district includes most of Alabama and parts of neighboring states, and contains six major river basins: Alabama-Coosa, Black Warrior and Tombigbee, Pascagoula, and Pearl. Major problem plants are: (1) water hyacinth (Eichhornia crassipes), (2) Eurasian water milfoil (Myriophyllum spicatum), (3) giant cutgrass, and (4) hydrilla. The most affected area of concentration is Lake Seminole (Florida and Georgia); other major problem areas are in Florida and Louisiana. Water hyacinth have infested about 7215 acres in the district, 3515 in Florida (not including Lake Seminole), 2100 in Louisiana, 800 in Lake Seminole, 500 in Alabama, 200 in Georgia, and 100 in Mississippi. Of 9000 acres of Eurasian water milfoil, 8000 are in Lake Seminole; the lake also contains 4500 acres of giant cutgrass. Of the 2000 acres of hydrilla, 1000 are in Lake Seminole and 1000 are in Lake Jackson, Florida. Four control programs (Louisiana, Georgia, Florida, and Tennessee) are in operation under the 1965 Cooperative Program Law, and two more are planned for Alabama and Mississippi. Flat-bottomed boats with boomless sprayers are generally used. (See also W78-11591) (Lynch-Wisconsin)
W78-11598

RESUME--AQUATIC PLANT CONTROL PROGRAM, WILMINGTON DISTRICT,
Army Engineer District, Wilmington, NC.
O. H. Johnson, Jr.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 49-51.

Descriptors: *Army Engineer Wilmington District, *North Carolina, *Alligatorweed, *Eurasian water milfoil, *Aquatic weed control, *Aquatic plant control program, Myriophyllum spicatum, Alternanthera philoxeroides, Biocontrol, Chemcontrol, 2-4-D, Alligatorweed flea beetle, Agasicles hygrophila, Herbicides.

The extent of infestations by alligatorweed (Alternanthera philoxeroides) and Eurasian water milfoil (Myriophyllum spicatum) in the Wilmington District of the U.S. Army Engineer South Atlantic Division is described, as well as measures for plant control. At present the primary problem is water milfoil; the scattered alligatorweed growths are no longer considered of major concern. However, even in regard to water milfoil no U. S. Army Corps of Engineers navigational projects are affected, nor are commercial or recreational high-use areas. Small boat owners, recreationists, shoreline residents, and some fishermen are those primarily inconvenienced. Little local concern or interest has been expressed, and the political future of control measures is uncertain. Limited chemical control efforts with 2,4-D were made in 1968, 1971, and 1974 with good results, but clearing lasted no more than three years. Water milfoil first appeared in 1965 in northeastern North Carolina in large, freshwater Currituck Sound, eventually covering 100,000 acres. In the early 1960s alligatorweed was the major aquatic plant problem, and it continues to infest drainage canals, small lakes, ponds, and streams in the coastal plains. Chemical control work was begun in 1960, and in 1967 releases of the alligatorweed flea beetle (agasicles hygrophila) were begun. Although the beetle successfully overwintered, the climate prevents sufficient buildup for significant control. (See also W78-11591) (Lynch-Wisconsin)
W78-11601

AQUATIC PLANT CONTROL IN THE CHARLESTON DISTRICT,
Army Engineer District, Charleston, SC.
J. L. Carothers.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on

the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 53-54.

Descriptors: *Alligatorweed, *Charleston district, *South Carolina, *Brazilian elodea, *Aquatic weed control, *Biocontrol, *Aquatic plant Control program, Army engineer Charleston district, Egeria densa, Alternanthera philoxeroides, Alligatorweed flea beetle, Agasicles hygrophila, Stem borer, Vogtia malloi, Chemcontrol, Herbicides, Silvex, 2-4-D, Santee-Cooper project(SC), Diquat, Lake Moultrie(SC), Lake Marion(SC), Eutrophication, Water pollution effects.

Brazilian elodea (Egeria densa) is currently the major aquatic plant problem in South Carolina public waters, while alligatorweed (Alternanthera philoxeroides), formerly a serious problem, has recently diminished so that no spraying was necessary in 1976. Notable elodea infestations occur in Lake Marion, the upper Cooper River and tributaries, and abandoned rice fields. Elodea, first reported in Lake Marion in 1965, had infested 10,000-20,000 acres by 1974. The only large-scale elodea control efforts were conducted in 1974 and 1975 on Lake marion with ortho diquat; treatment was effective only for a short time, followed by reinfestation and spreading to new areas. A management plan for aquatic plant control in Lakes Marion and Moultrie, which constitute the Santee-Cooper hydroelectric project, is under development. The first cooperative control program of the Charleston District of the U.S. Army Engineer South Atlantic Division, signed in 1960 and terminated in 1967, involved the South Carolina Public Service Authority (PSA). The current program with the South Carolina Department of Agriculture was begun in 1967; both programs have been directed exclusively at alligatorweed. The alligatorweed flea beetle (Agasicles hygrophila) proved more successful than the stem borer (Vogtia malloi). Herbicides have been used when needed. Under the 1960 contact the PSA provided manpower and equipment while the Federal Government furnished up to 70% of required funds and herbicides (granular Silvex and 2,4-D). (See also W78-11591) (Lynch-Wisconsin)
W78-11602

RESPONSE OF HYDRILLA TO VARIOUS HERBICIDES,
Texas Parks and Wildlife Dept., San Antonio. State Wide Noxious Vegetation Control Program.
For primary bibliographic entry see Field 5G.
W78-11613

UPTAKE AND METABOLISM OF DIMETHYLAMINE SALT OF 2,4-D BY FISH,
Syracuse Research Corp., New York.
H. C. Sikka.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 195-200, 4 tab, 6 ref.

Descriptors: *2,4-D, *Herbicides, *Bioaccumulation, *Fish, *Absorption, *Metabolism, *Aquatic Plant Control Program, Aquatic weed control, Pesticide residues, Chemcontrol, Sunfishes, Channel catfish, Carbon radioisotopes, Radioisotopes, Tracers, Eutrophication, Water pollution effects.

Tests of the ability of fish to metabolize the herbicide 2,4-D under conditions of minimal microbial degradation showed very low uptake by bluegills and channel catfish and no bioaccumulation by either fish. Carbon-14 uniformly ring-labelled 2,4-dichlorophenoxacetic acid dimethylamine salt (DMA-2,4-D) and nonradioactive DMA-2,4-D were used in the experiments. Residues of 2,4-D detected in the fish were below this chemical's established tolerance limit of 1.0 ppm. Low DMA-2,4-D uptake may be due to the herbicide being mostly present in the water in an ionized form which is less likely to chemically partition from water into fish. The findings demonstrate that the fish were unable to metabolize 2,4-D. The fish removed less than 0.5% of the carbon-14-labelled DMA-2,4-D when exposed in aquaria to water containing two ppm of the herbicide. Maximum herbicide concentration in the fish was reached within 24 hrs of treatment, and did not change significantly thereafter for seven days. Catfish removed a smaller amount than did bluegills. Fish specimens were separated into two portions for analysis: head plus viscera, and edible flesh. Most of the radioactivity absorbed was found in the head plus viscera portions and relatively low concentrations in the edible flesh. The fish did not metabolize 2,4-D during the seven days following treatment. Bluegills administered carbon-14-labelled DMA-2,4-D by intraperitoneal injection excreted 90% within six hrs of treatment. (See also W78-11591) (Lynch-Wisconsin)
W78-11614

CHARACTERIZATION AND EVALUATION OF POLYMERS CONTAINING HERBICIDES AS PENDENT SIDE CHAINS,
Wright State Univ., Dayton, OH. Dept. of Chemistry.
F. W. Harris.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 201-216, 10 fig, 3 tab, 7 ref.

Descriptors: *Herbicides, *Controlled-release herbicides, *Polymers, *Hydrolysis, *2,4-D, *Silvex, *Aquatic Plant Control Program, Aquatic weed control, Chemcontrol, Rates of application, Pendent side chains, Fenac, Monomers, Homopolymers, Copolymers, Hydrogen ion concentration, Eutrophication, Water pollution effects.

One way to reduce excessive amounts of inert polymer carrier (70-90% w/w) in controlled-release herbicides is synthesis of polymers containing herbicides as pendent side chains. Major objectives of the present research were to: (1) complete a study of hydrolysis of polymers containing 2,4-D; (2) determine effects of pH on the polymers' rates of hydrolysis; (3) synthesize and polymerize a new series of vinyl monomers containing 2,3,6-trichlorophenylacetic acid (fenac); and (4) determine rates of hydrolysis of the polymers containing fenac under carefully controlled conditions. Results: (1) Vinyl monomers containing fenac can be polymerized by free-radical techniques, but viscosities of the polymers are not as high for those prepared from vinyl monomers containing 2,4-D. (2) Homopolymers containing 2,4-D or fenac as pendent substituents will not undergo hydrolysis in water with a pH of seven or eight at 30C; increasing the length of the pendent side chains does not result in hydrolysis. (3) Copolymers containing 2,4-D or fenac and hydrophilic residues will slowly hydrolyze in water at 30C; increasing pH from seven to eight does not significantly enhance the hydrolysis rate; carboxylic acid groups are the most effective intramolecular catalyst for hydrolysis. Future research should be directed at copolymers containing herbicides and hydrophilic residues, which appear to have considerable potential as controlled-release agents. (See also W78-11591) (Lynch-Wisconsin)
W78-11615

DEVELOPMENT AND EVALUATION OF CONTROLLED RELEASE HERBICIDES,
Creative Biology Lab., Inc., Barberton, OH.
For primary bibliographic entry see Field 5G.
W78-11616

EFFICACY EVALUATION OF CONTROLLED-RELEASE HERBICIDES,
University of Southwestern Louisiana, Lafayette. Dept. of Plant Industry.
For primary bibliographic entry see Field 5G.
W78-11617

PROGRESS IN THE USE OF PLANT PARTHOGENS AS BIOLOGICAL CONTROLS FOR AQUATIC WEEDS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W78-11618

TOTAL PHOSPHORUS MODEL FOR THE GREAT LAKES, (DISCUSSION),
Cleveland State Univ., OH.
S. R. Goswami.
American Society of Civil Engineers, Journal of the Environmental Engineering Division, Vol. 104, No. 2, p 376-377, April 1978. 4 ref.

Descriptors: *Model studies, *Phosphorus, *Great Lakes, *Eutrophication, *Mathematical models, Nutrients, Limiting factors, Lakes, Seasonal, Sediments, Interstices, Algae, Phytoplankton, Settling velocity.

A critique discusses eutrophication-related oversimplifications and omissions of a proposed model of phosphorus inputs into the Great Lakes (Chapra, 1977), (See W78-03643). The model ignores seasonal variability, such as the late spring or summer peak of eutrophic conditions, when all principal parameters are catalyzed by temperature-regulating stratification. In the budget model a positive term should be included on the right-hand side of equation relating resolubilization of phosphorus to its release to the water. In attributing a sizeable fraction of incoming phosphorus to lacustrine sediments, no provision appears to have been made for phosphorus incorporation into the algal mass, unless 'S' accounts for both benthic microbial flora and fauna and the floating algal mat. The sediment surface area is assumed to be the same as the lake's surface area, which is unlikely, and the presence of interstitial water which may account for a substantial fraction of A sub s is ignored. Since input from the lakes includes many nonpoint sources, and the lakes generally do not have a uniform depth, it probably cannot be assumed that settling velocities are always independent of depth; it is not likely that the relationship between the discharge rate terms (v and A sub s) is linear. Reduction factors or coefficients should be included in equation 10 to account for the retentivity of phosphorus in overland runoff. (Lynch-Wisconsin)
W78-11623

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN, I. INTRODUCTION - THE STUDY AND THE STUDY AREA,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
D. J. Tranter.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 5, p 529-539, 1977. 7 fig, 65 ref.

Descriptors: *Indian Ocean, *Zooplankton, *Copepods, *Euphausiids, *Pteropods, *Ecosystems, *Oceanography, Oceans, Seasonal, Biomass, Hydrology, Abundance, Species composition, Biocenoses, Distribution, Currents(Water), South Equatorial Current, Nutrients, Primary productivity, Chlorophyll, Latitudinal studies, Eutrophication.

This paper introduces a series of final reports on a 1962-1963 seasonal survey of hydrology and zooplankton in the eastern Indian Ocean and

presents some important results. Besides hydrology, reports deal with zooplankton biomass, numbers, and seasonal distribution, and species of copepods, euphausiids, amphipods, and pteropods. Samples were collected at 18 stations on the 110 degree E. meridian between 9 degrees 30' and 32 degrees S. latitude. Evidence indicates that plankton biocenoses are related to Sverdrup's water masses. The South Indian Ocean Gyre acts as a basin where nutrient-depleted surface waters enter and sink; the floor of the basin, which is the permanent deep oceanic thermocline, impedes nutrient enrichment from below. Dynamic uplift on the right-hand flank of the South Equatorial Current, the major circulation feature of the study area, leads to nutrient enrichment of the euphotic zone and increased plankton production. This 'Java dome' is the major anomalous physical feature in the eastern Indian Ocean. A northern tropical zone and southern subtropical zone are recognized as subsystems within the study area. Tropical plankton and micronekton biomass exceeds subtropical biomass, with maxima in May-October. Zooplankton in the tropical zone are in phase with nutrients and productivity, but not well correlated with chlorophyll-a; zooplankton in the subtropical zone were out of phase with chlorophyll-a, which was here well-correlated with productivity. (See W78-11625 thru W78-11627) (Lynch-Wisconsin)
W78-11624

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN III. NUMERICAL ABUNDANCE AND BIOMASS,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
D. J. Tranter, and J. D. Kerr.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 5, p 557-583, 1977. 21 fig, 2 tab, 27 ref.

Descriptors: *Indian Ocean, *Zooplankton, *Abundance, *Biomass, *Distribution, *Eutrophication, *Oceanography, Nutrients, Oceans, Latitudinal studies, Ecosystems, Regression analysis, Seasonal, Diurnal, Larvae, Fish eggs, Decapods, Amphipods, Coelenterata, Copepods, Tropical regions, Subtropic, Algae.

Zooplankton samples collected August 1962-August 1963 along the 110 degree E. meridian in the eastern Indian Ocean were analyzed for abundance and biomass in relation to distribution-controlling factors. Regression analysis showed that season, latitude, and time of day were often significant causes of variance. Several organisms were more abundant by night than by day: Decapoda, Amphipoda, fish eggs, fish larvae, Coelenterata, and sometimes Copepoda. Numbers were generally high in late winter (June-September) and low in early summer, with a secondary peak in early autumn (March). Numbers were generally high at low latitudes (9-15 degrees S.) and low at high latitudes (25-32 degrees S.), except fish eggs and larvae, whose center of abundance was 24-25 degrees S. Seasonal periodicity was frequently in phase along the study section, numerical abundance reaching a peak one to two months after a general phytoplankton bloom at the onset of the southeast monsoon. Mass transport of upper waters during the south monsoon season suggests that the subtropical-tropical synchrony (despite no subtropical source of nutrient enrichment comparable to the Java dome), considerable enrichment at both the Java dome and northwest Australian shelf between May and August, and whale distribution patterns constitute a trophic sequence. The second zooplankton peak (in March) results from a summer algal bloom generated possibly by remineralization of organic matter from the previous southeast monsoon season. (See also W78-11624) (Lynch-Wisconsin)
W78-11625

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN V. ECOLOGY OF THE COPEPODA,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
D. J. Tranter.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 5, p 593-625, 1977. 15 fig, 12 tab, 76 ref.

Descriptors: *Copepods, *Indian Ocean, *Zooplankton, *Distribution patterns, *Ecosystems, *Ecology, *Computer programs, *Oceanography, *Species composition, Oceans, Temporal distribution, Spatial distribution, Faunal lists, Species diversity, Seasonal, Bioindicators, DIVINF, MULTCLAS, GROUPER, Biocenoses, Geocenoses, Tropical regions, Subtropic.

Spatial and temporal distribution patterns of 70 copepod species from the eastern Indian Ocean along the 110 degree E. meridan are described, based on a 1962-63 survey. Data are evaluated for use in site and species classifications, and the classification DIVINF and MULTCLAS were used to identify major habitat complexes and relate them to Rochford's water masses. The program GROUPER and inverse DIVINF analyses were then used to identify niche and habitat complexes (biocenoses and geocenoses). The diversity regime was described with numerical data. The greatest proportion of endemic species occurred south of Java, including such neritic species as Acartia erythraea and Eucalanus dentatus, upwelling species as Calanoides carinatus, and other species, including Eucalanus crassus, Euchaeta concinna, and Candacia catula. The best bioindicator of tropical water was Candacia pachydactyla, and of mixtures of tropical and subtropical water was Euchaeta wolfendeni. Diurnally and seasonally separate biocenoses were found, characterized in particular by the genus Pleuromamma. The agglomerative program MULTCLAS, using quantitative and qualitative data, defined plankton geocenoses more clearly than the simple divisive program DIVINF using qualitative (presence-absence) data alone. Six geocenoses were identified, two tropical, two subtropical, and two mixed. A diversity maximum was located at 20 degrees S. in the tropical convergence, using the Shannon-Wiener entropy function H. (See also W78-11624) (Lynch-Wisconsin)
W78-11626

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN VII. ECOLOGY OF THE AMPHIPODA,
Australian Museum, Sydney.
H. A. Tranter.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 5, p 645-642, 1977. 6 fig, 3 tab, 33 ref.

Descriptors: *Indian Ocean, *Ecology, *Amphipods, *Zooplankton, *Distribution, *Species composition, *Classification, *Oceanography, Abundance, DIVINF, MULTCLAS, Ecosystems, Salinity, Water temperature, Subtropic, Tropical regions, Seasonal, Faunal lists, Vertical migration.

Hyperiid amphipods were sampled along the 110 degree E. meridan in the eastern Indian Ocean August 1962-August 1963; 64 species taken in 215 samples were identified and counted, and their distribution analyzed. Divisive and agglomerative numerical analyses were conducted to determine sampling site groups, species groups, and interrelationships. One species group (Phronimella elongate, Anchylomera blossevillei, and Hyperietta stephenseni) correlated with low-temperature, high salinity subtropical waters; three other groups correlated with the higher-temperature, low-salinity tropical waters (Vibilia armata, Eupronoe armata, E. minuta; Platyscelus serratulus, Paratyphis maculatus; and Paraphronima gracilis, Eupronoe laticarpa, Amphithyrus bispinosus). Ten species were present at over 40% of the stations, and another 28 species (48%) were present at over 10% of the stations. Mean species per station was 10. All species are listed with data on occurrence, and are discussed by family. The computer program DIVINF was used to classify the 215 sampling sites according the presence or absence of the 34 most widespread species, and the program MULTCLAS was used to classify the 99 night sampling sites with reference to the 32 most ubiquitous species at those sites. Diurnal vertical migration was indicated by the data. (See also W78-11624) (Lynch-Wisconsin)
W78-11627

HYDROCARBONS OF OYSTERS AND SHORT-NECKED CLAMS IN HIROSHIMA BAY,
Hiroshima Univ. (Japan). Faculty of Integrated Arts and Sciences.
S. Yasuda, and N. Fukamiya.
Bulletin of the Japanese Society of Scientific Fisheries, vol. 44, no. 5, p521-524, 1978. 2 fig, 2 tab, 12 ref.

Descriptors: *Oil pollution, *Oil, *Oysters, *Clams, Organic compounds, Gas chromatography, Laboratory tests, Path of pollutants, Chemical analysis, Water analysis, Biodegradation, Chemical resdues, *Alkanes, *Tissue analysis, Bioaccumulation, Tapes, *Biotransformation.

The n-alkane distributions of oysters and short-necked clams collected from Hiroshima Bay were examined. An absence of any biogenic odd-carbon predominance of n-alkanes was found. After 30 days of starvation of the clams in artificial sea water, considerable amounts of hydrocarbons were found to be retained, but the n-alkane distribution showed a preferential disappearance of shorter chain odd-carbon n-alkanes. Furthermore, the fecal hydrocarbons of the clams showed an even-carbon, predominance of the n-alkanes. Although petroleum oil was not detected by taste or smell, the values of carbon preference index and n-C 16 ratio indicated some low-level oil pollution of the bivalves. Moreover, the presence of non-biogenic alkylated benzenes also indicated that some oil pollution of the oysters had occurred. (EIS-Deal)
W78-11635

TRANSFER OF COBALT-60 FROM PHYTOPLANKTON TO THE CLAM (MERCENARIA MERCENARIA),
National Inst. of Radiological Sciences, Nakaminato (Japan). Marine Radio-Ecological Research Station.
M. Nakahara, and F. A. Cross.
Bulletin of the Japanese Society of Scientific Fisheries, vol. 44, no. 5, p419-425, 1978. 3 fig, 4 tab, 7 ref.

Descriptors: *Clams, *Phytoplankton, *Cobalt, Primary productivity, Secondary productivity, Radioisotopes, Food chains, *Cytological studies, *Diatoms, Radioactive wastes, Water pollution sources, Path of pollutants, Nuclear wastes, Nuclear powerplants, *Tissue analysis.

The transfer of cobalt-60 from phytoplankton (primary producer) to clams (primary consumer) was investigated to obtain additional information about the movement of cobalt-60 in the marine ecosystem. The retention of cobalt-60 in the clams after feeding radioactive phytoplankton varied with size of the clams and cell density and species of phytoplankton fed to the clams. At high cell densities, the retention of cobalt-60 by the clams was reduced with increasing cell density and size of the clams. More than 43% of the radioactivity which was introduced into the pallial cavity of the clams with the diatom (Nitzschia closterium) at cell densities less than 5 x 10 to the seventh power cells/l was retained in the clams two days after feeding. (EIS-Deal)
W78-11636

A THREE-YEAR STUDY AT WINSOR COVE: SALT MARSH GRASSES AND NO. 2 FUEL OIL,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
G. R. Hampson, and E. T. Moul.
Oceanus, Vol. 20(4), 1977, p 25-30, 4 fig, 8 ref.

Descriptors: Oil, *Oil spills, *Salt marshes, Water pollution effects, Sediments, Massachusetts, *Peat marsh plants, Toxicity, Path of pollutants, Methodology, Erosion, Erosion rates, Winsor Cove, Buzzards Bay, *No. 2 fuel oil, Salt marsh grasses, Salt marsh degeneration, Saliconnia.

The marsh grass community in a small cove in Massachusetts that was affected by spilled oil from a barge in October of 1974 has shown a progressive resistance to reestablish itself over the last three years. The sediments in some areas around the marsh grass roots contain hydrocarbons, which have impregnated the peat substrate. Erosion rates over the three-year period have been 24 times greater than those at a nearby control site. (EIS-Katz)
W78-11637

THE WEST FALMOUTH SPILL - FLORIDA, 1969,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
H. L. Sanders.
Oceanus, Vol. 20(4), 1977, p 15-24, 3 fig, 2 tab, 10 ref.

Descriptors: Oil, *Oil spills, toxicity, *Mortality, *Fish kills, *Massachusetts, Marine flora, Marine fauna, Benthos, Water pollution effects, Sediments, Mussels, Molluscs, Path of pollutants, Decomposition, Degradation, Gas chromatography, Florida, *No. 2 fuel oil, West Falmouth Harbor, Oil contamination, Hydrocarbons, Buzzard Bay sediments, Polychaetes, Capitella, *West Falmouth, Oil spill.

The author describes the biological effects of the oil spill resulting from the wreck of the Tanker Florida which occurred off West Falmouth, Massachusetts. The immediate biological effects of the spill as well as the long range effects are briefly described. (EIS-Katz)
W78-11638

FATE AND EFFECTS OF OIL IN MARINE ANIMALS,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
J. J. Stegeman.
Oceanus, Vol. 20(4), 1977, p 59-66, 3 tab, 4 fig, 8 ref.

Descriptors: Marine animals, *Marine fish, Mollusks, Crustaceans, Oysters, Bottom fish, *Lobsters, Animal physiology, *Animal behavior, Biochemistry, Oil, *Oil spills, Water pollution effects, Toxicity, Mortality, Reviews, Marine bacteria.

Summarizes are presented of some of the current theories regrading the fate and effects of oils, both of natural origin and that resulting from spills in aquatic organisms. The mechanisms of hydrocarbon accumulation as well as animals ability to dispose of these compounds are considered. The disappearance of acculumated hydrocarbons begins immediately upon the transfer of fish, crustaceans and molluscs from contaminated to uncontaminated water. (EIS-Katz)
W78-11639

A GENETIC LOOK AT FISH EGGS AND OIL,
National Marine Fisheries Service, Milford, CT. Milford Lab.
A. C. Longwell.
Oceanus, Vol 20(4), 1977, p 46-58, 2 tab, 11 fig, 7 ref.

Descriptors: Oil, *Oil spills, *Massachusetts, Water pollution effects, Marine fish, Commercial fish, Commercial fisheries, *Toxicity, Mortality, Fish eggs, Juvenile fish, Fish physiology, Fish populations, Pathology, Fish behavior, *Genetics, *Argo Merchant Oil Spill, Cod eggs.

The buoyant fish eggs sampled in the vicinity of Argo Merchant oil spill were observed. Oil droplets were seen of 94% of the cod eggs. Cytological and cytogentic assays of mortality and morbidity of cod and pollock eggs from the vicinity of the Argo Merchant oil spill were made. Speculation in the genetic effects of major oil spills on fish populations were made. (EIS-Katz)
W78-11640

A RAPID METHOD OF DETERMINING MAXIMUM PERMISSIBLE CONCENTRATIONS OF TOXICANTS IN LAKE AND STREAM FISHERIES,
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 5A.
W78-11642

SEASONAL DYNAMICS OF THE HEMATOLOGICAL PARAMETERS IN SOME BLACK SEA FISHES AND CHANGES THEREIN AFTER EXPERIMENTAL POISONING WITH PETROLEUM PRODUCTS,
All-Union Inst. of Marine Fisheries and Oceanography, Batumi (USSR), Georgian Div.
A. M. Kotov.
Hydrobiological Journal, Vol 12(4), 1976, p 47-52, 2 tab, 2 fig, 14 ref. (translated from Russian).

Descriptors: Oil, *Oil spills, *Water pollution effects, Path of pollutants, Marine fish, Fish physiology, Fish behavior, Biochemistry, Seasonal, Toxicity, Mortality, *Bioassay, Laboratory test, *Fish pathology, *Hematological parameters, Fish blood, *Dissolved petroleum products, Red blood cells, White blood cells.

Seasonal changes in the hematological parameters (hemoglobin concentration, number of erythrocytes and leukocytes, leukocyte formula and color index) in three Black Sea fish species, as well as the effect (on these parameters) of dissolved petroleum products at concentrations causing acute, subacute and chronic poisoning were investigated. Pathological disturbances of different degrees of intensity, oligochromemia, decrease in the number of erythrocytes and leukocytes, monocytopenia, eosinophilia, lymphocytosis, and neutrophilic leukocytosis were detected. (EIS-Katz)
W78-11643

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF POLLUTION BY ZINC, CADMIUM, LEAD AND COPPER. I. EFFECTS OF ENVIRONMENTAL VARIABLES ON UPTAKE OF METALS,
Melbourne Univ., Parkville (Australia). Dept. of Zoology.
D. J. H. Phillips.
Marine Biology, Vol 38, p. 56-69, 1976. 5 tab, 30 ref.

Descriptors: Metals, *Mussels, *Zinc, *Cadmium, *Lead, *Copper, Water pollution effects, Environmental effects, Seasonal, Salinity, Path of pollutants, On-site investigations, Animal physiology, *Monitoring, Water temperature.

The net uptake of zinc, cadmium, lead and copper by the common mussel, Mytilus edulis L. exposed to different conditions was investigated with a view to using this species as an indicator of contamination of the marine environment by these metals. Seasonal variation in concentrations of zinc, cadmium and copper was found in samples collected at three separate locations. The relationship of seasonal variation to tissue weight and absorption route of the metals is discussed. Near to freshwater inputs of trace metals, the concentrations of zinc, cadmium and lead in mussels were found to vary according to the depth at which the mussels collected; in summer when freshwater run-off is less, this effect was absent. Low salinities did not affect the net uptake of zinc of lead. Low temperatures had no effect on the net uptake of zinc or lead; the net uptake of cadmium was unaffected by low temperatures at high salinities but was decreased by low temperatures at low salinities. The presence of the other metals had no effect on the individual net uptake of either zinc, cadmium or lead. A sampling program was devised to eliminate the effects of these environmental variables and to allow the use of M. edulis as an indicator of zinc, cadmium and lead in marine and estuarine environments. (EIS-Katz)
W78-11644

INFLUENCES OF TEMPERATURE AND SALINITY ON OXYGEN CONSUMPTION OF TISSUES IN THE AMERICAN OYSTER (CRASSOSTREA VIRGINICA),
Maryland Univ. Eastern Shore, Princess Anne. Dept. of Biology.
E. L. Bass.
Comparative Biochemistry and Physiology, Vol 58, No 2B, 1977, p. 125-130, 12 tab, 6 fig, 35 ref.

Descriptors: *Oysters, Animal physiology, Molluscs, Biochemistry, *Water temperature, Salinity, Laboratory tests, *Bioassays, Laboratory animals, Laboratory equipment, Methodology, Sea water, Oxygen, *Dissolved oxygen, *Oxygen consumption, Acclimation, Gill tissues, Mantle tissues.

Oxygen consumption of three oyster tissues was used to assess responses to alterations in temperature and salinity. Cold-acclimated gill tissue showed good acclimatory ability, while mantle tissue showed little and muscle none. Among warm-acclimated tissues gill and mantle showed partial acclimation and muscle none. Upon dilution of the sea water medium gill and mantle tissues showed increased oxygen consumption, while muscle tissue showed no alteration. No significant alterations in tissue oxygen consumption took place in response to increased salinity of the medium. (EIS-Katz)
W78-11645

AN ASSESSMENT OF THE POTENTIAL CARCINOGENIC HAZARD OF PETROLEUM HYDROCARBONS IN THE MARINE ENVIRONMENT,
University of Manchester Inst. of Science and Technology (England).
P. J. King.
Rapports et Proces-Verbaux des Reunions, Conseil International Pour L'Exploration de la Mer, Vol 171, p 202-211, 1977. 4 tab, 54 ref.

Descriptors: *Organic compounds, *Water pollution effects, *Oil, *Toxins, *Toxicity, Pathology, Aromatic compounds, Path of pollutants, Public health, Reviews, Pollutants, Food chains, Commercial shellfish, Commercial fish, *Carcinogenic effects, *Polycyclic aromatic hydrocarbons.

Crude petroleums are known to contain low concentrations of a number of substances mainly of the polycyclic aromatic hydrocarbons type, which can, on prolonged intimate contact, cause skin cancer in man. Similar substances are present in the environment as byproducts of pyrolysis etc. and as natural constituents of certain vegetable foodstuffs. These substances have only a very limited solubility in water and at such low concentrations should cause little hazard, but there is a possibility of their concentration in the food chain. This paper attempts to examine all aspects of this problem in the light of published research in a variety of disciplines. (EIS-Katz)
W78-11646

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EFFECT OF EFFLUENT FROM FISH PROCESSING PLANTS ON AQUATIC ORGANISMS,
Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Astrakhan (USSR).
E. I. Beschetnova, and G. V. Zemkov.
Hydrobiological Journal, Vol 12(2): 1976, p. 54-57 3 tab, 10 ref. (Russian translation).

Descriptors: *Bioassay, *Mortality, Toxicity, Dissolved oxygen, Daphnia, Freshwater fish, Fish eggs, *Food processing industry, Water pollution, Water pollution effects, Oxygen demand, Fish physiology, Fish behavior, Pathology, Astrakhan fish packing and refregeration plant, Fish packing.

Bioassays were conducted with fish and Daphnia to determine the acute toxicity and chronic toxicity of the effluent from the Astrakhan Fish Packing and Refregeration plant. The acute toxicity experiments showed that the effluent caused an oxygen deficiency in the water. The suspended matter covered fish eggs, thus suffocating them. Long-term experiments with effluent up to 10.0 ml/liter showed no ill effects and no pathological signs were observed. (EIS-Katz)
W78-11647

THE CHEDABUCTO BAY SPILL - ARROW, 1970,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5B.
W78-11648

FECUNDITY OF BLUEGILL AND WARMOUTH FROM A SOUTH CAROLINA BLACKWATER LAKE,
Carolinas Virginia Nuclear Power Associates, Inc., new Hill, NC. Energy and Environmental Center.
F. M. Panek, and C. R. Cofield.
The Progressive Fish Culturist, Vol 40(2), 1978, p 67-68. 2 fig, 7 ref.

Descriptors: Freshwater fish, *Lakes, *Primary productivity, Sunfish, Bass, *Reproduction, Fish eggs, South Carolina, Growth, Fecundity, Hydrogen ion concentration, *Acidic water, *Blackwater lakes, Sunfish, Warmouth bass, Lepomis, Lake Robinson, South Carolina.

The relations of fecundity to total length (mm) were developed for the bluegill (Lepomis macrochirus) and warmouth (L. gulosus) from a large southeastern blackwater lake. Fecundity estimates for bluegills ranged from 571 to 27,027 eggs per female and were related to total length by the expression log 10 F=2.337 + 2.839 log 10 TL (mm) with r2 = 0.59 (where F= fecundity and TL= total length). Bluegill fecundity was lower and diameters of mature eggs were smaller than those reported in the literature. Fecundity estimates for warmouths ranged from 798 to 34,257 eggs per female and could be expressed by the relation log 10 F=4.678 + 3.889 log 10 TL(mm) with r2=0.67. Fecundity of warmouths as determined from this relation is similar to that for fish in other habitats. (EIS-Katz)
W78-11649

RESPONSES OF HETEROTROPHIC BACTERIAL POPULATIONS TO PH CHANGES IN COAL ASH EFFLUENT,
Texas Univ. Health Science Center at Houston. School of Public Health.
R. K. Guthrie, D. S. Cherry, and F. L. Singleton.
Water Resources Bulletin, Vol 14, No 4, p 803-808, August 1978. 1 fig, 2 tab, 14 ref.

Descriptors: *Hydrogen ion concentration, *Water pollution effects, *Aquatic bacteria, *Bioindicators, *Fly ash, Water pollution sources, Aquatic microorganisms, Biological communities, Pseudomonas, Industrial wastes, Water temperature, Environmental effects, Acidity, Acidic water, Bacillus, Flavobacterium, Sarcina, Achromobacter, Chromobacterium, Brevibacterium, *Coal ash effluents.

Total culturable heterotrophic bacteria in a coal ash basin and drainage system were monitored over a period of two years. In the first year heavy (bottom) ash was sluiced to the basin resulting in a pH of 6.5. During the second year fly ash was precipitated and added to the sluice lowering the basin pH to 4.6. Sulfate concentration during 1975 ranged from 16-73 ppm (mean 33) and in 1976 from 44-88 ppm (mean 72). Mean annual basin temperatures were 28.8 and 26.0C, respectively. Approximately 1500 m in the receiving swamp below the basin, mean pH and temperature were 6.8 and 22.2C for the first year, and 5.4 and 22.1C for the second. Total culturable bacteria and diversity (colony types) were reduced at all sampling stations by 44 and 30 percent, respectively, whereas the percentage of the population comprised of chromagenic bacteria increased by 51 percent at the lower pH. Data indicated the pH had a greater effect than did water temperature when temperature was within the range of 15-25C. The predominant genera within the system in the first year were Bacillus, Sarcina, Achromobacter, Flavobacterium, and Pseudomonas. In the second year, at the lower pH, predominant genera were Pseudomonas, Flavobacterium, Chromobacterium, Bacillus, and Brevibacterium. (EIS-Katz)
W78-11651

ESTIMATED ZOOPLANKTON PRODUCTION AND THEIR AMMONIA EXCRETION IN THE KUROSHIO AND ADJACENT SEAS,
Australian Inst. of Marine Science, Townsville.
T. Ikeda, and S. Motoda.
Fishery Bulletin, Vol 76, No 2, p 357-368, 1978. 3 fig, 5 tab, 60 ref.

Descriptors: *Ammonia, *Zooplankton, *Food chains, *Biological communities, *Secondary productivity, *Distribution, Productivity, Nutrients, Trophic levels, Nitrogen compounds, Biomass, Water temperature, Respiration, Cycling nutrients, Invertebrates, Seasonal, Aquatic microorganisms, Size, *Kuroshio Sea(Japan).

Production and ammonia excretion of zooplankton in the Kuroshio and adjacent seas were estimated from field data of biomass, size distribution, and habitat temperature of zooplankton, and from experimental data of respiration and ammonia excretion rates as functions of body size and temperatures. Winberg's basic balanced equations were applied to calculate production from respiration data. Further, mortality related to the lifespan and the ratio of herbivores to carnivores in the zooplankton community were estimated from theoretical assumptions. In this study, 18-72% of primary production was grazed by herbivorous zooplankton, and production of herbivorous zooplankton, was 10-60 mg C/square meter per day. The ecological efficiency between primary and secondary production was 5-22%. Ammonia-nitrogen excreted by zooplankton was 4-24 mg N/square meter per day, which can support 11-44% of the nitrogen requirements of primary production. (EIS-Katz)
W78-11652

STUDIES ON THE RELATIVE TOXICITY OF FEW SYNTHETIC DETERGENTS TO A FISH MACRONES VITTATUS,
D.A.V. Coll., Muzaffarnagar (India). Dept. of Zoology.
S. R. Verma, D. Mohan, and R. C. Dalela.
Acta Hydrochimica et Hydrobiologica, Vol 6(2), 1978. p. 121-128. 4 tab, 1 fig, 16 ref.

Descriptors: *Detergents, *Surfactants, Bioassay, Toxicity, *Water pollution effects, Mortality, Laboratory tests, Freshwater fish, Domestic wastes, Fish behavior, Phosphates, Freshwater fish.

In the present investigation, static bioassay studies have been made with few synthetic detergents so as to determine to 50 per cent lethal concentration (LC50) and harmless concentrations. The LC50 values of these detergents ranged from 0.28 to 1.73 mg/l (from 6 to 96 hours). The Swascofix E45 is the most highly toxic and Swascol 4 L the least toxic detergent and the other lies between them. The safe concentrations for different detergents have been worked out. On the basis of these data it is suggested that a lot of treatment of dilution is necessary for the safe disposal of these detergent wastes. (EIS-Katz)
W78-11653

ACUTE RESIDUAL TOXICITY OF SEVERAL WASTEWATER DISINFECTANTS TO AQUATIC LIFE,
Grand Valley State Colleges, Allendale, MI. Dept. of Biology.
R. W. Ward, and G. M. DeGraeve.
Water Resources Bulletin, Vol 14, No 3, p 696-709, 1978. 5 tab, 42 ref.

Descriptors: *Chlorine, *Disinfection, *Bromine, *Ozone, *Waste water treatment, Chorine compounds, Chlorination, Waste water, Toxicity, Daphnia, Sulfur compounds, Salmonids, Carp, Bioassay, Chemical analysis, Water treatment, Water purification, *Sulfur dioxide.

This study was conducted to determine the comparative acute toxicity of chlorine, bromine chloride, and ozone in wastewater, and to determine any acute toxicity associated with chlorinated wastewater which had been dechlorinated with sulfur dioxide. Toxicity tests were conducted with several species of cyprinids, salmonids and centrarchids, and the freshwater macroinvertebrate, Daphnia magna. Chlorinated effluent exhibited the greatest potential for residual toxicity of any disinfected stream tested. The reduced residual toxicity of chlorobrominated or ozonated effluent was largely the result of the more rapid dissipation of these disinfectants in wastewater. The acute residual toxicity of chlorinated effluent was eliminated by dechlorination with sulfur dioxide. (EIS-Deal)
W78-11654

THE FACTORS INFLUENCING THE DISTRIBUTION OF SACCORHIZA POLYSCHIDES IN THE REGION OF LOUGH INE,
Glasgow Univ. (Scotland). Dept. of Botany.
T. A. Norton.
Journal of the Marine Biological Association of the United Kingdom, Vol 58, p 527-536, 1978. 1 fig, 3 tab, 29 ref.

Descriptors: *Environmental effects, *Primary productivity, *Marine plants, *Silts, *Marine algae, Growth rates, Plant diseases, Aquatic plants, Lake sediments, Distribution patterns, Grazing, Biological communities, Laboratory tests, On-site Investigations, *Lough Ine(Ireland), Saccorhiza polyschides, *Sea Urchins.

Saccorhiza polyschides has failed to colonize Lough Ine, a marine inlet in Co. Cork, Ireland, in spite of the abundance of spores swept in continually by the tide. The reasons for this failure were investigated by means of both culture experiments in the laboratory and transplantation experiments in nature. The responses of S. polyschides were contrasted with those of Laminaria saccharina, a closely related species that does grow in the Lough. Of the abiotic environmental conditions which may be correlated with the absence of S. polyschides from the Lough, only excessive siltatin seems to be critical. Silttion cannot wholly explain the exclusion of S. polyschides from Lough Ine for in culture at least, it seems to operate equally effectively against L. saccharina. It seems clear that the combined effects of siltation, preferential grazing by the sea urchin Paracentrotus lividus, and tissue decay, ac-

celerated by the conditions in the Lough, are sufficient to explain the absence of S. polyschides from Lough Ine. (EIS-Katz)
W78-11655

EFFECTS OF INTRINSIC AND ENVIRONMENTAL FACTORS ON OXYGEN CONSUMPTION IN THE BLUE CRAB, CALLINECTES SAPIDUS, RATHBUN,
Virginia Inst. of Marine Science, Gloucester Point.
C. E. Laird, and P. A. Haefner, Jr.
Journal of Experimental Marine Biology and Ecology, Vol 22, p 171-178, 1976. 1 tab, 2 fig, 34 ref.

Descriptors: *Crabs, *Respiration, *Environmental effects, *Animal physiology, *Salinity, *Water temperature, Crustaceans, Invertebrates, Shellfish, Oxygen, Metabolism, Size, Temperature, Laboratory tests, Callinectes, *Blue crab.

The effect of weight, sex, temperature, and salinity on oxygen consumption in intact Callinectes sapidus has been determined. Weight-specific oxygen consumption decreases with increasing wet weight from 20 to 200 g; sex has no effect over this weight range. Oxygen consumption is little affected by experimental salinities from 10 to 30 o/oo. Crabs acclimated to cold (10C) consume more oxygen when acclimated to low salinity (10 o/oo) than when acclimated to high salinity (30 o/oo). Crabs acclimated to low salinity consume more oxygen when cold acclimated than when warm acclimated (24C). Oxygen consumption increases with experimental temperature from 10 to 25C and is higher in cold acclimated crabs than in warm acclimated crabs, except at the intermediate temperature (17.5C), where there is no apparent effect of acclimation temperature. (EIS-Katz)
W78-11656

DER QUEEKSILBERGEHALT IN MUSKELN DES KARPFENCYPRINUS CARPIO L. - ALS INDIKATOR DER WASSERVERUNREINIGUNG (THE MERCURY CONTENT OF CARP (CYPRINUS CAPRIO L.) MUSCLES AS AN INDICATOR OF WATER PURIFICATION,
Institut fuer Meereslebensmittel Technologie, Szezecin (Poland).
For primary bibliographic entry see Field 5A.
W78-11657

ORGANOCHLORINE AND MERCURY RESIDUES IN THE HARP SEAL (PAGOPHILUS GROENLANDICUS),
Guelph Univ. (Ontario). Dept. of Biomedical Sciences.
P. Jones.
The Science of the Total Environmental, Vol 5, 1976. p. 181-199, 8 tab, 37 ref.

Descriptors: *Polychlorinated biphenyls, *DDT, Insecticides, Polychlorinated hydrocarbon insecticides, *Mercury, metals, *Path of pollutants, Water pollution effects, *Animal pathology, Public health, Juvenile growth stage, Dieldrin, *Harp seals, Pagophilus groenlandicus, *methyl mercury, Tissue concentrations, *Seal pups, Mercury residues.

Samples of blubber, liver, kidney and brain, obtained from 10 male, 6 female neonatal, and 4 lactating female harp seals (Pagophilus groenlandicus) were analyzed for DDT, dieldrin, PCB, and total mercury. Methyl mercury levels in blood were also determined. Biocide deposition was not significantly different in female and male ten day old pups. There was no significant difference in biocide levels in the liver of the 14/+ day old males, but in blubber there were significant differences in dieldrin and DDT. There was no clear relationship between biocide levels in the 6-18 year old lactating adults and their pups. Younger adult seals (6 and 7 years) were found to have higher levels of PCB and DDT levels in their blubber than did older females (10 and 18 years). Wide intraspecific variation was noted in organochlorine and mercury residue levels. Pups taken in 1973 were found to have lower organochlorine residues than pups taken in the same area in 1971. Preliminary investigation indicates that detectable amounts of organochlorine and mercury residues are capable of crossing the placenta in the harp seal. (EIS-Katz)
W78-11658

ORGANIC POLLUTION OF BOTTOM MUD IN THE SETO INLAND SEA AND ITS REMOVAL EXPERIMENT,
Nansei Regional Fisheries Research Lab., Hiroshima (Japan).
For primary bibliographic entry see Field 5G.
W78-11659

A FLOW-THROUGH TESTING PROCEDURE WITH DUCKWEED (LEMNA MINOR L.),
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-11660

EFFECT OF HYDROGEN SULFIDE ON THE SURVIVAL RATE OF EGGS AND EMBRYONAL MITOSES OF THE BLACK SEA TURBOT,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
V. N. Ivanov, T. G. Usenko, and A. V. Parkhomenko.
Hydrobiological Journal, Vol. 12(2), 1976, p 60-62, 1 tab, 6 ref. (Translated from Russian).

Descriptors: Bioassay, *Toxicity, Mortality, Fish eggs, *Hydrogen sulfide, Marine fish, Fish genetics, Fish physiology, *Fish reproduction, Laboratory tests, *Oxygen, Embryonic growth stage, *Black Sea, Black Sea turbot, *Egg survival, Embryonal mitoses.

Bioassays with turbot eggs showed that the maximum hydrogen sulfide concentrations at which fish survived was 2.2 to 2.3 mg/l. Sublethal concentrations of hydrogen sulfide in seawater did not have a cytogenic effect. Fish eggs in the toxic levels of hydrogen sulfide died before the mutagenic effect of hypoxin was manifested. (EIS-Katz)
W78-11661

A SURVEY OF THE FISH POPULATIONS OF THE MIDDLE SEVERN ESTUARY BASED ON POWER STATION SAMPLING,
Bath Univ. (England). School of Biological Sciences.
M. W. Hardisty, and R. J. Huggins.
International Journal of Environmental Sciences, Vol. 7, 1975, p 227-242, 1 tab, 15 fig, 23 ref.

Descriptors: *Estuaries, *Nuclear power plant, Marine fish, Seasonal, *Distribution, Animal populations, Methodology, Statistical methods, Bottom fish, Fish populations, *Fish harvest, Fish migration, *Power plant sampling, England, Middle Severn Estuary, Oldbury-on-Severn, Power Station.

Over a period of a year, weekly 24-hour samples have been taken of fish species collected from the screens of the Oldbury-on-Severn Nuclear Power Station in the Middle Severn estuary (U.K.). The faunal list consists of 48 species compared with the 44 species recorded in a 3-year survey (based on the examination of commercial catches) made over 30 years earlier. Numbers of fish as well as variety of species increased through the autumn and winter, reflecting in part a seasonal movement of several gadoid species into the estuary. The Power Station samples contained some species not previously recorded, specifically for the Oldbury region often in considerable numbers. A short description of the biological characteristics and seasonal changes in frequency is given for each of the more important estuarine species. (EIS-Katz)
W78-11662

EFFECT OF HYDRAULIC WORKS ON THE PARASITE FAUNA OF THE DNIEPER RIVER,
Akademiya Nauk URSR, Kiev. Inst. Zoology.
A. P. Markevich, M. P. Iskov, V. P. Koval, and M. I. Chernogorenko.
Hydrobiological Journal, Vol. 12(2), 1976, p 1-6. 27 ref. (Translated from Russian).

Descriptors: Freshwater fish, *Fish diseases, *Parasitism, Commercial fish, *Dams, Reservoirs, *Reservoir fisheries, Zooplankton, Crustaceans, Mollusks, Fisheries, Food chain, Sediments, Worms, Public health, Species diversity, Trematodes.

The construction of dams and reservoirs in the Dnieper River has resulted in changes of the parasitic fauna of resident fishes. One of the main factors responsible for altering the species composition of fish parasites with a complex life cycle was the change in abundance and diversity of the aquatic invertebrates that serve as intermediate hosts. The decrease on the infestation of fishes with trematodes that require mollusk hosts decreased by 60-75% in the lower reservoir. (EIS-Katz)
W78-11663

TOXICOLOGICAL CHARACTERISTICS AND SYMPTOMS OF ACUTE PHENOL POISONING IN SOME FRESHWATER CRUSTACEANS AND MOLLUSKS,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
V. A. Alekseyev, and B. N. Antipin.
Hydrobiological Journal, Vol. 12(2), 1976, p 27-33, 21 ref, 1 tab. (translated from Russian).

Descriptors: *Phenols, Industrial wastes, Water pollution effects, Animal physiology, *Pathology, *Bioassay, Toxicity, Methodology, Mortality, Molluscs, Crustaceans, Benthos, Zooplankton, Invertebrates, *Daphnia, *Copepoda.

The resistance of freshwater Crustacea to phenol after 48 hours exposure varies (in terms of LC 100) from 20 mg/liter in Polyphemidae to 240 mg/liter in Ostracoda. The resistance of mollusks is mugh higher; from 400 mg/liter in Physidae and Dreissenidae to 1600 mg/liter in Sphaerlidae. The resistance of these organisms depends on a host of factors, the most important being: morphological and physiological (thickness of the integument, presence of a shell, size of the gill surface, mode of feeding, metabolic rate), age-related (various stages of ontogeny), behavioral (mobility, ability to avoid the poisonous environment), ecological (type of water body, reaction to natural pollution), and abiotic (ambient temperature, oxygen concentration). A comparison of the symptoms of poisoning in the animals studied revealed five main phases of the pathological process: increase in general motor activity, loss of coordination due to convulsions, paralysis and parts of the body involved in locomotion, deep paralysis, and death. (EIS-Katz)
W78-11664

LETHAL TEMPERATURES OF AMMOCOETES OF THE SOUTHERN HEMISPHERE LAMPREY, GEOTRIA AUSTRALIS GRAY,
Murdoch Univ., (Western Australia). School of Environmental and Life Sciences.
D. J. Macey, and B. C. Potter.
Environmental Biology of Fish, Vol. 3(2), 1978. p 241-243. 3 fig, 13 ref.

Descriptors: Freshwater fish, *Juvenile forms, Stress, *Water temperature, Thermal water,

Bioassay, Mortality, Methodology, Temperature, Distribution, *Distribution patterns, *Lampreys, *Lethal limit, Western Australia, *Ammocoetes, Resistance time, Geotria australis.

The resistance time of ammocoetes of Geotria australis was related to the time of emergence from the substrate. The incipient lethal temperatures of animals acclimiated at 5, 15, and 25C was 27.3, 27.5 and 28.2C, respectively, the ultimate incipient lethal being 28.3C. This value, which is similar to that of Northern Hemisphere lampreys such as Lampetra planeri, almost certainly accounts for the restriction of this species to the southernmost rivers in Western Australia. (EIS-Katz)
W78-11665

WATER QUALITY AND THE OCCURRENCE OF CHIRONOMUS RIPARIUS MEIGEN (DIPTERA: CHIRONOMIDAE) IN A STREAM RECEIVING SEWAGE EFFLUENT,
Plymouth Polytechnic (England). Dept. of Environmental Sciences.
A. M. Gower, and P. J. Buckland.
Freshwater Biology, Vol. 8, p 153-164, 1978. 8 fig, 2 tab, 38 ref.

Descriptors: *Water quality, *Sewage effluents, *Diptera, Waste water(Pollution), Sewage treatment, Waste water treatment, Outlets, Eutrophication, Larval growth stage, Growth stages, Lotic environment, Nutrients, Oxygen demand, Municipal wastes.

The effects of a sewage effluent in Moat Brook, Staffordshire, England, were determined from regular collections of water and biological samples from directly comparable stations above and below the sewage outfall. The eutrophic conditions below the outfall result in the replacement of Polypedilum laetum by Chrionomus riparius (except in the spring) as the dominant member of the Chironominae. Continuous recruitment of first instar larvae of the population of C. riparius in summer and autumn results in much overlap of generations, but emergence trap captures suggest at least five generations in the year. The usefulness of C. riperius as an indicator of enriched conditions in lotic ecosystems should be considered in relation to oviposition behavior and the occurrence and seasonal variation in density of the adults and aquatic stages (including the more conspicuous third and fourth instar larvae). (EIS-Deal)
W78-11666

SOME FACTORS AFFECTING PHOTOSYNTHESIS AND RESPIRATION MEASUREMENTS IN CLADOPHORA GLOMERATA,
State Univ. of New York Coll. at Fredonia. Dept. of Biology.
K. E. Mantai, and C. Haase.
Journal of Great Lakes Research, Vol. 3, p 191-195, 1977. 3 fig, 1 tab, 12 ref.

Descriptors: *Photosynthesis, *Respiration, *Cladophora, Chemical reactions, Hydrogen ion concentration, Lake Erie, Algae, Cytological studies, Carbon, Phytoplankton, Growth rates, Primary production, Methodology, *Buffers.

Literature values for photosynthesis rates in Cladophora glomerata vary widely. There are several possible reasons for this, including light-limitation in certain types of experiments. Photosynthesis and respiration in Cladophora appear to be strongly pH dependent. Photosynthesis in Cladophora samples from Lake Erie show a pH optimum of about pH 8.2, with rates decreasing to near zero by pH 9.6. Respiration shows a bimodal pH response curve, with optima at about pH 7.6 and pH 9.2. Thus, experiments performed in unbuffered systems can greatly underestimate photosynthesis in Cladophora due to pH changes caused by CO2 uptake. Choice of buffers is an important consideration. Tricine is considered to be biologically unreactive and has a pH of 8.15, making it an ideal buffer for use in slightly alkaline systems. Tris buffer, however, shifts the pH optimum for photosynthesis in Cladophora (measured as oxygen evolution) to about pH 9.0. The response curve for respiration is the same in either buffer. Photosynthesis in Cladophora is depressed in a 100% oxygen atmosphere, suggesting that these cells photorespire. This further complicates estimates of net photosynthesis. (EIS-Deal)
W78-11667

METABOLISM, CRITICAL OXYGEN TENSION, AND HABITAT SELECTION IN DARTERS (ETHEOSTOMA),
Alabama Univ., University. Dept. of Biology.
G. R. Ultsch, H. Boschung, and M. J. Ross.
Ecology, Vol. 59, No. 1, p 99-107, 1978. 3 fig, 4 tab, 32 ref.

Descriptors: *Animal metabolism, *Respiration, *Darters, Oxygen requirements, Habitats, Aquatic habitats, Ecology, Niches, Freshwater fish, Water temperature, Seasonal, Metabolism, Fish physiology, Alabama, *Oxygen tension, Critical oxygen tension, Habitat selection, Metabolic rate, Oxygen consumption.

Six species of darters were studied in the field and laboratory to relate respiration to habitat selection. The species ranged in habitat preference from a fast-water form to a slow-water form. Field measurements showed that winter oxygen tensions were not limiting the distribution of the darters when these tensions were compared with the critical oxygen determination made in the laboratory at a low temperature (10C). However, summertime ambient oxygen levels were as low as 3.3 ppm, a level that was 1.0-1.7 ppm below the wintertime critical oxygen tension (Pc) of several of the species. The fishes compensated for this by lowering Pc in the summer. This finding is contrary to previously reported results on the relationship between Pc and temperature. While not all darters selected habitats such that the downward shift of Pc in summer was of ecological consequence, this was the case in 1 of the slow-water stream forms which inhabits waters in the summer that would be uninhabitable without such a shift in Pc. (EIS-Deal)
W78-11669

LARVA DEFORMITY IN STRIPED BASS, MORONE SAXATILIS (WALBAUM), AND BLUEBACK HERRING, ALOSA AESTIVALIS (MITCHELL), DUE TO HEAT SHOCK TREATMENT OF DEVELOPING EGGS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
T. S. Y. Koo, and M. L. Johnston.
Environmental Pollution, Vol 16, 1978, p 137-149. 3 tab, 3 fig, 15 ref.

Descriptors: *Water temperature, Water pollution effects, Herrings, *Striped bass, Laboratory tests, Laboratory equipment, Fish eggs, Stress, Bioassay, Methodology, Mortality, *Thermal water, *Thermal powerplants, Heated water, *Heat shock, *Larval deformities, Morone, Blueback herring, Alosa aestivalis.

Fertilized eggs of striped bass and blueback herring were subjected to time-temperature exposure typically experienced by entrained organisms in a power plant cooling system. Egg mortality and hatchability were not necessarily good criteria in assessing temperature effects for, even when there was no significant difference in mortality and hatchability between experimental and control lots, adverse effects were manifested in the deformity of larvae hatched. Deformities took the form of shortened body, enlarged finfold, and curved or twisted spine. The severity and incidence of deformity were related to temperature dose, i.e., the product of the elevated temperature and exposure time. No immediate heavier mortality was observed in deformed larvae than in normal larvae, but the lack of normal swimming ability of the deformed larvae suggests their poor eventual survivability. (EIS-Katz)
W78-11671

HEAVY METAL POLLUTION OF THE RIVER IRWELL (LANCASHIRE, UK) DEMONSTRATED BY ANALYSIS OF SUBSTRATE MATERIALS AND MACROINVERTEBRATE TISSUE,
Salford Univ. (England). Dept. of Biology.
J. P. Eyres, and M. Pugh-Thomas.
Environmental Pollution, Vol 16, 1978, p 129-136, 3 tab, 2 fig, 8 ref.

Descriptors: *Metals, *Zinc, *Lead, *Copper, Water pollution effects, Dissolved oxygen, Spectrophotometry, Amphipods, *Sediments, Animal physiology, Biochemistry, Chemical analysis, Hydrogen ion concentration, Oligochaetes, Asellus, Erpobdella, Tissue metal concentrations, River Irwell.

The macroinvertebrate benthos of the River Irwell is impoverished to an extent that cannot be explained solely in terms of organic pollution. Relatively high dissolved oxygen levels are maintained as a result of turbulence. Atomic absorption spectrophotometry reveals substrate-bound levels of lead, copper, and zinc higher than those recorded for an unpolluted river over almost the entire length of the Irwell, and at some sites the contamination is particularly severe. Concentrations in water are very low and it appears that high pH (about 7) leads to rapid precipitation of the discharged metals to substrate materials. The relationships between levels of the metals in substrate materials and in the tissues of Asellus aquaticus L. and Erpobdella octoculata (L.) have been investigated. (EIS-Katz)
W78-11672

DEHP IN THE VICINITY OF AN INDUSTRIAL AREA IN FINLAND,
Helsinki Univ. (Finland). Dept. of Environmental Science.
P.-E. Persson, H. Penttinen, and P. Nuorteva.
Environmental Pollution, Vol 16, 1978, p 163-166, 1 tab, 16 ref.

Descriptors: *Water pollution effects, Path of pollutants, *Freshwater fish, *Phytoplankton, *Zooplankton, Benthos, Biochemistry, Pikes, *Industrial wastes, Sticklebacks, Perch, Soils, DEHP, *Di-(2-ethyl hexyl)phthalate, Roach, Rutilus, Tissue concentrations.

Samples of fish, net plankton, freshwater and soil arthropods and soil obtained in the vicinity of an industrial area were analyzed for di-(2-ethyl hexyl)phthalate (DEHP) content. The highest concentration was found in soil arthropods (2.8 mg/kg). No contamination was discovered in plankton, but the levels of contamination in other organisms were as follows: 0.1 mg/kg in small fish (fry and sticklebacks), freshwater arthropods, molluscs, and perch; 0.5 mg/kg in bream, and 1.1 mg/kg in roach. The muscle and kidney of pike were free from contamination but the contamination of pike's liver was equivalent to 2.3 mg/kg. (EIS-Katz)
W78-11673

METAL CONCENTRATIONS IN SOME SEAWEEDS OF GOA (INDIA),
National Inst. of Oceanography, Panjim (India).
For primary bibliographic entry see Field 5B.
W78-11674

LONG RANGE MOVEMENT AND HOMING BY LARGEMOUTH BASS (MICROPTERUS SAL-

MOIDES) IN A THERMALLY ALTERED RESERVOIR,
Wake Forest Univ., Winston Salem, NC. Dept. of Biology.
T. Quinn, G. W. Esch, T. C. Hazen, and J. W. Gibbons.
Copeia, 1978, No 3, p 542-545. 1 tab, 1 fig, 11 ref.

Descriptors: *Bass, Freshwater fish, *Fish migration, Water pollution effects, *Water temperature, Thermal effects, Fish behavior, Fish physiology, Nuclear energy, *Nuclear powerplants, Nuclear reactors, Nuclear wastes, Thermal pollution, Thermal powerplants, South Carolina, Par pond, Cooling pond.

Par Pond is an 1,120 hectare cooling reservoir for a nuclear production reactor locatee near Aiken, S.C. largemouth bass were caught, tagged and released. The study indicated that movement between thermal and ambient locations occurred but infrequently. Movements were more frequent from ambient to thermal locations. (EIS-Katz)
W78-11675

EFFECTS OF ORGANIC FRACTIONS FROM SECONDARY EFFLUENT ON SELENASTRUM CAPRICORNUTUM (KUTZ),
Rensselaer Polytechnic Inst., Troy, NY.
D. R. Sachdev, and N. L. Clesceri.
Journal Water Pollution Control Federation, Vol 50, 1978, p 1810-1820. 8 tab, 26 ref.

Descriptors: *Algae, *Bioassay, *Nutrients, *Organic compounds, Water pollution effects, Sewage, Sewage effluents, Nitrogen, Phosphorus, Eutrophication, *Organic fractions, Secondary effluents, Algal bioassay, Selenastrum capricornutum, Effluent fractionation, *Growth rate, *Standing crops.

The secondary treated effluents from two domestic wastewater treatment facilities were membrane filtered (0.45 microns), concentrated via freeze-drying technique, and then fractionated. Effect of the concentrated effluents and their various organic fractions on the maximum specific growth rate and maximum standing crop of Selenastrum capriconutum was investigated. In general the concentrated effluents and the organic fractions with apparent molecular weight greater than 700 indicated stimulatory effects on the maximum standing crop. The stimulation of S. capricornutum was the result of the organic compounds in these fractions. The supplemental nitrogen, phosphorus or inorganic carbon added to the medium from the addition of the organic fractions did not contribute to the stimulation of this alga. Neither the concentrated effluents nor any of the organic fraction showed any inhibitory effect on S. capricornumum. (EIS-Katz)
W78-11678

ECOLOGICAL STUDIES ON OLIGOCHAETA INHABITING DEPOSITING SUBSTRATA IN THE IRWELL, A POLLUTED ENGLISH RIVER,
Salford Univ. (England). Dept. of Biology.
J. P. Eyres, N. V. Williams, and M. Pugh-Thomas.
Freshwater Biology, vol. 8, p 25-32, 1978. 3 tab., 5 fig., 18 ref.

Descriptors: *Oligochaetes, *Tubificids, Aquatic animals, *Benthic Fauna, Water pollution effects, *Spatial distribution, *Sampling, *Life cycles, Annelids, Benthos, Invertebrates, Seasonal, Populations, On-Site investigations, Environmental effects, Water quality, Mine wastes, Dissolved oxygen, Tubifex, Limnodrilus, Nais, *River Irwell(England).

Oligochate worms dominate the macroinvertebrate fauna of the River Irwell, in northwest England. The river is polluted by domestic and industrial wastes. Tubificids constituted 86.8% of the worm fauna, with three dominant species, Tubifex tubifex, representing 43.1% of the total oligochaetes, Limnodrilus hoffmeisteri, representing 26.8% and Limnodrilus udekemianus, representing 16.7%. The Naididae were the next most abundant worms, representing 6.1% of the oligochaete fauna, with Nais elinguis comprising 5.0%. T. tubifex and L. hoffmeisteri were abundant along the length of the river, but reached their greatest numbers in the organically polluted lower reaches at Agecroft and Salford. The density of L. udekemianus was low in the Irwell above the entry point of the heavily polluted River Roch, but high below this point. N. elinguis was abundant above the Roch entry point and scarce below it. In the three dominant tubidicids, the main population recruitment occurred during the summer months (April to September for T. tubifex, May to November for L. hoffmeisteri and June to October for L. udekemianus). In N. elinguis, there was massive recruitment in April. (EIS-Katz)
W78-11680

ELEVATED HEAVY METALS: A STRESS ON A POPULATION OF WHITE SUCKERS, CATOSTOMUS COMMERSONI, IN HAMELL LAKE, SASKATCHEWAN,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
G. A. McFarlane, and W. G. Franzin.
Journal of the Fisheries Research Board of Canada, vol. 35, 1978, p963-970. 4 tab., 7 fig., 13 ref.

Descriptors: *Metals, *Zinc, *Copper, *Cadmium, Suckers, Growth, Reproduction, Animal populations, Fish eggs, Fish populations, *Water pollution effects, Path of pollutants, Fish reproduction, Canada, *Stress, *White sucker, *Hamell Lake, Heavy metal fallout, Heavy metal smelters.

This study examined populations of white suckers (Catostomus commersoni), in two physically and chemically similar lakes in the vicinity of, and receiving heavy-metal fallout from, a base-metal smelter complex near Flin Flon, Manitoba. The white suckers occupying Hamell Lake, Saakatchewan, which is contaminated by Zn, Cu, and Cd, showed signs typical of a population under stress when compared with the population in Thompson Lake, Manitoba, which contains much lower levels of these metals. Hamell Lake, white suckers showed greatly increased growth in length and weight, increased fecundity, and earlier age of maturation, but reduced spawning success, reduced larval and egg survival, smaller egg size, and reduced longevity compared with Thompson Lake white suckers. We attraibute these differences to elevated heavy metals in Hamell Lake waters, particularly in early spring, a most critical period in the reproductive cycle of these fish. Effects of the metals on other species of fish in Hamell Lake are also discussed. (EIS-Katz)
W78-11682

EFFECTS OF UPTAKE AND DISCHARGE OF PETROLEUM HYDROCARBONS ON THE RESPIRATION OF THE SOFT-SHELL CLAM, MYA ARENARIA,
Industrial Environmental Research Lab.-Cincinnati, Edison, NJ. Oil and Hazardous Materials Spills Branch.
D. M. Stainken.
Journal of the Fisheries Research Board of Canada, vol. 35, p637-642, 1978. 1 fig., 3 tab., 32 ref.

Descriptors: *Oil, *Clams, *Respiration, *Animal metabolism, *Toxicity, Oil spills, Oil pollution, Organic compounds, Aromatic compounds, Path of pollutants, Water pollution effects, Animal physiology, Fuels, Depuration, Naphthalenes, Mya.

A winter (4 C) spill condition was simulated in which young soft-shell clams were exposed to subacute concentrations of No. 2 fuel oil-in-water emulsions for 28 d. Clams were exposed at the beginning of the experiment to single dose concentrations of 10, 50, and 100 ppm. Hydrocarbons were rapidly accumulated by clams within 1 wk after exposure. The accumulated hydrocarbons then decreased each week as the hydrocarbon content of the water decreased. Methyl substituted naphthalene isomers were the principal compounds accumulated and retained by the clams after 3 wk of oil exposure. A dose-response relationship was observed in the respiratory rates as measured by oxygen consumption. The lowest concentrations of oil caused a doubling of the respiratory rates and greater oil concentrations caused a depression in rate. During the depuration period, many of the hydrocarbons present in clam tissue were again found to be methyl substituted naphthalene isomers. The respiratory rates of all groups of oil-exposed clams remained altered from the controls, but the magnitude of difference tended to decline toward the controls. (EIS-Deal)
W78-11683

ALTERATIONS IN GROWTH AND PHYSIOLOGY OF SOFT-SHELL CLAMS, MYA ARENARIA, CHRONICALLY OILED WITH BUNKER C FROM CHEDABUCTO BAY, NOVA SCOTIA, 1970-76,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
E. S. Gilfillan, and J. H. Vandermeulen.
Journal of the Fisheries Research Board of Canada, vol. 35, p630-636, 1978. 4 fig., 3 tab., 21 ref.

Descriptors: *Oil, *Clams, *Animal physiology, *Growth rates, *Animal metabolism, *Sediments, Oil spills, Oil pollution, Organic compounds, Lagoons, Population, Path of pollutants, Water pollution effects, Metabolism, Mya, *Tissue analysis.

Two populations of soft-shell clam, one from a chronically oiled lagoon (since the Arrow oil spill in 1970) and the other from a nonoiled lagoon, were compared as to population structure, growth and metabolism. The oiled lagoon sediments contained up to 3800 miacrograms/g oil and clams up to 200 micrograms/g hydrocarbon in their tissues. The oiled population of clams differed from the nonoiled population in lower total numbers with fewer mature adults, a 1-2 yr lag in tissue growth, a lower shell gorwth rate, and a reduced carbon flux with a lower assimilation rate. Results are interpreted to indicate that the recovery potential of M. arenaria in these oiled sediments is low and that these oiled populations remain under conditions of continued stress 6 yr after the Arrow spill. (EIS-Deal)
W78-11684

AVOIDANCE CHAMBER RESPONSES OF MAYFLY NYMPHS EXPOSED TO EIGHT HERBICIDES,
Fish and Wildlife Service, Denver, CO. Fish-Pesticide Research Lab.
L. C. Folmer.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 3, p 312-318, 1978. 3 tab, 4 ref.

Descriptors: *Rainbow trout, *Animal behavior, *Fish behavior, Aquatic insects, *Mayflies, *Herbicides, *Pesticide toxicity, *Diquat, *Copper sulfate, *2,4-D, *Dalapon, *Pesticide residues, Water pollution effects, Path of pollutants, *Avoidance, *Acrolein, *Aquathol K, *Roundup(Pesticide).

Because movement (stream drift) or death of insects may have a deleterious influence on the nutrition of a resident fishery, it was important to determine whether a representative insect world, like fry of rainbow trout, avoid some of the most commonly used herbicides. The avoidance behavior of mayfly nymphs was analyzed under three concentrations of eight herbicides. Mayfly

nymphs avoided the highest test concentration of copper sulfate, diquat, and Roundup, but did not avoid the other herbicides at the experimental concentrations tested. (EIS-Deal)
W78-11685

UPTAKE, METABOLISM, AND EXCRETION OF DDT BY THE FRESH WATER SNAIL, VIVIPARA HELICIFORMIS,
Delhi Univ. (India). Dept. of Zoology.
D. V. Yadav, H. C. Agarwal, and M. K. K. Pillai.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 3, p 300-306, 1978. 6 fig, 7 ref.

Descriptors: *DDT, *DDD, *DDE, *Chlorinated hydrocarbon pesticides, *Pesticide kinetics, *Animal metabolism, *Snails, Pesticide residues, Path of pollutants, Animal physiology, Mollusks, Vivipara.

Snails were exposed under laboratory conditions to three concentrations of DDT (0.005, 0.01, and 0.05 ppm). All snails accumulated the DDT rapidly. The total DDT in the snails after 24 hours was 1.5, 3.25, and 3.78 ppm respectively. DDD and DDE were the only two metabolites detected in the snails. After transfer to aquaria containing uncontaminated water, the DDT and its metabolites were excreted very rapidly in the first 24 hours (75%). (EIS-Deal)
W78-11686

HEPATIC PATHOLOGY IN A FRESH-WATER TELEOST CHANNA PUNCTATUS (BLOCH) EXPOSED TO SUB-LETHAL AND CHRONIC LEVELS OF THREE ORGANOPHOSPHOROUS INSECTICIDES,
University of the Pubjab, Lahore (Pakistan). Dept. of Zoology.
M. A. Anees.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 5, p 524-527, 1978, 1 tab, 8 ref.

Descriptors: *Organophosphorous pesticides, *Diazinon, *Insecticides, *Pesticide toxicity, *Pesticide kinetics, *Toxicity, *Animal pathology, *Teleosts, *Cytological studies, *Fish physiology, *Animal metabolism, Organic compounds, Pesticides, Path of pollutants, *Parathion, *Dimethoate, Tissue analysis, Liver.

The three insecticides investigated (Diazinon, Methyl Parathion and Dimethoate) produced detectable liver injury at both high and low concentrations. The same concentrations of these insecticides have already been observed to cause many tissue changes in the intestine and disturbances in the distribution of serum proteins. The available evidence indicates that similar symptoms developed in fish liver after exposure to organophosphates.
W78-11687

A SURVEY OF THE MACROFAUNA OF A COAL-WASTE POLLUTED LANCASHIRE FLUVIAL SYSTEM,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
J. P. Greenfield, and M. P. Ireland.
Environmental Pollution, vol. 16, 1978, p105-122. 5 tab., 3 fig., 55 ref.

Descriptors: *Benthos, Animal populations, *Water pollution effects, Iron, Industrial wastes, *Coal mine wastes, *Coal mines, Freshwater fish, Bethos, Aquatic environment, Aquatic insects, Iron, Oligochaetes, Sediments, Lead, Zinc, Copper, Ammonia, Lancashire, Burnley, *Coal mine polluted river, *Iron hydroxide, Blanketing effects.

The effect of coal mine spoils in the Burnley area of Lancashire on the pollution of adjacent rivers was investigated from 1974 to 1975. Areas of the rivers studied showed heavy deposits containing iron hydroxide which blanketed the substratum. The macroinvertebrate community above the site of pollution showed a high diversity. At the site of deposition of iron compounds there was a reduction in diversity to oligochaetes and the larvae of chironomids. The blanketing effect of the iron compounds seemed to be the most important factor in this depletion. Four species of fish were found above the site of pollution: bullhead, minnow, stickleback, and stoneloach. At the site of moderate pollution minnows and bullheads were no longer found and in the area of heavy pollution no fish were taken. Caging experiments indicate that physical pollution was the limiting factor. There was no subsequent recovery of C. gobio and P. phoxinus downstream of te source of heavy pollution and G aculeatus and N. barbatulus only appeared after the polluted river was joined by the River Calder. The macroinvertebrate community showed signs of some recovery. (EIS-Katz)
W78-11688

SURVIVAL AND REPRODUCTIVE SUCCESS OF BLACK DUCKS FED METHYL MERCURY,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
M. T. Finley, and R. C. Stendell.
Environmental Pollution, vol. 16, 1978, p51-64. 4 tab., 2 fig., 28 ref.

Descriptors: *Mercury, Heavy metals, *Toxicity, Mortality, Bioassay, *Bird eggs, *Black ducks, Water pollution effects, Path of pollutants, *Animal pathology, Animal growth, Animal physiology, Reproduction, Feeds, Hatching, Ducks(Wild), *Anas rubripes, Clutch size, Egg production, Hatchability, Survival, Ducklings, Brain lesions, *Mercury poisoning.

A diet containing 3 ppm mercury was fed to black ducks (Anas rubripes) for periods of 28 weeks during two consecutive breeding seasons. Clutch size, egg production, number of eggs incubated, hatchability, and survival of ducklings were lower during both years in hens fed mercury. Reduced hatchability and poor duckling survival were the most harmful effects. During 2 years, 13 pairs of breeders fed mercury produced only 16 ducklings that survived 1 week compared with 73 ducklings from 13 pairs of controls. Mercury residues in eggs, embryos, and ducklings averaged about 30% lower during the secnd breeding season compared with the first year results. Third eggs laid by treated hens contained a mean of 6.14 and 3.86 ppm mercury during the first and second years. Whole embryos that failed to hatch contained means of 9.62 and 6.08 ppm mercury during the first and second years. Brans of dead ducklings contained between 3.25 and 6.98 ppm mercury and exhibited lesions characteristic of mercury poisoning. Relative tissue mercury levels for treated adult breeders were: feathers greater than liver greater than kidney greater than breast muscle greater than brain. Mercury levels in males and females did not differ. (EIS-Katz)
W78-11689

THE EFFECTS OF A POLYCHLORINATED BIPHENYL (AROCLOR 1254) ON THE WHITE PELICAN: ULTRASTRUCTURE OF HEPATOCYTES,
South Dakota State Univ., Brookings. Dept. of Veterinary Science.
I. J. Stotz, and Y. A. Greichus.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 3, p 319-325, 1978. 2 fig, 1 tab, 12 ref.

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Toxicity, *Pesticide residues, *Cytological studies, *Animal pathology, *Animal physiology, *Animal metabolism, *Electron microscopy, Path of pollutants, Pesticides, Mode of action, Tissue analysis, Bioaccumulation, Liver, *Pelicans.

Nine test birds were given a controlled dosage of PCBs while nine more birds served as controls. Liver cells were subsequently analyzed for pathological changes. Comparison of ultrastructural morphological characteristics indicated a 22% greater hepatocyte size in the treated birds. Hepatocytes from treated pelicans had significantly greater numbers of mitochondria and vacuoles and significantly fewer cristae per mitochondria than controls. (EIS-Deal)
W78-11690

PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS AND ANIMALS FROM THE ISLAND OF MALTA,
Bristol Univ. (England). Dept. of Inorganic Chemistry.
For primary bibliographic entry see Field 5B.
W78-11691

PRUDHOE CRUDE OIL IN ARCTIC MARINE ICE, WATER, AND SEDIMENT ECOSYSTEMS: DEGRADATION AND INTERACTIONS WITH MICROBIAL AND BENTHIC COMMUNITIES,
Louisville Univ., KY. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-11693

DISTRIBUTION AND ABUNDANCE OF HYDROCARBON-UTILIZING BACTERIA IN SEDIMENTS OF CHEDABUCTO BAY, NOVA SCOTIA, IN 1976,
Fisheries and Marine Service, Halifax (Nova Scotia).
For primary bibliographic entry see Field 5B.
W78-11694

EFFECTS OF AROCLOR 1248 AND 1260 ON THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
Environmental Research Lab.-Duluth, MN.
D. L. DeFoe, G. D. Veith, and R. W. Carlson.
Journal of the Fisheries Research Board of Canada, vol. 35, p997-1002, 1978. 4 tab., 3 fig., 11 ref.

Descriptors: *Toxicity, Bioassay, Freshwater fish, Minnows, *Aroclor, *Polychlorinated biphenyls, Juvenile fish, Fish eggs, Reproduction, Larvae, Fathead minnows, PCB's, Aroclor 1248, Aroclor 1260, Pimephalus promelas, *Bioconcentration, Chronic toxicity, Depuration.

Fathead minnows were exposed to Aroclor 1248 and 1260 in flow-through bioassays to determine the acute (30-d) and chronic (240-d life cycle) effects on the larvae and adults, as well as the bioconcentration of the mixtures of PCBs in the fish. Newly hatched larvae (less than 8 h old) were the most sentitive; the calculated 30-d LC50 was 4.7 micrograms/L for Aroclor 1248 and 3.3 microgram/L for Aroclor 1260. Reproduction in fathead minnows occurred at concentrations as high as 3 micrograms/L for Aroclor 1248 and 2.1 microgram/L for Aroclor 1260, concentrations that significantly affected larval survival. The 20% reduction in the standing crop in the second-generation fish at concentrations as low as 0.4 microgram/L was due to the death of the larvae soon after hatching. The bioconcentration factor for PCBs was independent of the PCB concentration in the water; in adult females at 25 C it was approximately 1.2 x 105 for Aroclor 1248 and 2.7 x 105 for Aroclor 1260. Females accumulated about twice as much PCBs as the males because of the greater amount of lipid in the female. Exposed fish placed in untreated Lake Superior water eliminated less than 18% of the body burden after 60d. (EIS-Katz)
W78-11695

AROMATIC HYDROCARBONS IN BENTHIC ORGANISMS FROM COASTAL AREAS POLLUTED BY IRANIAN CRUDE OIL,
Institute of Marine Research, Bergen (Norway).
For primary bibliographic entry see Field 5B.
W78-11696

TRACE ELEMENTS IN THE FLESH AND LIVER OF TWO FISH SPECIES FROM POLLUTED AND UNPOLLUTED AREAS OF THE AEGEAN SEA,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
For primary bibliographic entry see Field 5B.
W78-11697

EFFECTS OF CHRONIC EXPOSURE TO PETROLEUM UPON THE GROWTH AND MOLTING OF JUVENILES OF THE ARCTIC MARINE ISOPOD CRUSTACEAN MESIDOTEA ENTOMON,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
J. A. Percy.
Journal of the Fisheries Research Board of Canada, vol. 35, p650-656, 1978. 2 fig., 2 tab., 19 ref.

Descriptors: *Oil, *Growth rates, *Juvenile growth stage, *Isopods, *Mortality, *Toxicity, Oil pollution, Oil spills, Organic compounds, Growth stages, Crustaceans, Benthic fauna, Water pollution effects, Animal physiology, Animal metabolism, *Crude oil, Mesidotea, Molting, Water-soluble fractions.

Juveniles of the benthic marine isopod Mesidotes entomon were chronically exposed to different concentrations of water-soluble fraction of fresh and weathered Norman Wells crude oil and of fresh Pembina crude for 160 D. The 100% extracts conained 1.72, 1.12, and 0.56 pm of oil (determined fluorimetrically), respectively. Most of the animals completed five or six molts before the end of the experiment. Long-term mortality was high in the 100% extracts of the oils, but most of the animals molted at least once before dying. None of the deaths occurred in conjunction with the molt. Stimulation of the onset of the subsequent molt occurred in some exposure groups. A significant increase in the duration of the intermolt period only occurred at the highest oil concentrations. Effects on growth were slight at concentrations lower than that which is lethal during chronic exposure. (EIS-Deal)
W78-11698

BEHAVIOR OF DDT, POLYCHLORINATED BIPHENYLS (PCB'S), AND DIELDRIN AT VARIOUS STAGES OF REFINING OF MARINE OILS FOR EDIBLE USE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
R. F. Addison, M. E. Zinck, R. G. Ackman, and J. C. Sipos.
Journal of the American Oil Chemists' Society, vol. 55, p391-394, April 1978. 2 tab., 24 ref.

Descriptors: *Pesticide residues, *DDT, *DDD, *DDE, *Polychlorinated biphenyls, *Dieldrin, *Commercial fish, *Marine fish, *Path of pollutants, *Public health, *Food processing industry, *Herring, Chlorinated hydrocarbon pesticides, Pollutants, Organoleptic properties, Fish oil, Marine oils, Margarine, Herring oils.

Two 300-lb. batches of Eastern Canadian herrin (Clupea harengus) oil were subjected to pilot plant processing to margarine stock for edible use. Samples were taken at various stages during processing for analysis of residues of the insecticide DDT and its meta bolites DDD and DDE, of polychlorinated biphenyls (PCBs) and of dieldrin. Residue concentrations in the oil were not affected by degumming (phosphoric acid wash), alkali refining, or bleaching with activated earth. DDT and dieldrin were readily and completely destroyed by commercial hydrogenation over Ni catalyst, and DDD was largely removed at the same time. DDE and PCBs were partially reduced during hydrogenation in the one run in which DDD was completely removed, but were unaffected in another run, in which DDD was only partially removed. Deodorization of the oil with steam and vacuum effectively removed those residues which survived hydrogenation. Analysis of the Ni catalyst before and after hydrogenation showed that removal of residues during hydrogenation was not due to their adsorption to the catalyst, but was more probably due to metal-catalyzed degradation to unidentified products. Deodorizer condensates showed only a slight enrichment in residue levels over those found in the oil. (EIS-Katz)
W78-11699

EFFECTS OF PHOSPHORUS FROM APATITE ON DEVELOPMENT OF FRESHWATER COMMUNITIES,
Waterloo Univ. (Ontario). Dept. of Biology.
E. A. Smith, C. I. Mayfield, and P. T. S. Wong.
Journal of the Fisheries Research Board of Canada, vol. 34, p2405-2409, 1977. 1 tab, 5 fig, 22 ref.

Descriptors: *Nutrients, Environmental effects, Biological communities, *Phosphorous. *Phosphates, Aquatic algae, *Nitrogen, *Oligotrophy, *Productivity, *Biomass, Zooplankton, Mineralogy, Laboratory tests, Phosphorous compounds, Crystals, Water quality, Nutrient requirements, Carbon cycle, Erosion, *Apatite, *Hydroxyapatite, *Fluorapatite.

Phophorus-free nutrients were added to three epilemnetic (pH 7.8) 40-L taks. Apatite crystals (30-100 microns) were added at loading rates of 30, 2, and 0 mg/day. After a 60-day incubation at 20C, levels of particulate organic carbon, particulate nigroten, and particulate organic phosphorus in Tank 1 increased from 0.42, 0.090, and 0.015 to 6.10, 0.820, and 0.430 micrograms/ml, respectively. This increase was due to the proliferation of algae, bacteria, and zooplankton and did not occur in the tank with only P-free nutrients. Algae and bacteria grew extensively on the surfaces of apatite crystals causing crystals to aggregate. Zooplankton increases followed those in algae and bacteria, and grazing was restricted to the areas around the apatite crystals. Results suggest that the contribution of soluble ortho-phosphate from apatite to the P-cycle of aquatic environments would be more important under oligotrophic conditions than in areas receiving high loadings of athropogenic phosphate, particularly where high erosion increases apatite loadings. (EIS-Katz)
W78-11700

PRELIMINARY ECOLOGICAL-GENETIC COMPARISON BETWEEN UNPERTURBED AND OIL-IMPACTED UROSALPINX CINEREA (PROSOBRANCHIA: GASTROPODA) POPULATIONS: NOBSKA POINT (WOODSHOLE) AND WILD HARBOR (WEST FALMOUTH), MASSACHUSETTS,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
T. J. Cole.
Journal of the Fisheries Research Board of Canada, vol. 35, p 624-629, 1978. 4 fig, 22 ref.

Descriptors: *Oil, *Population, *Genetics, *Ecology, *Biological communities, Oil pollution, Oil spills, Mortality, Enzymes, Organic compounds, Electrophoresis, Water pollution effects, Oyster drill, Urosalpinx, Demography.

Catastrophes, whether natural or man-made, impinge on populations of organisms by increasing mortality, thus reducing population numbers. Recent theoretical studies indicate that demographic and genetic changes may result from such events. The 1969 oil spill at Wild Harbor offered an opportunity to obtain empirical data on this relationship between ecology and genetics. The organism studied was the oyster drill. Monthly samples were collected for each of 3 yr from the recolonizing population and from a long-standing population. Genotypes at two allozymic loci were determined. Demographic information was obtained by mark-recapture experiments during 1973-75. Ana+yses of population dynamics indicated that a reasonably functioning population has been reestablished at Wilder Harbor. However, genetic structure (as revealed by genotypic distributions) of Wild Harbor drills exhibited generally greater year-to-year variation than did Nobska ortganisms. This may have resulted from genetic change caused by gene migration from different co-adapted gene complexes and from stochastic 'founder' effects. More information on the interdigitation of ecology and genetics is needed, however, before implications of these findings are fully realized. (EIS-Deal)
W78-11701

UPTAKE OF HYDROCARBONS FROM MARINE SEDIMENTS CONTAMINATED WITH PRUDHOE BAY CRUDE OIL: INFLUENCE OF FEEDING TYPE OF TEST SPECIES AND AVAILABILITY OF POLYCYCLIC AROMATIC HYDROCARBONS,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
G. Roesijadi, J. W. Anderson, and J. W. Blaylock.
Journal of the Fisheries Research Board of Canada, vol. 35, p608-614, 1978. 1 fig, 3 tab, 22 ref.

Descriptors: *Oil, *Absorption, *Bottom sediments, *Aromatic compounds, *Food habits, *Animal metabolism, *Animal physiology, Oil pollution, Oil spills, Organic compounds, Sediments, Benthic fauna, Path of pollutants, *Crude oil, Bivalves, Macoma, Phascolosoma, Protothaca, Tissue analysis, Bioaccumulation.

Selected benthic animals were exposed to marine sediments contaminated with Prudhoe Bay crude oil, and uptake of hydrocarbons was monitored under various experimental schemes. When uptake of aliphatic and diaromatic hydrocarbons by two deposit feeders, Macoma inquinata and Phascolosoma agassizii, was compared with that of a suspension feeder, Protothaca staminea, we found that the deposit feeders generally accumulated hydrocarbons to a greater extent that the suspension feeder. However, other factors, such as the intrinsic capabilities of species to accumulate hydrocarbons, also played an important role in the extent of contamination. Hydrocarbon concentrations in the bivalve species increased during the 60-d exposure period; whereas concentrations in the sipunculid appeared to have reached an equilibrium relatively early in the exposure. (EIS-Deal)
W78-11702

IMPORTANCE OF SEDIMENT WORKING BY THE DEPOSIT-FEEDING POLYCHAETE ARENICOLA MARINA ON THE WEATHERING RATE OF SEDIMENT-BOUND OIL,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
D. C. Gordon, Jr., J. Dale, and P. D. Keizer.
Journal of the Fisheries Research Board of Canada, vol. 35, p 591-603, 1978. 8 fig, 13 tab, 24 ref.

Descriptors: *Oil, *Bottom sediments, *Worms, *Food habits, *Microbial degradation, *Absorption, Oil spills, Oil pollution, Organic compounds, Sediments, Gas chromatography, Fluorescence, Spectroscopy, Biodegradation, *Polychaetes, Tissue analysis, Bioaccumulation, Arenicola.

The interactions between the polychaete Arenicola marina, a common deposit-feeder in

sandy intertidal areas, and sediment contaminated with fresh reference oils and weathered Bunker C oil remaining from the 1970 Arrow spill were investigated in laboratory experiments. Worms can tolerate low concentrations of sediment-bound oil, although the sediment working rate is reduced upon oil type, concentration, and degree of weathering. Hydrocarbon concentrations, measured gravimetrically and by gas chromatography and fluorescence spectroscopy, were substantially lower (17-72%) in worm casts than in initial sediment. This loss can be accounted for by microbial degradation, which is stimulated by the worms' activity, uptake of hydrocarbons into worms, and perhaps dissolution. (EIS-DEal)
W78-11703

TEMPERATURE AND WATER VELOCITY EFFECTS ON THE SWIMMING PERFORMANCES OF YOUNG-OF-THE-YEAR STRIPED MULLET (MUGIL CEPHALUS), SPOT (LEIOSTOMUS XANTHURUS), AND PINFISH (LAGODON RHOMBIDIES),
North Carolina State Univ., at Raleigh. Dept. of Zoology.
R. A. Rulifson.
Journal of the Fisheries Research Board of Canada, vol. 34, p2316-2322, 1977. 3 tab, 3 fig, 16 ref.

Descriptors: Environmental effects, *Fish behavior, *Mullets, *Entrainment, *Water temperature, *Swimming, *Velocity, *Currents(Water), Aquatic environment, Commercial fish, Sport fish, Laboratory tests, Estuarine environment, Movement, Water circulation, Water velocity, *Swimming behavior, Mugil, Leiostomus, Lagodon, Pinfish.

Swimming performances of young-of-the year striped mullet (Mugil cephalus), spot (Leiostomus xanthurus), and pinfish (Lagodon rhomboides) were tested by examination of the combination of physical endurance and swimming behavior to provide information on potential fish entranment and impingement problems at industrial intakes. Tests were conducted at three temperatures (15-25C) and six water velocities (12-48 cm/s). Fish lengths ranged from 1.4 to 7.0 cm TL. Fish tested at high temperatures exhibited increased time for steady swimming and for impingement avoidance. Temperature was also positively correlated with maximum swimming speeds and with the number of bursts performed during drift-burst activity (drifting with the current and returning upstream-with a burst of swimming). Increased water velocities resulted in decreased times of steady swimming and impingement avoidance, and reduced drift-burst activity. Larger fish avoided impingement longer and had faster maximum swimming speeds; however, smaller fish showed stronger rheotaxis and swam steadily for longer periods at equal water velocities. Abnormally heavy mullet and spot had reduced capabilities for position maintenance (steady swimming) which may decrease their ability to avoid impingement. (EIS-Katz)
W78-11704

EFFICACY OF CERTAIN DISINFECTANTS AGAINST INFECTIOUS PANCREATIC NECROSIS VIRUS,
Washington Univ., Seattle. Coll. of Fisheries.
D. G. Elliott, and D. F. Amend.
Journal of Fish Biology, Vol. 12, p. 277-286, 1978. 8 tab, 19 ref.

Descriptors: *Fish diseases, *Aquiculture, *Viruses, Viricides, Rainbow trout, Bioassay, Chlorine, Iodine, Iodides, Pathology, Hardness(Water), Mercury, *Disinfection, Hydrogen ion concentration, *Disinfectants, Iodophor, *Formalin, *Organic mercurial compounds, *Infectious pancreatic necrosis.

The virucidal properties of iodopher, chlorine (sodium hypochlorite), formalin, thimerosal (organic mercurial compound), malachite green, and acriflavine were tested on infectious pancreatic necrosis virus (IPNV). Iodine and chlorine showed good activity, but efficacy depended on the concentration of virus, the presence of oganic matter (calf serum), and water pH. Water hardness (0-300 mgl-1 as CaCO3) did not affect virucidal activity. (EIS-Katz)
W78-11705

INTERACTION OF IONIZED AND UN-IONIZED AMMONIA ON SHORT-TERM SURVIVAL AND GROWTH OF PRAWN LARVAE, MACROBRACHIUM ROSENBERGII,
California Univ., Davis. Hydrobiology Lab.
D. A. Armstrong, D. Chippendale, A. W. Knight, and J. E. Colt.
Biological Bulletin, Vol. 154, p. 15-31, 1978. 5 fig., 2 tab., 50 ref.

Descriptors: *Aquiculture, *Commercial shellfish, *Shrimp, Bioassay, Toxicity, Mortality, Laboratory tests, *Ammonium compounds, Animal physiology, Animal pathology, Growth, Juvenile growth stage, Methodology, Hydrogen ion concentration, *Macrobrachium.

The toxicity of ammonia to Marcrobrachium larvae was tested at pH 6.83, 7.60, and 8.34, and the respective 144 hr 1050 values were 80, 44, and 14 mg ammonia/liter. Toxicity of ammonia was not due solely to the NH3 molecule. In solutions of different pH equal NH3 concentrations, survival was greatly reduced as NH4+ levels increased. A model is proposed to explain the differential effect of amonia as pH varies. At higher pH (8.4) toxicity results from copious diffusion of NH3 into larvae. At lower pH (6.8) toxicity is thought to result from competitive inhibition of Na+ transport by NH4+. Retardation of growth was documented in sublethal concentrations of smmonia at 6.8 and 7.6. The average dry weight was about 26% less than that of controls (P less than 0.05) after a seven day exposure. Results are discussed relevant to the culture and maintenance of crustaceans, and it is concluded that ammonia will not pose a substantial threat in adequately managed systems. (EIS-Katz).
W78-11706

DISRUPTION OF PRECOPULATORY BEHAVIOR IN THE AMPHIPED ANISOGAMMARUS PUGETTENSIS UPON EXPOSURE TO BLEACHED KRAFT PULPMILL EFFLUENT,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
J. C. Davis.
Water Research, Vol. 12, p. 273-275, 1978. 1 fig., 14 ref.

Descriptors: *Amphipoda, *Bioassay, *Animal behavior, *Pulp wastes, Pulp and paper industry, Bleaching wastes, Reproduction, Sockeye salmon, Toxicity, Mortality, Crustacieans, Industrial wastes, Water pollution sources, *Copulatory behavior.

Marine amphipods in precopula were used in statid 117 h bioassays with neutralized, filtered bleached kraft pulp mill effluent (BKME) and daily solution replacement. The effluent interfered with precopula behavior; high concentrations (40% of full strenght BKME) resulted in rapid release of paired amphipods. A concentration-related time to 50% release of paired individuals was observed. For one batch of BKME the behavioral threshold concentration (E050) was estimated at 10-15% of full strenght BKME. The estimated 96 h LC50 for underyearling coho salmon (Oncerhychus kisutch) for the same effluent tested in freshwater was 36% BKME - illustrating a greater sensitivity of the amphiped behavioral bioassay in comparison to the salmonid acute lethal toxicity test. The amphiped precopula bioassay for toxicity testing has some merit in that it is moderately quantitative under given test conditions and does not require elaborate equipment. (EIS-Katz).
W78-11707

UPTAKE OF WATER-SOLUBLE GASOLINE FRACTIONS AND THEIR EFFECT ON OXYGEN CONSUMPTION IN AQUATIC STAGES OF THE MOSQUITE (AEDES AEGYPTI (L.),
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 5G.
W78-11710

INTERACTION OF CHEMICAL POLLUTANTS AND VIRUS IN A CRUSTACEAN: A NOVEL BIOASSAY SYSTEM,
Environmental Protection Agency, Gulf Breeze, FL. Gulf Breeze Environmental Research Lab.
J. A. Couch, and L. Courtney.
Annals of the New York Academy of Sciences, Vol. 298, p. 497-504, 1977. 6 fig, 9 ref.

Descriptors: *Viruses, *Aroclors, *Animal parasites, Polychlorinated biphenyls, Animal pathology, Mortality, Shrimp, Absorption, Bioassay, Infection, Toxicity, Hosts, Pesticides, Bioaccumulation, Tissue analysis.

A large group of shrimp, 23.3% of which has light Baculovirus infections, was divided equally into two groups. One group was exposed to the chemical stressor Aroclor 1254 (a polychlorinated biphenyl) at 0.7 ppb for 35 days in flowing seawater. The other group was maintained as a control group in flowing seawater. Viral presence in exposed shrimp samples increased with time at a significantly greater rate than did viral frequency in control shrimp. Viral prevalence in Aroclor-exposed shrimp survivors was 75% after 35 days, whereas in control shrimp, only 45.7% had patent viral infections. This finding suggests an interaction along chemical stressor (Aroclor 1254), host and virus. The nature or mechanism of this interaction has not been defined, but the shrimp virus system shows promise for future bioassays of influence of low concentrations of pollutants on natural pathogen-host interactions. (EIS-Katz)
W78-11712

DISTRIBUTION OF NEOPLASMS AND OTHER DISEASES IN MARINE FISHES RELATIVE TO THE DISCHARGE OF WASTE WATER,
Southern California Coastal Water Research Project El Segundo.
A. J. Mearns, and M. J. Sherwood.
Annals of the New York Academy of Sciences, Vol. 298, p. 210-224 1977. 2 fig, 7 tab, 37 ref.

Descriptors: *Fish diseases, *Demersal fish, Industrial wastes, Municipal wastes, Outfall sources, Animal pathology, DDT, Water pollution sources, Toxicity, Fish populations, Polychlorinated biphenyls, Aromatic compounds, Organic compounds, *Neoplasms, *Microstomus, *Dover sole, *Fin erosion.

This study was based on an examination of approximately 290,000 fishes that comprised 151 species collected from southern California coastal waters. Approximately 5% of the fishes were affected with external signs of disease, such as fin erosion, tumors, color abnormalities, and attached macropharasites. Fin erosion diseases were reported in the greatest number of species and occurred at the highest frequencies. Unlike the fin erosion disease, the tumor diseases in this report do not appear to be unrelated to single municipal waste water discharge or to other discrete sources of pollutants. The prevalence of lip papillomas in white croaker was apparently higher in past years than in recent years, and this tumor was found primarily in fish caught off the coasts of Orange and Los Angeles Counties. The occurrence of skin tumors on young Dover sole covers an even wider geographic area, and the disease is quite similar to

that which affects pleuronectids as far north as Bristol Bay, Alaska. The lack of association with specific waste discharge conditions coupled with an apparent relation to the life cycle of the Dover sole suggest that changes in waste discharge practices will have little impact on the prevalence of these tumors unless the changes affect survival rates and distributional patterns of young fish. (EIS-Katz)
W78-11713

A LONG-TERM STUDY OF THE EFFECTS OF WATER-SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE SURVIVAL, DEVELOPMENT RATE, AND GROWTH OF THE MUD CRAB RHITHROPANOPEUS HARRISII,
Texas A and M Univ., College Station. Dept. of Biology.
R. B. Laughlin, Jr., L. G. L. Young, and J. M. Neff.
Marine Biology, Vol. 47, p 87-95, 1978. 4 fig, 3 tab, 32 ref.

Descriptors: *Oil, *Oil pollution, *Crabs, *Growth rates, *Toxicity, Oil spills, Organic compounds, Fuels, Growth stages, Larval growth stage, Crustaceans, Mortality, Water pollution effects, Bioassay, *Zoeae, *Naphthalenes, Survival.

Mud Crabs were exposed continuously for 6 months after hatching to water-soluble fractions (WSF) of No. 2 fuel oil. The zoeal stages were the most sensitive to fuel oil. Of the zoeal stages, the first stage appeared to be the most sensitive. The combined duration of the 4 zoeal stages was significantly increased by increasing WSF exposure concentrations. The megalopa and crab stages were particularlay sensitive, particularly when compared to zoeal stages. However, mean duration of the megalopa and first crab stages was significantly affected by oil exposure. Individuals which survived the highest exposure concentrations as larvae appeared to grow larger during the crab stages, so that at the end of 6 months comparably staged crabs were equal to or larger than both control crabs and those exposed to low WSF concentrations. The data indicate that these crabs possess considrerable ability to recover from the effects of chronic sublethal exposure to petroleum hydrocarbons. The most deleterious effects of oil pollution on this species may be due to its impact on larval recruitment into the adult population. (EIS-Katz)
W78-11715

BIOCHEMICAL CORRELATES OF DISSOLVED MERCURY UPTAKE BY THE OYSTER OSTREA EDULIS,
Southampton Univ. (England). Dept. of Oceanography.
J. J. Wrench.
Marine Biology, Vol. 47, p. 79-86, 1978. 4 fig, 3 tab, 18 ref.

Descriptors: *Biochemistry, *Oyster, *Mercury, *Animal metabolism, Proteins, Metabolism, Absorption, Potassium, Metals, Heavy metal, Animal physiology, Water pollution effects, Path of pollutants, Biological membranes, Tissue analysis, *Ostrea.

From previous work, the equilibrium concentration factor for dissolved mercury in the digestive gland of Ostrea edulis was found to be three to four times higher than that of the gills. In the present study, an analysis of soluble protein revealed values of 49.3 plus or minus 14.2 mg g wet tissue -1 for the digestive gland and 0.7 plus or minus 0.1 mg g wet tissue -1 for the gills. Starvation significantly reduces the soluble protein level of the digestive gland to 31.1 plus or minus 6.4 mg g -1 and that of the gills to below the limit of detection. These results suggest that the difference in concentration factors betwen the gills and digestive gland may be based on a quantitative difference in macromolecular binding sites. (EIS-Katz)
W78-11716

METABOLISM OF AROMATIC HYDROCARBONS IN MARINE ORGANISMS,
National Marine Fisheries Service, Seattle, WA.
D. C. Malins.
Annals of the New York Academy of Sciences, Vol. 298, p. 482-496, 1977. 4 fig, 3 tab, 42 ref.

Descriptors: *Animal metabolism, *Aromatic compounds, *Enzymes, Biochemistry, Organic compounds, Oil, Fuels, Oysters, Marine animals, Metabolism, Fish physiology, Salmonids, Gas chromatography, Cytological studies, Chemical analysis, Bioaccumulation, *Depuration.

This discussion evaluates the status of our understanding of aromatic hydrocarbons metabolism in marne life, particularly with respect to the enzyme systems involved and the nature of the products formed. Representative findings in the areas of tissue accumulation and depuration and metabolic enzyme systems were summarized. (EIS-Katz)
W78-11717

THE FATE AND EFFECT OF PETROLEUM IN CONTROLLED ECOSYSTEM ENCLOSURES,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5B.
W78-11718

EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5A.
W78-11719

EFFECTS OF INSECTICIDES, OIL DISPERSANTS AND SYNTHETIC DETERGENT ON THE EMBRYONIC DEVELOPMENT IN MEDAKA, ORYZIAS LATIPES,
K. Hirose, and K. Kawakami.
Bulletin of the Tokai Regional Fisheries Research Lab. No 91, p. 9-17, 1977. 4 fig, 3 tab, 14 ref.

Descriptors: *Embryonic growth stage, *Insecticides, Growth stages, Growth rates, Reproduction, Linear alkylate sulfonates, Water pollution effects, Toxicity, Mortality, DDT, Diazinon, Pesticide toxicity, *Dispersants.

This study was undertaken to learn the effects of insecticides (DDT, PAP, and diaginon), oil dispersants (No. 2 and No 5) and LAS on the embryonic development of medaka, Oryzias latipes. In the fertilized eggs exposed to DDT (0.04, 0.004 and 0.0004)ppm) the embryonic developments were retarded at stage such as development of vascular system or observation of melanin in eyes. Mean day from fertilization to hatching also showed considerably high values in DDT groups. The embryonic development in diaginon was similar to that in the control. But hatching rates were reduced in 5 and 1 ppm diaginon. No. 2 did not effect the developing embryos, whereas, No. 5 showed a severe effect. The experiment was also carried out to learn whether some observed abnormal responses to sublethal exposures to PAP, diazinon, No. 5 and LAS were due to the period of incubation or due to the effect followed by hatching. (EIS-Katz)
W78-11720

WHAT NORTH SEA OIL MIGHT COST FISHERIES,
Marine Lab., Aberdeen (Scotland).
R. Johnston.
Rapports et Proces-Verbaux des Reunions, Conseil International Pour L'Exploration de la Mer, Vol 171, p. 212-223, 1977. 2 fig, 10 tab, 9 ref.

Descriptors: *Water pollution effects, *Marine fisheries, *Oil industry, *Food webs, *Fish behavior, *Toxicity, Oil fields, Exploitation, Natural gas, Primary productivity, Biodegradation, Oil spills, Commercial fishing, Inhibitors, Food chains, Biological communities, Commercial fish, Commercial shellfish, *North Sea.

There is an urgent need for a reasoned assessment of the impact of oil and oil-related developments on the fisheries of the North Sea. The available information is inadequate for a valid simulation and instead a number of theoretical relationships are assumed between fish production and its underlying food web. On this basis, taking into account of the more important proven or probable modes of action of North Sea oil, a tentative appraisal is made of the possible loss as equivalent fish resulting from oil spillages of various magnitudes and probabilities. The physical encumbrance of oil-related developments on fishing is then assessed. A third factor is natural gas exploitation and its attendant risks and interferences. Losses reckoned as fish production or its approximate cash equivalent are shown to be small even for a catastrophic oil spill. Physical obstruction to fishing might be construed as a more serious interference. (EIS-Katz)
W78-11721

APPARENT EFFECTS OF FLOODING ON DISTRIBUTION AND LANDINGS OF INDUSTRIAL BOTTOMFISH IN THE NORTHERN GULF OF MEXICO,
National Marine Fisheries Service, Pascagoula, MS. National Marine Fisheries Center.
For primary bibliographic entry see Field 2L.
W78-11722

ACUTE TOXICITY OF NITRITE TO LARVAE OF THE GIANT MALAYSIAN PRAWN, MACROBRACHIUM ROSENBERGII,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. A. Armstrong, M. J. Stephenson, and A. W. Knight.
Aquaculture, Vol 9, p. 39-46, 1976. 2 fig, 2 tab, 20 ref.

Descriptors: *Toxicity, *Bioassay, *Nitrites, *Larval growth stage, *Lethal limit, *Shellfish, Growth rates, Laboratory tests, Nitrogen compounds, Larvae, Crustaceans, Invertebrates, Aquiculture, Water quality, Water pollution effects, *Shrimp, *Macrobrachium rosenbergii, *Sublethal effects.

Static bioassays of up to 8 days duration were performed on 10-14 day old larvae ranging in weight from 80 to 140 micro gr/larva. The 24-, 96- and 192-h LC50 values were 130, 8.6, and 4.5 mg NO2-N/l respectively. The highest concentrations of nitrite in which no mortality were observed were 9.7 and 1.4 mg/l in a 24- and 168-h period. There was a significant difference in weight of control larvae compared with those exposed to 1.8 mg/l for 8 days. (EIS-Katz)
W78-11723

ENVIRONMENTAL CARCINOGENESIS STUDIES IN FISHES OF THE GREAT LAKES OF NORTH AMERICA,
Guelph Univ. (Ontario). Dept. of Microbiology.
R. A. Sonstegard.
Annals of the New York Academy of Sciences, Vol 298, p. 261-269, 1977. 38 ref.

Descriptors: *Chemical wastes, *Great lakes, *Animal pathology, *Suckers, *Carp, *Viruses, *Epizootiology, Toxicity, Mortality, Industrial wastes, Municipal wastes, Water supply, Water sources, Water pollution, Potable water, *Carcinogenesis, *Neoplasms, Tumors.

A survey of over 50,000 fish revealed epizootics of gonadal tumors in carp, goldfish, and carp x goldfish hybrids and papillomas in white suckers. Several large museum collections taken prior to 1952 exhibited no gonadal tumors while samples from the same geographic area 25 years later revealed tumor frequencies as high as 100% in older males. It was hypothesized that PCBs and/or DDT may be involved in the tumor etiology. White sucker papillomas were also found to be widespread. A virus-chemical synergy was proposed as the mechanism of tumor development. The role of extensive industrial chemical pollution in animal and human carcinogenesis was also discussed. (EIS-Katz)
W78-11724

MASS MORTALITY AMONG MINNOWS PHOXINUS PHOXINUS (L.) IN LAKE TVEITEVATN, NORWAY, DUE TO AN ABERRANT STRAIN OF AEROMONAS SALMONICIDA,
National Veterinary Inst. Oslo (Norway).
T. Hastein, S. J. Saltveit, and R. J. Roberts.
Journal of Fish Diseases, Vol 1, p. 241-249, 1978. 1 tab, 6 fig, 7 ref.

Descriptors: *Mortality, *Fish kill, *Fish diseases, Fish physiology, Pathology, Freshwater fish, Bacteria, *Hydroelectric power, Minnows, Laboratory tests, Methodology, Brown trout, *Mass mortality, Phoxinus phoxinus, Lake Tveitevatn, Norway, Aeromonas salmonicida, Clinical features.

Mass mortality in minnows Phoxinus phoxinus (L.) was investigated in the Vinje water system, southern-central Norway. The main clinical feature was the development of extensive haemorrhagic skin lesions from which was isolated a non-pigmented, fish-pathogenic strain of Aeromonas salmonicida. (EIS-Katz)
W78-11725

TISSUE LESIONS OF TIGER SALAMANDERS (AMBYSTOMA TIGRINUM): RELTIONSHIP TO SEWAGE EFFLUENTS,
Texas Tech Univ., Lubbock. Dept. of Biological Sciences.
F. L. Rose.
Annals of the New York Academy of Sciences, Vol 298, p. 270-279, 1977. 2 fig, 1 tab, 24 ref.

Descriptors: *Salamanders, *Sewage lagoons, *Playas, *Aromatic compounds, Amphibians, Sewage treatment, Sewage effluents, Life history studies, Growth stages, Larval growth stage, Organic compounds, Fuels, Cytological studies, Toxicity, Mortality, *Tissue analysis, *Neoplasms, *Carcinogens, *Perylene.

A population of facultative neotenous tiger salamanders inhabiting a sewage lagoon at Reese AFB, Hurlwood, Texas, was found to have an exceptionally high rate of spontaneous skin lesions. The population is composed of an estimated 28,000 large, reproductively mature larvae that are restricted to the lagoon. Only about 17% of the population metamorphoses normally. In contrast, tiger salamanders from uncontaminated lagoons in the same general vicinity metamorphose normally; however, no neoplasms were discovered in larvae sampled from the non-sewage lagoons. N-nitrosamine analyses of water and tissue samples of larvae were negative. Polycyclic aromatic hydrocarbons analyses revealed traces of benzo(a)pyrene in the sludge; however, perylene, a constituent of jet fuel, was found in high concentration (330 ppb). These results indicate that perylene, which was previously found not to be tumorigenic to mice and rats, should be retested as a possible agent for nonmammalian species. (EIS-Katz)
W78-11726

SURVIVAL AND OXYGEN CONSUMPTION OF PRAUNUS FLEXUOSUS AND NEOMYSIS INTERGER, AND EMBRYONIC DEVELOPMENT OF THE LATTER SPECIES, IN DIFFERENT TEMPERATURE AND CHLORINITY COMBINATIONS,
Delta Inst. of Hydrobiological Research, Yerseke (Netherlands).
A. G. Vlas Blom, and J. H. B. W. Elgershuizen.
Netherlands Journal of Sea Research, Vol 11, No 3-4, p. 305-315, 1977. 5 fig, 2 tab, 19 ref.

Descriptors: *Embryonic growth stage, *Growth rates, *Animal physiology, *Environmental effects, *Water temperature, *Respiration, *Copepods, Resistance, Aquatic habitats, Invertebrates, *Crustaceans, Hatching, Growth stage, Temperature, Growth rates, *Chlorine, *Praunus, Neomysis.

Laboratory tests show that both Neomysis integer and Praunus flexuosus have wide tolerance ranges for salinity. Praunus tolerates higher salinities than Neomysis though the two species show considerable overlap. Praunus is more susceptible to the effects of high temperature than Neomysis. The greater tolerance of Neomysis to low salinity as well as to high temperature makes this species better adapted to habitats in which this combination of environmental factors occurs than Praunus. (EIS-Katz)
W78-11729

SOME LETHAL AND SUB-LETHAL EFFECTS IN CRANGON CRANGON AT EXPERIMENTAL K+ ENRICHMENT OF THEIR ENVIRONMENT,
Netherlands Inst. voor Onderzoek der Zee, Texel.
E. L. M. White-Maas, and D. H. Spaargaren.
Netherlands Journal of Sea Research, Vol 11, No 3-4, p. 316-324, 1977. 5 fig, 6 ref.

Descriptors: Environmental effects, *Bioassay, *Potassium, *Shrimps, *Mortality, *Salinity, *Water temperature, Shellfish, Toxicity, Lethal limits, Temperature, Animal physiology, Laboratory tests, Ions, Invertebrates, Crustaceans, Animal behavior, Crangon crangon, *Sublethal effects, Heart rate.

Experiments are described in which some effects in shrimps, Crangon crangon are studied when KO1 is added to sea water of various salinities at low and high temperature. Dependent on concentration, sudden changes in environmental K+ concentration, especially at extreme salinities, appeared to be harmful. The results are explained in terms of the capabilities of shrimps to regulate their internal K+ concentrations. (EIS-Katz)
W78-11730

NEOPLASIA IN SOFT-SHELL CLAMS (MYA ARENARIA) COLLECTED FROM OIL-IMPACTED SITES,
Environmental Research Lab., narragansett, RI.
P. P. Yevich, and C. S. Barszcz.
Annals of the New York Academy of Sciences, Vol 298, p. 409-426, 1977. 12 fig, 4 tab, 9 ref.

Descriptors: *Clams, *Oil spills, *Animal pathology, Oil pollution, Water pollution effects, Maine, Cytological studies, Reproduction, Animal physiology, Fuels, Toxicity, *Tissue analysis, *Neoplasms, Carcinogens.

Clams collected from two Maine oil spill sites have consistently shown neoplasms. While gross examination failed to reveal any abnormalities, microscopic examination found reproductive system neoplasms in both males and females. The neoplasms, which were found in from 1 to 22% of sampled specimens, were highly malignant. It was concluded that the neoplasms were the result of some alteration in the animals' environment. Laboratory tests attempting to link the neoplasms with the specific oils spilled are in progress. (EIS-Katz)
W78-11731

ENVIRONMENTAL SIGNIFICANCE OF FIN EROSION IN SOUTHERN CALIFORNIA DEMERSAL FISHES,
Southern California Coastal Water Research Project El Segundo.
M. J. Sherwood, and A. J. Mearns.
Annals of the New York Academy of Sciences, Vol 298, p. 177-189, 1977. 3 fig, 5 tab, 22 ref.

Descriptors: *Demersal fish, *Fish diseases, Fish physiology, Industrial wastes, Municipal wastes, Outfall sewers, DDT, Polychlorinated biphenyls, Bottom sediments, Organic compounds, Animal pathology, Toxicity, Bottom fish, *Fin erosion, Microstomus, Dover sole, Tissue analysis.

Fin lesions in Microstomus pacificus were characteriszed by a minimal inflammatory response and by the absence of associated microorganisms. The fish most frequently affected were those most often in contact with bottom sediments. Diseased specimens from the shelf had higher levels of total DDT and a tendency toward higher levels of total PCB in muscle tissue and a greater liver to body weight ratio than did unaffected specimens from the same area. Laboratory exposure of M. pacificus to contaminated sediments from the shelf resulted in the development of fin erosion. Chlorinated hydrocarbon levels and liver weight to body weight ratios in the exposed fish approached those measured in fish from the shelf. These studies suggest that the role of chlorinated hydrocarbons should be tested directly in future experiments. (EIS-Katz)
W78-11732

ON THE METABOLIC ADAPTATION OF CARCINUS MAENAS TO REDUCED OXYGEN TENSIONS IN THE ENVIRONMENT,
Nederlands Inst. voor Onderzoek der Zee, Texel.
D. H. Spaargaren.
Netherlands Journal of Sea Research, Vol 11, No 3-4, p. 325-333, 1977. 3 fig, 13 ref.

Descriptors: *Crabs, *Respiration, *Animal physiology, *Anaerobic conditions, Oxygen sag, *Water temperature, Crustaceans, Invertebrates, Oxygen, Environmental effects, Temperature, Metabolism, Laboratory tests, Oxygen consumption, Stress.

Data are given for the oxygen consumption, heart rate and relative blood ion concentration in the shore crab, Carcinus maenas, during periods of reduced oxygen pressure and anoxic conditions in its environment. Down to values of about 20 mm Hg pO2, Carcinus regulates oxygen uptake. The oxygen uptake is more strongly influenced by temperature than heart rate. Anoxic conditions can be survived during about two days. During anoxia apparently internal changes occur, causing the animals to loose locomotory control. Ion regulatory capabilities are, however, unaffected. Up to a certain time these internal changes are reversible; then a slow recovery takes place when the normal environmental oxygen concentration is restored. (EIS-Katz)
W78-11735

ACID PRECIPITATION IN NORWAY: EFFECTS ON AQUATIC FAUNA,
Norsk Inst. for Vannforskning, Blindern.
G. R. Hendrey, and R. F. Wright.
Journal of Great Lakes Research, Vol 2, Sup 1, p. 192-207, 1976. 3 fig, 45 ref.

Descriptors: Hydrogen ion concentration, *Acidic water, *Acidity, *Air pollution, *Air pollution effects, Nutrients, Nitrates, Phosphates, Sulfates, Phytoplankton, Zooplankton, *Primary productivity, Freshwater fish, Salmonids, *Fish kills, Mortality, *Acid precipitation, *Norway.

The effects of acid precipitation on the aquatic fauna of Norwegian lakes and streams are reviewed. Among subjects discussed are the effects on water chemistry, especially pH, sulfate, nitrate, and phosphate concentration. Acid precipitation has resulted in severs damage to fish populations of all kinds especially salmonids. Massive fish kills are observed particulary in the spring. The acidification of the fresh waters severely affects the invertebrate fauna so that the numbers of species are reduced, food chains are shortened and the population levels fluctuate erratically. Both zooplankton and phytoplankton are adversely affected. (EIS-Katz)
W78-11737

THE EFFECTS OF OIL ON LOBSTERS,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
J. Atema.
Oceanus, Vol 20, No 4, p. 67-73, 1977. 5 fig, 5 ref.

Descriptors: *Animal behavior, *Oil, Oil spills, *Water pollution effects, *Lobsters, Maine animals, Commercial shellfish, Laboratory tests, Methodogy, *Bioassay, Mortality, Kerosene, La Rosa Crude Oil, No. 2 Fuel Oil, *Feeding behavior.

Petroleum hydrocarbons are acutely toxic to the lobster, Homarus americanus. They react in a variety of abnormal ways when exposed to different concentrations of these hydrocarbons, ranging from death throes, and spastic-like behaviors to critical delays in feeding responses. The effects upon the behavior of lobsters to kerosene, La Rosa crude oil and Number 2 fuel oil were investigated in the laboratory. (EIS-Katz)
W78-11739

DISTRIBUTION OF 1-14C-HEXADECANE IN THE LOBSTER, HOMARUS AMERICANUS, AT VARIOUS TIMES AFTER INJECTION INTO THE PERICARDIAL SINUS,
National Inst. of Environmental Health Sciences, Research Triangle Park, NC.
For primary bibliographic entry see Field 5B.
W78-11741

SURVIVAL AND REPRODUCTION OF GAMMARUS LACUSTRIS AND G. PSEUDOLIMNAEUS UNDER TWO EXPERIMENTAL CONDITIONS,
Environmental Research Lab.-Duluth, MN.
B. J. Halligan.
The Progressive Fish Culturist, Vol 40, No 2, p. 59-62, 1978. 2 tab, 16 ref.

Descriptors: *Methodology, Laboratory tests, *Laboratory animals, *Crustaceans, Amphipods, Zooplankton, Environment, *Aquiculture, Fish food organisms, Juvenile growth stages, Mortality, Populations, *Reproduction.

Life-cycle tests on the survival and reproduction of the amphipods Gammarus lacustris and G. pseudolimnaeus were conducted under two nontoxicant experimental conditions: with several amphipods per tank and with individual pairs per tank. Juvenile and adult survival of the two species was similar with several amphipods per tank, but was higher for G. lacustris among the the reproducing larval pairs. In the multiple-animal tanks G. lacustris females had larger broods than did G. pseudolimnaeus females and both species produced more young per female and more broods per female than in the tanks with individual pairs. Our results indicate that these amphipods may be reared more successfully with several animals per tank than with only two. Of the two species, G. lacustris may be preferred for use in chronic toxicity tests because of its greater fecundity, larger size, and wider distribution. (EIS-Katz)
W78-11742

NEOPLASMS IN ESTUARINE MOLLUSKS AND APPROACHES TO ASCERTAIN CAUSES,
National Marine Fisheries Service, Oxford, MD.
C. A. Farley.
Annals of the New York Academy of Sciences, Vol 298, p. 225-232, 1977. 1 fig, 1 tab, 20 ref.

Descriptors: *Animal pathology, *Dieldrin, *Pesticide toxicity, *Clams, *Animal diseases, Mollusks, Mortality, Pesticides, Toxicity, Chlorinated hydrocarbon pesticides, Cytological studies, Bacteria, Macoma, *Neoplasms, *Carcinogens, Tissue analysis.

This report describes a method for maintaining a detritus-feeding bivalve mollusk, Macoma balthica, for extended periods under controlled laboratory conditions, and reports on observations of an initial attempt to expose clams to the chlorinated hydrocarbon dieldrin. Histopathologic studies of exposed animals demonstrated the presence of numerous naturally occurring diseases, some of which are probably highly pathogenic. Dieldrin-fed populations showed evidence of increased hyperplasia of the kidney and other tissues, possibly indicating stimulation of proliferative activity by the pesticide. Because hyperplasia usually precedes neoplastic transformation a longer study might have produced more definitive results concerning induction of neoplasms. (EIS-Katz)
W78-11743

A TECHNIQUE FOR PREDICTING IN-STREAM FLOW REQUIREMENTS OF BENTHIC MACROINVERTEBRATES,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-11744

THE TOXICITY OF PURE HYDROCARBONS TO MUSSEL LARVAE,
Universite de Bretagne-Occidentale, Brest (France).
S. Le Roux.
Rapports et Proces-Verbaux, des Reunions, Conseil International Pour L'Exploration de la Mer, Vol 171, p. 189-190, 1977. 5 fig.

Descriptors: *Organic compounds, *Mussels, *Larval growth stage, *Toxicity, *Growth rates, *Adsorption, Molluscs, Crustaceans, Invertebrates, Water pollution effects, Bioassay, Laboratory tests, *Oil, Oil spills, *Sub-lethal effects.

Larvae of mussels (Mytilus edulis) were exposed to five pure hydrocarbons at concentrations ranging from 1 to 100 ppm for short and extended periods of time. Growth rates of larvae exposed to 100 ppm surpassed controls organisms. Decalin inhibited growth at all concentrations, while the rate of growth increased with increased concentrations of isopropyl benzine and cyclohexane. The reason for this stimulation of growth is not known. (EIS-Katz)
W78-11745

SAND DOLLAR EMBRYOS AS MONITORS OF ENVIRONMENTAL POLLUTANTS,
Trinity Coll., Hartford, CT.
For primary bibliographic entry see Field 5A.
W78-11747

CHANNELIZATION AND INVERTEBRATE DRIFT IN SOME IOWA STREAMS,
Iowa State Univ., Ames. Dept. of Animal Ecology.
D. W. Zimmer, and R. W. Bachmann.
Water Resources Bulletin, Vol 14, No 4, p. 868-883, August, 1978. 7 fig, 3 tab, 24 ref.

Descriptors: *Invertebrates, Aquatic habitats, Biological communities, *Channel improvement, Streams, *Channel morphology, Channels, Biomass, Environmental effects, Productivity, Aquatic environment, Distribution patterns, Fish food organisms, Benthos, Depth velocity, *Des Moines River(Iowa), *Channelization, *Channel sinuousity.

Habitat diversity and invertebrate drift were studied in a group of natural and channelized tributaries of the upper Des Moines River during 1974 and 1975. Channelized streams in this region had lower sinuousity index values than natural channel segments. There were significant positive correlations between channel sinuosity and the variability of water depth and current velocity. Invertebrate drift density, expressed as biomass and total numbers, also was correlated with channel sinuosity. Channelization has decreased habitat variability and invertebrate drift density in streams of the upper Des Moines River Basin and probably has reduced the quantity of water stored in streams during periods of low flow. (EIS-Katz)
W78-11748

THE EFFECTS OF TEMPERATURE ON THE DEVELOPMENT AND MORTALITY OF EGGS OF PERCH, PERCA FLUVIATILIS,
Freshwater Biological Association, Windemere (England).
S. A. Guma'a.
Freshwater Biology, Vol 8, p 221-227, 1978. 2 tab, 5 fig, 27 ref.

Descriptors: *Perches, *Water temperature, *Mortality, *Fish eggs, *Embryonic growth stage, *Hatching, Temperature, Environmental effects, Laboratory tests, Fish reproduction, Reproduction, Growth rates.

The rate of development and mortility of perch Perca fluviatilis was studied at ten different constant temperatures. The rate of development was inversely related to the incubation temperature, whereas the rate of mortality was directly related to the incubation temperature. The sum of heat (degree-days) required for 10, 50 and 90% of the eggs to hatch was found to be constant, regardless of the incubation temperature, with mean values (with 95% confidence limits) of 91.4 (83.3-102.0) degree-days above 4.6C for 10% hatched, 97.0 (90.9-104.2) degree-days above 4.9C for 50% hatched and 101.0 (94.3-108.7) degree-days above 5.0C for 90% hatched. Mortality among the different embryological stages was highest for the pre-hatching stage (i.e. when eye-pigment has been formed) at all temperatures. High mortality among the early stages occurred at temperatures below 8C and above 12C. (EIS-Katz)
W78-11749

TOXICITY, BOD AND COLOR OF EFFLUENTS FROM NOVEL BLEACHING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, M. Le Bourhis, M. Wostradowski, and S. Prahacs.
Pulp and Paper of Canada, Vol. 79, No. 7, p 41-47, July, 1978. 6 fig, 8 tab, 26 ref, 2 append.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Bleaching wastes, *Toxicity, *Chlorination, Biochemical oxygen demand, Chemical oxygen demand, Color, Recycling, Mathematical models, Waste water treatment, Industrial wastes.

The toxicity to fish, BOD, and COD of effluents from five soft and hardwood pulp bleaching processes were measured in a laboratory study. The techniques employed CED, DPD, OCE, ODE, and OCE bleaching sequences; four of the processes used gaseous reagents and two employed rapid press caustic extraction. An equation for calculating the net volume of pollutants discharged to a sewer, incorporating the recycling of bleaching effluents, was derived as a function of the net effluent volume discharged, the concen-

ıtion of the pollutant, the fraction of filtrate cycled, and the number of completed cycles. oxicity was measured in toxic units (TU) which ere calculated from the ratio of effluent toxicant oncentration to lethal threshold concentration of e toxicant. The OED bleaching sequence was und to produce the lowest toxicity and also the west BOD, COD, and color of all the sequences xamined. Toxicity increased significantly ecause of chlorine residuals in chlorine bleaching fluents. The use of gaseous chlorine reduced the xicity of the effluents compared to conventional ueous chlorination practices; toxicity also inreased through the formation of chlorinated orınics. The use of chlorine dioxide produced little r no residual chlorine or chlorinated organics, ereby reducing toxicity. Effluents from rapid ess caustic extraction sequences were found to e less toxic than effluents from conventional rocesses; oxygen bleaching did not reduce toxici- but did result in lower values for BOD, COD, nd color. The ODE sequence reduced COD by 5-82% and BOD by 82-83%. (Lisk-FIRL)
V78-11782

ITRIFICATION AND OTHER FACTORS AFECTING NITROGEN IN THE HOLSTON IVER,
Tennessee Valley Authority, Chattanooga.
. J. Ruane, and P. A. Krenkel.
ournal Water Pollution Control Federation, Vol. 0, No. 8, p 2016-2028, August, 1978. 8 fig, 3 tab, 1 ref.

Descriptors: *Nitrification, *Denitrification, Rivers, *Reservoirs, *Nitrogen fixing bacteria, Dissolved oxygen, Nitrates, Ammonia, Nitrites, Nitrogen, Nitrogen cycle, Industrial wastes, Biochemical demand, Nitrogen compounds, Oxygen sag, Waste water treatment, Municipal wastes, *Holston River(Tenn), Tennessee.

Recent Studies measured nitrification and dentrification in the Holston River near Kingsport, Tennessee; factors influencing these processes and the impact of nitrogen on the Cherokee Reservoir near Jefferson City were also evaluated. Along the 151.3 km stretch of the river studies, total nitrogen inputs to the river included 82 kg/day by a sewage treatment plant, 27 kg/day by a paper mill, 2,497 kg/day by an ammunition plant, and 7,312 kg/day by a chemical plant. Dissolved oxygen, pH, temperature, benthic oxygen demand, and standing crops of attached aquatic plants were measured in river samples; the rates of change in ammonia, nitrate, and nitrite levels within the various stream reaches were used to calculate the oxidation rate for nitrogeous BOD. Significant nitrification did not occur until river mile 137.9 and was attributed to nitrifying bacteria requiring up to 10 days to generate; denitrification occurred in the upstream reaches were nitrofiers were absent. The point of observed nitrofication, occurring after about 0.2 days, corresponded to the critical dissolved oxygen sag. Oxygen depletion in the Cherokee Reservoir was dependent upon influent oxygen demand, decomposition of aquatic weeds, ammonia regeneration by zooplankton, fish excretions, and overall biological respiration. (Lisk-FIRL)
W78-11786

LARGE EUNICE HARASSII AUDOUIN AND MILNE-EDWARDS FROM A SLUDGE DISPOSAL AREA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
A. J. M. Walker.
Proceedings of the Royal Irish Academy, Section B: Biological, Geological and Chemical Science, Vol. 77, No. 9, p 175-179, 1977. 3 fig, 8 ref.

Descriptors: *Sludge disposal, *Annelids, *Benthic fauna, *Growth rates, *Environmental effects, Worms, Sewage sludge, Bays, Sludge worms, Sampling, Municipal wastes.

Four polychaete specimens, identified as Eunice harassii Audouin and Milne-Edwards, found in Ireland's Dublin Bay where sewage sludge is discharged, were larger and had more branchial filaments than other specimens previously documented. The appearance of Eunice harassii had not been previously recorded in Irish waters. The maximum number of branchial filaments on specimens found in earlier studies had been 15; Eunice specimens collected in Liverpool Bay, Menai Bridge, and Museum specimens from the English Channel had up to 26 filaments. The four Dublin Bay anelids had maximum filament numbers of 24, 30, 32, and 34; setiger widths for three of the four specimens were in the 8-10 mm range. The fragmented worms were found in Dublin Bay at a depth of about 30 m in an area receiving about 140,000 wet tons/yr primary sewage sludge; the enrichment of the area was thought to be a primary factor in the large size of the Eunice harassii. (Lisk-FIRL)
W78-11829

BIOASSAYS-PROCEDURES AND RESULTS,
Research Triangle Inst., Research Triangle Park, NC.
For primary bibliographic entry see Field 5A.
W78-11834

ANTIBIOTIC RESISTANCE PATTERN OF SALMONELLA WELTEVERDEN STRAINS ISOLATED FROM MAN, ANIMALS, SEWAGE AND WATER,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5A.
W78-11842

TOXICITY-TEST ON FISH CARASSIUS AURATUS IN WATERS AND SEWAGES CONTAINING PHENOL, TREATED WITH NACLO OR WITH CLO2 (IL TEST DI ITTIOTOSSICITA' SU ACQUE E LIQUAMI DEPURATI CON IPOCLORITO E BIOSSIDO DI CLORO, IN PRESENZA DI FENOLO),
Naples Univ. (Italy). Dept. of Hygiene and Science.
For primary bibliographic entry see Field 5A.
W78-11845

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME I, PRESERVING THE STATISTICAL STRUCTURE IN LAKE TRANSPORT CALCULATIONS,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
K. W. Bedford, R. M. Sykes, and C. Babajimopolous.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 391, Price codes: A11 in paper copy, A01 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 527X, May 31, 1978. 225p, 75 fig, 5 tab, 127 ref, 4 append. OWRT A-039-OHIO(1) B-063-OHIO(2).

Descriptors: *Model studies, *Lakes, *Reservoirs, *Circulation, *Turbulence, Limnology, *Fluid mechanics, Diffusion, *Computer models, Fourier analysis, Time series analysis, Stochastic processes, *Eutrophication, Path of pollutants.

Turbulence so seriously effects the transport of pollutants that a study was undertaken to derive and implement a lake circulation and pollutant transport model which preserves the detailed spectral structure of the turbulent fluctuation during computations made with a coarse grid work. The three dimensional rigid lid, shallow water wind driven governing equations include inertial effects but exclude thermal stratification. A spatial filtering technique derived and applied to the equations and a time splitting formulation of the pressure and velocity equations was derived. Source wink terms for the transport equations were formulated from simple first order kinetics. The results indicate that for a stochastically correct wind shear a fully three dimensional turbulence structure will never be possible within rigid lid lake models. Further, it is absolutely necessary that higher order filtering be applied, not only are the statistics calculable but this allows the use of a viscosity formulation that is grid size dependant and which eliminates the need for continuous updating of eddy viscosity coefficients. The intensity of the source sink term does not affect the overall concentration of pollutants for one day periods, the turbulence and circulation fields do however. (See also W78-11864).
W78-11863

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME II, COMPARATIVE STUDY OF THE MATHEMATICAL FORMULATIONS FOR PRIMARY PRODUCTIVITY IN STRATIFIED LAKES,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
R. M. Sykes, K. W. Bedford, and K. L. Smarkel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 392, Price codes: A11 in paper copy, A01 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 527 X, May 31, 1978. 209p, 25 fig, 15 tab, 147 ref, 4 append. OWRT A-039-OHIO(1) B-063-OHIO(2).

Descriptors: *Model studies, *Lakes, *Eutrophication, *Primary productivity, Food chains, Nutrients, Phytoplankton, Zooplankton, Thermal stratification, Ohio, Path of pollutants, *Canadarago Lake(Ohio), *Cayuga Lake(Ohio).

The ability of existing eutrophication models to reproduce high density spatial and temporal field data was tested in order to determine the minimal structural complexity needed in such models. Structural components studied included oxygen, benthal deposits, dissolved and suspended organic matter, nutrients, light, temperature, vertical thermal stratifications, diffusive transport and settling, zooplankton and algai. Algae were represented as having either constant phosphorus contents, or constant structural plus variable soluble and variable polyphosphate contents. Both mono-type and Lotka-Volterra-type kinetic formulas were used. these components represent all eutrophication models presently in use, except those incorporating multiple algae species. The models tested can reproduce only the spring bloom; they fail qualitatively to represent late summer conditions or during other seasons. The minimal set of structural components necessary to reproduce the spring bloom are: monod-type kinetics, nutrients (one-limiting), algae with constant phosphorus contents, zooplankton, settling and diffusion, benthal deposits, oxygen, dissolved organic matter and more complex representations on algae cellular phosphorus. (See also W78-11863).
W78-11864

AVOIDANCE BY HERRING OF DISSOLVED COMPONENTS IN PULP MILL EFFLUENTS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
D. J. Wildish, H. Akagi, and N. J. Poole.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 5, p 521-525, November, 1977. 7 ref, 3 tab.

Descriptors: *Pulp wastes, *Water pollution effects, *Fish behavior, Herrings, Aquatic animals, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Sulfite liquors, Lignins, Effluents, Fish, Sulfite pulp mills,

Lignosulfonates, Humic acid, Glucose, Dehydroabietic acid, Fructose, Acetic acid, Formic acid, Abietic acid, Tall oil, Furfural, Catechol, Organic wastes, Organic acids, Organic compounds.

The soluble chemical components in pulp mill effluents which initiate avoidance or preference responses by herring (Clupea harengus) were identified. Analytical-grade sodium lignosulfonate and humic acid were avoided at about 1 mg/liter and their nominal concentration thresholds were estimated to be 0.1-0.3 and 0.1-0.2 mg/liter, respectively. Fish exposed to analytical-grade D-glucose and dehydroabietic acid showed a significant preference but the results could not be replicated. Control and experimental data were not significantly different for assays with analytical-grade fructose, acetic, formic, and abietic acids, tall oil, furfual, and catechol. Herring avoided sulfite mill effluent containing 1.2-1.9 mg/liter sodium lignosulfonate at a concentration threshold equivalent to 2.5-2.9 mg/liter. Possible explanations for the disagreement with the nominal concentration threshold estimated for analytical-grade sodium lignosulfonate are that herring respond to the chemical differences of the two lignosulfonate samples tested, or are affected by the masking of the lignosulfonate in sulfite mill effluent by other chemicals present. (Swichtenberg-IPC)
W78-11900

TOXICITY AND BOD OF EFFLUENTS DERIVED FROM THE THERMOMECHANICAL PULPING OF EASTERN CANADIAN WOOD SPECIES,
Pulp and Paper Research Inst. of Canada, Pointe Claire.
A. Wong, J. Costantino, D. Breck, D. Herschmiller, and J. G. Rae.
Canadian Pulp and Paper Association Technical Section, 64th Annual Meetin (Montreal), Preprints, p A197-205, January 31-February 3, 1978. 9 fig, 20 ref, 4 tab.

Descriptors: *Pulp wastes, *Toxicity, *Biochemical oxygen demand, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Canada, Balsam fir trees, Spruce trees(Picea), Effluents, Pulp and paper industry, Water pollution effects, Water pollution, Thermomechanical pulping, Groundwood pulping, Resin acids, Organic acids, Pollutants.

A study by MacMillan Rothesay Ltd. (New Brunswick) and the Pulp and Paper Research Institute of Canada indicated that the toxicity and BOD of washer filtrates from thermomechanical and stone groundwood pulp samples (balsam fir/spruce furnishes) were comparable. Toxicity averaged 300 (toxic units X oven-dry ton of pulp) and BOD averaged 20 kg/oven-dry ton of pulp. These findings suggested that a newsprint mill operating on 100% thermomechanical pulp would not discharge effluents with significantly higher toxicity and BOD levels than a mill operating on stone groundwood and purchased semibleached kraft pulp. The toxicity of both thermomechanical pulping and stone groundwater effluents was apparently related to the resin acid content of the effluent. The chip washing operations at MacMillan Rothesay produced little or no toxicity and BOD. Most of the pollutants originated in the first refining stage of a two-stage thermomechanical pulping system. (Swichtenberg-IPC)
W78-11905

AN INVESTIGATION OF THE EXTENT OF RESIDUAL BIOSOLIDS DEPOSITION IN QUIESCENT RECEIVING WATERS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
H. S. Costa.
NCASI Stream Technical Bulletin, No 304, 14 p, February, 1978. 4 fig, 7 tab.

Descriptors: *Pulp wastes, *Suspended solids, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Outfalls, Biological treatment, Pulp and paper industry, Effluents, Deposition(Sediments), Surface waters.

Data on the percent volatiles in core samples taken from the bottom of quiescent receiving waters adjacent to outfalls indicate that the suspended biosolids in biologicaly treated pulp and paper effluents have no definitive impact on the receiving waters. (Swichtenberg-IPC)
W78-11914

CORROSION IN CLOSED WHITE WATER SYSTEMS,
Institute of Paper Chemistry, Appleton, WI.
D. F. Bowers.
Tappi, Vol 61, No 3, p 57-61, March, 1978. 7 fig, 1 illus, 7 ref, 6 tab.

Descriptors: *Pulp wastes, *Industrial water, *White water(Paper machines), *Closed systems, *Corrosion, Wastes, Industrial wastes, Pulp and paper industry, Stainless steel, Sulfates, Chlorides, Hydrogen ion concentration, Temperature, Water pollution effects, Metals, Alloys, Water pollution sources, Pitting(Corrosion), Electrolytes.

A research program conducted by the Engineering Division of the Institute of Paper Chemistry (Appleton, Wisconsin) is designed to evaluate both uniform and localized corrosion of metals by recycled paper-machine white water in closed systems. Uniform corrosion test results for mild steel and Type 304 stainless steel in both real and simulated white water show the effects of pH, temperature, and chloride content. Preliminary results for localized corrosion of Types 304 and 316L stainless steel as a function of sulfate and chloride concentration in simulated white water are reported. Corrosion severity increases at sulfate/chloride ratios of 3:1 and less. An improvement in corrosion resistance for Type 316L compared to Type 304 stainless steel under crevice test conditions created by pulp deposits is indicated by these initial results. (Swichtenberg-IPC)
W78-11919

THE MUSSEL WATCH,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W78-11957

DESORPTION OF RADIOACTIVITY FROM NEARSHORE SEDIMENT,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5B.
W78-11961

THE DYNAMICS OF AN ESTUARY AS A NATURAL ECOSYSTEM,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
F. J. Vernberg, R. Bonnell, B. Coull, R. Dame, Jr., and P. DeCoursey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 357, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Ecological Research Series No EPA-600/3-77-016, January 1977. 95 p, 9 fig, 10 tab, 169 ref.

Descriptors: *Estuaries, *Ecosystems, *South Carolina, *Baseline studies, Water pollution effects, Salt marshes, Environmental effects, Resources development, Outer Continental Shelf, Spartina alterniflora.

A research program was initiated to understand the dynamics of a relatively undisturbed estuary-marshland ecosystem, the North Inlet Estuary near Georgetown, South Carolina. The study consisted of two substudies: a macroecosystem substudy and a microecosystem substudy. The objectives of the macroecosystem study were to establish baseline data on an undisturbed estuary to provide a scientific basis for comparative studies on effects of various stresses of pollutants on other estuarine environments; and to develop models of an estuarine ecosystem which would predict probable effects of environmental perturbation. The principal objective of the microecosystem study was to develop and test replicate experimental salt marsh units at the microecosystem level as diagnostic tools for the assessment of both long- and short-term pollution effects on the Spartina alterniflora salt marsh community. A conceptual model of energy flow for the entire marsh-estuarine ecosystem was developed which consisted of three sub-models. A simulation of the water column submodel and a simulation by a linear systems model of an intertidal oyster community was completed. Much baseline data needed for model development is available on primary producers, zooplankton, meiofauna, benthic macrofauna, decomposers, and relevant physical parameters. (Sinha-OEIS)
W78-11966

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFYGL, PART II, NITROGEN AVAILABLE IN LAKE ONTARIO TRIBUTARY WATER SAMPLES AND URBAN RUNOFF FROM MADISON, WISCONSIN,
Texas Univ. at Dallas.
W. F. Cowen, K. Sirisinha, and G. F. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 230, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/3-77-045, May 1977. 87 p, 28 fig, 11 tab, 30 ref, 2 append. 1BA608, R-800537-02.

Descriptors: *Lake Ontario, *Nutrients, *Nitrogen, *Organic compounds, *Inorganic compounds, *Tributaries, Great Lakes, Lakes, Rivers, Niagara River, Oswego River(NY), Genesee River(NY), Black River(NY), Madison(WI), Wisconsin, Algae, Ammonia, Bacteria, Nitrates, Aerobic conditions, Limiting factors, Mineralization, New York.

Analysis and incubation of water samples from four Lake Ontario tributaries--the Niagara, Genesee, Oswego, and Black Rivers--shows that, in general, over 50% of total nitrogen present is immediately available for algal growth or potentially available after mineralization by bacteria. Samples were collected in March-June 1973, analyzed for nitrogen forms, and incubated anaerobically in darkness to promote mineralization of soluble inorganic nitrogen from the organic nitrogen. Amounts of ammonia and nitrate were calculated as a function of incubation time. Results from each tributary were highly variable, and no single value was found which described total nitrogen availability in a given river. An effort was made to estimate available amounts of organic nitrogen; organic nitrogen availability was low in samples with high organic nitrogen concentrations. Direct estimation of particulate organic nitrogen availability by dark incubation of membrane-filterable particles yielded values which conflicted with availability data from incubations of unfiltered river water. Data on urban stormwater drainage samples from Madison, Wisconsin showed that over 80% of total nitrogen may be converted to an available form for algal growth in about 100 days. Further research is needed on such factors as solution temperature, mixing effects, and trace element composition which may influence available nitrogen. (See also W78-11993) (Lynch-Wisconsin)
W78-11992

LGAL NUTRIENT AVAILABILITY AND MITATION IN LAKE ONTARIO DURING YGL, PART III, ALGAL NUTRIENT LIMITA-ON IN LAKE ONTARIO DURING IFYGL,
isconsin Univ.-Madison.
. Sridharen, and G. F. Lee.
vailable from the National Technical Informa-n Service, Springfield, VA 22161 as PB-270 293, ice codes: A04 in paper copy, A01 in microfiche. eport EPA-600/3-33-046a, May 1977. 46 p, 17 fig, tab, 1 ref. 1BA608 R-800537-02.

escriptors: *Algae, *Limiting factors, Nutrients, *Lake Ontario, *Phosphorus, Genesee River(NY), *Niagara River, *Black iver(NY), *Oswego River(NY), Phytoplankton, FYGL, Great Lakes, Lakes, Rivers, Bioassay, itrogen, Tributaries, Metals, Poisons, ladophora.

Vater samples from five Lake Ontario stations nd from the mouths of four tributaries in summer nd fall 1972 and spring 1973 indicated phosphorus s the main factor limiting algal growth in the lake nd in the Niagara and Black Rivers. By late ummer both nitrogen and phosphorus limitation vas indicated in the lake and in the Niagara River; Black River samples also indicated nitrogen limita-ion. In the Genesee River and most Oswego River amples nitrogen appeared to be the limiting fac-or, although some Oswego River samples showed imitation due probably to a toxic metal, the toxici-y of which is eliminated by addition of EDTA, or ossibly to a lack of micronutrients. The primary ecommendation is that all municipalities with opulations exceeding 1000 which contribute lomestic wastewater to Lake Ontario or its tribu-aries, immediately initiate 90% phosphorus emoval from the wastewater. Further research is eeded in two major areas: (1) factors limiting growth of Cladophora, an attached alga causing erious water quality problems in Lake Ontario ear the shore; and (2) clarification of limiting fac-tors in the Genesee and Oswego Rivers, with par-ticular attention to determining whether phosphorus input reduction to these waters would be sufficient to limit algal growth, and also to identification of toxicants which may be currently limiting growth. Standard algal assay procedures were used in this study. (See also W78-11993) (Lynch-Wisconsin)
W78-11993

SURVEY OF CHEMICAL FACTORS IN SAGINAW BAY (LAKE HURON),
Cranbrook Inst. of Science, Bloomfield Hills, MI.
V. E. Smith, K. W. Lee, J. C. Filkins, K. W. Hartwell, and K. R. Rygwelski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 680, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/3-77-125, October 1977. 142 p, 55 fig, 50 tab, 24 ref. R802685.

Descriptors: *Saginaw Bay(MI), *Lake Huron, *Eutrophication, *Water chemistry, *Water quality, Estuarine environment, Lakes, Great Lakes, Michigan, Remote sensing, Model studies, Chlorophyll, Data collections, Baseline studies, International Joint Commission, Winds, Nutrients, Oligotrophy, Circulation, Stratification.

Water quality as indicated by 15 biochemical parameters was surveyed in Saginaw Bay, Michigan (western Lake Huron) during 1974-75 as part of the International Joint Commission's Upper Lakes Reference Study. Objectives of the overall study were to establish a base of water quality information and provide data for modelling biological and hydrological processes in the bay. Findings indicate that highly eutrophic waters in the inner part of Saginaw Bay undergo complex mixing with oligotrophic Lake Huron waters in the outer bay; the bay is characterized by high primary production, active circulation, and frequent water level changes induced by wind stress. Thermal stratification apparently occurs only briefly during early spring, except in deep waters of the outer bay where a thermocline persists throughout the summer. Data indicate a significant improvement of most water quality parameters since 1965, especially in the inner bay (presumably due to decreased nutrient input rates). The Saginaw River system continues its adverse effect on bay water quality, though no parameters were consistently in violation of established standards. An eight-fold increase in chlorophyll-a concentrations from the outer to inner bay reflects nutrient enrichment. This study monitored temperature, dissolved oxygen, conductivity, chloride, pH, alkalinity, Secchi depth, chlorophyll, nitrate, phosphate, organic nitrogen, total phosphorus, organic carbon, total solids, and major metals. Remote sensing was useful in extrapolating water quality to unsampled areas. (Lynch-Wisconsin)
W78-11994

DISTRIBUTION OF PHYTOPLANKTON IN SOUTH CAROLINA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
S. C. Hern, J. W. Hilgert, V. W. Lambou, F. A. Morris, and M. K. Morris.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 451, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/3-77-102, September 1977. 64 p, 1 tab, 11 ref, 1 append.

Descriptors: *South Carolina, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Bioindicators, *Impoundments, *National Eutrophication Survey, Algae, Reservoirs, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, Fishing Creek Reservoir(SC), Lake Greenwood(SC), Lake Hartwell(SC), Lake Marion(SC), Lake Murray(SC), Lake Robinson(SC), Lake Wateree(SC), Lake Wylie(SC), Lake Moultrie(SC), Lake Keowee(SC), Lake Secession(SC), Lake William C. Bowen(SC), Saluda Lake(SC).

Phytoplankton species composition and abundance were determined for 13 South Carolina lakes and impoundments; trophic status was also assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, and species diversity and abundance indices. The study was conducted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Selection of sampling sites was based on actual or potential accelerated eutrophication problems as determined by three criteria: (1) contamination by sewage treatment plant effluents, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes studied were Fishing Creek Reservoir, Lakes Greenwood, Hartwell, Marion, Murray, Robinson, Wateree, Wylie (Catawba), Moultrie, Keowee, Secession, and William C. Bowen, and Saluda Lake. Data are summarized in an appendix, containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer's indices, designed for water samples with high organic pollution, incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, the other with 20 species. The Brillouin and Shannon/Weaver species diversity indices are also used. (Lynch-Wisconsin)
W78-11995

DISTRIBUTION OF PHYTOPLANKTON IN MISSISSIPPI LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
L. R. Williams, W. D. Taylor, F. A. Hiatt, S. C. Hern, and J. W. Hilgert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 388, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-101, September 1977. 29 p, 3 tab, 11 ref, 1 append.

Descriptors: *Mississippi, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Bioindicators, *Impoundments, *National Eutrophication Survey, Algae, Reservoirs, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, Arkabutla Reservoir(MS), Enid Lake(MS), Ross Barnett Reservoir(MS), Sardis Lake(MS), Grenada Lake(MS).

Species composition and abundance of phytoplankton were determined for five Mississippi lakes and impoundments; trophic level was also assessed by means of various water quality indices, including Nygaard's five trophic state indices. Part of the National Eutrophication Survey, the study was conducted in spring, summer, and fall 1973. Selection of lakes was based on actual or potential accelerated eutrophication problems, determined by three criteria: (1) contamination by sewage treatment plant effluents, (2) surface area of at least 40 ha, and (3) minimum hydraulic retention time of 30 days. Sampling sites were Arkabutla Reservoir, Enid Lake, Ross Barnett Reservoir, Sardis Lake, and Grenada Lake. Data are summarized in an appendix which contains alphabetical phytoplankton species lists with concentrations of each species by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer's indices designed for water samples with high organic pollution, incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, the other with 20 species. Each taxa is assigned a pollution index number. Components of Nygaard's and Palmer's indices are given in tabular form. (Lynch-Wisconsin)
W78-11996

ASSESSMENT OF THE EFFECTS OF NUTRIENT LOADINGS ON LAKE ONTARIO USING A MATHEMATICAL MODEL OF THE PHYTOPLANKTON.
Hydroscience, Inc., Westwood, NJ.
Report prepared for International Joint Commission, Windsor, Ontario, Canada, Great Lakes Water Quality Board. March 1976. 116 p, 38 fig, 19 tab, 22 ref.

Descriptors: *Phytoplankton, *Lake Ontario, *Nutrients, *Mathematical models, *Eutrophication, *International Joint Commission, Great Lakes, Lakes, Rivers, Niagara River, Lake Erie, Genessee River, Trent River, Tributaries, Algae, Simulation analysis, Model studies, Nutrient removal, Biomass, Chlorophyll, LAKE 1 model, Phosphorus, Nitrogen, International Commissions.

To determine potential effects of phytoplankton biomass levels in Lake Ontario of ongoing nutrient removal programs of the U.S.-Canadian Water Quality Agreement (W.Q.A.) for the Great Lakes, a series of mathematical modelling simulations were conducted. The study focused on five components: (1) data compilation and evaluation of historic nutrient loads to Lake Ontario (1967-74); (2) evaluation of 1974 phosphorus and nitrogen loads; (3) review of W.Q.A. loads, and preparation of alternative loading scenarios for simulation; (4) reduction of the scenarios to formats required by the LAKE 1 whole lake phytoplankton model; and (5) summarization and evaluation of LAKE 1 model simulations under the scenarios and drawing appropriate conclusions. Results represent trends and ranges only, and should not be interpreted as predictions of actual future phytoplankton biomass levels. Among conclusions are: (1) Simulations utilizing reasonable model kinetics indicate current peak phytoplankton concentrations are not in equilibrium with present nutrient loadings, and show a trend toward peak

chlorophyll levels 50-100% higher than current peaks of 10-12 micrograms/liter over the next 10-15 years. (2) 1974 total phosphorus loading to the lake is estimated at 75,000 lbs/day, and total nitrogen at 1,043,000 lbs/day. (3) The phosphate detergent ban has resulted in a significant (5400 lbs/day) reduction in phosphorus concentration in the lower Niagara River. (Lynch-Wisconsin)
W78-11998

ELUTRIATOR/MICROCOSM SYSTEM PILOT MODEL AND TEST,
Naval Ocean Systems Center, Kailua, HI.
E. C. Evans III, and R. S. Henderson.
Available from the National Technical Information Service Springfield, Va 22161, as PB-272 472, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-093, August 1977. 40 p, 14 fig, 8 tab, 17 ref, 1 append. IAG D6-F941.

Descriptors: *On-site data collections, *Prototype tests, *Bottom sediments, *Benthic fauna, *Kaneohe Bay(HI), *Nutrients, *Methodology, Hawaii, Sediments, Diverson, Sewage disposal, Estuaries, Estuarine environment, Bays, Water pollution control, Environmental effects, Sediment-water interfaces, Nutrient flux, Elutriation, Heavy metals, Biological communities, Ecosystems.

Laboratory procedures were developed for transferring sediments and resident faunal communities from Kaneohe Bay, Hawaii, to a prototype testing facility consisting of buckets or trays placed in large flow-through tanks of seawater. The experimental facility, or 'elutriator/microcosm,' was developed to obtain accurate information on nutrient exchange rates and on the influence of biological activity on these rates. Sewage discharges into Kanoehe Bay are scheduled for diverson to a deep offshore location in August 1977, and the new experimental system will be used to monitor changes in the benthic ecosystem. Two bucket-scoop collection methods for sediment transfer were sucessfully tested: (1) with buckets placed directly in the testing tanks; and (2) scooping followed by transfer of contents to polyethylene trays for placement in the tanks. The second method was preferable. Capture efficiency was high, as measured by number of alpheid shrimp(Alpheus machkayi) in field observations vs those in samples. Transferred communities were maintained over 90 days. Burrowing by the shrimp increased sediment surface area two or three-fold. Fauna increased about 10-fold during the 92 to 135-day test periods. Sediments did not cause observable changes in nutrient concentratons in the flow-through waters, suggesting that nutrient-rich sediments can act as an analogue to an artificial reef. (Lynch-Wisconsin)
W78-12000

TROPHIC EQUILIBRIUM OF LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Zoology.
W. T. Edmondson.
Available from the National Technical Information Service Springfield VA 22161, as PB-273 106 Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-087, August 1977. 35 p, 3 fig, 3 tab, 25 ref. R 8020 82-03-1.

Descriptors: *Lake Washington, *Trophic level, *Equilibrium, *Lake restoration, *Phosphorus, *Nutrients, *Water pollution control, Water chemistry, Lakes, Eutrophication, Washington, Diverson, Sewage disposal, Phytoplankton, Algae, Chlorophyll, Transparency, Zooplankton, Primary productivity.

The process of recovery of Lake Washington (Washington State) following diversion of sewage effluent in 1963-68 is described, and results of a post-recovery study in 1973-76 are presented. Nutrient enrichment began in 1941, and in 1958 a public vote requires diversion of the sewage. With initial diversion of one-third of the effluent beginning 1963, water quality in the lake ceased deteriorating, and with further diversion began to recover as measured by increasing transparency and decreasing phytoplankton abundance. By 1972 the lake appeared to coming into equilibrium. Detailed limnological studies were made during part of the lake's deterioration and all of its recovery. This paper presents data for 1973-76, with comparative data for 1933 and 1950, when water quality was acceptable, and from 1963 when response to eutrophication was maximal. A major change is taking place in zooplankton composition, with the disappearance of Oscillatoria and the reappearance of Daphnia after an absence of over 23 year. As this event is probably not directly related to trophic recovery, it appears that the lake is entering a new phase. Following diversion, total phosphorus decreased rapidly until it largely stabilized in 1971 at 17 micrograms/liter, with a slight decreasing trend. The lake has retained about 56% of the phosphorus entering in 1971-75. Phytoplankton has decreased faster than phosphorus during 1971-76. A major increase in transparency occurred in 1976. (Lynch-Wisconsin)
W78-12001

DISTRIBUTION OF PHYTOPLANKTON IN WEST VIRGINIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
V. W. Lambou, F. A. Morris, M. K. Morris, L. R. Williams, and W. D. Taylor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 515, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-103, September 1977. 21 p, 3 tab, 11 ref, 1 append.

Descriptors: *West Virginia, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Impoundments, *Bioindicators, *National Eutrophication Survey, Algae, Reservoirs, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, Bluestone Reservoir(WV), Lake Lynn Reservoir(WV), Summersville Reservoir(WV), Tygart Reservoir(WV).

Phytoplankton species composition and abundance were determined for four West Virginia reservoirs; trophic status was also assessed by means of several waste quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was condicted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Impoundments were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes syrveyed were Bluestone Reservoir, Lake Lynn Reservoir(Cheat Lake), Summersville Reservoir, and Tygart Reservoir. Data are summarized by reservoir in an appendix contaning alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. The Palmer indices, designed for water samples with 20 genera, the other with 20 species. (Lynch-Wisconsin)
W78-12002

THE TROPHIC STATUS AND PHOSPHORUS LOADINGS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington.
E. B. Henson, and G. K. Gruendling.
Available from the National Technical Information Service, Springfield, VA, 22161 as PB-273 502, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/3-77-106, September 1977. 141 p, 18 fig, 29 tab, 80 ref, 5 ref. CC6991931-J CC6991932-J.

Descriptors: *Lake Champlain, *Trophic level, *Phosphorus, *Eutrophication, *Waterpollution control, *Nutrient, Water pollution effects, Water management, Lakes, New York, Water chemistry, Algae, Phytoplankton, Cyanophyta, Zooplankton, Point pollution, Nonpoint pollution, Limnology, Cladophora, Vollenweider models, Model studies, Phosphates.

The phosphorus loading and budget, trophic status, and limnology of the Lake Champlain basin in New York and Vermont indicated deterioration of the lake's water quality. Symptoms of eutrophication include increases in Cladophora and aquatic weed growth, bacterial contamination, turbidity, toxins, cyanophytes, and mesotrophic-eutrophic diatom species. Secci disc readings have declined in the past decade, as have dissolved oxygen concentrations in the epilimion in early summer. Phosphorus loadings for each of 12 regions of the phosphorus-controlled lake are given. Total phosphate-phosphorus loading is calculated at 748 metric tons/yr, 90% of which is derived from surface drainage and 5% from direct waste treatment plant discharges. Only about 20% of the loading is discharged from the lake's outlet, indicating that some 600 metric tons are retaned each year. Vollenwieder's 1976 model was applied to each region. For the lake as a whole the critical phosphorus concentration (P)c amounted to 31.5 micrograms/liter, indicating very high phosphorus loading. Only four of the 12 regions were below the eutrophic level of (P)c-20 micrograms/liter. For the lake as a whole phosphorus loading would have to be reduced by 68% to achieve a (P)10 level (oligotrophic), 53% to (P)15 (mesotrophic), and 37% to the base of the eutrophic level. An inventory is given of point pollution sources, which account for 42% of phosphorus loading to the lake. (Lynch-Wisconsin)
W78-12003

STANDING CROP OF BENTHIC INVERTEBRATES OF LAKE WINGRA AND LAKE MENDOTA, WISCONSIN,
Wisconsin Univ.-Madison.
F. M. El-Shamy.
In: Transactions of the Wisconsin Academy of Sciences, Arts and Letters, Vol. 65, 1977, p 217-224. 1 fig, 12 ref.

Descriptors: *Lake Wingra(WI), *Lake Mendota(WI), *Benthic fauna, *Invertebrates, *Sunfishes, *Eutrophication, Insects, Wisconsin, Madison(WI), Lakes, Standing crop, Biomass, Abundance, Hyalella, Chironomids, Larvae, Mayflies, Fish, Species composition, Feeding rates.

A study of benthic invertebrates in Lakes Wingra and Mendota, Madison, Wisconsin June-August 1972 showed that decline in benthic invertebrates in Lake Wingra has significantly affected fish population dynamics in the lake. Bottom organisms were highly diversified and more abundant in Lake Mendota than in Lake Wingra, with maximum differences in early summer and least differences in August. Stomach analyses of bluegills in the two lakes reveal the importance of macroinvertebrates in the diet of the fish. However, Lake Wingra bluegills also depend on planktonic organisms throughout the growing season, and small and large fish feed on particles of similar size. In contrast, Lake Mendota bluegills prey almost exclusively on benthic macroinvertebrates, and there is a definite correlation between food particle size and fish size. Not only is more energy expended in catching the tiny plankton, but the microscopic animals have more indigestible material per unit of body weight than larger organisms. Extensive studies have confirmed that Lake Mendota bluegills grow faster and consume more food than those of Lake Wingra. Benthic invertebrates caught from Lake Wingra were mainly chironomid larvae, with

ome water mites and mayfly nymphs. Hyalella as absent, and damsel flies and caddis flies rare. n Lake Mendota Hyalella was abundant, while amsel flies, caddis flies, and stone flies were ound only occasionally. (Lynch-Wisconsin)
W78-12004

HANGES IN SUBMERGED MACROPHYTES N GREEN LAKE, WISCONSIN FROM 1921 TO 971,
f. J. Bumby.
n: Transactions of the Wisconsin Academy of ciences, Arts and Letters, Vol. 65, p 120-151. 9 ig, 1 tab, 34 ref. (1977).

Descriptors: *Submerged plants, *Macrophytes, Green Lake(WI), *Myriophyllum spicatum, Eutrophication, *Water quality, Wisconsin, Lakes, Potamogeton, Najas flexilis, Vallisneria mericana, Chara, Cladophora, Microcystis aeruinosa, Anabaena flos-aquae, Aphanazomenon los-aquae, Gloeotrichia echinulata, Phytoplankton, Filamentous algae, Algae, Zooplankton, Litoral.

Changes in 1971 of a 1921 survey of aquatic plants t 30 selected stations in Green Lake, Wisconsin, howed an overall decrease in total biomass. Three lepth zones were sampled: zone one, 0-1 m; zone wo, 1-3 m; and zone three, 3-10 m. Five species ncreased in biomass: Myriophyllum spicatum (the nost abundant species and the one with the largest ncrease in biomass), Vallisneria americana, Najas lexilis, Potamogeton crispus, and Ranunculus ongirostris. Eight species decreased: P. richardsonii, Heteranthera dubia, P. zosteriformis, Elodea canadensis, P. pectinatus, Zannichellia palustris, Ceratophyllum demersum, and Chara sp. Four species of Potamogeton were not found in he 1971 quadrats; however, all but P. foliosus were found elsewhere in the lake. Chara sp. had he greatest decrease (over 600 gm/sq m). The greatest decrease in total biomass occurred in the deepest part of littoral zone three, followed by the decreases in zone two and zone one. All stations with the highest biomass in 1921 decreased, while he low 1921 stations showed no consistent pattern of change. In 1971 biomass of the filamentous algae, mainly Cladophora sp., constituted a serious nuisance in the littoral zone, and was the most important autotroph by weight in zone one, and third in zones two and three. No Cladophora problem existed in 1921. Cyanophyta among phytoplankton in 1971 were Microcystis aeruginosa, Anabaena flos-aquae, Aphanazomenon flos-aquae, and Gloeotrichia echinulata. (Lynch-Wisconsin)
W78-12006

PHOTOSYNTHESIS OF THE SUBMERGENT MACROPHYTE CERATOPHYLLUM DEMERSUM IN LAKE WINGRA,
Istituto Italiano di Idrobiologia, Pallanza (Italy).
P. Guilizzoni.
In: Transactions of the Wisconsin Academy of Sciences, Arts and Letters, Vol. 65, 1977, p 152-162. 5 fig, 20 ref. NSF BMS75-19777.

Descriptors: *Ceratophyllum demersum, *Macrophytes, *Lake Wingra(WI), *Submerged plants, *Photosynthesis, *Eutrophication, Myriophyllum spicatum, Lakes, Wisconsin, Madison(WI), Carbon radioisotopes, Primary productivity, Depth, Light intensity, Light penetration, Age, Leaf-stem ratio, Littoral.

Photosynthetic rate measurement of shoot sections of the submerged aquatic macrophyte Ceratophyllum demersum in eutrophic Lake Wingra (Madison, Wisconsin) showed that declining primary productivity correlated with diminishing irradiance at lower depths, increasing tissue age, and reduction in the leaf/stem ratio. A carbon-14 method was used in the measurements. The saturated photosynthetic rate of 2.3 mg C/g (dry wt)/hr for C. demersum was attained at 650-700 microE/sq m/sec at a water temperature of 21C. In Lake Wingra, a small alkaline lake, C demersum grows in scattered patches anchored in the soft sediment within the Myriophyllum spicatum community which dominates the littoral zone. Comparison of the two species indicates that C. demersum may be characterized as a species adapted to low light intensity, and C. demersum plants showed a much more rapid reduction of carbon-14 uptake from growing tips to the bottom. Field experiments were designed to study photosynthesis of C. demersum within the M. spicatum community, while laboratory tests were directed at determining the photosynthetic profile of C. demersum exposed to constant light and a water temperature of 25C. Specimens were collected in August-September 1975; details of the experiments are given. (Lynch-Wisconsin)
W78-12007

PROGRAM AND ABSTRACTS: SYMPOSIUM ON NONBIOLOGICAL TRANSPORT AND TRANSFORMATION OF POLLUTANTS ON LAND AND IN WATER.
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-12015

THE PHOTOCHEMISTRY OF XENOBIOTICS,
California Univ., Davis.
For primary bibliographic entry see Field 5B.
W78-12017

REACTION RATES OF ELECTRON PAIR DONOR MOLECULES WITH POLLUTANTS IN WATER,
Brown Univ., Providence, RI. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-12020

ADSORPTION AND TRANSPORT OF POLLUTANTS ON SUSPENDED PARTICLES,
Bedford Inst. of Oceanography Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5B.
W78-12022

PREDICTIVE MODELING OF THE BEHAVIOR OF POLLUTANTS IN THE AQUATIC ENVIRONMENT,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5B.
W78-12024

PREDICTION OF SOLUBILIZATION OF HYDROPHOBIC ORGANIC COMPOUNDS IN WATER,
Pomona Coll., Claremont, CA.
For primary bibliographic entry see Field 5B.
W78-12025

THE ENVIRONMENTAL PHOTODEGRADATION OF SELECTED ORGANOMETALIC COMPLEXES,
Eastman Kodak Co., Rochester, NY. Health, Safety and Human Factors Lab.
H. B. Lockhart, Jr.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May, 1976, p. 110-113. 4 fig, 10 ref.

Descriptors: Pollutants, Path of pollutants, Metals, *Manganese, *Iron, *Cobalt, Environmental effects, Light, Light intensity, Chemical reactions, *Chelation, Hydrogen ion concentration, *Aquatic environment, Laboratory studies, methodology, *Photolysis, *EDTA, *Chelating agents, Organometallic complexes, Sunlight, EDTA chelates, Photodegradation.

Synthetic chelating agents, such as EDTA, are used in our society. These chelating agents reach the aqueous environment via the discharge of wastes. Due to the concentrations of common metal ions in natural waters and the formation constants for the complexes formed between chelating agents and these metal ions, any study of the environmental fate of chelating agents must be, in fact, a study of these complexes. (See also W78-12015) (EIS-Katz)
W78-12026

KINETICS OF HYDROLYSIS AND OXIDATION OF ORGANIC POLLUTANTS IN THE AQUATIC ENVIRONMENT,
Stanford Research Inst., Menlo Park, CA.
W. R. Mabey, and T. Mill.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 114-121. 3 tab, 12 ref.

Descriptors: Pollutants, Path of pollutants, *Degradation(Decomposition), *Organic wastes, Chemical properties, Chemical reactions, Chemical wastes, Hydrogen ion concentration, Aquatic environment, Water temperature, *Oils, *Hydrolysis, *Free Radical oxidation, Alkoxy radicals, Olefins, *Organic halides, Epoxides.

Oxidation and free radicals oxidation can be important degradation pathways for some organic pollutants in aquatic environments. Knowledge of the theoretical and experimental features of these reactions can be meaningfully applied to prediction of degradation rates and to design of experiments that are relevant to environmental conditions. Three general hydrolysis mechanisms can be described. Depending on the compound, the hydrolysis kinetics may be acid and/or base catalyzed as well as being pH independent in a neutral reaction with water. The observed rate of hydrolysis may be due to any one or a combination of these mechanisms and will be determined by the pH and the temperature of the aquatic environment. (See also W78-12015) (EIS-Katz)
W78-12027

PREDICTION OF VOLATILIZATION RATE OF POLLUTANTS IN AQUEOUS SYSTEMS,
Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry.
D. Mackay, and Y. Cohen.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 122-129. 3 fig, 11 ref.

Descriptors: Pollutants, Aquatic environment, *Volatility, Water quality, Waste treatment, *Dissolved solids, Particulates, *Physical properties, *Physico-chemical properties, Water particulate surfaces, *Volatilization rates, Aqueous system, *Pollutant volatilization, Surface microlayers, *Evaporating pollutant, Henry's Law.

In predicting the rate of volatilization of pollutants from aqueous environments the Whitman two film resistance approach is used, yielding a mass flux equation in which the three major parameters are the Henry's Law constant and the gas and liquid phase mass transfer coefficients. These three parameters are discussed in terms of the availability of data representation of environmental conditions, methods of obtaining such data experimentally or theoretically with emphasis on areas of inadequacy. Finally, some complications introduced by surface organic microlayers and the presence of interfering dissolved or particulate materials are outlined. It is concluded that the major areas of uncertainty are the value of the liquid phase mass transfer coefficient and the effects of other dissolved materials in modifying the Henry's Law constant of and evaporating pollutant. (See also W78-12015) (EIS-Katz)
W78-12028

ENVIRONMENTAL PHYSICS AND CHEMISTRY OF AQUATIC POLLUTANTS,
Harvard Univ., Cambridge, MA. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 5B.
W78-12030

OXIDATION AND REDUCTION OF PESTICIDES IN SOILS AND SEDIMENTS,
Department of Agriculture Beltsville, MD.
J. R. Plimmer.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 152-156.

Descriptors: *Pesticides, *Soils, *Sediments, Oxidation, Reduction potential, Aquatic environment, *Degradation(Decomposition), Chemical reactions, Oxygen, Anaerobic conditions, Organic loading.

Several mechanisms may be involved in the transformation of pesticides in soils and aquatic systems. Of these, transformation by microorganisms is predominant, but may purely chemical reactions may accompany biological pathways. The distinction between chemical and biological transformations in soils presents many experimental problems. Reactive intermediates may be generated in metabolic processes or arise by the action of free radiclas in soil. Some chemical systems may be used as models to provide useful insights into the nature of the processes involved. Reactions occuring in sediments depend on the the availability of oxygen. Anaerobic processes will be favored as oxygen is depleted in sediments rich in organic nutrients. Measurement of redox potential may be a useful guide to potential reaction pathways. (See also W78-12015) (EIS-Katz)
W78-12032

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2H.
W78-12038

DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL,
Agricultural Research Council, Compton (England). Inst. for Research on Animal Diseases.
For primary bibliographic entry see Field 5G.
W78-12072

THE IMPACT OF SUBTIDAL SEWAGE OUTFALLS ON THE INTERTIDAL MACROFAUNA OF SEVERAL CENTRAL PUGET SOUND BEACHES,
Washington Univ., Seattle.
For primary bibliographic entry see Field 2L.
W78-12095

METHODS FOR MEASURING THE ACUTE TOXICITY OF EFFLUENTS TO AQUATIC ORGANISMS,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5A.
W78-12099

DISTRIBUTION OF PHYTOPLANKTON IN MARYLAND LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
V. W. Lambou, F. A. Morris, R. W. Thomas, M. K. Morris, and L. R. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 940, Price codes: A04 in paper copy, A01 in microfiche. Publication No EPA-600/3-77-124, October 1977. 24 p, 3 tab, 11 ref, 1 append.

Descriptors: *Maryland, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Impoundments, *Reservoirs, Bioindicators, Algae, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, National Eutrophication Survey, Deep Creek Lake(MD), Liberty Reservoir(MD), Loch Raven Reservoir(MD), Johnson Pond(MD).

Phytoplankton species composition and abundance were determined for four Maryland lakes and reservoirs; in addition, trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed were Deep Creek Lake, Liberty Reservoir, Loch Raven Reservoir, and Johnson Pond. Data are summarized by lake in an appendix containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer indices incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, and one with 20 species. (Lynch-Wisconsin)
W78-12100

5D. Waste Treatment Processes

WATER POLLUTION CONTROL IN METAL FINISHING INDUSTRY,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
C. P. C. Poon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 089, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, (1978). 13 p, 1 fig, 2 tab, 1 ref. OWRT A-062-RI(1).

Descriptors: *Metal finishing waste water, Copper, Nickel, Zinc, Cadmium, Chromium, Cyanide, Electrochemical reaction, Electroflotation, Seawater, Performance model, Cost, Industrial wastes, Waste water treatment, Coagulation, Chlorination.

A unique electrochemical reactor was used for batch treatment of metal finishing waste water. Using low DC currents, waste water containing copper, nickel or zinc, or cadmium with cyanide, and chromium could be removed successfully to meet the federal effluent quality standards. Electro-coagulation and flotation as well as chlorination were responsible for all the reactions required in the removal processes. Sacrificing iron anode was used for the chromium removal processes while a plantinated anode was used for others. Performance models and a cost analysis were presented. Use of lower electric currents often resulted in a higher metal removal potential expressed as mg metal removal per kwh power consumption.
W78-11380

THE RELIABILITY OF SAND DEWATERING BEDS FOR SLUDGE MEASURED BY THE PERFORMANCE INDEX,
Clark (Edward E.), Miami, FL.
K-m. Lo, and D. D. Adrian.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 925-941, 1978. 6 fig, 3 tab, 7 ref.

Descriptors: *Dewatering, *Reliability, *Design, *Methodology, *Sand beds, *Sludge, Computer models, Economics, Climatic data, Weather, Effects, Simulation analysis, Systems analysis, Equations, Uncertainty, Cost minimization, Marginal analysis.

This study relates to the development of a methodology to aid an engineer design sand beds for sludge drainage and drying based on the nature of the sludge, climatic conditions, and economic factors. Computer simulation proved useful in studying the uncertainty introduced by weather effects on the performance of sand dewatering beds. Computer simulation also brought about a union of engineering and economic analysis. The methodology involves the following steps: (1) formulation of a mathematical model for sludge drainage and drying on sand beds; (2) preparation of input data; (3) validation of the simulation experiments; and (4) analysis of the simulaton outputs to attain an optimum system design. Simulation of sludge dewatering for 20 year periods for weather conditions typical of various cities of the United States produced a random variable, the required dewatering time, and its frequency distribution. The frequency distribution was affected by weather conditions. The sludge solids content usually dominated the effects of specific resistance in affecting the dewatering time. Two different economic analyses were used: selecting the alternative that would fulfill the target output at minimum cost and marginal analysis. (See also W78-11386) (Bell-Cornell)
W78-11415

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN: SUMMARY REPORT.
Army Engineers District, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A036 641, Price codes: A08 in paper copy, A01 in microfiche. April 1974, 16 sections, 17 tab, 18 fig, 1 annex. Appendices A-I published as separate volumes.

Descriptors: Waste water(Pollution), *Waste water treatment, *Lake Michigan, *Planning, *Management, Waste water disposal, Environmental effects, Illinois, Indiana, Topography, Population, Land use, Economics, Engineering, Design, Alternative planning, Resources, Storm water, Institutions, Local governments, State government, Sludge disposal, Land treatment, Social aspects, Economic impact, Water pollution, *Illinois River, *Waste water management, Water quality management, Chicago(IL).

The study's purpose is twofold: to identify and evaluate waste water treatment systems that might eliminate pollutant discharges into the study area's lakes and streams; and to incorporate these evaluations into relevant plans. The objective is to use these accomplishments to provide a framework for decision. This summary report is a review of a planning study intended to assist the states and local agencies in Northeastern Illinois and Northwestern Indiana which are responsible for planning for responsible waste water management. For long-term planning, the projected needs for the year 2020 were used; however, final design was based on the more immediate requirements of 1990. Reviewed in this summary document are background information, design considerations, development and selection of alternatives, final alternative plans, the evaluation framework, resource implications, socio-environmental impacts, institutional assessment, economic assessments, impact perspective and views of local interest. General conclusions of the study are presented: any of the five final alternatives would improve the quality of Lake Michigan and the Illinois River as well as tributary streams in the areas; existing waste water management plans are inadequate; all alternatives have flexible time schedules; industrial options include total or par-

l on-site treatment; recreational potentials, prorty values, and water supply quantities in the udy area would be greatly enhanced by treatent to suggested water quality levels; and no sine alternative is clearly best from all perspectives. ecific conclusions are also presented for storm ater management, resource requirements, reonalization and sludge management. (See W78-476 thru W78-114831) (Zayac-NC)
78-11475

ASTEWATER MANAGEMENT STUDY FOR HICAGO SOUTH END OF LAKE MICHIGAN-- PPENDIX A: BACKGROUND INFORMATON.
rmy Engineers District, Chicago, IL.
vailable from the National Technical Informaon Service, Springfield, VA 22161, as AD-A036 2, Price codes: A09 in paper copy, A01 in icrofiche. July 1973, 7 sections, Bibliography, 30 b, 24 fig, Summary Report and Appendices B-I ublished as separate volumes.

escriptors: *Lake Michigan, *Planning, *Flood ontrol, *Water supply, *Water quality, *Land se, Indiana, Illinois, Geology, Topography, rainage, Climatology, Industrial wastes, Muicipal wastes, Hydrologic systems, Water polluon, Pollution abatement, Land treatment, ecreation facilities, Wildlife conservation, Wilife management, Navigation, Electric power, ottom sediments, Institutions, Governments, Waste water management, *Illinois River, Invenry, Open space, Pollutant loadings, Objectives, hicago(IL).

his appendix is a compendium of background inormation for the study area. First inventoried is nd, climatological and biological conditions. and use is then discussed, including present and rojected land use patterns for the study area. hese data are then used as the basis for populaion and industrial flow projections. Water anagement needs are discussed in terms of flood ontrol, minimum hydrologic flows, water supply nd quality, open space, recreational developent, wildlife restoration and conservation, avigation and electric power. Reaches are then isted in terms of their peculiar hydrologic egimes, including bottom deposits, critical oadings and ultimate quality goals. Planning obectives are reviewed as defined by earlier studies, y regional commissions and by potential land reatment areas per county. Restrictions for water anagement--including those restrictions on the se of Lake Michigan waters, by government tructure and by fragmentation of management acion--are then listed. Finally, current and planned ater management activities are inventoried. hese include current abatement operations, reional plans, water supply alocations, open space lanning, flood control, fish and wildlife enhancement, navigation and electric power generation. (See also W78-11475) (Zayac-NC)
W78-11476

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MANAGEMENT-APPENDIX B: BASIS OF DESIGN AND COST AND DATA ANNEX APPENDIX B: BASIS OF DESIGN AND COST.
Army Engineers District, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA as AD-A036 643, Price codes: A00 in paper copy, A01 in microfiche, AD-A036 644, Price codes: A10 in paper copy, A01 in microfiche. Appendix: July 1973, 7 sections, 102 fig, 76 tab, Data Annex: May 1973, 7 sections, 20 fig, 22 tab. Summary Report and Appendices C-I published as separate volumes.

Descriptors: *Lake Michigan, *Cost analysis, *Design standards, *Management, *Water quality, *Planning, Illinois, Indiana, Cost comparison, Resources, Environmental effects, Design criteria, Regional analysis, Industries, Conveyance structures, Soil management, Non-structural alternatives, Water reuse, Waste water treatment, Impacts, Water pollution, Land treatment, Sludge disposal, *Illinois River, Management systems, *Design comparisions, *Water water management, Data Annex, Industrial treatment, Synergism, Chicago(IL).

This appendix contains the criteria and rationale used to design and cost the final five waste water management alternatives presented in the Summary Report and detailed in Appendix D. This appendix is divided into two parts and bound separately--a formal volume and a Data annex. The Data Annex presents more detailed, supporting information pertinent to the formal presentation and is structured parallel to that volume. Design summaries are first presented for each of nine systems--regional treatment, industrial treatment, sludge management, storm water management, conveyance, rock and residual soil management, reuse, synergism and non-structural management systems. The flow bases of design are discussed next. Present domestic-commercial and industrial flows are used to develop projected flows; and present stormwater flows are used to project future stormwater flows. These projected total flows are then summarized. Each of the component bases of design are inventoried according to the above mentioned system, followed by a cost estimation methodology. This methodology is then applied to the nine systems. Finally, impacts of each system are assayed, including impacts of resources and system performance. (See also W78-11475) (Zayac-NC)
W78-11477

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN-- APPENDIX C: PLAN FORMULATION.
Army Engineers District, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A036 645, Price codes: A08 in paper copy, A01 in microfiche. July 1973, 9 sections, 19 tab, 47 fig. Summary Report and Appendices A, B and D-I published as separate volumes.

Descriptors: *Lake Michigan, *Planning, *Analysis, *Evaluation, *Water quality, *Waste water treatment, Indiana, Illinois, Institutions, Environmental effects, Social aspects, Cost analysis, Cost comparisons, Resources, Pollutants, Storm water, Water reuse, Conservation, Water pollution, Land treatment, Sludge disposal, *Illinois River, *Waste water management, *Guidelines, *Water quality management, Concepts, Procedures, System design, Public involvement, Chicago(IL).

This appendix presents the planning concepts and procedures used in developing the five waste water management alternatives proposed in the study. This appendix in particular documents the study's objectives and strategies including: the plan-formulation process; the establishment of the basis of system design; and the evaluation of proposed alternatives. Each alternative is structured to meet the study area's long-term needs for 2020; however, final design is based on the requirements of 1990. After presenting background information, the appendix turns toward the study goals for water quality standards, pollutant sources, storm water runoff, and water reuse and conservation. A planning overview--including socio-environmental studies, institutional studies and public involvement--is then presented. The initial stage for plan formulation considers strategy and alternative selection criteria; it then suggests a first state planning perspective. An intermediate stage of plan formulation then develops costing comparisons of the initial stage's alternatives. More intermediate alternatives are then developed and new modifications to design criteria are identified. A framework for assessment is next developed and used to study resource consumption and impacts to areal resources, cost, institutions, and the socio-environmental area. the final stage of plan formulation begins by developing guidelines for final screening, and then uses these criteria to look at the five proposed alternatives. Design modifications are then suggested, followed by a summary and plans for public involvement. (See also W78-11475) (Zayac-NC)
W78-11478

WASTEWATER MANAGEMENT STUDY CHICAGO SOUTH END OF LAKE MICHIGAN-- APPENDIX D: DESCRIPTION AND COST OF ALTERNATIVES.
Army Engineers District, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A036 646, Price codes: A13 in paper copy, A01 in microfiche. July 1973, 7 sections, 54 tab, 34 fig. Summary Report and Appendices A-C, E-I published as separate volumes.

Descriptors: *Lake Michigan, *Waste water(Pollution), *Management, *Planning, *Waste water treatment, Indiana, Illinois, Urbanization, Suburban areas, Alternative costs, Alternative planning, Regional analysis, Economics, Model studies, Methodology, Construction cost, Flow characteristics, Land treatment, Sludge disposal, Storm water, *Illinois River, *Waste water management, Chicago(IL).

This appendix describes cost and analyzes construction phasing for each of the final five regional waste water management plans presented in the Summary Report and selected in Appendix B. A brief sketch of the five alternatives follows. Alternative I is a reference plan designed to meet current stream quality standards as identified by Illinois and Indiana; Alternative II proposes physical-chemical treatment technologies to meet the no-discharge of critical pollutants (NDCP) water quality goals; Alternative III provides for advanced biological technologies to meet NDCP goals; and Alternative V proposes using advanced biological treatment technologies in the urbanized areas and land treatment techniques in the outer, suburban areas to meet NDCP goals. The alternatives are first described in detail. Next, a phasing and implementatin schedule for each alternative is considered. Using unit costs developed in Appendix B, management systems costs are Aggregated for each alternative over the implementation schedule; present worth and annual average charges are then presented. The regional waste water management alternatives are then compared using both cost comparisons and comparisons of the stream flow regime impacts. These five current alternatives are then compared with previous alternatives developed in a 1972 study. Finally, recommendations are made for future pilot projects. (See also W78-11475) (Zayac-NC)
W78-11479

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN-- APPENDIX E: SOCIAL-ENVIRONMENTAL EVALUATION.
Corps of Engineers, Chicago, IL. Chicago District.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 647, Price codes: A05 in paper copy, A01 in microfiche. July 1973, 2 annex, 5 sections, 44 tab, 10 fig. Summary Report and Appendices A-D, F-I published as separate volumes.

Descriptors: *Social aspects, *Environmental effects, *Lake Michigan, *Waste water treatment, *Social impacts, *Water quality, Indiana, Illinois, Alternative planning, Aesthetics, Soils, Air quality, Resources, Management, *Illinois River, *Waste water management, Human values, Quality-of-life, Subjective indicators, Objective indicators, Matrices, Chicago(IL).

This appendix assesses the social and environmental impacts likely to arise from the implementation of the five waste water management alternatives

presented in the Summary Report and detailed in Appendix D. These evaluations were done by using Alternative I--the reference alternative--and subjectively assessing the effects of the four other alternatives to it. This appendix is based on an analysis of the processes by which the proposed alternatives might affect both the environment and the quality of life. Four sets of impact parameters are assayed: system components, their construction and operation, as well as their expected performances; environmental resource attributes of the study area; man's social well-being as determined by his resource use activities; and the relative worth of human values and goals. Changes created in environmental conditions and resource use by waste water management activities are then studied to determine how these changes modify both human activities and the availability of these activities. A matrix was used to make subjective judgments as to how a major system component (e.g. conveyance, treatment process, distribution of treated effluent, sludge management) affected each major environmental element (e.g. water quality, air quality, soil, aesthetics, etc.) and subsequently human activities (recreation, land use, transportation, etc.). Advantages and disadvantages of this approach are discussed, the main points of which include this being an attempt to quantify the unquantifiable, and that impacts are expressed in terms of subjective assessments. (See also W78-11475) (Zayac-NC)
W78-11480

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX G: VALUATION.
Corps of Engineers, Chicago, IL. Chicago District.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 649, Price codes: A11 in paper copy, A01 in microfiche. July 1973, 12 sections, 2 annex, 28 tab, 14 fig. Summary Report and Appendices A-F, H-I published as separate volumes.

Descriptors: *Lake Michigan, *Alternative planning, *Environmental effects, *Economic impact, *Water quality, *Planning, Indiana, Illinois, Implied benefits, Resource allocation, Resources, Resource mix, Social aspects, Cost comparisons, Institutions, Water reuse, Water pollution, Impacts, Waste water treatment, Conservation, Land treatment, *Illinois River, *Waste water management, Valuations, Implications, Use potential, Environmental goals, Chicago(IL), Socio-environmental impacts.

This appendix presents a broad evaluation of the implications and use potential inherent in each of the final five waste water management alternatives presented in the Summary Report and detailed in Appendix D. Its analysis evaluates the functional components of each proposed alternative. Components include collection facilities, treatment processes and sludge (residual) handling and management. Also included in the analysis of each alternative are its economic, water reuse, resource and local ramifications. An effort has been made to balance consumptive demands against socio-environmental goals. After an initial review of the study scope, area and value components of waste water management are studied. Included here are water quality goals, available technologies, pollutant sources, storm water runoff and reuse and conservation objectives. The process of alternative selection is reviewed by looking at strategy considerations and possible arrangements of above mentioned components. Resource implications are next studied; here a framework for assessment as applied to resource consumption and areal resource impact is presented. Following is an identification of socio-environmental considerations: labor requirements, social disruptions and socio-environmental impacts. Institutional and economic assessments are then presented. System-related changes--both in the study area and outlying areas--are analyzed in terms of water balance, flood control, stream usage, land use changes, rock and soil management, power generation and agri-business. Cost comparisons are also considered. (See also W78-11475) (Zayac-NC)
W78-11481

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX H: PUBLIC INVOLVEMENT/PARTICIPATION PROGRAM.
Corps of Engineers, Chicago, IL. Chicago District.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 650, Price codes: A24 in paper copy, A01 in microfiche. July 1973, 5 sections. Summary Report and Appendices A-G and I published as separate volumes.

Descriptors: *Lake Michigan, *Planning, *Water quality, *Waste water treatment, Indiana, Illinois, Participating funds, Alternative planning, Interagency cooperation, Coordination, Communication, Programs, Management, Water supply, *Waste water management, *Illinois River, *Public participation, Citizens advisory committees, Interaction, Correspondence, Citizen involvement, Communications media, Public meetings, Chicago(IL).

This appendix documents both public involvement and participation in the C-SELM study. Procedures used by the Corps of Engineers are described, along with a general review of public meetings, contacts with citizen advisory groups, interagency coordination and the relationships with the various communications media. Feedback modes which the Corps used to encourage communication with the public are also described. A program overview first summarizes the effort. Included here is an historical perspective of public involvement and program objectives. The program structure is noted, including methods such as advisory committees, public meetings, governmental coordination, media coverage and special briefings. The program sequence is then described: Stage I-Initiation of Study; Stage II-Initial Alternatives; Stage III-Intermediate Alternatives; Stage IV-Selection of Final Alternatives; and Stage V-Agricultural Developments. The overview concludes with an analysis of the program's effectiveness. Stage I is divided into two parts: initial public meetings in Indiana and Illinois, including the Corps' presentation; and the results of the citizens advisory committee in local planning districts and sanitary districts. Stage II is highlighted by development and screening of an initial set of 19 alternatives and interactions with the public during that process. Stage III reviews the evaluation of the intermediate set of 11 alternatives selected from the initial set. Intermediate advisory committee meetings, technological issues, socio-environmental impact analysis methodology and questions raised by citizens are summarized. Stage IV reviews the interactions with the public in the final selection of alternatives and public meetings concerned with plan formulation. Stage V reviews agricultural development and presents various correspondence. (See also W78-11475) (Zayac-NC)
W78-11482

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX I: COMMENTS.
Corps of Engineers, Chicago, IL. Chicago District.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 651, Price codes: A09 in paper copy, A01 in microfiche. January 1974, 5 sections. Summary Report and Appendices A-H published as separate volumes.

Descriptors: *Lake Michigan, *Participation, *Waste water treatment, *Water quality, *Planning, Illinois, Indiana, Local governments, State governments, Impacts, Land treatment, *Illinois River, *Waste water management, Values, *Public participation, Federal agencies, State agencies, Regional agencies, Local organizations.

This appendix contains all the formal comments from local, state and Federal entities resulting from their reviews of the C-SELM study's Summary Review and other appendices. Presented are the perspectives these entities, plus citizen groups and individuals, have of the alternative waste water treatment technologies, regional systems and planning options considered in the study. From the comments contained in this appendix, it is concluded that there is no single 'best' alternative: all alternatives have different benign and malign environmental, social and regional impacts to different individuals and concerns. The appendix has tried to take a neutral approach in its characterization of the range of impacts. But the comments contained in this appendix make it clear that the issues raised by the study have forged strong opinions on the part of organizations of citizens as voiced by opinions recorded at public meetings and through work groups. The comments indicate that a final decision cannot be made on narrowly defined technical or cost-effective bases. Rather, this appendix suggests that 'the final answer must be determined by the residents of both the study and outlying areas working with the states in determining a solution for all'. Thus, the appendix's purpose is to present an array of viewpoints so that the desirable and undesirable technical and economic issues can be balanced against a personal framework of desires and goals. (See also W78-11475) (Zayac-NC)
W78-11483

THREE-STEP TREATMENT FOR PIGGERY WASTES,
Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.
H. Vanstaen, J. P. Voets, and W. Verstraete.
Water Research, V. 10, No. 10, p 927-928, 1976. 1 fig., 2 tab., 5 ref.

Descriptors: *Aerobic treatment, Biochemical oxygen demand, Nitrification, Activated sludge, Physical properties, Chemical properties, *Waste water treatment, *Swine wastes, *Anaerobic treatment, Effluent quality.

This paper reports the results of a pilot study in which an alternative three-step method for the treatment of piggery wastes was investigated. In this three-step treatment, the first aerobic treatment transforms the soluble BOD to microbial biomass and causes partial nitrification. The second step acts as a septic tank. A large amount of the biomass is retained and considerable amounts of oxidized nitrogenous compounds are removed. The third tank provides conventional activated sludge treatment. During the experiments the manure from a sow house, in which the manure was diluted because of an unlimited drinking water supply, and a fattening pig house, in which the drinking water supply was limited for a few hours a day, was used. Two experiments were conducted, one using the diluted wastewater and the other using the more concentrated wastewater. In the first experiment using the diluted wastewater, about 70% of the treated volume of wastewater could be discarded as effluent while 30% had to be stored as surplus sludge. In the second experiment, the total amount of surplus sludge to be stored amounted to plus or mirus 50% of the initial volume. In both experiments, the effluents were of acceptable BOD, appearance and odor. The content of non-degradable organic matter, N and P made them unacceptable for discharge into oligotrophic waters, although the liquid effluent could be discharged into a farm holding pond. (Bates-East Central)
W78-11547

OLD-CLIMATE WATER/WASTEWATER RANSPORTATION AND TREATMENT -- A BLIOGRAPHY,
aska Univ., College. Inst. of Water Resources.
Tilsworth, D. W. Smith, G. M. Zemansky, and R. Justice.
vailable from the National Technical Informa- n Service, Springfield, VA 22161 as PB-286 258, ice codes: A07 in paper copy, A01 in microfiche. eport No. IWR-72, December 1977. 135 p. VRT A-047-ALAS(1), 14-31-0001-5002.

escriptors: *Water treatment, *Waste water eatment, *Alaska, Arctic, *Bibliographies, chnology, Treatment facilities, Transporta- n(Wastes), Cold regions.

is bibliography contains 1,400 citations, includ- g published and unpublished papers, on cold cli- ate water and wastewate transportation and eatment systems. Sources listed include state d federal agency files which contain information systems in Alaskan communities and the lyeska Pipeline Service Company camps. eferences to systems in other northern countries e also included. The objectives of this study ere to identify causes of the failure of Alaskan ater and wastewater treatment and transporta- n facilities and to seek methods for design im- rovements. Originally, the investigators contem- ated an evaluation of systems performance in mote areas in relation to the original conception, anning, design, and construction. Because of the emendous amount of literature examined, the valuation was undertaken in a subsequent study, Alaska Wastewater Treatment Technology' (A- 58-ALAS) by Ronald Johnson. (See W78-11575) 78-11574

LASKA WASTEWATER TREATMENT ECHNOLOGY,
laska Univ., College. Inst. of Water Resources.
. A. Johnson.
vailable from the National Technical Informa- on Service, Springfield, VA 22161 as PB-286 235, rice codes: A09 in paper copy, A01 in microfiche. ompletion Report No. IWR-86, January 1978. 185 , 38 fig, 27 tab, 137 ref, 2 append. OWRT A-058- LAS(1), 14-34-0001-7003.

escriptors: Waste treatment, *Waste water treat- ent, Technology, *Treatment facilities, *Alaska, Performance, *Operation costs, Activated ludge, Industrial waste treatment, Sewage treat- ent, Sludge treatment, Tertiary treatment, Aero- ic treatment, Septic tanks, Sewage treatment lants, Waste stabilization ponds, Coagulation.

An assessment has been made of wastewater treat- ent technology in Alaska. Some of the larger mu- icipalities such as Juneau and Fairbanks have iological treatment plants that are meeting secon- lary standards. By the middle of 1976, the pipeline amps and pump stations were averaging around 2% BOD5 removal using mainly a combination of iological and physical-chemical treatment. Most f the industries, including the pulp mills and eafood processors, and the largest municipality, Anchorage, utilize only primary treatment. The ulp mills, however, have recently agreed to in- tall additional treatment capacity to be in com- liance with PL 92-500. Wastewater treatment is irtually nonexistent at many remote villages. However, some progress is being made in upgrad- ng sanitation facilities in some of the villages. The USPHS has installed around sixty sanitation ystems with running water. The Alaska Depart- ent of Environmental Conservation is installing ome physical-chemical and extended-aeration ackage plants as part of a Village Safe Water Pro- gram. Detailed operating dat are not available for ll but a few of the largest treatment plants. But, here are sufficient data to verity that encapsu- lated plants can work well in cold climates. For in- dividual homes or other small-scale users, the op- tions are septic tanks, aerobic package plans, or composting toilets. A large portion of operating costs of both small or large treatment plants are related to sludge disposal. Care must be taken to ensure that disposal does not contaminate groundwater. One promising method of disinfection that deserve wider consideration in lime addition, which has been shown to be effective at low temperatures and is simpler to use than chlorine addition. Freezing should be considered as a means of dewatering sluge. (See also W10-11519).
W78-11575

A MASS BALANCE STUDY OF RECYCLING SECONDARY MUNICIPAL WASTEWATER ON ABANDONED FIELD ECOSYSTEMS,
Michigan State Univ., East Lansing. Dept. of Zoology.
T. M. Burton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 275, Price codes: A04 in paper copy, A01 in microfiche. Institute of Water Research, Michigan State University, East Lansing. Completion Report. July, 1978. 51 p, 15 fig, 16 tab, 13 ref. OWRT A-091-MICH(1), 14-31-0001-6023.

Descriptors: *Water reuse, *Irrigated land, *Municipal wastes, Sewage disposal, Nitrogen, Phosphorus, Leaching, Vegetation management, Nutrient budgets, *Recycling, *Oldfields, *Mass balances, *Michigan, *Land application.

An experiment on the management of a municipal wastewater land application system using abandoned fields was conducted in 1976 and 1977 on a 10-year old oldfield site on thirty-six 0.07 ha plots arranged within 6 experimental blocks. Irrigation levels of 0, 5, and 10 cm/week of secondary effluent were used. Harvest treatments included no harvest, one harvest in June, and two harvests in June and September. Mass balances were construced for phosphorus and nitrogen for all treatments. The oilfield was very effective at wastewater renovation at all harvest treatment throguh most of the growing season. Nitrate-N concentrations in soil water leaching past the 120 cm depth remained well below the 10 mg/l drinking water standard except during September and October on the unharvested plots. Phosphorus remainded at blackground levels on all plots at the 120 cm depth. Harvesting extended the irrigation season by promoting active plant uptake into October. Harvesting in June removed 77% and 52% of added N on the 5 and 10 cm/week areas; harvesting in June and September removed 94% and 83% of N added to the 5 and 10 cm/week plots, respectively. Harvesting removed significant amouns of P. Harvesting and irrigation affected the makeup of the plant community. The irrigated harvested plots were dominated by quack grass (Agropyron repens) while the unharvested, irrigated plots were dominated by goldernrod (Solidago sp.). Vegetation response and plant species interactions are discussed.
W78-11577

THE INDUSTRIAL WASTE STUDIES PROGRAM. SUMMARY REPORT ON THE AUTOMOBILE INDUSTRY.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11629

FEDERAL GRANTS AWARDED FOR CONSTRUCTING WASTE TREATMENT FACILITIES WHICH BENEFIT INDUSTRIAL USERS.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11633

ACUTE RESIDUAL TOXICITY OF SEVERAL WASTEWATER DISINFECTANTS TO AQUATIC LIFE,
Grand Valley State Colleges, Allendale, MI. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11654

STANDARD UNITS SOLVE SEWAGE TANK ACCESS PROBLEM.
For primary bibliographic entry see Field 8G.
W78-11677

HUGE LOADS FUND WORLD'S LARGEST SEWAGE WORKS.
For primary bibliographic entry see Field 5G.
W78-11756

FILTRATION MEDIA FOR SEWAGE APPLICATIONS.
Water Services, Vol 82, No 989, p 422, July, 1978.

Descriptors: *Dewatering, *Filters, *Sludge treatment, *Membranes, *Filtration, Diatomaceous earth, Activated carbon, Separation techniques, Porosity, Pores, Waste water treatment, Municipal wastes.

Webron Products Ltd. of Rossendale, Lancashire, England, has introduced the Hydron needle felt wet filtration fabric. The fabric, which is used as a cover on rotary drums, has been pretested in filter presses and rotary drum filtration plants for dewatering digested sewage sludges. Results of the testing indicate that the Hydron product has a high liquid throughput rate and a long working life; it is also capable of producing a high quality filtrate and high solids content sludge cake. Filter press investigations have demonstrated that needle felt media provide high flow rates through the pore structure, shorter batch cycle time, and easy release of the sludge cake. The Hydron fabric, which is suitable for use with diatomaceous earth and activated carbon, is available in filtration grades ranging from coarse for sewage sludge to fine for particulate removal and clarification. (Lisk-FIRL)
W78-11762

ADVANCED WASTEWATER TREATMENT PLANT GAINS CARBON REGENERATION FURNACE.
Consulting Engineer, Vol 42, No 7, p 40, July, 1978.

Descriptors: *Tertiary treatment, *Activated carbon, *Incineration, *Burning, *Drying, Equipment, Aeration, Steel, Oxidation, Treatment plants, Waste water treatment, Municipal wastes.

A 7-hearth activated carbon regeneration furnace has been installed in the Coleshill, England, advanced waste water treatment plant, under the jurisdiction of the Severn-Trent Water Authority. The furnace is constructed of a mild steel, 5 m-high stack lined with refractory blocks; a variable speed shaft drives a rotating nickel-chrome rabble arm unit in each 1.5 m diameter hearth to agitate the carbon as it falls through the hearth floor gratings. The carbon is dried by five burners and an electrical fan supplying combustion air at a rate of 5.6 cu m/min. The burners, conveyors, and motors are individually controlled and monitored with ultra-violet detection. Plant operating conditions are continuously monitored in the main plant control room and plant malfunction data is conveyed by remote signalling to an alarm system in the control room. Steam is generated on-site and injected at 54 kg/hr into five of the hearths. Waste gases are saturated with water and passed through a two-stage scrubbing unit before returning to the furnace stack. (Lisk-FIRL)
W78-11763

FLUIDIZATION TREATMENT PROCESS TO BE TRIED.
Consulting Engineer, Vol 42, No 7, p 41, July, 1978.

Descriptors: *Biological treatment, *Microbial degradation, *Nitrification, *Denitrification, *Sands, Biochemical oxygen demand, Biomass, Nutrient removal, Flow, Fluid mechanics, Waste water treatment, Municipal wastes.

The Oxitron biological treatment system, developed by Ecolotrol Inc. of New York and distributed by Dorr-Oliver, provides nitrification and denitrification of waste water. The Oxitron system consists of a reactor filled with a biomass support media, such as sand, that is expanded to more than twice its compacted size. The waste water is introduced upwards into the media at a rate sufficient to maintain fluidization of the media. The large surface area of the fluidized bed provides a higher concentration of active biomass, including bacteria and higher-order microorganisms. This higher concentration reportedly permits higher hydraulic loading rates during biological carbonaceous BOD removal. (Lisk-FIRL)
W78-11766

SYSTEM CURBS NITROGEN IN PLANT-EFFLUENT STREAMS,
Cooperative Farm Chemicals Association, Lawrence, KS.
A. D. Holiday.
Chemical Engineering, Vol 85, No 18, p 93-95, August, 1978. 2 fig, 1 tab.

Descriptors: *Chemical wastes, *Fertilizers, *Condensers, *Evaporators, *Nitrogen, Water reuse, Nitrates, Ammonia, Ureas, Steam, Boilers, Agricultural chemicals, Waste water treatment, Industrial wastes.

The Cooperative Farm Chemicals Association's nitrogen fertilizer plant in Lawrence, Kansas, utilizes waste heat to evaporate and concentrate effluent streams for ammonium nitrate and water recovery for reuse in process operations. The industrial complex contains an ammonia plant, two urea plants, six nitric acid plants, and two ammonium nitrate plants; two concentrator and condenser units have been installed for process stream treatment. Supplied with stream from the nitrate plant's atmospheric pressure neutralizer, the first concentrator produces a condensate with 0.5-1.0 weight percent ammonium nitrate, a level suitable for make-up absorber feed water. The concentrator operates at an efficiency of 90.7%. The second concentrator treats the stripper overhead from the carbon dioxide-removal system; the condensate is returned to the boiler system as feed water. The first concentrator evaporates water at a rate of 78 gal/min; the second unit has an evaporation capacity of 232 gal/min. Since the system was installed, the heat load on the cooling towers has been reduced by 12%. The ion-exchange load for demineralizing water was lowered from 200 to 120 gal/min, and the hot-lime treater load decreased to 50% of its capacity. Steam requirements were reduced by 29,000 lbs/yr; treatment chemical needs were decreased by 135 tons/yr. The system cost about $4,000-5,000/million Btu/hr of heat rejection capacity. (Lisk-FIRL)
W78-11767

CONTINUOUS FLOW DOSAGE OF FLUORINE: COMPARISON OF COLORIMETRIC AND POTENTIOMETRIC METHODS (DOSAGE EN 'FLOW CONTINU' DU FLUOR: COMPARISON DE METHODES COLORIMETRIQUE ET POTENTIOMETRIQUE),
Institut d'Hygiene, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.
W78-11768

INDUSTRIAL ENVIRONMENTAL CONTROL: LEGISLATIVE, INDUSTRIAL AND SOCIAL ASPECTS,
Imperial Chemical Industries Ltd., Billingham (England). Agricultural Div.
R. Pocock, and A. Docherty.
Chemistry and Industry, No 14, p 512-516, July, 1978. 5 fig.

Descriptors: *Chemical wastes, *Fertilizers, *Air pollution, *Sulfur compounds, *Ammonium salts, Nitrogen compounds, Nitrates, Nitrites, Mercury, Proteins, Nutrients, Toxins, Filters, Water pollution sources, Waste water treatment, Industrial wastes.

Water and air pollution abatement practices at the ICI fertilizer plant in Billingham, England, are described. Atmospheric sulfur dioxide emissions have been reduced by conversion from coal to natural gas in the boiler plant. The use of liquid sulfur for the production of sulfuric acid, the replacement of ammonium sulfate with ammonium nitrate for fertilizers, and the construction of new ammonia plants have also brought about reductions. Emissions of nitrogen oxides from nitric acid plants have been decreased from 4,000 ppm in the oldest plant to less than 360 ppm in the newest plant by a more efficient absorption system. The increased recovery of nitric acid, sodium nitrite, and sodium nitrate with this system has provided additional revenue for pollution control. Fumes generated by the prilling tower production of ammonium nitrate will be controlled by irrigated filters. In exchange for the installation of trunk sewers by the local sewage authority, the industrial plant reduced its pollutant load by 50%; to comply with further agreements with the Northumbrian Water Authority, the plant will reduce its pollutant load by an additional 50%. Other discharge controls will be required when England's Control of Pollution Act becomes effective. Mercury is removed from the chlor-alkali cell effluent and cyanide ions are rendered non-toxic with sodium hypochlorite. The protein plants use ICI deep shaft effluent treatment systems to remove aerobic organisms; nutrient-rich effluent and phosphoric acid have replaced river water in some of the air scrubbing systems and have reduced the discharge of the effluent to the river. (Lisk-FIRL)
W78-11769

CHARACTERIZATION, TREATMENT, AND DISPOSAL OF WASTEWATER FROM MARYLAND SEAFOOD PLANTS,
Maryland Univ., College Park. Center for Environmental and Estuarine Studies.
R. B. Brinsfield, P. N. Winn, and D. G. Phillips.
Journal Water Pollution Control Federation, Vol 50, No 8, p 1943-1952, August, 1978. 4 tab, 14 ref.

Descriptors: *Food processing industry, *Clams, *Oysters, *Crabs, *Fish, E coli, Biochemical oxygen demand, Suspended solids, Oily water, Aerated lagoons, Sumps, Chlorination, Disinfection, Ultraviolet radiation, Ozone, Screens, Shellfish, Waste water treatment, Industrial wastes.

Samples of waste water from Maryland blue crab, fish, Atlantic oyster, and soft shell clam processing plants were evaluated for water quality standards established by federal guidelines mandating the best practical control technology currently available by 1977, and the 'best available control technology economically available' by 1983. Static screening of waste water from the hand shucking of oysters and clams produces an effluent which meets the total suspended solids, BOD, oil and grease, and pH standards established by both guidelines. While the fish processing plants in the survey met pH and oil and grease allowances, BOD and total suspended solids concentrations were higher than permitted; however, all plants are located near planned municipal treatment plants to which the effluent will ultimately be discharged. The blue crab processing effluent complied with the pH and oil and grease levels but exceeded the BOD and solids limitations. Effluent from all seafood processing plants must be disinfected before discharge and contain no more than 70 coliforms/100 ml and 0.5 mg/liter residual chlorine. Most plants exceeded both of the latter standards; E. coli populations were unusually high. Alternative treatment processes applicable to the blue crab effluent included: aerated lagoons; screening, polishing, aeration, and settling; batch biological treatment; and 20-mesh screening followed by sump tank collection and chlorination. Disinfection techniques considered for all plant effluents incorporated improved chlorination practices, ultraviolet irradiation, and ozonation. (Lisk-FIRL)
W78-11770

FRUCTOSE PLANT EXPANSION AIDED BY NEW WASTEWATER TREATMENT FACILITY.
Industrial Wastes, Vol 24, No 4, p 24-25, July-August, 1978.

Descriptors: *Food processing industry, *Treatment facilities, *Sweet corn, *Biological treatment, *Activated sludge, Aeration, Settling basins, Centrifugation, Separation techniques, Cooling towers, Sludge treatment, Dewatering, Rotors, Equipment, Nutrients, Waste water treatment, Industrial wastes.

Effluent from fructose production at the Corn Sweeteners plant in Cedar Rapids, Iowa, is treated on-site by a 3-mgd treatment plant which provides biological degradation, aeration, clarification, cyclone degritting, rotary straining, and centrifugation. Waste water from corn wet milling is cooled in a 30-ft tower and biologically treated in two aeration basins, each with a 5.2 million gal capacity. Caustic additions are used to control pH; phosphate is added if there is a nutrient deficiency. After 5-6 days of biological treatment, the effluent passes by gravity through 30-inch pipe to two 465,000 gal capacity clarifiers for 30 min of settling. Scum is skimmed from the top; clarified effluent is discharged; and activated sludge is removed for further treatment or returned to the aeration tanks. The activated sludge is distributed to one of seven degritting centrifuge units, followed by rotary strainers to remove remaining tramp and large materials. The sludge, containing 0.50-0.75% solids, is then introduced into a high-speed, disc-nozzle centrifugal thickener equipped with a rotor, impeller, and internal recycle underflow system. Effluent rises up through a disc stack and out through the rotor to an overflow tank for reuse in plant operations. Sludge is further dewatered to 6% solids and dried for other uses. The treatment system has a waste removal efficiency of about 90%. (Lisk-FIRL)
W78-11771

KINETIC MODEL FOR FLOCCULATION WITH POLYMERS,
IEC International Environmental Consultants Ltd., London (Ontario).
P. M. Huck, and K. L. Murphy.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE4, p 767-784, August, 1978. 3 fig, 6 tab, 15 ref.

Descriptors: *Flocculation, *Kinetics, *Mathematical models, *Metals, *Alkalis(Bases, Polymers, Anions, Chemical precipitation, Zinc, Copper, Iron, Model studies, Design criteria, Mixing, Velocity, Waste water treatment, Mine water, Industrial wastes.

A semi-empirical model was derived to represent the kinetics of flocculation of metal hydroxides by an anionic polymer. The model expressed the supernatant particulate metal concentration subsequent to flocculation and settling as a function of the initial metal hydroxide concentration, root-mean-square velocity gradient, and time. The flocculation rate of metal precipitates followed a

cond order function, dependent upon metal concntration and decreasing with time. Substantial oc breakup occurred with increased mixing time; e critical mixing level, the product of the mixing ne and velocity gradient, was approximately ,000. The model was applied to simulated and tural mine waters containing iron, zinc, or pper. The particle aggregation rate was higher r zinc than it was for iron or copper; aggregation tes higher initial metal concentrations were ineased by the increased surface coverage of the olymer. The model results indicated that a short ixing and flocculation time and a high velocity adient should be maintained during clarification. isk-FIRL)
78-11772

REATMENT OF PLATING EFFLUENT BY ULFIDE PROCESS,
ermutit Co., Inc., Paramus, NJ.
. C. Scott.
roducts Finishing, Vol 42, No 11, p 64-70, Aust, 1978. 4 fig, 2 tab.

escriptors: *Chemical precipitation, *Heavy etals, *Iron compounds, *Lime, Alkalis(Bases), Chromium, Nickel, Copper, eutralization, Chelation, Flocculation, Settling asins, Separation techniques, Filtration, Deatering, Sands, Coals, Polymers, Waste water eatment, Industrial wastes.

he Phillips Plating Co. in Phillips, Wisconsin, eveloped the Sulfex process which utilizes iron lfide to precipitate heavy metals from electross nickel plating effluents. The effluents contain pper, nickel, trivalent and hexavalent chromim, and chelating agents at a pH of 0.8-2.4. The aste water is initially neutralized with lime to pH 0-8.0 and introduced into the precipitator where H is maintained at 8.0-9.5. Larger than ichiometric amounts of the slightly soluble iron lfide and a polymer are added at the inlet of the recipitator, reducing metal hydroxides to less oluble metal sulfides and hexavalent chromium to ivalent chromium for precipitation as chromium ydroxide. Waste water in the mixing zone flows rough a curtain baffle into a settling zone where dense sludge blanket bearing excess iron sulfide rms; effluent passing through this blanket is subcted to further flocculation. The supernatant ontains 0.01 mg/liter copper, 0.05 mg/liter nickel, .71 mg/liter trivalent chromium, and 0.05 mg/liter on. The sludge, containing 1.5-2.0% solids, is lown into a collection sump from which it passes a recessed plate filter press for dewatering to 0% solids. Supernatant is filtered through an nthracite-sand pressure filter. (Lisk-FIRL)
V78-11773

HE INFLUENCE OF ULTRASOUND ON THE HICKENING OF THE SLUDGE FROM SOME UNICIPAL AND INDUSTRIAL WASTES,
olitechnika Slaska, Gliwice (Poland).
. Kowalska, J. Bien, and E. Zielewicz.
custica, Vol 40, No 2, p 99-103, June, 1978. 2 fig, ref.

escriptors: *Ultrasonics, *Polyelectrolytes, Metals, *Sludge treatment, *Consolidation, ound waves, Sewage sludge, Flocculation, oagulation, Anions, Sedimentation, Waste water eatment, Industrial wastes.

ltrasound and polyelectrolytes reduced the olume of concentrated sludge during the thickenng of metal processing effluents and digested ewage sludge. The metal sludge, bearing a solids ontent of 30.3 g/cu decimeter, was treated at a osage of 5 mg/g dry mass with anion-active floculants (Magnafloc LT-24 or LT-25) and exposed o a sound frequency of vibration of 20 kilohertz or 2 min. Digested sewage sludge with a solids ontent of 17.8 g/cu decimeter was treated with 2 ng/g dry mass of Zetag 92 ot 10 mg/g dry mass of Zetag 63 and sonicated using the same frequency at 18C. Untreated inorganic sludge settled more rapidly than the untreated organic sludge. Ultrasound enhanced flocculant activity by partially emulsifying the insoluble polyelectrolyte for more uniform distribution over the solid particles. The ultrasonic waves disrupted the stability of the hydration layer, permitting replacement of the layer by polyelectrolyte macroparticles; the sonic waves also disrupted the association of water by destroying the weak dipole-dipole interaction. The metal sludge system usually reached equilibrium within 60 min of sonic treatment and generally within the first 5-8 min. The organic sludge was more amenable to flocculation with Zetag 92; the system had not reached equilibrium after 60 min but consolidation processes continued. (Lisk-FIRL)
W78-11774

CUPRIC-ION MONITOR USING ION-SELECTIVE ELECTRODE FOR INDUSTRIAL EFFLUENT, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Engineering.
For primary bibliographic entry see Field 5A.
W78-11775

99 PCT RECOVERY, EFFLUENT BELOW ONE PPM.
Products Finishing, Vol 42, No 11, p 42-46, August, 1978. 1 fig.

Descriptors: *Metals, *Chromium, *Nickel, *Evaporators, *Condensers, *Steam, Boiling, Heat exchangers, Separation techniques, Foaming, Equipment, Waste water treatment, Industrial wastes.

Two closed-loop, Corning evaporative-recovery units, installed at the Hon Industries' chromium-nickel plating plant in Muscatine, Iowa, reclaim more than 99% of the plating solutions, producing an effluent containing less than 1 ppm heavy metal. The two units, one for nickel and one for chromium, operate at capacities up to 50 gal/hr. The rinse from the plating tank, containing the highest concentration of metal from drag-out, overflows to a holding tank and is pumped to the evaporator. The rinse water initially enters a vertical, tubular, climbing-film evaporator which receives steam injections of 5-10 lbs/sq in; the effluent, containing anti-foaming additives, is allowed to boil. Foaming is suppressed in the separator by an impingement dome, a downward vapor entry, and a de-mister pad. When the proper chromium concentration is reached, the solution is fed back to the plating tank. Water vapor from the separator is channelled to a shell-and-tube condenser supplied with cooling water from plating operations. A vacuum pump lowers the pressure to 0.5 atm and forces condenser water back to the electroplating tanks. The recovery units can provide automatic control and shut-down in the event of malfunction. Trivalent chromium and heavy metals are removed on a cation exchange column incorporated into the chromium recovery loop. The cost of treatment chemicals that would be required to remove chrome is estimated at $12,000. (Lisk-FIRL)
W78-11776

OIL REFINERY SLUDGE - AN INDUSTRY LOOKS TO LAND CULTIVATION,
A. Frank.
Sludge Magazine, Vol 1, No 3, p 26-31, May-June, 1978. 1 tab.

Descriptors: *Oil wastes, *Application methods, *Farms, *Land use, *Land management, Agricultural engineering, Sludge, Oil industry, Heavy metals, Ultimate disposal, Waste storage, Ponds, Waste water treatment, Sludge treatment, Soil amendments, Industrial wastes.

On-site land farming of oil refinery sludges is being conducted by Exxon's Bayway Refinery and Chemical Plant in Linden, New Jersey, and by Rollins Environmental Services in Baton Rouge, Louisiana. Residues from crude, slop emulsion, distillate and additive tanks, separator bottoms, and other processes are applied at a rate of about 100-133 tons/acre/yr to an eight-acre farm plot which has a two-ft layer of impermeable clay below saline groundwater. The wastes, containing 20-25% oil, are applied weekly to a depth of 3.5 inches and disk-harrowed to a depth of 6-8 inches. The soil is monitored every two months for: temperature, which increases by 10-15F after sludge application; pH; nutrients; phosphates; oil; grease; and heavy metals. Earthen dikes at the ends of the site retain pond water and control runoff. Costs for land application average $3/ton, increasing to $8/ton when seasonal storage of the sludges is required. The 55-acre Rollins site receives 20-25 lbs/sq ft of sludge bearing 2.6% oil in the form of parafinic, naphthenic, and aromatic compounds. The sludge is disk-harrowed to a depth of 6 inches, and the plot is cultivated every 2-3 wks. The site contains a dense clay subsurface stratum at more than 50 ft and a stable water level at 60 ft. Rollins, a waste management contractor, land-applies sludges with metal concentrations of 10-100 ppm and consistencies ranging from fairly liquid to stiff. (Lisk-FIRL)
W78-11777

HIGH RATE FILTRATION OF REFINERY OILY WASTEWATER EMULSIONS,
Texas Univ. at Austin. Dept. of Civil Engineering.
M. J. Humenick, and B. J. Davis.
Journal Water Pollution Control Federation, Vol 50, No 8, p 1953-1964, August, 1978. 7 fig, 8 tab, 12 ref.

Descriptors: *Oily water, *Emulsions, *Oil industry, *Filtration, *Polyelectrolytes, Cations, Anions, Coagulation, Chemical precipitation, Separation techniques, Suspended solids, Head loss, Hydraulic design, Coals, Sands, Filters, Interfaces, Waste water treatment, Industrial wastes.

High-rate or pressure filtration of oil-in-water emulsions through a sand and anthracite filter was assessed according to the oil and suspended solids content of the filtrate and the head loss under various conditions. Alum and cationic, anionic, and nonionic polyelectrolytes were evaluated as filtration or coagulation aids. Flow rates were varied over 4.3-10.2 liters/sq m/sec; influent oil and suspended solids concentrations encompassed 100, 300, or 500 mg/liter. Cationic polyelectrolytes were more effective filter aids than the other agents tested; with a cationic polyelectrolyte, the high-rate filter could accomodate effluent volumes up to 98 cu m/sq m of filter area. Higher volumes of treated effluent were achieved at the lowest filtration rate. Effluent suspended solids concentrations were found to be inversely proportional to the emulsion volume filtered; a five-fold increase in suspended solids reduced the filtered volume to 20-25%. Filter performance was not significantly affected by the influent oil concentration or the type of oil in the emulsion. Headloss occurred primarily at the top of the filter and at the sand and anthracite interface; air scour was required to backwash the filter. The lowest oil effluent concentrations obtained by this filtration process were in the range of 6-9 mg/liter. (Lisk-FIRL)
W78-11778

HYDROCARBON EMISSIONS FROM REFINERY WASTEWATER AERATION,
C. P. Richardson, and J. O. Ledbetter.
Industrial Wastes, Vol 24, No 4, p 26-28, July-August, 1978. 3 tab, 17 ref.

Descriptors: *Organic compounds, *Oil wastes, *Air pollution, *Activated sludge, *Aeration, Mathematical models, Chemical oxygen demand, Carbon, Oily water, Volatility, Waste water treatment, Industrial wastes.

An estimation methodology was developed for measuring hydrocarbon emissions by air stripping during aeration of oil refinery waste water. A mathematical model for air stripping considered the rate of change in effluent concentration as proportional to the quantity of removable volatiles present at any time and the interfacial available for transfer. Air stripping constants at aeration rates of 1, 3, and 5.3 liters/min/liter waste were calculated from the rate of total organic carbon removal during the aeration of a combined industrial effluent. The stripping rate constants from the remaining total organic carbon were expressed as a function of the maximum fraction of strippable material, the fraction of refractory material, the aeration time, and the stripping rate constant. Hydrocarbon emissions from a waste water treatment plant's six-bay aeration basin amounted to 17.2 ppm as methane at the entrance to the basin, 8.9 ppm at one-third the distance, 3.4 ppm at two-thirds of the distance along the basin, and 2.8 ppm at the end of the basin. An exponential decrease in hydrocarbon concentration was observed as the distance along the aeration basin increased; the representative hydrocarbon concentration was estimated at 7.3 mg/liter. Calculations of emissions by a hypothetical refinery producing 50 gal effluent/barrel of oil containing a COD concentration of 600 mg/liter demonstrated that 1.5% of the total hydrocarbon concentration was emitted by activated sludge treatment of the wastes. (Lisk-FIRL)
W78-11779

TMP EFFLUENTS: A REVIEW,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
For primary bibliographic entry see Field 5A.
W78-11780

CONVERSION OF SULFITE PULPING WASTE TO AN AGRICULTURAL PRODUCT,
Charmin Paper Products Co., Mehoopany PA.
W. A. Eberhardt, J. L. Lewis, J. L. Scharp, and C. A. Barton.
Journal Water Pollution Control Federation, Vol. 50, No. 8, p 1893-1904, August 1978. 8 fig, 11 tab, 12 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Activated sludge, *Drying, *Dewatering, Sulfite liquors, Fertilizer, Feeds, Fish diets, Turf grasses, Heat treatment, Waste water treatment, Sludge treatment, Industrial wastes.

An activated sludge flash dryer operating at the Mehoopany, Pennsylvania, plant of Procter and Gamble Paper Products Co. reduces the moisture content of sulfite pulping wastes to about 7.17%. Pulping waste water is introduced into an equalization basin followed by phosphoric acid and lime additions. The effluent is treated in two basins equipped with aerators providing a total of 600hp. Following clarification, the waste activated sludge is concentrated to 5-6% solids by a disc centrifuge and further dewatered to 13-18% solids in a solid-bowl centrifuge. The sludge is introduced into a chest for metered feed to a mixer where it is combined with a dry fertilizer feed. The temperature of 316-649C. The sludge and hot gas are pneumatically conveyed up through an air lift dryer duct and into a cyclone for gas-solids separaton. Particulate emissions from the cyclone have been reduced to within standards by modifying the dryer air heater and installing a gravity separator and an impingement scrubber. The dried product contains an average of 1.75% phospeoric acid and low heavy meta concentrations. The material, which is subsequently sold as a turf grass fertilizer, has also been found as effective fish food supplement. The net cost of the drying process, after the product is sold for fertilizer, is about $42/metric ton. (Lisk-FIRL)
W78-11781

ASSESSMENT OF MODELS FOR STORM AND COMBINED SEWER MANAGEMENT.
Y. Wada.
Technology Reports of the Kansai University, No. 19, p 109-114, March, 1978. 2 fig, 3 tab, 6 ref.

Descriptors: *Storm drains, *Combined sewers, *Surface runoff, *Mathematical models, *Simulation analysis, Analytical techniques, Deposition(Sediment), Sewerage, Urban runoff, Model studies, Waste water disposal, Hydraulic engineering, Municipal wastes.

Five mathematical models were evaluated for accuracy in predicting storm and combined sewer runoff and pollutant deposition in storm and combined sewer systems. The Complete Mixing model and the Inaba model offered combined calculations of surface and pipe-deposit runoff. The Energy Operation model was a runoff model for pipe deposited systems. Combined runoff models incorporating the conservative momentum equation for pipe deposited systems. Combined runoff models incorporating the conservative momentum equation for water quality and quanity included the Deposited Pollution Load Model and the Scored Pollution Load model. While all the models were considered easy to use, the Energy Equation model and the Deposited Polltuion Load model were found to be more accurate in simulating runoff pollutant load on application to the Osaka, Japan, drainage system. The Energy Equation model calculated the runoff pollutant load as a function of critical scored flow, runoff rate, and residual load. A high degree of correlation was apparent between the observed and simulated BOD, ammonia-nitrogen, and phosphate loads in the runoff. The Deposited Pollution Load model calculated the surface runoff pollutant load, the flow rate, and the quantity of deposited pollutants as functions of water depth, rainfall intensity, catchment area, residual load, and travel time. (Lisk-FIRL)
W78-11783

WATER POLLUTION CONTROL WITH INTERCEPTORS,
L. Blenderman.
Domestic Engineering, Vol. 232, No. 1, p 38-40, 80, July, 1978. 6 fig, 1 tab.

Descriptors: *Interceptor sewers,*Oil wastes, *Maintenance, *Regulation, *Building codes, Inspection, Separation techniques, Sanitary engineering, Sewerage, Waste water treatment, Municipal wastes.

The country of Monroe, New York, adopted a sewage use law to control the size, installation, and servicing of grease, oil, and solids, interceptor sewers. Faulure to empty sewers or improper cleaming practices by interceptor sewer owners, such as restaurants, gas stations, and food processing plants, led to the adoption of inspection and fining regulatons. The county inspects the number of hook-ups, the flow volume, and the type and size of the interceptor to be installed before a building permit is issued. The contractor or plumber must comply with regulations for flow restriction units and baffles and interceptor iocation; he must also instruct the owner in the use and mainteance of the interceptor. When an interceptor becomes plugged due to an owner's failure to empty it, the county cleans the sewer and a violation citation is issued. the occurrence of a second plugging subjects the owner to a waring, followed by a fine and a cleaning charge for the third plugging incident. Cleveland, Ohio, has simular sewage use laws. (Lisk-FIRL)
W78-11784

THE EFFECT OF WASTE WATER REUSE IN COLD REGIONS ON LAND TREATMENT SYSTEMS,
Army Terrestrial Sciences Center, Hanover, NH.
I. K. Iskandar.
Journal of Environmental Quality, Vol. 7, No. 3, 361-368, July-September, 1978. 5 fig, 5 tab, 26 ref.

Descriptors: *Application method, *Soil tests, *Soil amendments, *Nutrient removal, *Leaching, Return flow, Nitrates, Ammonia, Grasses, Loam, Silts, Biochemical oxygen demand, Phosphorus, Nitrogen, Cold region, Waste water treatment, Waste water disposal, Municipal wastes.

The impact of land applicaton fo primary and secondary effleunt on ground-water quality, solids, and vegetation in cold climates was investigated over a 2-yr period at the Arm's Cold Reguons Laboratory in Hanover, New Hampshire. Three cells containing Windsor sandy loam and three contangin Charlton silt loam with depths of 150 cm were established; for a 1-yr period, two sandy laom cells received 5 and 15 cm/wk secondary effluent and one silt loam cell received 5 cm/wk. The other test cells received 7.5 cm/wk primary effluent. Vegetation, primarily quackgress, was harvested six times over the two-year period. Test cell leachate for the 1-yr period contained 8.1-16.3 mg/liter total nitrogen, is less then 0.5 mg/liter total phosphorus, 8.5-10.3 mg/litter organic carbon, 0.6-2.1 mg/litter BOD, and 21.9-28.0 mg/litter chloride. High nitrate concentrations in the leachate during early summer were attributed to oxidation of ammonia stored in the soils during winter months; the ammonia was oxidized to nitrate within the top 45 cm of the soil. Nitrogen removal was primarilty by plant growth and percolation. Effluent applicaton at a rate of 15 cm/wk to one test cell consistently produced a leachate containing an excess of nitrate-Nitrogen for 9 mos of the year. Heavy metals were confined primarily to the top 15 cm of soil; leaching below this level was attributed to a decrease in soil pH. (Lisk-FIRL)
W78-11787

POLIOVIRUS REMOVAL FROM PRIMARY AND SECONDARY SEWAGE EFFLUENT BY SOIL FILTRATION,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
C. P. Gerba, and J. C. Lance.
Applied and Environmental Microbiology, Vol. 36, No. 2, p 247-251, August, 1978. 2 fig, 3 tab, 22 ref.

Descriptors: *Viruses, *Adsorption, *Soil filters, *Sewage effluents, *Application methods, Analytical techniques, Hydrologic aspects, Sands, Loam, Columns, Separation techniques, Return flow, Activated sludge, Sampling, Waste water treatment, Municipal wastes.

The adsorption of poliovirus from primary and secondary effluents was examined using packed soil columns 250 cm in length and batch tests with loamy sand. Virus-seeded primary and secondary effluents were applied for nine consecutive days to soil columns; fluid samples were collected at various depths along the columns. Batch tests were conducted in a centrifuge with varying soil concentrations and constant virus concentrations. Poliovirus adsorption on the soil columns was similar for both primary and secondary effluent. In 1-ml samples, viruses were not detectable below 40 cm in primary or secondary effluent flooded columns; in one case, viruses reached a depth of 80 cm in secondary effluent tests. Passage of the effluents through the top 5 cm of the columns removed about 1 log of virus, but the removal of another log of virus required passage through an additional 35 cm of soil. The viable virus concentration after one day of storage decreased by about 50% in primary effluent and by 57% in secondary wastes. About 5 plaque-forming units/ml were desorbed from the soil column to a depth of 80 cm by flooding with deionized water immediately after primary effluent application. The adsorption of poliovirus was not influenced by the organic concentration at the various depths but was directly dependent upon the soil type; low adsorp-

on occurred with unconsolidated silty sand and ravel. (LisksFIRL)
W78-11789

LUDGE GAS AN ENERGY SOURCE IN EWAGE WORKS,
I. Bicknell.
Civil Engineering, p 61, 63, 65, May, 1978. 9 ref, 2 ppend.

Descriptors: *Sludge digestion, Methane, Anaerobic digestion, *Fuels, *Reclamation, Carbon dioxide, Nitrogen, Heat treatment, Gases, Incineration, Boilers, Heat balance, Waste water treatment, Sludge treatment, Municipal wastes.

The use of methane gas from sludge digestion is discussed as a fuel source for sewage treatment plant operations. A plant serving 1,000 people, utilizing sludge digestion tanks with a 30 day capacity of 82.5 cu m, can supply 30 cu m/day of digestion gas. The gas contains methane, carbon dioxide, and nitrogen, with a caloric value of 24.5 megajoules/cu m. While small plants may not economically utilize the surplus digestion gas produced, power costs to heat boiler water, which raises the sludge digestion temperature to 35C, could be offset if the boiler system were expanded to also provide heating of offices and laboratories in small treatment plants. In large plants serving a population of 100,000 people, digestion gas ca be generated at a rate of 3,000 cu m/day at an available energy supply of 73,500 megajoules/day. Sludge digestion also has the advantage of easier sludge handling and may provide fuel for sludge incinerators. (Lisk-FIRL)
W78-11790

SEWERAGE STUDY HITS SOUTH TAHOE AWT COSTS.
Engineering News-Record, Vol. 201, No. 4, p 11, July 1978.

Descriptors: *Tertiary treatment, *Application methods, *Irrigation systems, *Ultimate disposal, *Cost comparisons, Nitrification, Nutrient removal, Reverse osmosis, Water reuse, Treatment facilities, Capital costs, Operation and maintenance, Waste water treatment, Municipal wastes.

South Lake Tahoe, Nevada, has been advised by the engineering firm of Culp, Wesner, Culp, of El Dorado, California, to convert from advanced waste water treatment to secondary tratment with irrigation disposal. Designs for expanding the 7.5 mgd tertiary treatment plant to 10 mgd demonstrated that secondary treatment with land application would require $20 million in capital expenditures and $1.4 million annually for operation and maintenance. This expense represents an annual savings of 27% plus an additional 50% energy consumption reduction. Nitrogen removal sould require $32 million in capital expenditures and $2.7 million for maintenance; expansion to nitrification would require capital expenditure of $25 million with annual maintenance costs of $2.5 million. A 1 mgd reverse osmosis water reclamation demonstration plant in addition to secondary treatment and land application was also considered; capital and operating costs were estimated at $2.5 million, respectively. (Lisk-FIRL)
W78-11791

MUNICIPAL SEWAGE SYSTEM SPRINGS 20-25 MILLION GALLON PROBLEM,
B. B. Mackay, Jr.
Solid Wastes Management, Vol. 21, No. 7, p 56, 58, July, 1978.

Descriptors: *Oxidation lagoons, *Reservoir leakage, *Human diseases, *Sewage, *Groundwater, Potable water, Water supply, Water pollution source, Waste water treatment, Municipal wastes.

The leakage of raw seage and sludge from oxidation lagoons into groundwater caused the illness of 700 residents in the area of West Plains, Missouri, in June 1978. The oxidation lagoons, constructed in caverned and fissued limestone, developed holes soon after completion in 1964. The first hole, which developed in the lagoon before it was completely operational, was 17 ft in diameter and between 10-20 ft deep. A second hole, which was 34 ft wide and 10-20 ft deep, developed in 1966 and released about 40 million gal of sewage into the ground water. Local authorities reportedly did not notify state agencies or the public of the leaks. The third leak occurred in May 1978 in the 37-acre lagoon; the local health department and the public were reportedly not informed of the new break in the lagoon until five days after it occurred. Residents in the town and surrounding area developed symptoms similar to dysentery and influenza. Water supplies had to be imported to the area by the National Guard. The lagoon was repaired before a geologic report was completed; a new treatment facility is planned for construction on the same site as the lagoons. (Lisk-FIRL)
W78-11794

THE WRC-WHERE THEY KNOW A BIT ABOUT WATER AND ARE LEARNING ALL THE TIME.
For primary bibliographic entry see Field 5G.
W78-11795

DEVELOPING NATIONS FACE PROBLEMS IN WATER AND WASTEWATER MANAGEMENT,
C. L. Larrick, and L. W. Adams.
Water and Sewage Works, Vol. 125, No. 6, p 62-63, June, 1978.

Descriptors: *Sewage, *Water supply development, *Sewerage, *Social aspects, *Governments, Social values, Financing, Priorities, Industrial wastes, Project feasibility, Future planning(Projected), Waste water treatment, Municipal wastes.

The past, present, and future status of water treatment and sewerage in developing countries is reviewed. Many developing nations are still serviced by pre-World War II water and waste water systems that are now inadequate for the population. The World Health Organization has financed feasibility studies for water and waste water management surveys in developing countries through the World Bank. Marginal progress has been achieved in urban centers within the past 10-15 yrs; sewerage systems are not often considered as important as a water supply system. Industrial development in emerging countries often occurs at the expense of sewerage systems and the environment; the governments and populations of developing countries should be made aware of the environmental impact of unrestricted industrial expansion. Water and waste water management and development are often not priorities in these countries. This has resulted in a large number of foreign-born engineers and scientists, trained in the United States and elswhere, who do not have positions to return to in their own countries. There is also a lack of trained management, administrative, and operations and maintenance personnel for water quality management projects in these countries, (Lisk-FIRL)
W78-11796

HEALTH EFFECTS OF LAND APPLICATION OF WASTEWATER AND SLUDGE: WHAT ARE THE RISKS,
Texas Univ. at San Antonio. Center for Applied Research and Technology.
C. A. Sorber, and B. P. Sagik.
Water and Sewage Works, Vol. 125, No. 7, p 82-84, July, 1978. 3 tab, 5 ref.

Descriptors: *Application method, *Sewage sludge, *Sludge disposal, *Waste water disposal, *Pathogens, Toxins, Metals, Salmonella, Protozoa, Viruses, E. coli, Seepage, Pathogenic bacteria, Diseases, Human diseases, Environmental effects, Waste water treatment, Municipal wastes.

The potential impact on public health of toxic materials and pathogenic organisms contained in waste water and sewage sludge applied to land was discussed at the 1977 Conference on Risk Assessment and Health Effects of Land Application of Municipal Wastewater and Sludge. Studies have concluded that pathogens can survive sewage treatment; pathogens isolated from sewage include salmonellae, shigellae, E. coli, enteric viruses, several species of protozoa, and a number of helminths. Transmission of disease from these pathogens by sewage applications to land, however, was considered unproven. Organic chemicals and metals present in primary sewage effluent were considered potential sources of groundwater contamination through toxin migration or seepage from land application sites. More research into the impact of these toxins on public health and their fate after land application of sewage was recommended. Another consideration in evaluating land application of wastes was the accuracy of epidemiological techniques to identify and quantify pathogens in waste water. Because of the nature of viral infection transmission, the source of a disease can be difficult to trace. The total removal of viruses from wastes was recommended before land application. (Lisk-FIRL)
W78-11797

ANSWERING MECCA'S SEWERAGE PRAYERS.
World Water, Vol. 1, No. 1, p 42-43, 45, May, 1978.

Descriptors: *Sewerage, *Treatment facilities, *Storm runoff, *Diversion structures, *Asbestos cement, Concrete pipes, Clay pipes, Epoxy resins, Humus, Filters, Sludge digestion, Dewatering, Sewage treatment, Construction materials, Equipment, Aqueducts, Potable water, Irrigation, Waste water treatment, Municipal wastes.

Sewage treatment facilities and sewer systems in Mecca, Saudi Arabia, must accommodate flows during pilgrimate periods that are double the normal flows. The English engineering consulting firm of J. D. and D. M. Watson has designed and supervised the construction of 65 km of trunk sewers, up to 1.02m in diameter, and 200 km of smaller sewers. To prevent corrosion of sewer pipes by thiobacillus concretivorus, the sewers have been installed with adequate gradients to prevent siltation and septicity; the trunk pipes are constructed of clayware and the minor sewers are asbestos cement lined with epoxy to resist sulfide corrosion. Periodic floods are controlled by a network of trapezoidal concrete-lined and channels surrounding the city to divert surface runoff from flowing into the dry river beds that comprise the city's main streets. One network of channels is 2 m deep, 2 m wide at the base, and 10 m wide at the top; the other network has channels with depths of 2.5 m and a bottom-to-top width range of 1.5-6.5 m. The only operational sewage treatment plant employs primary treatment, filter beds, humus tanks, primary digestion tanks, and sludge drying beds. Treated effluent may eventually irrigated green belts around the city; effluent is currently discharged into the dry river beds. The Watson engineering firm also supplied the designs for upgrading Mecca's 9th century vintage aqueduct water supply system. (Lisk-FIRL)
W78-11798

SOME THOUGHTS ON PIPELINES PAST, PRESENT AND FUTURE,
For primary bibliographic entry see Field 8G.
W78-11799

THE LAYING OF UNDERWATER POLYETHYLENE PIPELINES USING THE ATMOSPHERIC COUNTERPRESSURE METHOD (DAS VERLEGEN VON SEELEITUNGEN AUS POLYATHYLENROHREN IM LUFTGEGENDRUCKVERFAHREN),
For primary bibliographic entry see Field 8G.
W78-11800

DISPATCHER SIGNALIZATION OF OPERATIONAL DISTURBANCES IN SEWER SYSTEM PUMP STATIONS (AID FOR DESIGNERS) (DISPETCHERSKAYA SIGNALIEATSIYA O NARU SHENII NORMAL'NOGO REZHIMA RABOTY KANALIZATSIONNYKH NASOSNYKH STANTSII) (V POMOSHCH' PROEKTIROVSHCHIKU),
For primary bibliographic entry see Field 8G.
W78-11801

FEASIBILITY OF THE USE OF HYDROGEN PEROXIDE IN OVERLOADED WASTE-WATER PURIFYING PLANTS (MOZNOSTI VYUZITI PEROXIDU VODIKU V PRETIZENYCH CISTIRNACH ODPADNICH VOD),
Krajska Hygienicka Stanice Prague (Czechoslovakia).
J. K. Cerny.
Ceskoslovenska Hygiena, Vol. 22, No. 10, p 474-480, 1977. 4 tab, 4 ref.

Descriptors: *Aeration, *Oxygenation, *Hospitals, *Aerated lagoons, *Aqueous solutions, Oxygen, Activated sludge, Biological treatment, Alkalis(Bases), Waste water treatment, Laboratory tests.

Hydrogen perioxide was tested as an additional source of oxygen in waste water aeration treatment tanks during laboratory tests and in an overloaded plant treating waste water from a medical facility for tuberculosis and respiratory diseases. The results indicated that 1 kg oxygen could be added to the waste water for each 7.5 liter addition of a 40% hydrogen peroxide solution. The addition of hydrogen peroxide enhanced the activity and composition of the activated sludge organisms. Metered additions of hydrogen peroxide were consiered economically feasible in the event of treatment plant overloading or aeration equipment failure. There were problems associated with the handling of the caustic hydrogen peroxide. (Lisk-FIRL)
W78-11802

SMART SHOPPERS CUT COST OF TREATMENT PLANT.
Engineering News-Record, Vol. 201, No. 4, p 24, 28-29, July, 1978.

Descriptors: *Treatment facilities, *Activated sludge, *Oxygen, *Contracts, *Bids, Computers, Construction, Concrete piles, Piles(Foundations), Timber piles, Outfall sewers, Construction materials, Waste water treatment, Municipal wastes.

The division of a $364 million waste water treatment plant construction project into 18 separate contracts has saved an estimated $50 million. Construction of the Passaic Valley, New Jersey, plant is under the supervision of Charles A. Manganaro consulting engineers of New York City who staggered the bid dates of 11 of the contracts over an 11-mo period to take advantage of market fluctuations. The first phase of the project, a 300 mgd computerized pure oxygen-activated sludge system, is being constructed on timber piles and 60 tons concrete shell piles, driven 30-60 ft into a swampy site 10 ft above sea level. Oxygen injections of 600 tons/day will treat mixed municipal and industrial effluent with BOD and suspended solids loads of 400 ppm. A five mile 12-ft diameter outfall discharging waste water into New York Harbor will be converted from a gravity flow line to a pumped system. The second state of the project, still under design will include upgrading and some new construction for primary treatment system. (Lisk-FIRL)
W78-11803

THE FILTER BELT PRESS-APPLICATION AND DESIGN,
Simon-Hartley Ltd., Stoke-on-Trent (England).
E. P. Austin.
Filtration and Separation, Vol. 15, No. 4, p 320, 324, 326, 329-330, July/August, 1978. 4 fig, 1 tab.

Descriptors: *Sludge treatment, *Dewatering, *Filtration, *Polyelectrolytes, *Activated sludge, Gravity, Flocculation, Chemical precipitation, Equipment, Filters, Construction materials, Municipal wastes.

The design and application of filter belt presses are described for sludge dewatering. Free water within organic sludge is removed by gravity dewatering to produce a sludge containing 10% solids; intercellular water, chemically bonded around the sludge particles, is removed by chemicaly conditioning with a polyelectrolyte. Intracellular water within the biomass cells is expensive to remove and contributes to a higher BOD load. Compaction dewatering is usually accomplished on monoflament polyester filter belts, with small length-to-width ratios. The selection of filter belts, with tensile warp strengths ranging 140-280 kg/cm, depends upon the mechanical strength of the filter press machinery, the sludge characteristics, and the desired degree of dewatering. Municipal sludges can be dewatered to 20-45% solids; dewatering is enhanced by the ash content of the sludge. The range of polyelectrolyte dosages is larger for sludges with lower feed solids concentrations, such as oxidation ditch and activated sludges; stable digested sludges accommodate a much narrower range of optimum polyelectrolyte dosages. (Lisk-FIRL)
W78-11804

INFILTRATION THROUGH SOIL AS A TERTIARY TREATMENT OF SEWAGE EFFLUENT,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
C. W. Childs, P. L. Searle, and N. Wells.
New Zealand Journal of Science, Vol. 20, No. 4, p 433-437, December, 1977. 1 fig, 5 tab, 4 ref.

Descriptors: Infiltration, *Soils, Sewage disposal, *Tertiary treatment, *Nutrient removal, Sands, Clays, Loam, Silts, Phosphorus, Nitrogen, Coliforms, Flooding, Irrigation practices, Waste water treatment, Municipal wastes.

Infiltration of secondary effluent through ten 50-cm core soil samples from North Island, New Zealand, was used to investigate the effectiveness of the soils in tertiary treatment of municipal sewage. The soils included three silt loams, a stony loam, clay, two sandy loams, sand, sandy silt, and peat. The soil columns, with vegetation intact, were irrigated for 10 mos with tap water or seconary effluent at a rate of 55 mm/week during the warmer months and 27.5 mm/wk during winter months; the soils were also flooded weekly for 24 hrs during a 5-mo test priod. Leachates were analyzed for Na, K, Mg, Ca, Mn, Al, Fe, ammonium-N, nitrate-N, kjeldahl-N, total-P, F, and coliforms. The Otorohanga silt loam and the Taupo sandy silt produced leachates with 2.0 mg/liter or less total-N and 0.07 mg/liter or lss total-P under systematic irrigation and flooding conditions. These soils also consistently achieved the lowest coliform counts. The dry weight of the pasture vegetation on all columns treated with effluent was narly double the weight of plants watered with tap water. (Lisk-FIRL)
W78-11805

EDINBURGH SINKS (POUNDS STERLING) 35M IN UNDER CITY AND SEA SEWERAGE,
T. Paynting.
Surveyor, Vol 4481, No 151, p 17-18, April, 1978.

Descriptors: *Treatment facilities, *Interceptor sewers, *Sewerage, *Outfall sewers, *Construction costs, Settling basins, Screens, Separation techniques, Storm drains, Waste water disposal, Tunnels, Waste water treatment, Municipal wastes.

Edinburgh, Scotland's, 35 million pounds sterling sewage treatment project included the construction of a 55 mgd primary treatment plant, 8.4 km of interceptor lines, and a 2.8 km long outfall sewer. The treatment facility, with an ultimate design capacity of 74 mgd, was constructed on a stone graded foundation enclosed by a sheet-piled cofferdam. The plant has triple feed channels, bar screens, a feed conveyor belt to the screenings press, detritor tanks, and four 55 m-diameter sedimentation tanks. Interceptor sewers with diameters of 3,124 mm and 2,290 mm connect to the older sewers and have provisions for automatic storm overflow control. The outfall sewer was constructed in an undersea tunnel with a treatment plant access point located 52 m below the surface. The tunnel diminishes in diameter from 3.6 m to 0.9 m; it is equipped with 20 diffuser pipes located along the outer 760 m. Sewage sludge is discharged 16 km offshore by a specially designed vessel with a sludge capacity of 2,500 tons. (Lisk-FIRL)
W78-11806

NINE PUMP INSTALLATION FOR WESSEX WATER AUTHORITY.
For primary bibliographic entry see Field 8C.
W78-11807

PLANT TO DISINFECT WASTEWATER WITH OZONE,
R. K. Allen, and V. C. Oblas.
Water and Sewage Works, Vol 125, No 7, p 48-53, July, 1978. 4 fig, 2 tab.

Descriptors: *Ozone, *Activated sludge, *Disinfection, *Design criteria, *Treatment facilities, Specifications, Bids, Cost analysis, Oxygenation, Project planning, Municipal wastes, Sewage treatment, Aeration, Equipment, Waste water treatment.

A $38 million region project in western Washington include separation of storm and sanitary sewers and construction of the 13.9 mgd LOTT seconary treatment plant. The plant will utilize an equalization basin, a high-purity oxygen activated sludge system, and an ozone disinfection system to accommodate a BOD loading of 13,744 kg/day, an equalized flow of 35 mgd, and a maximum fow for partial treatment of 137 mgd. Space limitations at the existing site and the need to improve the quality of receiving waters provided additional impetus for selecting the ozone/oxygen process. Prior to design finalization, three modes of ozone-oxygen treatment were tested: air-fed, oxygen-fed once-through, and oxygen-fed recycle. Comparisons of the oxygen-fed systems according to process performance, control complexity, power requirements, track record, and current technology led to the selection of the once-through mode of operation for LOTT. Ozone generation will be controlled by the waste water flow and the oxygenation basin line pressure. Design specifications for LOTT's ozonation basin include: two contact chambers; an ozone dosage of 10 mg/liter; a detention time of 16 min; a 5.8 m-deep vertical baffled tank; tubular fine bubble diffusion equipment, submerged to 4.88 m; and a diffuser pore size of 60 microns. Bid specifications for the ozone generation equipment are designed to give consideration to capital cost, power efficiency, and heat recovery capability. (Schulz-FIRL)
W78-11808

FLUID TREATMENT WITH PLASTICS PASTA.
Consulting Engineer, Vol 42, No 7, p 40-41, July, 1978.

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Descriptors: *Trickling filters, *Percolation, *Packed beds, *Filtration, *Plastics, Biological treatment, Construction materials, Strength, Distribution, Organic loading, Filters, Waste water treatment, Municipal wastes.

Acalor International Ltd. has designed Biofil, an injection molded filter medium for percolating or trickling filters, absorption towers, and gas scrubbing systems. The spherical Biofil medium has triangular faces, a configuration that contributes to the strength of the material. The triangular faces are outlined by two serrated-edges interlock, providing greater stability to the packed bed, and allow for random packing of the media. Biofil promotes even contact time and uniform distribution of the waste water through a seris of planes. The use of Biofil media can reduce filter construction costs and size. (Lisk-FIRL)
W78-11809

ELECTROLYTIC DISINFECTION.
Consulting Engineer, Vol 42, No 7, p 41, 43, July, 1978.

Descriptors: *Electrolysis, *Disinfection, *Chlorination, *Cathodes, *Anodes, Platinum, Titanium, Hydrogen sulfide, Iron oxides, Saline water systems, Cesspools, Coliforms, Screens, Waste water treatment, Municipal wastes, Outfall sewers.

An electrolytically-produced hypochlorite solution, derived from sea water, is used to disinfect sewage from the English Channel island of Guernsey. The hypochlorite solution is obtained by passing sea water through a 3 mm gap between a platinized titanium anode and a mild steel cathode contained in two pairs of enclosed glass fiber electrolytic cells. Waste water from cesspools is treated at the rate of 7,000 gal/hr by treatment with ferric oxide for hydrogen sulfide removal, followed by metered treatment with the hypochlorite solution. The hypochlorite reduces bacillus coli in the sewage by 99.9%; the waste water is then screened, pumped to two 5,000 gal reactor tanks, agitated, and discharged to the oufal sewer. Power costs for pumping equipment and electrolysis were about 245 pounds sterling for one month; a similar treatment plant has been constructed at the island's Bellegreve outfall at Saint Peter Port. The treatment system replaced direct discharge of sewage through an outfall sewer to the sea. (Lisk-FIRL)
W78-11810

PREFAB PUMPING STATIONS.
For primary bibliographic entry see Field 8C.
W78-11811

LAND TREATMENT OF WASTEWATER AS AN INNOVATIVE OR ALTERNATIVE TECHNOLOGY,
S. J. Hadeed.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1709-1712, July, 1978. 1 fig.

Descriptors: *Application methods, *Legislation, *Spray irrigation, *Overland flow, *Infiltration, Return flow, Percolation, Cost analysis, Grants, Treatment facilities, Water conservation, Waste water treatment, Municipal wastes, Waste water disposal.

The 1977 Clean Water Act gives consideration to innovative and alternative waste water treatment processes. The act considers unconventional projects with total costs 15% more than the most cost-effective conventional projects as competitive; thus, grant eligibility would be extended to innovative projects with higher costs. These novel systems are defined as resource recovery processes, such as land application, water reuse, and energy recovery. Other criteria require: that the energy costs were 20% less than those required for the most cost-effective conventional system; that the process be relatively safe from upset and operational malfunctions; that toxins management be improved; that the project conserve water, land, and resources; and that methods incorporate treatment of both municipal and industrial wastes. Land application alternatives include overland flow, infiltration-percolation, and spray irrigation. The 28 mgd Muskegon, Michigan, biological treatment facility applies secondary effluent to corn crops by spray irrigation. While the facility has realized a 60% operating cost reduction from corn crop revenues, criticism has been directed at the site location, the potential groundwater contamination, the design of the storage lagoons, and the results of pilot plant tests. The act also requires that construction materials and treatment equipment be manufactured in the United States. (Lisk-FIRL)
W78-11813

REGIONAL WASTEWATER TREATMENT SYSTEMS IN JAPAN,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
E. D. Brill, Jr., and M. Nakamura.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1715-1726, July, 1978. 4 fig, 5 tab, 29 ref.

Descriptors: *Regional development, *Treatment facilities, *Interceptor sewers, *Sewerage, *Project planning, Land use, Drainage, Urban runoff, Urbanization, History, Economies of scale, Cultures, Waste water treatment, Municipal wastes.

Planning and implementation of regional waste water treatment facilities were surveyed in Japan. Japan's urban area has more than doubled since 1963 and the population served by drainage has increased from 7.4 to 22.6%; between 1976-1980 Japan is expected to spend $25 billion for sewerage. Prefectural governments in Japan are currently conducting a comprehensive regional planning program to design and implement waste water treatment facilities and sewerage projects. Waste water treatment planning in Japan encompasses a study of historical and cultural frameworks, short-run economies of scale, short-run effectiveness, and long and short-run flexibility. Other factors considered in comprehensive regional planning include drainage, water supply, and land use; the prefectural governments are responsible for planning projects, with the cooperation of the community; they also own and operate central facilities and interceptors. Although local communities do not directly participate in the regional planning projects, a program for the dissemination of public information provides public hearings, meetings, and tours of completed facilities. (Lisk-FIRL)
W78-11814

TURNING SLUDGE INTO SOIL CONDITIONER SOLVED A CITY'S DISPOSAL PROBLEM,
Water Pollution Control Div., Philadelphia, PA.
For primary bibliographic entry see Field 5E.
W78-11815

EFFECTIVENESS OF BACKWASHING FOR WASTEWATER FILTERS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
J. L. Cleasby, and J. C. Lorence.
Journal of the Environmental Engineering Division-ASCE, Vol 104, No EE4, p 749-765, August, 1978. 3 fig, 6 tab, 6 ref.

Descriptors: *Trickling filters, *Cleaning, Materials, *Fluid friction, *Scour, Air circulation, Pilot plants, Sands, Coals, Filtration, Granules, Treatment facilities, Depth, Waste water treatment, Municipal wastes.

A four-year study of backwashing practices suitable for municipal trickling filters has concluded that single media filters are most effectively washed by simultaneous air scour and subfluidization backwash. Water fluidization, air scour prior to water fluidization, and surface wash and subsurface wash before and during fluidization backwash were tested on three pilot-scale trickling filters packed with single, dual, or mixed media to treat secondary effluent. Single medium filters containing coarse sand had bed depths of 24-60 inches; the total depth of the dual coal and sand filter was 24 inches; the tri-media coal, sand, and garnet filter was 27 inches deep. Air scour or surface wash was considered essential for proper performance of filter beds within these depth ranges; these practices, in conjunction with water fluidization backwashing, were considered feasible but not optimum for all filter types tested. Separate backwashing of three coarse sand filters with different depths demonstrated that the initial 8 gal/min/sq ft backwash flow rate utilized during simultaneous air-water wash and water wash alone was insufficient; increasing the water flow rate to 15 gal/min/sq ft at an air flow rate of 8 cu ft/min/sq ft immediately improved media condition. A 12-15 inch bottom layer of media remained dirty; provisions were recommended for preventing the loss of filter media during backwashing. (Lisk-FIRL)
W78-11816

TREATMENT OF PRIMARY SEWAGE SLUDGE WITH ENZYMES,
University Coll. of Swansea (Wales). Dept. of Chemical Engineering.
J. S. Knapp, and J. A. Howell.
Biotechnology and Bioengineering, Vol. 20, No. 8, p 1221-1234, 1978. 7 fig, 19 ref.

Descriptors: *Cellulose, *Hydrolysis, *Settling velocity, *Filtration, *Physical properties, Sewage sludge, *Enzymes, Proteins, Yeasts, Fermentation, Resistance, Shear, Waste water treatment, Municipal wastes.

Cellulolysis of primary sewage sludge with an enzyme isolated from Trichoderma viride did not improve the filterability of sludge but did improve the settling characteristics of very dilute sludges. The cellulase preparation was obtained by removing the mycelium from a submerged culture of T. viride. One ml of the enzyme preparation was mixed with 39 ml of primary sewage sludge in all but one experiment where larger volumes were used. The specific resistance to filtration (SRTF) of the cellulase-treated sludges increased sharply within the initial 4-6 hrs of treatment. In some cases, the SRTF gradually returned to that of untreated sludge, while other sludge samples did not regain their original filtration properties even after 24 hrs of treatment. A 30-fold increase occurred in the settling rate of cellulase-treated dilute sludge containing 6 g/liter suspended solids. Settling doubled in treated sludge containing 20-25 g/liter solids. Cellulolysis tripled the settling rate at 50 g/liter solids but only increased the solids concentration by 30%. The protein concentration of the filtrate from the treated sludge increased 5-10 fold, up to 2.4 g/liter protein, and the BOD increased up to 13,000 mg/liter; the filtrate was capable of supporting the growth of yeasts, such as Candida utilis, for the production of single cell protein. The productivity, however, was low and the process was not considered economically feasible at this time. (Lisk-FIRL)
W78-11817

PURE OXYGEN FIXED FILM REACTOR,
Reid, Quebe, Allison, Wilcox and Associates, Inc. Indianapolis, IN.
S-J. Yeh, and C. R. Jenkins.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE4, p 611-623, August, 1978. 6 fig, 4 tab, 20 ref.

Descriptors: *Trickling filters, *Oxygen, *Activated sludge, *Organic loading, *Capillary action, Carbon, Biochemical oxygen demand, Nitrification, Ammonia, Denitrification, Aerobic treatment, Construction materials, Waste water treatment, Municipal wastes.

Laboratory tests were performed on a continuous-flow aerobic media trickling filter which supplies pure oxygen to the biomass through pressurized, thin capillary walls of Teflon. The studies concluded that the process was capable of accomodating higher organic loads than conventional trickling filters or activated sludge processes. The bench-scale reactor consisted of a 51-mm internal diameter, 1.7-m long Plexiglass pipe containing etched Teflon tubes with wall thicknesses of 0.33-mm, 0.79 mm, and 0.23 mm; upstream tube ends were attached to an oxygen inlet manifold, while the downstream ends were sealed. A synthetic waste water feed, with a BOD concentration of about 200 mg/liter and a pH of 6.15-7.00, was varied according to total organic carbon content over 55, 110, and 165 mg/liter; detention time in the reactor was maintained at 0.5, 1.0, 2.0, and 3.0 hrs for each organic loading. The organic removal efficiency in the reactor increased with detention time, reaching a plateau after about 1 hr at the lowest organic loading; for the other organic carbon concentrations, 2 hrs was considered the optimum detention time for 90% removal. Yield coefficients, dependent upon detention time in the aerobic media filter, were not as high as those conventional or oxygen activated sludge processes, but were comparable to those in high rate trickling filters. Although nitrification occurred along the length of the reactor, the rate decreased as the reactor length increased because of localized denitrification, inhibitory conditions, washout of nitrifying populations, and low ammonia concentrations. The oxygen demand for the filter system ranged over 1.4-2.27 lbs 02/lb BOD removed, to the demand of an oxygen activated sludge system. (Lisk-FIRL)
W78-11818

CITY OF HAMILTON WATER POLLUTION CONTROL PLANT,
Steven and Fitzmaurice, Christchurch (New Zealand).
D. L. Steven.
New Zealand Engineering, Vol. 33, No. 6, p 122-126, June, 1978. 2 fig, 2 ref.

Descriptors: *Treatment facilities, *Screens, *Settling basins, *Aeration, *Aerated lagoons, *Electrolysis, Chlorination, Outfall sewers, Project planning, Reinforced concrete, Construction materials, Equipment, Waste water treatment, Municipal wastes.

The first stage in a three-stage project to develop a municipal waste water treatment plant in Hamilton, New Zealand, involved the construction of primary treatment and chlorination facilities to accommodate an average dry weather flow of 45,500 cu m and installation of a 2,400 mm subfluvial outfall into the Waikato River. The second and third stage plans include the construction of secondary treatment facilities to increase the treatment capacity to 57,000 cu m and doubling the size of both primary and secondary facilities. Sewage flows by gravity through a 1,650 mm reinforced-concrete pipeline to the plant where it is passed through three bar screens each 1,800 mm wide. Screened sewage passes through a standing wave hydraulic control flume and aerated concrete conduits to the grit removal and aeration tanks where it is subjected to about 30 min of aeration at a rate of 0.4 cu m/min/meter tank length. Grit and settled particles are transferred from the tank bottom to hoppers for subsequent cyclone dewatering. Following preaeration, the waste water receives primary settling for about 2.2 hrs in three reinforced-concrete tanks equipped with sludge removal pumps and air jets for removal of surface grease, fat, and scum. Sodium hypochlorite is produced on-site by electrolysis of a brine solution; the waste water is chlorinated in the subfluvial outfall which also acts as a contact basin. The facility also contains two reinforced-concrete sludge digesters and a foul air reclamation system. (Lisk-FIRL)
W78-11819

TERTIARY TREATMENT OF EFFLUENTS BY FILTRATION,
Schumachersche Fabrik, Bietigheim (West Germany).
H. J. Schmidt-Holthausen.
Filtration and Separation, Vol. 15, No. 4, p 350, 352, 367, July-August, 1978. 1 fig, 1 tab.

Descriptors: *Tertiary treatment, *Filtration, *Porous media, *Coatings, *Impervious membranes, Sands, Coals, Diatomaceous earth, Perlite, Waste water treatment, Municipal wastes.

Separating layer filtration, sand filtration, and multi-layer filtration are evaluated and tertiary treatment methods for municipal waste water. Separating layer filtration, utilizing porous media, requires precoating of the filter layer with diatomite or perlite to prevent waste accumulation and filter clogging. Precoating of the filter medium can increase the surface filtration area within a small space, reduce backwash water and compressed air requirements for filter cleaning becuase of a fairly dry slid residue, and provide a chemical reagent for aditional treatment of resistant materials. Incorporating waterproof membranes between the filter layers enhances solis removal. During tertiary treatment, sand fltration requires two or more layers for adequate sludge retention. Tests have indicated that high performance with low resistance and maximum solids deposition can be achieved with a filter containing equal volumes of 1.5-2.5 mm hydro-anthracite and 0.7-1.2 mm quartz sand. A new highly porous media, Hydro-Multifilt, can be arranged in 400-600 mm layer thicknesses without upper layer stratification of fine particles. The round granules have a bulk density of about 640 kg/cu m and an apparent density of approximately 1.03 g/ml. Upflow rather than downflow filtration through a multi-layer filter is not considered as efficient because of the reduced filtration speed and potential breakthrough. (Lisk-FIRL)
W78-11820

AERATED-PILE COMPOSTING: A PROMISING NEW ALTERNATIVE FOR DISPOSING OF SEWAGE SLUDGE,
G. Dallaire.
Civil Engineering-ASCE, Vol. 48, No. 9, p110-117, September, 1978. 3 fig, 3 tab, 10 ref.

Descriptors: *Sludge digestion, *Sludge treatment, *Biodegradation, *Heat treatment, *Aeration, Wood waste, Pipes, Fertilizers, Microbial degradation, Soil amendments, Capital costs, Moisture content, Sludge disposal, Waste water treatment, Municipal wastes.

The United States Department of Agriculture's research center in Beltsville, Maryland, has developed an aerated-pile composting technique for digesting raw sewage sludge. The raw sludge is initially dewatered to about 22% solids content with a centrifuge, belt filter press, or vacuum filter; the solids content is further increased by mixing the sludge with woodchips. The mixture is then applied to a bed of woodchips which cover a suction aeration system. The compost pile is covered with a 1-ft insulating blanket of woodchips of compost. The aeration system draws air, heat, and moisture down through the compost pile to the suction pipe system. Within the first 3-5 days of composting, internal temperatures reach 80C, sufficient for destroying most pathogens. After 21 days of composting, the material is spread in thin layers or in windows for drying. The compost may also be piled, unaerated, for 30 days of curing if inclement weather conditions exist. If the compost is dried, the material is then screened to remove the woodchips and cured for 30 days; if the compost is initially cured, the material is then dried and screened. The use of aerated extended piles, in which piles are placed adjacent to one another and covered with a continuous layer of insulation, can reduce expenditures for land and woodchips. High heavy metal concentrations, especially cadmium, in the compost may render the material unsuitable for agricultural fertilizer. A composting system treating 10 dry tons sludge/day has an estimated capital cost of $376,200 and an annual operating cost of about $185,800. (Lisk-FIRL)
W78-11821

AIR-POLLUTING EFFECT OF ACTIVATED-SLUDGE WASTEWATER TREATMENT PLANTS (ELEVENISZAPOS SZENNYVIZTISZTITOK LEVEGOSZENNYEZO HATASA),
For primary bibliographic entry see Field 5A.
W78-11822

THE USE OF COAGULANTS IN PRIMARY SEDIMENTATION OF SEWAGE,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Civil Engineering and Building Technology.
F. H. Al-Momen, and H. Willis.
Public Health Engineer, Vol. 6, No. 3, p 179-181, 1978. 3 fig, 1 tab, 10 ref.

Descriptors: *Coagulation, *Chemical precipitation, *Domestic wastes, *Iron compounds, *Suspended solids, Biochemical oxygen demand, Filtration, Sludge treatment, Dewatering, Capillary action, Chlorides, Sulfates, Settling basins, Separation techniques, Waste water treatment, Municipal wastes.

Coagulation of primary domestic sewage with ferric chloride, aluminum sulfate, and aluminum chloride was evaluated in jar and laboratory settling column tests with respect to effluent suspended solids, BOD, and sludge filterability. Coagulant doses of 50, 100., 150, and 200 mg/liter were applied to effluent samples containing mean suspended solis concentrations of 165, 215, 256, and 362 mg/liter. An effective dose of 100-150 mg/liter ferric chloride reduced suspended solids by 80-90% and BOD by an average of 80%; this dosage also increased the capillary suction time of the sludge by a factor of 5.22 and produced a sludge with a moisture content of 99.34%. Aluminum sulfate, in an optimum dose range of 200-250 mg/liter, reduced suspended solids by 60 80% and BOD by 75%; it also increased sludge capillary suction time by a factor of 3.85, and produced a sludge with 99.25% moisture content. An effective dose of 100-150 mg/liter aluminum chloride resulted in an 85-90% decrease in suspended solids and an 80% decrease in BOD; it also increased capillary suction time by a factor of 4.19 and produced sludge with a moisture content of 99.30%. Sludge volumes more than doubled with all coagulants tested; effluent pH averaged between 7.20 and 7.50. Ferric chloride was considered the most effective coagulant of those evaluated. (Lisk-FIRL)
W78-11823

GRANULAR MEDIA FILTRATION OF SECONDARY EFFLUENT,
Central Weber Sewer Improvement District, Ogden, UT.
M. M. Dawda, M. L. Davidson, and E. J. Middlebrooks.
Journal Water Pollution Control Federation, Vol. 50, No. 9, p 2143-2156, September, 1978. 7 fig, 10 tab, 10 ref.

Descriptors: *Filtration, *Tertiary treatment, *Sands, *Coals, *Pilot plants, Treatment(Facilities), Chlorination, Hydraulic design, Biochemical oxygen demand, Suspended solids,

Nutrients, Design criteria, Filters, Waste water treatment, Municipal wastes.

A dual-media tertiary filter was tested in pilot studies at the Central Weber waste water treatment plant near Ogden, Utah, as a method of polishing secondary effluent to within BOD and suspended solids standards. The SVG filter, supplied by Envirotech Corp., consisted of a 4-ft diameter tank containing a filter compartment with one ft of anthracite coal at an effective size of 1.00-1.10 mm, overlying a one ft layer of sand with a 0.45 mm effective size; the coal and sand had an uniformity coefficient of 1.7. Hydraulic loadings of 3, 4, 5, and 6 gal/min/sq ft with automatic filter backwashing were employed. One filter cycle, 16-, 18-, 20-, and 24-hr composite samples were analyzed for BOD, suspended solids, nitrates, nitrites, ammonia, and total and orthophosphates. During summer months, chlorine had to be added to the influent to maintain a chlorine residual adequate for inhibiting the growth of Sphaerotilus which clogged the filter media. At a hydraulic loading of 3 gal/min/sq ft, filtered effluent containing less than 10 mg/liter BOD and suspended solids was produced; although this loading was considered optimum for effluent quality, a loading of 5 gal/min/sq ft was considered more economical. Smaller, more uniform media enhanced effluent quality and influenced the filter cycle duration. Chemical filtration aids, such as aluminum sulfate and cationic polymers with alum, significantly reduced the filter cycles; jar tests of coagulation aids were recommended before implementation. (Lisk-FIRL)
W78-11824

ULTRAFILTRATION MEETS DISCHARGE REGULATIONS AND REDUCES WASTE PUMP-OUT,
David W. Taylor Naval Ship Research and Development Center, Annapolis, MD.
L. R. Harris, P. Schatzberg, D. Bhattacharyya, and D. F. Jackson.
Water and Sewage Works, Vol. 125, No. 8, p66-71, August, 1978. 6 fig, 7 tab, 7 ref.

Descriptors: *Membrane processes, *Filtration, *Domestic wastes, *Semipermeable membranes, *Coliforms, Suspended solids, chemical oxygen demand, Tubes, Filters, Pressure, Waste water treatment, Ships.

Ultrafiltration membrane treatment of domestic sewage from marine vessels was evaluated as a method for treatment to within the stricter discharge standards of 150 mg/liter suspended solids and 200 coliforms/100 ml. An ultrafiltration module containing seven 1-inch diamter noncellulosic tubular membranes arranged in parallel, was used to treat several combinations of wastes including raw sewage and wastes from the galley, laundry, and shower areas. The module was operated in a semi-continuous mode at a pressure of 40 lb/sq inch and a circulation rate of 30 gal/min; a batch concentration pump-down mode was also tested with six modules in series, operated at the same circulation rates and pressure. At a food temperature of 80 F, raw sewage exhibited the lowest flux decline slope while galley wastes displayed the highest; higher initial fluxes resulted in high final fluxes after processing mixed wastes. The pump-down phase utilizing new membranes recovered 90% of the water after 15 hrs of processing, achieving a membrane flux of 60 gal/sq ft/day. When the feed temperature was increased to 130 F, the average flux increased, decreasing the flux decline slope: an average flux of 58 gal/sq ft/day was obtained at a feed temperature of 100 F. Membrane performance for the various waste parameters encompassed 61.5-91.0% removal of COD, 89.5-99.3% rejection of suspended solids, and more than 99% reduction of fecal coliforms. The use of a 200 mg/liter hypochlorite solutin to wash the membrane restored flux reasonably well and was considered more convenient than an enzyme-detergent wash. Total operating costs for a prototype ultrafiltration system were calculated at $2.99/1000 gal. (Lisk-FIRL)
W78-11825

RAW SEWAGE TREATMENT AT DEER CREEK PARK,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Angronomy.
S. S. Brar, and R. H. Miller.
Ohio Report, Vol, 63, No. 4, p57-59, July-August, 1978. 2 fig, 3 tab.

Descriptors: *Oxidation lagoons, *Application methods, *Chlorination, *Return flow, *Spray irrigation, Sewage lagoons, Soybeans, Alfalfa, Grasses, Storage tanks, Camp sites, Parks, Waste water treatment, Domestic wastes.

An oxidation lagoon-land application pilot plant was constructed at the Deer Creek State Park in Pickaway County, Ohio, to treat raw sewage from 232 campsites. Sewage was pumped to the stabilization pond for treatment, followed by chlorination in a storage tank, and spray irrigation onto 3-acre plots of reed canarygrass, soybeans, alfalfa, and tree seedlings. Samples were collected from the raw sewage, stabilization pond effluent, storage tank waste water, surface runoff, drainage water, and test wells in and near the land application sites. The stabilization pond reduced BOD by 85% and fecal coliforms by 99.9%; carbonate formation and increased pH, resulting from carbon dioxide uptake by blue-green algae in the pond, caused the precipitation of calcium and magnesium and decreased water hardness. Total phosphorus was reduced to 0.4 mg/liter and total nitrogen to 4.6 mg/liter in stabilization and pond effluent; further decreases in nutrient levels were observed in holding tank effluent and drainage water samples. Although effective treatment was obtained with the pilot system, it was noted that low usage of the camp sites during the study period resulted in atypical raw sewage characteristics. (Lisk-FIRL)
W78-11826

OZONATION IN A WASTEWATER REUSE SYSTEM: EXAMINATION OF PRODUCTS FORMED,
Cincinnati Univ., OH. Environmental Health Engineering.
V. J. Elia, C. S. Clark, K. T. McGinnis, T. E. Cody, and R. N. Kinman.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1727-1732, July, 1978. 5 fig, 1 tab, 17 ref.

Descriptors: *Ozonation, *Water reuse, *Tertiary treatment, *Ozone, *Reverse osmosis, *Pollutant identification, Gas chromatography, Organic compounds, Oxidation, Chemical reactions, Chemical oxygen demand, Water analysis, Hospitals, Toxicity, Bioassay, Analytical techniques, Disinfection, Waste water treatment.

The Kettering Laboratory of the University of Cincinnati in Ohio initiated experiments to examine the characteristics of water treated by a direct reuse system. The system was designed to treat raw wastes from five sources within a mobile surgical hospital, using ultrafiltration, reverse osmosis, and ozonation. A synthetic reverse osmosis permeate having a strength equivalent to 8 times that expected in a conventional hospital waste stream was contacted in a plexiglass chamber with 50 m/liter ozone; a gas flow rate of 6.2 liters/min, feedwater flow rates of 18.9-56.7 liters/hr, and ozonation times of 18-193 min were employed. After 193 min of ozonation, total organic carbon (TOC) and COD were reduced by 28 and 31%, respectively; ozonation produced acetone, acetaldehyde, and acetic acid. Concentrations of methanol, ethanol, and isopropanol were reduced by 70, 95, and 99%, respectively, during the first 60 min of ozonation. Additional studies examined the cytotoxicity of the ozonated samples using a mammalian cell culture bioassay system. Measured TOC values were significantly higher than calculated values, suggesting that all the oxidation products had not been identified. Further studies on the effects of oxidation products in a closed-cycle direct water reuse system were recommended. (Schulz-FIRL)
W78-11828

WIDER USE OF SEWAGE SLUDGE.
Effluent and Water Treatment Journal, Vol. 18, No. 7, p 311, 313, July, 1978.

Descriptors: *Sewage sludge, *Sludge disposal, *Dewatering, *Application methods, *Centrifugation, Sludge digestion, Model studies, Simulation analysis, Crop response, Transport, Ultimate disposal, Anaerobic digestion, Waste water treatment, Sludge treatment, Municipal wastes.

England's Water Research Center has developed a technique to evaluate the thickening properties of sewage sludges. A low speed centrifuge accelerates the sludge settling process and simulates the thickener's compressive force. Subjecting a sludge sample in a 10-cm tube to 20 min of gravitational acceleration is equivalent to 3.5 hrs of thickening in a 200-cm deep tank. The technique was developed during investigations into the agricultual applicaton of sewage sludge to plants. To reduce transport costs, it was necessary to increase sewage with 5% solids contents to 12% solids; the thickening analysis was also applied to laboratory studies on anaerobic digestion of sludges. The Center is evaluating the effects of applying three of undigested sludge and one lagooned sludge to agricultural crops for a 2-yr period. (Lisk-FIRL)
W78-11830

FLOW AND LOAD VARIATIONS IN TREATMENT PLANT DESIGN,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. C. Young, J. L. Cleasby, and E. R. Baumann.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE2, p289-303, April, 1978. 13 fig, 2 tab, 20 ref.

Descriptors: *Hydraulic design, *Design criteria, *Organic loading, *Treatment facilities, *Peak loads, Infiltration, Peaking capacity, Peak discharge, Biochemical oxygen demand, Ammonia, Waste water treatment, Municipal wastes.

Waste water flow and loading patterns at the Ames, Iowa, treatment plant were studied as a means of incorporating peak flow and load variations into the design of biological treatment plants. With an increase in population over the last 22 yrs, the organic loading on the plant has increased from an average 4,050 to 6,690 lbs/day BOD and from 3,655 to 7,396 lbs/day suspended solids. Flow rates to the plant peaked during spring months due to infiltration; the peak-month flow rate averaged 135% and the peak-day flow rate was about 191% of the annual flow rate. Peak 8-hr and 4-hr flow rates averaged 229% and 237%, respectively, of the annual average. From these parameters, it was estimated that biological treatment units should be designed to accommodate BOD loads of 1.3 times the average annual load and ammonia loads of 1.25 times the average annual load. Design oxygen supply rates were calculated as a function ofthe peak daily BOD and ammonia loads plus 50% of the peak 4-hr load rate. Design criteria was also developed for the final clarifiers, the surface setting rate, and the solids load. (Lisk-FIRL)
W78-11831

ACCUMULATION RATE AND CHARACTERISTICS OF SEPTIC TANK SLUDGE AND SURFACE,
Ontario Ministry of the Environment, Toronto.

M. Brandes.
Journal Water Pollution Control Federation, Vol. 50, No. 5, p 936-943, May, 1978. 7 tab, 11 ref.

Descriptors: *Septic tanks, *Sewage sludge, *Cleaning, *Domestic wastes, *Chemical analysis, Organic wastes, Degradation(Decomposition), Analytical techniques, Volumetric analysis, Waste water treatment, Sludge disposal, Municipal wastes.

The impact of septic tank capacity and waste water strength on the accumulation rate and the chemical and biological sludge characteristics was evaluated in three septic tanks with different capacities and influent volumes over a 2-yr period. The chemical and bacteriological properties of the sludge and septage were dependent upon the strength of the waste water and the detention time in the tank. The 3,410 liter tank, treating toilet wastes, had a detention time of 9.7 days; the 4,590 liter tank, treating additional bathroom and kitchen wastes, had a detention time of 24 days; and the 8,980 liter tank, treating bathroom, kitchen, and laundry wastes, maintained effluent for 1.9 days. Septage was found to accumulate in the tanks at a rate of 200 liters/capita/yr. Longer detention times enhanced decomposition of organic matter and solids removal. Permissible time intervals between cleanings were calculated as 8.08 yrs for the small tank, 2.89 yrs for the medium tank, and 1.44 yrs for the large tank; health regulations required that the small size tank be cleaned every 4.2 yrs. (Lisk-FIRL)
W78-11832

BIOCHEMICAL OXYGEN DEMAND PROGRESSION IN MIXED SUBSTRATES,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-11833

A NOMOGRAM FOR THE DETERMINATION OF AMMONIA IN WASTEWATER BY A KNOWN ADDITION TECHNIQUE,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Applied Chemistry Labs.
For primary bibliographic entry see Field 5A.
W78-11835

METHODS FOR CHECKING THE OPERATION OF ACTIVATED-SLUDGE WASTEWATER TREATMENT PLANTS AND FOR DETERMINING DESIGN CRITERIA FOR NEW TREATMENT FACILITIES (MODSZEREK ELEVENISZAPOS SZENNYVIZTISZTITO TELEPEK UZEMENEK ELLENORZESERE, UJ TELEPEK TERVEZESI ADATAINAK A MEGHATAROZASARA),
Fovarosi Csatornazasi Muvek, Budapest (Hungary).
W. Fleps, T. Pal, and M. Szilagyi.
Hidrologiai Kozlony, No. 4, p 166-173, 1978. 1 fig, 5 tab, 5 ref.

Descriptors: *Activated sludge, *Instrumentation, *Oxygen demand, *Respiration, *Suspended solids, Chemical oxygen demand, Optimization, Measurement, Pilot plants, Analytical techniques, Waste water treatment, Municipal wastes.

A flow-through respirometer measured the impact of increased aeration basin retention time, increased activated sludge concentration, and effluent suspended solids concentration on the COD removal efficiency of a Hungarian waste water treatment plant. The respirometer contained a flow-through reactor and settling tank, a gas scrubbing flask, an oxygen burette, feed valves, a graduated cylinder for collecting treated effluent, and a peristaltic pump for introducing raw sewage from the holding tank into the reactor. When the retention time in the aeration basin was increased from 2 to 4 hrs, COD removal only increased from 61.6 to 62.1%; COD removal decreased from 62.6 to 50.0% and unit oxygen demand increased from 58 to 70 mg/liter when the activated sludge concentration increased from 3.0 to 5.0 g/liter. Effluent suspended solids levels averaged 43 mg/liter over a 24 hr period; this high concentration, as well as high diurnal COD concentrations in industrial wastes discharged to the plant, were considered the causes of poor COD removal efficiency. Respirometer, pilot plant, and full-scale tests indicated that doubling the aeration basin retention time would reduce COD by 76-78% and suspended solids by 89-90%. (Lisk-FIRL)
W78-11837

THE OCCURRENCE OF AEROMONADS IN ACTIVATED SLUDGE: ISOLATION OF AEROMONAS SOBRIA AND ITS POSSIBLE CONFUSION WITH ESCHERICHIA COLI,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 5A.
W78-11838

DEVELOPMENT OF QUANTITATIVE METHODS FOR THE DETECTION OF ENTEROVIRUSES IN SEWAGE SLUDGES DURING ACTIVATION AND FOLLOWING LAND DISPOSAL,
Baylor Coll. of Medicine, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5A.
W78-11839

A MORE ECONOMICAL METHOD FOR THE DETERMINATION OF CHEMICAL OXYGEN DEMAND,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-11840

REGULAR TESTING CAN CONTROL HYDROGEN SULFIDE,
FMC Corp., San Jose, CA.
For primary bibliographic entry see Field 5A.
W78-11841

ANTIBIOTIC RESISTANCE PATTERN OF SALMONELLA WELTEVERDEN STRAINS ISOLATED FROM MAN, ANIMALS, SEWAGE AND WATER,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5A.
W78-11842

DETERMINATION OF ORGANOSILICONE IN SEWAGE SLUDGE BY ATOMIC ABSORPTION SPECTROMETRY, (IN JAPANESE).
Ajinomoto Co., Inc., Kanagawa (Japan). Central Research Labs.
For primary bibliographic entry see Field 5A.
W78-11844

TOXICITY-TEST ON FISH CARASSIUS AURATUS IN WATERS AND SEWAGES CONTAINING PHENOL, TREATED WITH NACLO OR WITH CLO2 (IL TEST DI ITTIOTOSSICITA' SU ACQUE E LIQUAMI DEPURATI CON IPOCLORITO E BIOSSIDO DI CLORO, IN PRESENZA DI FENOLO),
Naples Univ. (Italy). Dept. of Hygiene and Science.
For primary bibliographic entry see Field 5A.
W78-11845

SIGN-OF-CHARGE OF SPECIES OF CU, CD AND ZN EXTRACTED FROM SEWAGE SLUDGE, AND EFFECT OF PLANTS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5A.
W78-11846

H2-PRODUCING BACTERIA IN DIGESTING SEWAGE SLUDGE ISOLATED ON SIMPLE, DEFINED MEDIA,
North Dakota State Univ., Fargo. Dept. of Bacteriology.
For primary bibliographic entry see Field 5A.
W78-11847

DEEP SHAFT.
Consulting Engineer, Vol 42, No 7, p 43, July, 1978.

Descriptors: *Deep wells, *Biological treatment, *Hydraulic equipment, *Plastics, *Shafts(Excavations), Industrial wastes, Corrosion control, Equipment, Treatment facilities, Chlorides, Waste water treatment, Municipal wastes.

The deep shaft biological treatment system installed in England's Marsh Farms treatment plant treats both industrial and municipal wastes. The high chloride content of the waste water required that the 130 m deep shaft unit's downcomer be constructed of corrosion-resistant fiberglass-reinforced plastic. The deep shaft is 2 m in diameter, with a large bell-mouthed T-piece to distribute waste water to the downcomer. The downcomer hangs freely in the shaft and is constructed to withstand 30 yrs of services; the downcomer must have high mechanical strength and precision alignment in the shaft for efficient waste water treatment. (Lisk-FIRL)
W78-11848

MIXING FIXED-SPEED PUMPS TO VARIABLE FLOWS,
Dillon (M. M.) Ltd., London (Ontario).
For primary bibliographic entry see Field 8C.
W78-11849

SECONDARY CLARIFIER WITH A DIFFERENCE.
Consulting Engineer, Vol 42, No 7, p 41, July, 1978.

Descriptors: *Settling basins, *Hydraulic equipment, *Intakes, *Outlets, *Channels, Sludge disposal, Overflow, Skimming, Equipment, Hydraulic design, Waste water treatment, Municipal wastes.

The Rim Flo secondary clarifier is equipped with both feed and decanting channels at the periphery of the tank and a suction header sludge removal unit. The clarifier was designed by Envirex Inc. and is distributed in England by Paterson Candy International. The design of the clarifier reportedly permits greater waste water volumes, higher overflow rates, maximum hydraulic stability, full surface skimming, and lower construction costs than conventional clarifiers with central feed well units. Clarifiers that have been converted to the peripheral channel configuration have accommodated greater volumes without tank expansion. The Rim Flo is also equipped with a rotary suction tube containing specificaly sized and spaced outlets for a sludge removal. The central shaft of the rectangular, tapered suction tube runs parallel to the base of the clarifier and can remove low density sludges or provide rapid sludge removal. (Lisk-FIRL)
W78-11850

AUTOMATIC CONTROL OF THE ACTIVATED SLUDGE PROCESS-I. DEVELOPMENT OF A SIMPLIFIED DYNAMIC MODEL,
Exxon Co., Baytown, TX.
R. F. Lech, H. C. Lim, C. P. L. Grady, Jr., and L. B. Koppel.
Water Research, Vol 12, No 2, p 81-90, 1978. 7 fig, 3 tab, 21 ref.

Descriptors: *Activated sludge, *Mathematical models, *Model studies, *Dynamics, *Kinetics, Settling basins, Biological treatment, Growth rates, Organic load, Suspended solids, Waste water treatment, Municipal wastes.

Mathematical models were developed to describe the dynamic behavior of primary settlers, biological reactors, and final settlers in the activated sludge process. Steady state mass balances were calculated for flow rate, soluble organics concentration, and suspended solids concentration in the primary settler. The values were applied to a model depicting solids removal as a function of the underflow stream parametes or the overflow rate. Models were also developed for the degree of thickening in the settler, the effect of influent suspended solids concentration and influent flow rate, and the effluent soluble substrate concentration. In the biological reactor, the concentration of the influent substrate was the sum of the soluble and suspended substrate leaving the primary settler; the specific microbial growth rate was calculated as a function of the surrounding substrate using Monod's equation. Models also described the net rate of biomass production, the true growth yield, the material balances for live cells and substrate, the concentration of the mixed liquor suspended solids, and the recycled sludge concentration. Several models were evaluated for calculating the effluent suspended solids concentration in the final settler; transfer functions for the biological reactor incorporated dead time and steady-state gain parameters. (Lisk-FIRL)
W78-11851

AUTOTROPHIC DENITRIFICATION USING ELEMENTAL SULFUR,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
B. Batchelor, and A. W. Lawrence.
Journal Water Pollution Control Federation Vol 50, No 8, p 1986-2001, August, 1978. 9 fig, 8 tab, 24 ref, 1 append.

Descriptors: *Denitrification, *Nitrates, *Sulfur, *Bacteria, *Model studies, Kinetics, Mathematical models, Flocculation, Settling velocity, Cost analysis, Waste water treatment, Municipal wastes.

The kinetic, stoichiometric, and solids separation properties of an autotrophic denitrification process employing Thiobacillus denitrificans were evaluated in five continuous-culture, anaerobic slurry reactors using elemental sulfur. Steady-state stoichiometric reactions and nitrate removal were calculated for various solids retention time; the maximum denitrification rate was then determined for ratios of elemental sulfur to biomass ranging over 45-194 mg/mg nitrate-nitrogen. A series of zone settling velocity and flocculant settling tests were conducted at several elemental sulfur concentrations. The observed biomass yield remained fairly constant within a range of growth rates, elemental sulfur-to-biomass values, and temperatures, indicating negligible microbial decay; a stoichiometric equation for autotrophic denitrification was derived from the average observed biomass yield and an empirical cell mass formula. Under steady-state conditions, the continuous flow reactors achieved about 99.5% nitrate removal. The maximum unit rate of denitrification was a linear function of the sulfur-to-biomass concentration ratio; the influence of temperature was described by the Arrhenius equation. Within the lower ranges of sulfur-to-biomass, smaller solid fluxes were produced; the solids flux was linearly related to the sulfur-biomass slurry solids level. The effluent suspended solids concentration was proportional to the overflow rate. (Lisk-FIRL)
W78-11852

KINETIC PARAMETERS AND RELATIVE TURNOVERS OF SOME IMPORTANT CATABOLIC REACTIONS IN DIGESTING SLUDGE,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
H. F. Kaspar, and K. Wuhrmann.
Applied and Environmental Microbiology, Vol. 36, No. 1, p 1-7, July, 1978. 4 fig, 4 tab, 24 ref.

Descriptors: *Sludge digestion, *Anaerobic bacteria, *Methane, *Hydrogen, *Oxidation, Kinetics, Anaerobic digestion, Organic wastes, Microbial degradation, Hydrolysis, Model studies, Saturation, Waste water treatment, Municipal wastes.

The kinetics of fatty acid degradation, methanogenesis by acetate splitting, and lithotrophic methane generation were evaluated in laboratory-scale anaerobic digesters. Under steady-state conditions, the initial acetate concentration averaged 0.26 millimoles/liter with an average degradation rate of 0.27 millimoles/liter/hr; the acetate concentration was then increased to 1-2 millimoles/liter with sodium acetate under conditions of system saturation. Acetate degradation increased by 56% at saturation with a maximum degradation rate of 0.63 millimoles/liter/hr; the half-saturation concentration averaged 0.32 millimoles. Under steady-state conditions, the propionate concentration was less than 0.02 millimoles/liter with a degradation rate averaging 0.03 millimoles/liter/hr; at system saturation, propionate removal averaged 0.19 millimoles/liter/hr, attaining a maximum of 0.233 millimoles/liter/hr and a half-saturation concentration of 0.094 millimoles/liter. Hydrogen removal comprised less than 1% of the maximum potential degradation rate. Acetate splitting was considered the rate-limiting factor in anaerobic digestion. The unused hydrogen consumption capacity acted as a buffer for dissolved hydrogen partial pressures low enough for exergonic oxidation of fatty acids. Bacteria capable of anaerobic fatty acid oxidation and hydrogen generation were considered essential in methane-forming ecosystems. (Lisk-FIRL)
W78-11853

DYNAMICS AND CONTROL OF THE ACTIVATED SLUDGE WASTEWATER PROCESS,
Diamond Shamrock Co., Painesville, OH.
U. Attir, and M. M. Denn.
AIChE Journal, Vol. 24, No. 4, p 693-698, July, 1978. 8 fig, 2 tab, 11 ref, 1 append.

Descriptors: *Dynamic programming, *Model studies, *Activated sludge, *Settling basins, *Simulation analysis, Control systems, Sewage sludge, Underflow, Recycle, Performance, Mathematical models, Systems analysis, Waste water treatment, Municipal wastes.

Dynamic modelling of the reactor and the settling basin in an activated sludge system established a control strategy in which the settler underflow and recycle rates were maintained at a constant ratio with respect to the feed flow rate. The reactor model described the BOD and solids concentration in the reactor volume in terms of the volumetric flow rates, feed concentration, recycle stream, stoichiometric yield factor, and the reaction rate; the organism growth rate at a steady state in the reactor followed the Monod equation. Steady state modelling of the solids flux in the settler was based on a curve encompassing convective, gravity, and total fluxes. The settler was divided into zones of clarification, thickening, and compaction; concentration layers between the thickening and compaction zone were described by mass balance equations and the velocity of solids discontinuity. The response of settlers to two-step alterations in feed rate and to 24 hr cyclic feeds was simulated; underloading was found to destroy the buffering action of the sludge blanket and render the system unable to adequately resume steady state conditions. A compromise between controlling the sludge blanket level in the settler and the reactor solids concentration was reached by computing the optimum settler underflow rate for each feed rate and maintaining a constant underflow-to-feed rate ratio. (Lisk-FIRL)
W78-11854

HYDRAULIC ANALYSIS OF MODEL TREATMENT UNITS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
F. L. Hart, and S. K. Gupta.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE4, p 785-798, August, 1978. 9 fig, 6 tab, 15 ref, 1 append.

Descriptors: *Model studies, *Tracers, *Fluorescent dye, *Hydraulic design, *Prototypes, Froude number, Reynolds number, Mathematical models, Analytical techniques, Design criteria, Tracking techniques, Prototype tests, Chlorination, Waste water treatment, Municipal wastes.

A technique incorporating dye tracing procedures was applied to a model chlorine contact chamber to provide design criteria for optimum treatment unit configuration. For a model or prototype unit with a fixed length scale and actual prototype flow, the required model flow was varied to obtain a tracer output paralleling the prototype response. For a prototype with a flow rate of 8.6 mgd, the required model flow with equal detention times was calculated at 10 gal/min; when designed according to the Froude number or the Reynolds number, the required flow was calculated as 29 gal/min or 710 gal/min, respectively. For a model with a 142 gal volume and a scale ratio of 1:8.43, the recovery of a fluorescent dye injected in the influent was measured with a fluorometer; the model flow rate was varied over 6.4-40.0 gal/min. Based on dye curve variations in the model and comparison of the relative magnitudes of model and prototype dye curves, a flow of 6.4-19.0 gal/min produced parameters closely correlated to the model performance. Thus, the design flow rate calculated by the data similitude technique was significantly lower than those rates recommended by the Froude or Reynolds numbers. The mean detention time index, the dead space fraction, the plug flow, the standard detention efficiency, and the fraction dead volume adequately simulated prototype performance. (Lisk-FIRL)
W78-11855

DESIGN 'EFFECTIVE' COST-EFFECTIVE SYSTEMS,
C. M. Lee.
Water and Wastes Engineering, Vol. 15, No. 7, p 66-68, 70, 72, July, 1978. 2 fig, 4 tab.

Descriptors: *Design criteria, *Cost analysis, *Treatment facilities, Economics, *Performance, Cost comparisons, Analytical techniques, Constraints, Annual costs, Research and development, Regional economics, Model studies, Alternate planning, Forecasting, Project planning, Water quality, Waste water treatment, Municipal wastes.

A five-step cost-effective analysis scheme was developed for designing and constructing municipal waste water treatment plants. The collection of baseline reference data in the first step provides an outline of project objectives, limitations and constraints, quality standards, and service loads; this information from local, regional, and state resources is interpreted into objectives for the individual waste treatment project. The second step defines the potential type of service load, operating schemes, and alternative configurations

capable of achieving planning objectives. In the third step, mathematical cost-effective models simulate waste water treatment processes and predict system performance under various waste streams, time patterns, and operating constraints. From the models, the measure of effectiveness is evaluated for each treatment configuration and operating performance is predicted during regular and peak flow periods. Environmental, investment, annual operating, and research and development costs are then applied. Threshold levels for cost, effectiveness, and environmental impact are employed in step four to evaluate each alternative; the optimization of these threshold values is achieved through sensitivity analysis and trade offs. Treatment processes, cost, and configurations are manipulated to form the optimum threshold configuration. Once the alternative configuration has been decided, step five provides documentation of all design specifications. (Lisk-FIRL)
W78-11856

NITRIFICATION AND ALKALINITY RELATIONSHIPS IN ACTIVATED SLUDGE,
Virginia State Dept. of Health, Lexington.
R. W. Benninger, and J. H. Sherrard.
Journal Water Pollution Control Federation, Vol. 50, No. 9, p 2132-2142, September, 1978. 9 fig, 4 tab, 8 ref.

Descriptors: *Nitrification, *Alkalinity, *Activated sludge, *Model studies, *Nitrates, Ammonia, Nitrogen, Chemical oxygen demand, Design criteria, Laboratory tests, Analytical techniques, Waste water treatment, Municipal wastes.

Alkalinity destruction during nitrification and factors influencing the oxidation of ammonia were investigated in laboratory-scale activated sludge systems, operated under steady state conditions with influent COD-to-total Kjeldahl nitrogen (TKN) ratios of 6.5:1 and 4.2:1. From nitrification reactions, stoichiometric calculations indicated that 7.14 mg alkalinity/liter were destroyed and 4.57 mg/liter 02/liter were required to oxidize 1 mg ammonia/liter to nitrate-nitrogen. The activated sludge reactors were operated at several mean cell residence times up to 15.2 days. Mathematical models were derived for the minimum aeration time required to sustain nitrification, the mean cell residence time, and the observed yield coefficient. Greater mean cell residence times reduced TKN, ammonia, and alkalinity; larger COD:TKN ratios at a specific residence time also improved nitrification. Longer residence times also reduced TKN in the sludge, reduced waste sludge production, and increased the nitrate content of the effluent; higher influent COD:TKN ratios reduced effluent TKN, ammonia, and nitrate levels. The ratio of alkalinity destroyed to TKN removed increased at longer residence times and lower COD:TKN ratios. The stoichiometric value initially calculated for alkalinity destruction proved to be higher than observed. TKN and ammonia were completely removed and COD reduced by 91.1% after 15.2 days at an influent COD:TKN ratio of 6.61:1. (Lisk-FIRL)
W78-11857

MATHEMATICAL MODELS OF BIOLOGICAL WASTE TREATMENT PROCESSES FOR THE DESIGN OF AERATION TANKS,
Akademiya Nauk SSSR, Moscow. Inst. Vodnykh Problem.
V. A. Vavilin, and V. B. Vasilyev.
Water Research, Vol. 12, No. 7, p 491-501, 1978. 8 fig, 1 tab, 32 ref.

Descriptors: *Activated sludge, *Kinetics, *Aerated lagoons, *Mathematical models, *Storage, Biodegradation, Oxidation, Organic loading, Physicochemical properties, Absorption, Adsorption, Flocculation, Model studies, Optimization, Control, Waste water treatment, Municipal wastes.

Formal activated sludge process models which incorporated pollutant sorption by activated sludge flocs, as well as biooxidation, were developed for designing aeration tanks and stabilization tanks in completely-mixed and plug-flow systems. The reactor kinetics of organic matter consumption and activated sludge growth as described by Monod's equation were considered too general and limited to describe microbial growth and decay rates, the impact of growth rate saturation on substrates, and process inhibition by high organic loading and metabolic products. Nonlinear models describing biooxidation kinetics were presented for plug-flow, completely-mixed, and multiple-step aeration tanks; optimization of process kinetics for varying substrate characteristics was considered dependent upon the hydrodynamic regime of mixing within the aeration tank. Evaluation of process kinetics, using theoretical process parameter values, by the Monod equation and its derivatives concluded that sorption of organic materials by activated sludge was a significant factor not included in the kinetic models. Differential equations, which incorporated the total suspended solids concentration without stored substrate and the sorbed pollutant concentration, were developed to include the oxidation of stored substrate on and in the sludge flocs within the stabilization tank. Models incorporating sorbed substrate were developed for several activated sludge process control configurations. (Lisk-FIRL)
W78-11858

PHASE SEPARATION OF ANAEROBIC STABILIZATION BY KINETIC CONTROLS,
Westvaco Corp., Covington, VA.
M. L. Massey, and F. G. Pohland.
Journal Water Pollution Control Federation, Vol. 50, No. 9, p 2204-2222, September, 1978. 16 fig, 5 tab, 17 ref.

Descriptors: *Anaerobic digestion, *Acid bacteria, *Methane bacteria, *Mathematical models, *Kinetics, Fermentation, Acids, Volatility, Model studies, Growth rates, Biomass, Separation techniques, Waste water treatment, Municipal wastes.

Examination of process kinetics of the acid and methane fermentation phases of anaerobic stabilization indicated that phase separation improved process stability and control and reduced the total required reactor volumes. Utilizing the continuous growth theory, mathematical models for both the acid and methane phase reactors described the specific growth rates of acid or methane formers, the concentrations of formers in the effluent, and the available substrate concentration. A retention time of 32.7 hrs or less in the acid reactor enhanced substrate conversion to volatile acids but inhibited the growth of methane-forming organisms and the utilization of volatile acids; the methane reactor retention times were varied over 46.9-133.9 hrs in three tests. Organic carbon in the acid reactor was primarily converted to acetic acid and propionic acid; the concentration of propionic acid exceeded that of acetic acid after 24 hrs retention. Although gravity settling and biomass recycling in the acid reactor enhanced process operation, the same procedure was not feasible in the methane reactor because of the poor settling properties of the biomass solids. In the acid phase, the kinetic models defined a maximum specific growth rate of 2.7/hr, a saturation constant of 2,583 mg COD/liter, a yield of 0.31 mg volatile suspended solids/mg COD utilized, and a decay constant of 0.065/hr. The methane phase yielded maximum specific growth rates of 0.43 and 0.86/day and saturation constants of 369 mg acetic acid and 164 mg butyric acid/liter for acetic and butyric acid-utilizers, respectively. (Lisk-FIRL)
W78-11859

CONTROL AMMONIA NITROGEN WITH SINGLE-STAGE NITRIFICATION - BIOLOGICAL CONVERSION OF AMMONIA CAN BE MADE USING THE ACTIVATED SLUDGE PROCESS,
Metropolitan Sanitary District of Greater Chicago, IL.
W. L. Munch.
Water and Wastes Engineering, Vol 15, No 2, p 16-20, August, 1978. 3 fig, 1 tab, 2 ref.

Descriptors: *Activated sludge, *Nitrification, *Ammonia, *Nitrogen fixing bacteria, *Sewage sludge, Mathematical models, Analytical techniques, Operations research, Optimization, Dissolved oxygen, Growth rates, Waste water treatment, Municipal wastes.

Control parameters were identified and mathematical models were developed for maintaining nitrificaton activity in activated sludge treatment reactors. Single-stage nitrification was dependent upon the solids retention time (SRT). The SRT, in turn, controlled the net microbial growth rate in the reactor, especially that of Nitrosomonas and Nitrobacter. The growth of nitrifying bacteria was also affected by temperature, ammonia-nitrogen, dissolved oxygen, pH, toxic metals, and organic compounds. The SRT, which must be increased for the growth of nitrifying bacteria, could be controlled by calculating the mixed liquor suspended solids concentration, the total aeration tank volume, and the sludge wasting rate. At a specific SRT, the aeration tank solids content was calculated from the mixed liquor suspended solids and the aeration tank volume; the sludge wasting rate was the quotient of the total solids level in the aeration tank and the solids retention time. the required waste sludge flow rate was obtained from the sludge wasting rate the the waste sludge solids concentration. Utilizing these mathematical models, the 1,440 mgd West-Southwest sewage treatment works in Stickney, Illinois, conveted its four aeration facilities to simultaneous nitrification. A graph, developed from the model studies, depicted the optimum parameters for nitrification in each facility. Implementation of nitrification processes in the four units reduced effluent ammonia-nitrogen concentrations at the outfall to 0.7-4.6 mg/liter over a year-long period. (Lisk-FIRL)
W78-11860

PROBLEMS ON SUBSTRATE CONCENTRATION IN DESIGNING NITRIFICATION-DENITRIFICATION METHOD WATER TREATMENT PLANTS (SHOKA DATCHISO HO MIZUSHORI PURANTO NO SEKKEI NI OKERU KISHITSU NODO NO MONDAI),
S. Fukunaga.
Ishikawa Harima Giho, Vol. 18, No. 3, p 243-246, 1978. 5 fig, 2 tab, 16 ref.

Descriptors: *Nitrification, *Denitrification, *Alcohols, *Laboratory tests, *Analytical techniques, Model studies, Nitrogen, Design criteria, Carbon, Waste water treatment, Municipal wastes.

Laboratory experiments verified hypotheses obtained from a literature review that denitrification rates in waste water treatment systems were controlled by the concentration of methanol in the influent. In nitrification-denitrification process, methanol was assumed to be a source of organic carbon which influenced the rate of denitrification. Tests conducted in a laboratory reactor revealed that the change of the denitrification rate along the process line was directly related to the concentration gradient of methanol in the apparatus. Denitrification was also directly dependent upon the temperature maintained within the apparatus. Permissible concentrations of nitrogen in the influent and methanol in the effluent were cited as important considerations in designing denitrification systems. (Lisk-FIRL)
W78-11861

HYGIENIZATION OF SEWAGE SLUDGE WITH ELECTRON BEAMS.
Sulzer Technical Review, Vol 50, No 4, p 179, 1977. 1 fig.

Descriptors: *Electronic equipment, *Disinfection, *Sewage sludge, *Deflection, *Penetration, Conveyance structures, Sludge treatment, Irradiation, Equipment, Waste water treatment, Municipal wastes.

The Sulzer electron beam-hygienization plant for disinfection of sewage sludge employs an electron accelerator and scanner system, in addition to a sludge supply, dosing, and regulating system. Electron beams, emitted from an electron source with a heated cathode, are fine and tightly packed with low energy. The electrons gain maximum energy as they pass through an accelerator in a vacuum. A scanner system containing a thin titanium foil strip is used to deflect the electron beam by an alternating magnetic field to adapt the beam to the width of the sludge. A sludge dosing system continuously distributes a preset amount of sludge onto a conveyor roller at a thickness suitable for electron beam penetration. The electrons are braked as they come into contact with the 2,000 mm width of the sludge on the conveyor roller. Throughput speed is determined by the beam current; throughput quantity is controlled by the sludge thickness and width, and the roller rotation speed. (Lisk-FIRL)
W78-11883

TOWARD THE EFFLUENT-FREE BLEACHED KRAFT PULP MILL (VERS L'USINE DE PATE KRAFT BLANCHIE SANS EFFLUENT),
Centre Technique du Papier, Grenoble (France).
For primary bibliographic entry see Field 3E.
W78-11899

CLOSED WATER CYCLE SYSTEMS AT PULP AND PAPER MILLS (SISTEMY ZAMKNUTOGO VODOPOL'ZOVANIYA NA PREDPRIATIYAKH OTRASLI),
For primary bibliographic entry see Field 3E.
W78-11901

COLOR REMOVAL FROM KRAFT MILL CAUSTIC EXTRACTION EFFLUENT USING ALUMINUM AND IRON,
Saskatchewan Univ. Saskatoon.
M. S. Nasr, and D. G. MacDonald.
The Canadian Journal of Chemical Engineering, Vol 56, No 1, p 87-93, February, 1978. 11 fig, 25 ref, 2 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Decoloring, Color, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Pulp wastes, Aluminum compounds, Iron compounds, Hydrogen ion concentration, Lignins, Salts, Chemical precipitation, Kraft mills.

The highly colored compounds found in the caustic extraction effluents of kraft bleach plants can be removed by chemical reaction with trivalent metal ions, Me(III), notably Al and Fe. At pH of 2.8 or less, these ions react stoichiometrically with carboxylic acid groups (A) on the lignin compounds to form moderately soluble MeA(3) salts. Above pH 2.8, the OH ions compete with the A groups for the Me(III) ions to forms highly insoluble metal salts. Maximum color removal (i.e maximum insolubility) occurs at pH 5 for Al and pH 3.3 for Fe. Color removals of 99.6% and 98.8% can be achieved with Al and Fe, respectively, for an effluent containing 12,000 APHA color units treated with 7 moles of Al or Fe ions per cu m of effluent. (Witt-IPC)
W78-11902

USE OF WASTE LIQUOR FROM BISULFITE PULPING TO PRODUCE MIXED CULTURE SINGLE-CELL PROTEIN,
Quebec Univ., Trois-Rivieres.
S. N. Lo, J. R. Moreau, and G. St.-Laurent.
The Canadian Journal of Chemical Engineering, Vol 56, No 1, p 94-98, February, 1978. 1 fig, 23 ref, 8 tab.

Descriptors: *Sulfite liquors, *Waste water treatment, *Activated sludge, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp wastes, Waste treatment, Pulp and paper industry, Proteins, Biological treatment, Cultures, Canada, Foreign countries, Water pollution control, Carbohydrates, Vitamins, Return(Monetary), Spent sulfite liquor, Sulfite pulp mills, Economics, Byproducts.

The activated sludge process might be used in the near future to treat spent sulfite liquor from small bisulfite pulp mills (less than 300 tons/day) in Canada as a means of controlling water pollution. It was found that bio-sludge solids from such a process contained approximately 38% protein, 47% carbohydrates, some vitamins, and essential minerals. This biosubstance, a mixed culture in nature, can be considered as a good source of single-cell protein. A laboratory procedure for producing this biomass in a sterile and dried form is described. The conversion of carbohydrates in spent sulfite liquor to biomass was carried out in a 400-liter aerated continuous-flow reactor. Under the operating conditions studied, the sludge yield coefficient was 0.53 g of biomass/g of carbohydrates removed. Cash returns from the sale of biomass by two bisulfite mills (a high-yield mill producing 250 tons/day and a low-yield mill producing 300 tons/day of pulp) would probably offset the cost of operating their biological effluent treatment plants. (Witt-IPC)
W78-11903

IMPROVED HEAT ECONOMY WITH LOCKMAN PRE-EVAPORATION AT THE HUSUM SULFATE MILL USING DIGESTER FLASH STEAM,
MoDo-Chemetics A. B., Ornskoldsvik (Sweden).
For primary bibliographic entry see Field 3E.
W78-11904

IN-PLANT RECYCLE AND REUSE IN AN INTEGRATED FINE PAPER MILL,
Boise Cascade Corp., Rumford, ME.
For primary bibliographic entry see Field 3E.
W78-11906

DEGRADABILITY OF TOXICANTS IN CHLORINATION STAGE EFFLUENTS,
British Columbia Research Council, Vancouver.
J. M. Leach, J. C. Mueller, and C. C. Walden.
Canadian Pulp and Paper Association Technical Section, 64th Annual Meeting (Montreal), Preprints, p B123-B129, January 31-February 3, 1978. 11 ref, 6 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Toxicity, Degradation(Decomposition), Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Hydrogen ion concentration, Pulp wastes, Foreign countries, Canada, Aeration, Chlorides, Ions, Biological treatment, Effluents, Biodegradation.

The effect of pH, in the absence of microorganisms, on the detoxification by aeration of kraft and sulfite pulp bleaching (chlorination-stage) effluents was studied. Biodegradability was also measured separately at pH 7 laboratory fermentation units. Kraft pulp chlorination effluents were detoxified by aeration for 6 days under sterile conditions at pH 7 or 9. However, an effluent sample from high-temperature chlorination was not detoxified at these pH values. Detoxification was accompanied by release of chloride ion. Only limited degradation of the toxic material occurred at pH 3. Toxicants in sulfite pulp chlornation effluents were less degradable than those in kraft mill effluents. Biological treatment improved the rate of toxicity removal compared with aeration under sterile conditions. (Swichtenberg-IPC)
W78-11907

DETOXIFICATION OF LINERBOARD EFFLUENTS USING PHYSICAL-CHEMICAL TECHNIQUES,
Pulp and Paper Resaerce Inst. of Canada, Pinte Claire.
J. Dorica, and A. Wong.
Canadian Pulp and Paper Association Technical Section, 64th Annual Meeting (Montreal), Preprints, p B179-B184, January 31-February 3, 1978. 7 fig, 23 ref, 2 tab.

Descriptors: *Pulp wastes, *Toxicity, *Waste water treatment, Aeration, Activated carbon, Coagulation, Wastes, Industrial wastes, Pulp and paper industry, Water pollution treatment, Water pollution sources, Waste treatment, Oxone, Suspended solids, Hydrogen ion concentration, Biochemical oxygen demand, Lime, Chemical precipitation, Nutralization, Filtration, Foreign countries, Canada, Aluminum sulfate, Decoloring, Kraft mills, Linerboard, Board mills, Color, Effluents.

Kraft linerboard effluent samples were detoxified at the Pulp and Paper Research Institute of Canada by physiochemical treatment techniques using (1) aeration in the presence of powdered activated carbon followed by coagulation with alum and (2) ozone treatment of effluents containing little or no suspended solids at neutral pH. The former technique also resulted in simultaneous decolorization and a 25% reduction in BOD. In the case of ozone treatment, no color removal and a slight increase in BOD occurred. Single-stage effluent treatment using lime, alum, or ozonization of the raw unfiltered effluent was found to be unsatifactory for consistent detoxification of highly toxic effluents. Lime precipitation increased the effluent toxicity slightly. Effluent neutralization to pH 7 followed by filtration significantly decreased toxicity. (Swichtenberg-IPC)
W78-11908

EFFLUENTS FROM PAPER MILLS,
For primary bibliographic entry see Field 3E.
W78-11909

RECENT ADVANCED TREATMENT PROCESSES FOR WASTEWATER AND SLUDGE IN THE PAPER AND PULP INDUSTRY,
Hitachi Plant Engineering and construction Co. Ltd. (Japan).
K. Izawa, Y. Suga, T. Yamaguchi, and K. Kishigami.
Hitachi Review, Vol 25, No 5, p 183-188, 1976. 6 fig, 4 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Lime, Bleaching wastes, Electrolysis, Burning, Activated carbon, Sludge disposal, Incineration, Black liquor, Kraft mills, Waste paper.

The recent strengthening of waste water discharge regulations has rendered inadequate the flocculation/sedimentation or flotation method which has been conventionally applied to pulp and paper effluent treatment. Descriptions are given of the following methods for treating pulp and paper industry effluent: Hi-Lime (high lime dosage) treatment of kraft bleach plant effluent, electrolysis of waste-paper mill effluent, black liquor incineration, and activated carbon treatment. Sludge incineration is also described. (Witt-IPC)

W78-11910

WASTE-WATER CENTRIFUGAL DECANTERS FOR SEWAGE TREATMENT PLANTS.
For primary bibliographic entry see Field 8C.
W78-11911

CHARACTERIZATION OF DISPERSED RESIDUAL SOLIDS IN BIOLOGICALLY TREATED PULP AND PAPER MILL EFFLUENTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
J. J. McKeown, and H. S. Costa.
NCASI Stream Improvement Technical Bulletin, No 303, 24 p, February, 1978. 4 fig, 10 illus, 5 ref, 4 tab.

Descriptors: *Pulp wastes, *Suspended solids, *Particle size, *Biological treatment, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Oxidation lagoons, Aerated lagoons, Microscopy, Electron microscopy, Zeta potential, Foods, Aquatic insects, Organic matter, Colloids.

The particle size and size distribution of suspended solids in biologically treated effluents from three full-scale aerated stabilization basins and a pilot-plant basin were determined using scanning electron and optical microscopy. The solids were also characterized by zeta-potential measurements and by determination of their deoxyribonucleic acid content. The study showed that the residual solids were principally organic in nature and generated during treatment. Particle sizes were 1-8 micrometers, a suitable range for aquatic insect food and a limiting range for effective removal by sedimentation and filtration. The stability of these dispersed solids is attributed to steric hindrance and/or adsorption of hydrated hydrophilic colloids rather than to charge repulsion. (Swichtenberg-IPC)
W78-11913

ENERGY SAVINGS: EXAMPLE OF THE TARASCON MILL (OF LA CELLULOSE DU RHONE) (ECONOMICS D'ENERGIE: POUR L'EXEMPLE TARASCON),
M. Garaud.
La Papeterie, Vol 99, No 11, p 525-526, 529, 531, November, 1977. 2 fig, 4 illus.

Descriptors: *Evaporation, *Pulp wastes, *Waste water treatment, Evaporators, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Foreign countries, Steam, Black liquor, Kraft mills, Europe, France.

The six-effect black-liquor evaporator installed at a French kraft pulp mill is described. The evaporator units are of the long vertical tube type and are equipped with internal pre- and/or post-reheaters. Yield of the installation is 4.4 tons of steam/ton of water evaporated, giving a savings of about 1 ton of steam/ton of pulp produced at the mill. (Speckhard-IPC)
W78-11915

OPERATING EXPERIENCE WITH VOITH CLAIFIERS IN A BOARD MILL (BETRIEBSERFAHRUNG MIT DEM VOITH-RUNDKLAERBECKEN IN EINER KARTONFABRIK),
Deutsche Zuendholzfabriken G.m.b.H., Baiersbronn (West Germany).
W. Gey.
Der Papiermacher, Vol 28, No 2, p 25-29, February 18, 1978. 6 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Clarifiers, *Operation and maintenance, Board mill, Foreign countries, Europe, Water pollution treatment, Water pollution sources, Wastes, Industrial wastes, Pulp and paper industry, Waste treatment, Germany, White water(Paper machines), Fiber recovery.

A Voith Clarifier installed at a German paperboard mill is described. The clarifier is designed to handle 250-300 cu m/hr of paper-machine white water and other effluents, recovering fibers as a suspension having a consistency of at least 2%. The clarifier features a floor with a very slight incline.(Speckhard-IPC)
W78-11916

COST OF ENVIRONMENTAL CONTROL IN THE PULP AND PAPER INDUSTRY (NAKLADY NA OCHRANU ZIVOTNEHO PROSTREDIA V PRIEMYSLE CELULOZY A PAPIERA),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
V. Kubelka, and G. Milchova.
Papir a Celuloza, Vol 32, No 11, p 297-300, 304, November, 1977. 5 ref, 11 tab.

Descriptors: *Pulp and paper industry, *Pollution abatement, *Costs, Water pollution sources, Air pollution, Water pollution control, Economics, United States, Canada, North America, Biochemical oxygen demand, Suspended solids, Capital costs, Operating costs, Europe, Sweden, Czechoslovakia.

The pulp and paper industry is blamed as a major water and air polluter, but the public does not realize that during the last years the industry considerably reduced the discharge of pollutants at an enormous cost. Based on data from Western Europe (mainly Sweden), U.S.A., and Canada, it is shown that for all pulp and paper industry categories, the BOD and suspended solids discharge has been significantly reduced since 1970. Tables are given showing current capital and operating costs of water and air pollution control in Sweden. The pulp and paper industry is among the most environmentally advanced industries. Future attention has to be directed toward improved pulping and papermaking processes to achieve the pollution-free mill goal. When the above cost data are applied to the Czechoslovakian pulp and paper industry, there will be a need for over 900 million Kcs (Czechoslovakian crowns) in additional funds to reach the desired pollution control level. (Trubacek-IPC)
W78-11917

MODERN METHODS OF UTILIZATION OF KRAFT PULP MILL CONDENSATES (WSPOLCZENSNE SPOSOBY ZAGOSPODAROWANIA KONDENSATOW Z CELULOZOWNI SIARCZANOWYCH),
Instytut Celulozowo-Papierniczy, Lodz (Poland).
For primary bibliographic entry see Field 3E.
W78-11918

A TEST AND A TECHNIQUE FOR PREDICTING FIVE DAY BOD VALUES OF KRAFT MILL WASTE,
Federal paper Board Co., Riegelwood, NC.
For primary bibliographic entry see Field 5A.
W78-11920

STUDY OF FILTER PRESS DEWATERING OF SLUDGE FROM THE EFFLUENT TREATMENT PLANT AT THE SLIVNITSA FIBERBOARD MILL (IZSLEDVANIYA VYRKHU MEKHANICHNOTO OBEZVODIYAVANE NA UTAJKITE OT PRECHISTVATELNATA STANTSIYA NA ZAVODA ZA D'RVESPOVLAKNESTI PLOSKOSTI -- GR. SLIVNITSA, S FILT'R-PRESA),
For primary bibliographic entry see Field 5E.
W78-11921

REAGENT-FREE METHOD OF EFFLUENT NEUTRALIZATION (BEZREAGENTNYI METOD NEITRALIZATSII STOKOV),
Selenginskii Tsellyulozno-Kartonnyi Kombinat (USSR).
V. I. Meshkov.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 26, p 5, October, 1977.

Descriptors: *Waste water treatment, *Pulp wastes, *Neutralization, *Aeration, Waste treatment, Hydrogen ion concentration, Carbon dioxide, Water pollution treatment, Wastes, Effluents, Acidic water, Liquid wastes.

Aeration is used toneutralize acidic pulp mill effluents after chemical treatment. Aeration lowers the carbon dioxide content, thereby increasing pH from 5.9-6.0 to 6.5-70. In winter, aeration should be intensified to 0.4 cu m of air per cu m of water, because of increased carbon dioxide content in the water. (DuVall-IPC).
W78-11925

ECONOMICAL EXPEDIENCY OF FLOTATION SAVEALL MODERNIZATION (EKONOMICHESKAYA TSELESOOBRAZNOST' MODERNIZATSII FLOTATSIONNYKH LOVUSHEK),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost, Moscow (USSR).
V. A. Kopylov.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 29, p 3-4, October 1977. 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Flotation, Wastes, Industrial wastes, Water pollution treatment, Waste treatment, Water pollution sources, Pulp and paper industry, Water purification, Effluents, Savealls, Printing papers, Sized papers, Rosin, Aluminum oxide, Polyacrylamide, White water(Paper machines).

A study of 30 flotation savealls showed that fully modernized Sveen-Pederson flotation savealls may be effectively used for white water solids recovery in the manufacture of rosin-sized papers with ash contents below 10%. Effluent from production of printing papers with ash contents up to 20% can be treated with a supplementary 5-7 mg/liter rosin size, 3 mg/liter of aluminum oxide, and 5 mg/liter of polyacrylamide. (DuVall-IPC).
W78-11926

UTILIZATION OF SCRUBBER WATER FROM LIME RECOVERY FURNACES (UTILIZATSIYA SKRUBBERNYKH VOD IZVESTEREGENERATSIONNYKH PECHEI),
Bratskii Lesopromyshlennyi Kompleks (USSR).
For primary bibliographic entry see Field 3E.
W78-11928

OPERATION OF SIMPLEX MECHANICAL TURBINE AERATORS IN AN EFFLUENT TREATMENT INSTALLATION (RABOTA MEKHANICHESKIKH TURBOAERATOROV 'SIMPLEKS' NA OCHISTNYKH SOORUZHENIYAKH),
Svetogorskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
N. P. Panchekhin, and E. A. Zhukova.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 32, p 9, November, 1977.

Descriptors: *Pulp wastes, *Waste water treatment, *Aerator, Waste, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Foreign countries, Operation and maintenance, Dissolved oxygen, Biological treatment, Pulp and paper industry, Aeration, Soviet Union(USSR).

Each of the 5 aeration tanks in the biological effluent-purifying station at the Svetogorsk Pulp and Paper Complex (USSR) is equipped with 8 Sim-

pled turbo-aerators that have a net power of 48 kw and can provide 1.7 kg of dissolved oxygen for each kw of power. (DuVall-IPC).
W78-11929

DISPOSAL OF AEROBICALLY DIGESTED SLUDGE,
Little Blue Valley Sewer District, Independence, MO. Interim Treatment Plant.
T. Watenburger.
Public Works, Vol. 109, No. 7, p 70, July, 1978.

Descriptors: *Sludge treatment, *Dewatering, *Filtration, *Aerobic treatment, *Sludge digestion, Filters, Application methods, Gravity, Pressure, Waste water treatment, Municipal wastes.

Four Model 80 sludge concentrators, manufactured by Ecodyne Corp.'s Smith and Loveless Division, were installed at the Little Blue Valley Interim Treatment Plant in Independence, Missouri, to dewater the large quantities of sludge produced in the aerobic digester. The 20 mgd capacity interim plant treats an average of 16 mgd of waste water in two combined aeration/settlement basins, an aerobic digester, and six sand filters; the final effluent contains about 5 mg/liter BOD and 2 mg/liter suspended solids. The concentrators process 13,000-25,000 gal/day of a thickened slurry with a 49-50% organic load and 4% solids content. The sludge is treated with a cationic polymer, flash mixed, and concentrated by gravity and pressure processes to 14.5% solids content. Gravity dewatering is performed on continuous, variable speed open-mesh filter screens; three sets of compression rollers further dewater the sludge in the pressure stage. The dewatered cake is pumped to a truck for removal to land application sites. (Lisk-FIRL)
W78-11930

APPLICATION OF REVERSE OSMOSIS AND ULTRAFILTRATION TO THE PURIFICATION OF PULP AND PAPER INDUSTRY EFFLUENTS. III. SEPARATION AND CONCENTRATION OF LIGNIN COMPOUND SOLUTIONS BY ULTRAFILTRATION (ZASTOSOWANIE ODWROCONEJ OSMOZY I ULTRAFILTRACJI DO OCZYSZCZANIA SCIEKOW Z PRZEMYSLU CELULOZOWO-PAPIERNICZEGO. III. ULTRAFILTRACYJNE ROZDZIELANIE I ZATEZANIE ROZTWOROW ZWIAZKOW LIGNINOWYCH),
Instytut Inzynierii Ochrony Srodowiska Politechniki Slaskiej, Gliwice (Poland).
M. Bodzek, O. Kominek, and I. Tanistra.
Przeglad Papierniczy, Vol. 33, No. 10, p 359-363, October, 1977. 18 ref, 7 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Ultrafiltration, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Membrane processes, Cellulose, Lignins, Effluents, Membranes, Cellulose acetate, Lignosulfonates, Separation techniques.

Ultrafiltration experiments were conducted on solutions of alkali lignin and calcium lignosulfonates, using cellulose acetate membranes Batch-301 (unheated), UF-17, and F. Determinations were made of the filtration rate (mean) and the degree of separation of the dissolved substances. An increase of concentration (within the 50-1000 g/cu dm range) lowered the filtration rate, but increased the degree of separation. Within the 5-10 atmosphere range, an increase of pressure increased the rate of filtration, but had little effect on the degree of separation. An 80% ultrafiltrate recovery was achieved with all concentrations and membranes. Generally, the retention of alkali lignin by the membranes was better than the retention of calcium lignosulfonates. Membrane UF-17 appeared more advantageous for the lignosulfonates. Larger scale experiments with actual mill effluents are needed to confirm the suitability of ultrafiltration for purification of industrial waste waters. (See also W78-00453; W77-09733 and W78-11933) (Stapinski-IPC)
W78-11932

APPLICATION OF REVERSE OSMOSIS AND ULTRAFILTRATION TO THE PURIFICATION OF PULP AND PAPER INDUSTRY EFFLUENTS. IV. PURIFICATION AND CONCENTRATION OF PULP WASHING EFFLUENTS BY ULTRAFILTRATION (ZASTOSOWANIE ODWROCONCJ OSMOZY I ULTRAFILTRACJI DO OCZYSZCZANIA SCIEKOW Z PRZEMYSLU CELULOZOWO-PAPIERNICZEGO. IV. ULTRAFILTRACYJNE OCZYSZCZANIE I ZATEZANIE SCIEKOW Z MYCIA MAS CELULOZOWYCH),
Instytyt Inzynierii Ochrony Srodowiska Politechniki Slaskiej, Gliwice (Poland).
M. Bodzek, O. Kominek, and I. Tanistra.
Przeglad Papierniczy, Vol. 34, No. 1, p 5-9, January, 1978. 4 fig, 8 ref, 5 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Reverse osmosis, *Ultrafiltration, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Membrane processes, Cellulose, Color, Effluents, Membranes, Black liquor, Sulfite liquors, Spent sulfite liquor, Cellulose acetate.

Ultrafiltration was carried out in a laboratory apparatus using F1, F2, and UF-17 cellulose acetate membranes, untreated and thermally treated at 50C. All experiments were conducted at room temperature and a gage pressure of 10 atmospheres to a predetermined ultrafiltrate recovery (defined as the ratio of the ultrafiltrate to the initial volume of the effluent). The effluents used in the study, which were equivalent by their composition to pulp washing effluents, were obtained by diluting a black liquor and a spent sulfite liquor to varying degrees and adjusting the pH to 7.6. The initial concentration of the effluents affected the rate of filtration and the load of the filtrate and the concentrate; the load of the filtrate, however, increased more slowly than the load of the concentrate. At an ultrafiltrate yield of 70%, the load reduction was 75-85%, and the color reduction over 90%. The UF-17 membranes gave a higher degree of purification, but had generally lower filtration rates. Ultrafiltration can be an effective means of decoloring effluents while achieving a relatively high load reduction. (See also W78-00453; W77-09733 and W78-11932) (Stapinski-IPC)
W78-11933

WATER FILTRATION METHOD,
H. E. Orensten, and V. C. Orensten.
U.S. Patent No. 4,077,877, 9 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 968, No 1, p 279, March 7, 1978.

Descriptors: *Patents, *Water quality control, *Filtration, Aquiculture, Aquatic life, Bacteria, Filters, Aeration, Waste water treatment.

Efficient biological and mechanical and/or chemical filtration or purification of the water in an aquatic life support system is achieved with a submerged device through which a high water flow rate is induced by a generally vertical flow of air through the hollow core of one or more filtration elements. Each filtration element accommodates a high flow rate (e.g. more than 50 gallons per hour) and can contain a viable colony of nitrifying bacteria. The preferred filtration device is comprised of a base with air inlets and air passageways to the hollow core of each filtration element. The base supports the filtration elements. (Sinha - OEIS)
W78-11940

MIXING APPARATUS FOR BIOCHEMICAL TREATMENT OF FLUIDS WITH OXYGEN,
Worthington, Pump, Inc., Mountainside, NJ. (Assignee).
B. Neumann.
U.S. Patent No. 4,079,008, 5 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 968, No 2, p 655-656, March 14, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Biologic treatment, Aerobic conditions, Aeration, Mixing, Turbulence, Jets, Equipment.

A mixing vessel is provided for the treatment of wastes with aerobic bacterial cultures having high-turbulent mixing under conditions supportive of rapid waste digestion. The mixing vessel contains a chamber with a sparger depending into the central portion and providing streams of incoming untreated waste feed that are distributed radially from the longitudinal axis of the vessel. Medially positioned in the chamber is an annular collector concentric to the sparger for withdrawing waste material under treatment into a recirculation loop. The collector is connected with a recirculation pump, a system outlet, an aeration fluid delivery means and a jet injector. The jet injector has a nozzle for propelling at high velocities a jet of fluids upwardly into the chamber along the longitudinal axis. The jet is comprised of recirculation wastes and entrained air. Rapid digestion may be achieved as aerobic bacterial culture contact with the waste under treatment in enhanced by the turbulent flow conditions and aeration fluid flow to support bacterial growth may be optimized. (Sinha - OEIS)
W78-11946

SYSTEM FOR RECYCLING WATER SOLUBLE WASTE LIQUIDS,
R. P. Malakul.
U.S. Patent No. 4,080,247, 7 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 1081-1082, March 21, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, Reclamation, Evaporation, Water reuse, Ethylene glycol.

A system for reclaiming solutions of waste chemicals such as ethelene glycol is provided. The water in the ethelene glycol is distilled or evaporated off at temperatures below the boiling point of the glycol. The system includes two or more interconnected evaporating stages each having a heating coil. The last or final evaporating stage is provided with an aqueous solution sensing loop for removing portions of reclaimed solution at predetermined levels and is provided with water sensing station for removing condensed steam or returning contaminated water to the input of the system. (Sinha - OEIS)
W78-11951

SLUDGE DEWATERING WITH CENTRIFUGES.
Water Services, Vol 82, No 989, p 399, July, 1978.

Descriptors: *Centrifugation, *Dewatering, *Sludge treatment, *Sewage sludge, *Centrifugal pumps, Waste water treatment, Separation techniques, Septic tanks, Sludge disposal, Municipal wastes.

KHD Industrieanlagen AG manufactures three types of solid bowl and screen centrifuges for dewatering sewage sludges. Solid bowl centrifuges, operating on the co-current principle, dewater sludges at throughput rates up to 120 cu m/hr when the rotor and screw speeds match the feed rate. The feed point is located in front of the drum's solid rear wall; this configuration allows for a settling zone in proximity to the feed point. Septic tank size at treatment facilities an be reduced when the centrifuge precedes the tank, reducing

the quantity ofsludge to be treated; centrifuges located after the tanks further reduce sludge. Besides primary dewatering, the centrifuges dewater digested sludges for storing or recycling. The solid bowl centrifuges can operate efficiently at low feed concentrations and provide extended settling durations for minute particle removal and improved solids compaction. (Lisk-FIRL)
W78-11952

SYMBIOTIC MEMBRANE SYSTEMS,
D. Pilson.
U.S. Patent No. 4,080,288, 5 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 1092-1093, March 21, 1978.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, Water pollution treatment, Separation techniques, Membrane processes, Semipermeable membranes.

An improved process of operating system and reactor for treating organic and inorganic wastes is described. The improvement of the invention consists of placing a membrane in the reactor between the gas phase and the liquid phase or biomass. The membrane is selected to control the flow of nitrogen and oxygen from the gas phase to the liquid phase or biomass and to control the flow of carbon dioxide from the biomass to the gas phase. By controlling the flow of oxygen and nitrogen through the membrane, an altered or desired atmosphere is established with an increased level of oxygen in contact with the liquid phase thereby permitting increased biological level of oxygen in contact with the liquid phase thereby permitting increased biological activity and a higher treatment efficiency (i.e, biochemical oxygen demand removal) in the reactor is obtained. (Sinha - OEIS)
W78-11953

APPARATUS FOR TREATING WASTE WATER OR SOLUTION,
Hitachi, Ltd. (Japan); and Hitachi Plant Engineering and Construction Co., Ltd. (Japan).
K. Ebara, T. Ogawa, and S. Takahashi.
U.S. Patent No. 4,080,289, 18 p, 16 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 1093, March 21, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, Reverse osmosis, Membrane processes, Semipermeable membranes, Separation techniques, Suspended solids, Scaling.

This invention relates to a treatment of waste water or solution, especially industrial waste water, by membrane process, and provides a method for treating scales and suspended materials precipitated or settled on the surface of a semipermeable membrane. Waste water is separated into a permeated solution and a concentrated solution by feeding the waste water or solution to a reverse osmosis apparatus using a membrane. A chemical pretreating apparatus prevents hard scales contained in the waste water or solution from precipitation during the concentration in the reverse osmosis apparatus. An apparatus for charging sponge balls is provided to mechanically remove suspended solids and other suspended matters, that is, soft scales when deposited on the surface of the membrane. The sponge balls are reused. (Sinha - OEIS)
W78-11954

SMALL CONTRACTORS TAKE ON TOUGH PIPE PLACEMENT.
Engineering News-Record, Vol 201, No 4, p 28, July, 1978.

Descriptors: *Interceptor sewers, *Construction joints, *Concrete pipes, *Welded joints, *Fabrication, Concrete, Conduits, Construction equipment, Construction materials, Sewerage, Linings, Waste water disposal, Municipal wastes.

A 15 ft steel elbow was used to connect an 84-inch diameter interceptor sewer to a new 72-inch diameter line that directs sewage to grit and screening operation in Newark, New Jersey. The 72-inch pipe consists of prefabricated concrete sections that were embedded in concrete to line an abandoned interceptor. The 2.5-ton elbow, which connects the refurbished line with Newark's city and airport interceptors, was bolted and braced in place within 6 hrs. Work was hastened when sewage behind the blocked-off construction site threatened to overflow into city streets. The elbow had one round flanged end and one square end connecteing to a concrete sluice; the pieces were bolted in place, thrust braced, and connected to the lines with vertical supports. The new line is part of a waste water treatment project currently under construction for Newark. Vacar Construction Corp., of Williston Park, New York, was the subcontractor for the elbow installation. (Lisk-FIRL)
W78-11956

SEWAGE PLANT BENEFITS FROM ADJUSTABLE FREQUENCY DRIVES.
Control Engineering, Vol. 24, No. 12, p 22, December, 1977.

Descriptors: *Pumps, *Treatment facilities, *Georgia, Equipment, *Design data, Waste water treatment, Liquid wastes, Electric motors, Sanitary engineering.

A Georgia sewage treatment plant has installed adjustable speed raw sewage pumps. General Electric's Speed Variator Products in Erie, Pennsylvania, produces the inverter drives used in the 10-mgd system. Incoming power is converted from AC to DC with a silicon diode rectifier and then inverted to adjustable AC voltage and frequency. This is accomplished by an SCR invertor with pulsewide modulation. The invertors provide four operable modes: two automatic and two manual. The lead pump operates at speeds adjusted according to flow measurements by the automatic bubbler sensor system. the lead pump operates at a constant speed controlled by the power bus when the lead pump is inadequate for the rate of flow. The lag pump starts automatically and maintains a desirable influent level with adjustible speed. Increased flow at this point causes the lag pump, controlled by the power bus, to increase to constant speed. When flow decreases, each pump reverts in sequential order to original drive. The system shuts down sequentially when a power failure occurs and starts in a prescribed order when power returns. The system was designed by Robert and Co Associates of Atlanta, Georgia. (Lisk-FIRL)
W78-11997

OZONE GIVES WASTE WATER THE TREATMENT.
Chemical Week, Vol. 122, No. 25, p 49, June, 1978.

Descriptors: *Ozone, *Disinfection, *Pilot plants, *Activated carbon, *Treatment facilities, Costs, Sewage treatment, Water treatment, Waste water treatment, Tertiary treatment, Activated sludge.

The use of ozone for water and waste water treatment in the United States is increasing, with the largest current application being the 30 mgd waste treatment plant in Springfield, Missouri. Major suppliers of ozone-producing equipment in the United States include Emery Industries, Union Carbide, Crane, Wellsbach, PCI, Trailigaz, and Degremont. Several current projects and contracts anticipated by these suppliers are described, including waste water treatment plants in: Meander, Ohio; Olympia, Washington; Indianapolis, Indiana; Tacoma, Washington; and Cleveland, Ohio. Cleveland's Westerly plant has used ozone-generating equipment supplied by Emery for disinfection, as well as to enhance tertiary treatment with activated carbon. EPA-sponsored pilot studies in several cities are currently testing the feasibility of activated carbon-ozone treatment for potable water. Additional EPA studies have examined dosage requirements for high level disinfection and compared costs for ozonation and chlorination. (Schulz-FIRL)
W78-11999

TOWN ABANDONS TERTIARY SEWAGE PLANT.
Engineering News-Record, Vol 201, No 1, p 11, July, 1978.

Descriptors: *Tertiary treatment, *Spray irrigation, *Application methods, *Filtration, *Clogging, Return flow, Sands, Filters, Polymers, Chemical precipitation, Failures, Waste water treatment, Municipal wastes.

Moosehead, Maine, Sanitary District's three-year-old tertiary treatment plant in Greenville will be replaced by a secondary effluent land application treatment system. The 250,000 gpd tertiary plant cost $4.3 million to construct; annual estimated operation and maintenance costs of $28,000 increased to $125,000 due to overtime paid to employees attempting to fix the sand filters. The upper 6 inches of the third stage 5 ft-long sand filters had clogged repeatedly with secondary effluent. Polymers could not alleviate the clogging problem and effluent was bypassed. Chemical treatment was applied directly to the final clarifiers. The proposed $2.5 million land application system will spray 80 acres of private woodlands with secondary effluent. (Lisk-FIRL)
W78-12005

SUBMERSIBLE SEWAGE PUMPS.
For primary bibliographic entry see Field 8C.
W78-12036

SOURCES AND CHARACTERISTICS OF SOLUBLE ORGANIC NITROGEN IN ACTIVATED-SLUDGE EFFLUENTS,
Stanford Univ., CA.
For primary bibliographic entry see Field 5A.
W78-12039

STOCHASTIC PROGRAMMING MODEL FOR WATER QUALITY MANAGEMENT IN A RIVER,
Asian Inst. of Tech., Bangkok (Thailand).
B. N. Lohani, and N. C. Thanh.
Journal Water Pollution Control Federation, Vol 50, No 9, p 2175-2182, September 1978. 7 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Water quality control, *Regional management, *Rivers, *Stochastic processes, *Chance-contrained programming, *Cost minimization, Optimization, Dissolved oxygen, Biochemical oxygen demand, Reliability, Probability, Operating costs, Mathematical models, Streamflow, Standards, Pollution abatement, Hsintien River(Taiwan), Equations, Systems analysis.

Considered is the determination of degree of waste reduction in a regional water quality management system. Presented is a stochastic programming model which minimizes the total operating cost of biochemical oxygen demand removal by ascertaining the degree of removal required at each treatment facility, without violating the desired oxygen standards in the stream. A zero-order decision rule chance-constrained programming model yields a deterministic equivalent that is a straightforward programming problem easily solvable by the available algorithm. The model includes a reliability parameter that provides an economic tradeoff between a desired water quality and the degree of satisfaction for a given annual budget. The model can be used to find the monthly optimal solutions

so that the full assimilative stream capacity may be used. The active treatment plants should be identified and operated with a higher skill and strict control. (Bell-Cornell)
W78-12041

OPTIMAL DESIGN OF REGIONAL WASTEWATER SYSTEMS: A FIXED-CHARGE NETWORK FLOW MODEL,
Georgia Inst. of Tech., Atlanta.
J. J. Jarvis, R. L. Rardin, V. E. Unger, R. W. Moore, and C. C. Schimpeler.
Operations Research, Vol 26, No 4, p 538-550, August 1978. 8 fig, 5 ref.

Descriptors: *Waste water treatment, *Design, *Optimization, *Networks, *Fixed-charge model, Water quality control, Pumping, Constraints, Mathematical models, Operations research, Equations, Cost minimization, Gravity flow, Regional systems.

Planning regional wastewater treatment systems requires that such factors as water quality, environmental impact, regional development, aesthetics, and cost be considered in the design process. Though costs are not the sole determinant of final design, the minimum cost design is a valuable input into the overall design process. A number of mathematical models for designing such systems has not led to computational success in obtaining optimal solutions to large-scale problems. This paper demonstrates how the problem of selecting a least-cost wastewater treatment system design can be modeled using network flow concepts and how special properties of the resulting network can be employed to make the problem tractable to current state-of-the-art fixed-charge network solution procedures. Described are the model, deveopment of input data, the network flow analysis method, simplifications, and results. The model includes alternative trunk-line connections, methods of treatment, and variation in system boundaries. Implementation of the procedure in Jefferson County, Kentucky is discussed. (Bell-Cornell)
W78-12043

STORAGE-TREATMENT MIXES FOR STORMWATER CONTROL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. P. Heaney, S. J. Nix, and M. P. Murphy.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 581-592, August 1978. 3 fig, 3 tab, 13 ref.

Descriptors: *Water pollution control, *Methodology, *Optimization, *Storm water, Estimating, Urban runoff, Combined sewers, Reservoir storage, Treatment, Simulation analysis, Constraints, Equations, Mathematical models, Systems analysis, United States, Ontario, Lagrange multipliers, Cost minimization, Prediction.

A methodology to estimate the cost of controlling pollution from urban storm-related discharges is presented. This procedure has been used to assess pollution from combined sewer overflows and stormwater runoff for each of the 248 urbanized areas in the United States and for a similar assessment in Ontario. Generalized predictive equations are developed for a set of assumed costs, based on relatively intensive studies of five cities: Atlanta, Denver, Minneapolis, San Francisco, and Washington. The first section describes the available storage-treatment options--their costs and effectiveness. Then, the production functions relating pollution control to storage and treatment are described. The solution to the problem of deriving the least cost mix of storage and treatment for any level of control is presented. The wet-weather optimization problem, assuming linear costs, is solved using Lagrange multipliers. Finally, a sample application of the methodology is made to a hypothetical United States city of 1,000,000. (Bell-Cornell)
W78-12046

OPTIMIZATION OF WASTE REMOVAL FOR WIDE SHALLOW RIVERS,
Drexel Univ., Philadelphia, PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-12047

COMPARISON OF TANGIBLES AND INTANGIBLES,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5G.
W78-12048

PLANNING TIME-PHASED REGIONAL TREATMENT SYSTEMS,
Environmental Protection Agency, Cincinnati, OH.
L. A. Rossman.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 685-700, August 1978. 1 fig, 5 tab, 22 ref.

Descriptors: *Waste water treatment, *Economic efficiency, *Optimization, *Massachusetts, *Regional development, *Cost control, *Cost minimization, *Expansion, Decision making, Water quality, Dynamic programming, Economic impact, Equations, Mathematical models, Systems analysis.

An economic optimization model for selecting least-cost regional wastewater treatment facility locations, interceptor routes, and capacity expansion schedules is developed. The model explicitly considers the interaction between facility location and capacity expansion decisions on total system cost. Cost functions for treatment facilities and interceptors and growth patterns for future wastewater flows may be of any form. The model is solved with a three-phase heuristic procedure utilizing dynamic programming. In comparison with a mixed integer programming model of a large-scale problem, the procedure demonstrates significant advantages in computational time, accuracy, and user requirements. The model is applied to facilities planning in a 208 study area of Massachusetts to demonstrate how the economic impacts of alternative management objectives and demographic projections can be assessed. (Bell-Cornell)
W78-12049

MODELING SEWER FLOWS USING TIME SERIES ANALYSIS,
Texas Univ. at Austin. Dept. of Mechanical Engineering.
J. W. Barnes, and F. A. Rowe.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 639-646, August 1978. 5 fig, 14 ref.

Descriptors: *Time series analysis, Flow, *Sewers, Probability, Computer models, Simulation analysis, Sewage, Statistical methods, Design, Long-term planning, Waste water treatment, Equations, Systems analysis, Box-Jenkins method.

Recently increased national attention directed at the combined sewer overflow problem has caused computer modeling to become an increasingly important tool in the long-term planning and design of wastewater treatment plants. Statistically valid hypothetical flows are an important adjunct to the use of such modeling tools. A method for generating realistic hypothetical sewage flows based on actual flow data is presented. The generation of such flows entails the description of probabilistic models for the actual flow series. The models described herein have been constructed using the Box-Jenkins Time Series Method. Models for time spans containing periods of heavy flow are developed for two locations, Springfield, Ohio and Anderson, Indiana. The same model form adequately describes the data for both locations. Finally, a technique for generating hypothetical flow series that have the same statistical properties as the original series is given. (Bell-Cornell)
W78-12051

COST EFFICIENCIES OF LARGE-SCALE INTEGRATED DAIRY PRODUCTION AND WASTE MANAGEMENT SYSTEMS,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W78-12055

AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY,
West of Scotland Agricultural Coll., Auchincruive, (Scotland).
S. Baines.
In: Utilization of Manure by Land Spreading. Commission of the European Communities, EUR 5672e, 1977, p. 413-432. 5 fig, 3 tab, 11 ref.

Descriptors: *Aerobic treatment, Design, Odor, Water pollution, Biodegradation, Temperature, *Waste treatment, *Farm wastes, Sludge residence time, Dissolved oxygen concentration, Pathogenic bacteria.

Data from laboratory experiments provide useful criteria for the design and operation of aerobic treatment plants to be used in systems where air and water pollution present problems. In the presence of an adequate supply of dissolved oxygen, a mixed population of microorganisms will become established and convert the chemical components of slurry from one form into another, and into microbial cells. Ultimately, aerobic metabolism will result in the production of carbon dioxide, water, inorganic salts, heat energy, and microbial cells. The variety and activity of microorganisms that become established and hence, the degree of biodegradation, depend on a variety of physical and chemical parameters including mean residence time of microorganisms or sludge residence time (SRT), dissolved oxygen concentration, and temperature. These factors are also important in the capital and operating costs of treatment systems. Because variation in operational parameters will affect the end products, the process can be manipulated to meet one or more of the desired objectives of treatment. Primary solids/liquid separation by physical and mechanical techniques must also be considered in conjunction with biological treatment to gain an appreciation of the economic and handling aspects. (Merryman-East Central)
W78-12059

A DYNAMIC MODEL OF NITRIFICATION-DENTRIFICATION IN THE ACTIVATED SLUDGE SYSTEM WITH POWDERED ACTIVATED CARBON. (VOLUMES I AND II),
Minnesota Univ., St. Paul.
J. S. Lee.
PhD Thesis, 1977. 415 p.

Descriptors: *Nitrification, *Denitrification, *Activated sludge, *Activated carbon, *Dynamic programming, Sampling, Pilot plants, Kinetics, Nitrates, Computer programs, Model studies, Waste water treatment, Municipal wastes.

A dynamic model of suspended growth biological nitrification-denitrification was developed with data from two activated sludge pilot plants, one of which contained powdered activated carbon in the

mixed liquor. The two reactors were operated with dynamic loading and were sampled every 2 hrs over 24-56 hr sampling periods. Effluent nitrate from both the nitrification and denitrification processes varied according to the cyclic flow and loading rates of the reactors; hydraulic and solids retention times directly controlled the degree of nitrification-denitrification. As dynamic loading increased, the concentration of non-biodegradable dissolved organic carbon increased in the nitrification effluent. The dynamic model, developed with a Newton-Shooting iteration computer program, predicted a higher substrate removal for powdered activated carbon. Activated sludge treatment with powdered activated carbon at 5C required a higher microbial population to effect the same degree of nitrification-denitrification obtained at 20C. Powdered activated carbon influenced denitrification kinetics; heterotrophic growth affected nitrification kinetics. The maximum growth rate coefficient was the most sensitive process parameter. (Lisk-FIRL)
W78-12066

PRESENT SITUATION AND PROBLEMS ON ENVIRONMENTAL PROTECTION AND CONSOLIDATION IN JAPAN,
Tokyo Univ. of Agriculture and Technology (Japan). Chemistry Lab.
For primary bibliographic entry see Field 5G.
W78-12073

A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND -- PART 2,
For primary bibliographic entry see Field 5G.
W78-12079

GROUNDWATER LEVELS AS AFFECTED BY SWINE WASTE LAGOONS IN HIGH WATER TABLE SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
O. T. Bucklew, Jr.
M.S. Thesis, July, 1976, 102 p. 11 fig, 2 tab, 17 ref.

Descriptors: *Virginia, Ammonia, Chlorides, Heavy metals, Leaching, *Farm wastes, Waste water treatment, *Anaerobic lagoons, Groundwater pollution, *Swine wastes.

The pollution hazard from anaerobic lagoons was examined. The study involved 2 lagoons in Southeast Virginia that had heavy concentrations of ammonia, chlorides, and heavy metals, which could cause contamination of water supplies. One lagoon was located at the Virginia Polytechnic Institute and State University Tidewater Research and Continuing Education Center at Holland Station, Virginia, and the other was located on a private farm near the Holland Station. Two series of wells were installed at each lagoon and groundwater levels were recorded. The water table was then plotted to determine the presence or absence of a groundwater mound around the lagoon, which would indicate seepage from the lagoon. A statistical analysis was used to evaluate the significance of temporal and spatial variations of the water table. Study findings indicated that: (1) Based on the data collected, there were no significant water table changes that could be attributed directly to seepage from the lagoons. (2) Many variables affected the profile of the water table in the vicinity of the lagoon which made an evaluation of the water table levels more difficult. (3) There was an indication of independent groundwater movement around the lagoons. (Merryman-East Central)
W78-12084

CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
R. J. Ruane, T-Y. J. Chu, and V. E. Vandergriff.
In: Proceedings of the 30th Industrial Waste Conference, Purdue University, May 6, 7 & 8, 1975, p 1043-1065. (1975). 18 fig, 6 tab, 16 ref.

Descriptors: *Fish farming wastes, Water pollution, Sedimentation, Organic compounds, Ammonia, Nitrogen, Phosphorus, Suspended solids, Effluents, Catfish, Fecal coliforms, Settleable solids.

Organic compounds, solids, ammonia nitrogen, and phosphorus are the main pollutants from high-density channel catfish raceways. The organic compounds and total phosphate are related to concentrations of solids. Concentrations of ammonia nitrogen and phosphate are related to concentrations of solids. Concentrations of ammonia nitrogen and dissolved oxygen can be used as measures of metabolic activity. It might be more desirable to feed the catfish at least twice rather than once daily. The results of 1974 studies indicate that only concentrations of settleable solids and fecal coliform bacteria exceed the proposed EPA guidelines for effluent limitations and therefore, will require some means for removal. However, if the feeding rate had been greater, the proposed EPA limits on ammonia nitrogen and suspended solids might also have been exceeded. The waste characteristics of raceway discharges varied considerably with activity (i.e. metabolic, feeding, and flushing). However, with respect to daily mass loads of pollutants, the metabolic and feeding periods contribute essentially all the wasteload. Monitoring of raceway effluents should consist of 24-hour composited samples to 'average' the effects of the various activity periods. Also, such samples should be collected during 'normal' days for the variables that affect wastewater characteristics (i.e. dissolved oxygen concentration, feeding rate, flow rate, and type of feed used (sinking vs. floating)). Variables affecting waste characteristics include dissolved oxygen concentration, temperature, size of fish, feeding rate, stocking density, water flow, type of food, and activity period. Simple sedimentation of raceway effluents for a detention time of 15 minutes can remove more than 76 percent of the settleable solids. The effluent from such a facility contains less settleable solids than the effluent limitations proposed by EPA. Suspended solids, organic compounds, and total phosphate are removed in the settling basin to a lesser extent. Removal of these pollutants is greater during the flushing period because a larger percentage is associated with the suspended solids. Further study is needed to determine: (1) the source of the fecal coliform bacteria in raceway culture; (2) the effects of temperature, feeding rate, stocking density, and other variables on generation of fecal coliform bacteria; and (3) methods to reduce generation of the fecal coliform bacteria or to economically disinfect the raceway discharge. (East Central Univ)
W78-12086

POULTRY WASTE MANAGEMENT ALTERNATIVES: A DESIGN AND APPLICATION MANUAL,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12093

PROCESS FOR CONDITIONING SEWAGE SLUDGE.
Australian Patent 492,957. Issued May 25, 1978. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol 48, No 18, p 1672, May, 1978.

Descriptors: *Sewage sludge, *Sludge treatment, *Sludge digestion, *Patents, *Heat treatment, Sludge disposal, Disinfection, Domestic wastes, Farm wastes, Waste water treatment, Municipal wastes.

A process has been patented for sterilizing sludge at high temperatures to condition it for land disposal. The sludge is initially heated within a temperature range of 65-150C for a period between 30 sec and 60 min. When the sludge is treated in the higher temperature ranges, the shorter time periods are used. After the sewage sludge has been thermally sterilized, it is biologically treated by digestion at a temperature of 32-60C. This conditioning process, which prepares the sludge for land disposal, is suitable for domestic as well as farm wastes. (Lisk-FIRL)
W78-12098

5E. Ultimate Disposal Of Wastes

DRIED CATTLE PAUNCH MANURE AS A FEED SUPPLEMENT FOR CHANNEL CATFISH,
Robert S. Kerr Environmental Research Lab., Ada, OK.
S. C. Yin, R. C. Summerfelt, and A. K. Andrews.
In: Proceedings, Oklahoma Industrial Wastes and Advanced Water Conference, V. 23, p. 75-82, 1972. 1 fig., 1 tab., 9 ref.

Descriptors: Bacteria, Drying, *Farm wastes, *Feeds, Refeeding, *Dried paunch manure, Catfish, Storing.

This report describes some of the preliminary work done with paunch manure prior to launching a full-scale experiment to test the feasibility of using dried paunch as a feed supplement in channel catfish culture. Data concerning actual time requirements for successful drying were inclusive, but the paunch was air dried successfully and it was found that the dehydrated product could be stored for months without spoilage. While dried paunch incorporated into fish feed conceivably could become a serious water pollutant, if the amount of feed given each day is based on a certain percentage (usually 2-3 percent) of the body weight of the fish such pollution is not likely. The feed should be consumed by the fish within a short period of time. However, in a suspended cage culture situation, the pellets may eventually drift out of the confines of the cage where the fish cannot reach them. If that should happen, the dried paunch in the feed would definitely pollute the water, depleting the dissolved oxygen to the detriment of the fish. Studies will be done to provide an answer to this problem. No Salmonellae were isolated from the fresh paunch and it was decided that this was probably due to the paunch's low pH. Because of the low pH, the material may be safe from contamination by pathogenic bacteria; however, this must be verified. Catfish studies to be conducted at Oklahoma State University are expected to produce reliable and conclusive information on whether dried paunch is suitable as a feed supplement in channel catfish culture. (Rowe-East central)
W78-11336

UNDERGROUND INJECTION ON LIQUID WASTE CAN BE ENVIRONMENTALLY SOUND,
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 6E.
W78-11338

OCEAN DUMPING.
For primary bibliographic entry see Field 6E.
W78-11358

FATE OF TRACE ELEMENTS IN SEWAGE SLUDGE-AMENDED SOILS,
Dayton Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-11363

TOXIC METAL CONCENTRATION OF THE WATER TABLE AS AFFECTED BY POULTRY MANURE,
Delaware Univ., Newark. Dept. of Plant Science.
For primary bibliographic entry see Field 5B.
W78-11370

A MASS BALANCE STUDY OF RECYCLING SECONDARY MUNICIPAL WASTEWATER ON ABANDONED FIELD ECOSYSTEMS,
Michigan State Univ., East Lansing. Dept. of Zoology.
For primary bibliographic entry see Field 5D.
W78-11577

WATER QUALITY AND THE OCCURRENCE OF CHIRONOMUS RIPARIUS MEIGEN (DIPTERA: CHIRONOMIDAE) IN A STREAM RECEIVING SEWAGE EFFLUENT,
Plymouth Polytechnic (England). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-11666

REGION OF DURHAM LEADS WAY WITH SLUDGE DISPOSAL.
Water Pollution Control, Vol 116, No 5, p 22, May-June, 1978.

Descriptors: *Sludge treatment, *Sludge disposal, *Surveys, *Application methods, *Irrigation practices, Incineration, Nutrients, Heavy metals, Landfills, Soil amendments, Waste water treatment, Municipal wastes.

A comprehensive study of sludge disposal techniques is planned for nine sewage treatment plants and six water treatment plants in the region of Durham, Ontario, Canada. The sewage treatment plants have capacities ranging over 0.4-15.0 mgd; the water treatment plants have capacities of 0.7-30.0 mgd. The study will investigate the current sludge handling and disposal techniques used in all the plants and the problems associated with sludge treatment. The nutrient concentrations and metal contents of the individual sludges produced by the treatment plants will be measured and the results compared to guidelines established by the Ministries of Agriculture and Food, Health, and Environment. The final report will evaluate land disposal, landfilling, lagooning, and incineration as singular or combined methods of diposing of sludge from each plant. (Lisk-FIRL)
W78-11738

OIL REFINERY SLUDGE - AN INDUSTRY LOOKS TO LAND CULTIVATION,
For primary bibliographic entry see Field 5D.
W78-11777

CONVERSION OF SULFITE PULPING WASTE TO AN AGRICULTURAL PRODUCT,
Charmin Paper Products Co., Mehoopany PA.
For primary bibliographic entry see Field 5D.
W78-11781

SURVEY OF HUMAN VIRUS OCCURRENCE IN WASTEWATER-RECHARGED GROUNDWATER ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Energy and Environment.
For primary bibliographic entry see Field 5B.
W78-11785

THE EFFECT OF WASTE WATER REUSE IN COLD REGIONS ON LAND TREATMENT SYSTEMS,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 5D.
W78-11787

ELIMINATION OF FECAL COLIFORM BACTERIA FROM SOIL IRRIGATED WITH MUNICIPAL SEWAGE LAGOON EFFLUENT,
Singapore Univ. Dept. of Microbiology.
For primary bibliographic entry see Field 5G.
W78-11788

SLUDGE GAS AN ENERGY SOURCE IN SEWAGE WORKS,
For primary bibliographic entry see Field 5D.
W78-11790

HEALTH EFFECTS OF LAND APPLICATION OF WASTEWATER AND SLUDGE: WHAT ARE THE RISKS,
Texas Univ. at San Antonio. Center for Applied Research and Technology.
For primary bibliographic entry see Field 5D.
W78-11797

INFILTRATION THROUGH SOIL AS A TERTIARY TREATMENT OF SEWAGE EFFLUENT,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 5D.
W78-11805

SLUDGE DEWATERING STUDIES AT HYPERION TREATMENT PLANT,
Los Angeles Bureau of Sanitation, CA.
G. T. Ohara, S. K. Raksit, and D. R. Olson.
Journal Water Pollution Control Federation, Vol. 50, No. 5, p 912-925, May, 1978. 9 fig, 9 tab.

Descriptors: *Sludge treatment, *Dewatering, *Drying, *Centrifugation, *Filtration, Polymers, Chemicals, Heat treatment, Sludge disposal, Cost analysis, Waste water treatment, Municipal wastes.

The Los Angeles Bureau of Sanitation investigated sludge treatment and dewatering techniques as an alternative to ocean disposal of the 150 tons sludge with a solids content of 2.5% produced daily. Pilot plant studies covered solid-bowl centrifugation, basket centrifugation, vacuum filtration, drying beds, and pressure filtration. Physical, chemical, and thermal conditioning techniques of sludge treatment were also studied. The most suitable methods were identified by the study as: drying bed or evaporation pond dewatering of chemically-conditioned sludge; solid-bowl centrifugation of chemically-conditioned, thermophilically digested sludge; and basket centrifugation of chemically-conditioned, mesophilically digested sludge. The latter two treatment processes cost $41.40 and $39.50/ton dry solids, respectively, while drying bed treatment cost $22.40/ton dry solids, excluding the cost of required land. (Lisk-FIRL)
W78-11812

TURNING SLUDGE INTO SOIL CONDITIONER SOLVED A CITY'S DISPOSAL PROBLEM,
Water Pollution Control Div., Philadelphia, PA.
F. Senske, and T. Lauletta.
Water and Sewage Works, Vol. 125, No. 7, p 24-26, July, 1978. 2 tab.

Descriptors: *Sludge treatment, *Dewatering, *Anaerobic digestion, *Sludge digestion, *Soil amendments, Sludge disposal, Fertilizers, Nutrients, Heavy metals, Waste water treatment, Municipal wastes.

As an alternative to ocean disposal, sewage sludge from Philadelphia, Pennsylvania, is anaerobically composited, cured, shredded, and given to the public as a soil amendment. Philorganic has a solids content of 60-70%, about 17,000 mg/kg phosphorus, 9,700 mg/kg Kjeldahl nitrogen, 12,100 mg/kg iron, 3,900 mg/kg potassium, and quantities of mercury, cadmium, chromium, copper, lead, manganese, nickel, zinc, potassium, arsenic, vanadium, selenium, and beryllium. Sludge excavated from storage lagoons, containing about 25% solids, is spread in an 8-inch layer, harrowed with an agricultural disc, and scraped into containers; the process requires about 4 wks and produces a sludge containing about 60% solids. The addition of a cleated-belt conveyor shedding unit with a 125 cu yd/hr input capacity produced a more uniform and spreadable product. Fresh sludge is anaerobically composed for 21 days, cured for 20 days, and transported to the shredder for Philorganic production. The shredder automatically removes foreign debris from the sludge and recovers up to 50% of the wood chips being tested as a bulking agent. (Lisk-FIRL)
W78-11815

AERATED-PILE COMPOSTING: A PROMISING NEW ALTERNATIVE FOR DISPOSING OF SEWAGE SLUDGE,
For primary bibliographic entry see Field 5D.
W78-11821

ULTRAFILTRATION MEETS DISCHARGE REGULATIONS AND REDUCES WASTE PUMPOUT,
David W. Taylor Naval Ship Research and Development Center, Annapolis, MD.
For primary bibliographic entry see Field 5D.
W78-11825

LAND DISPOSAL OF TOXIC SUBSTANCES AND WATER-RELATED PROBLEMS,
Energy Resources Co., Inc., Cambridge, MA.
E. Epstein, and R. L. Chaney.
Journal Water Pollution Control Federation, Vol. 50, No. 8, p 2037-2042, August, 1978. 2 tab, 28 ref.

Descriptors: *Sludge disposal, *Application methods, *Heavy metals, *Toxins, *Solubility, DDT, Chelation, Chemical reactions, Acidity, Alkalinity, Soils, Plants growth, Phytotoxicity, Sewage sludge, Sludge digestion, Municipal wastes, Trace elements, Cations, Pathogens, Polychlorinated biphenyls.

The physical and chemical reactions occurring in soils and plants when sludge is applied to land are reviewed. Certain heavy metals become divalent cations in acidic soils; in alkaline or neutral soils, hydroxyl ions are often formed. Soil acidity usually increases the solubility of trace elements and heavy metals, thereby increasing the uptake of these substances by plants. Organic matter may act as a chelating agent when contacted with metal ions in the soil; higher soil cation exchange capacities reduce heavy and toxic metal chelation. Reversion of toxic metals to unavailable chemical forms is controlled by soil pH, phosphate, and organic material contents; soil moisture, temperature, and aeration also control the availability of metals in the soil. Accumulations of heavy metals in plants from the application of sewage sludge, fertilizers, or pesticides can result in phytotoxic effects. Significant amounts of organic chemicals, such as polychlorinated biphenyls, and pesticides, have been found in raw sludge from Michigan and the District of Columbia. Human pathogens have been shown to survive in soils and on plants from less than one day to nearly 7 years; risks associated with these pathogens are significantly reduced when digested or composted sludges are applied to land. (Lisk-FIRL)
W78-11827

LARGE EUNICE HARASSII AUDOUIN AND MILNE-EDWARDS FROM A SLUDGE DISPOSAL AREA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W78-11829

WIDER USE OF SEWAGE SLUDGE.
For primary bibliographic entry see Field 5D.
W78-11830

ORGANIC ASSIMILATION CAPACITY OF MAUMEE RIVER ESTUARY AT TOLEDO, OHIO,
Earthview, Inc., Toledo, OH.
For primary bibliographic entry see Field 5G.
W78-11862

STUDY OF FILTER PRESS DEWATERING OF SLUDGE FROM THE EFFLUENT TREATMENT PLANT AT THE SLIVNITSA FIBERBOARD MILL (IZSLEDVANIYA VYRKHU MEKHANICHNOTO OBEZVODIYAVANE NA UTAJKITE OT PRECHISTVATELNATA STANTSIYA NA ZAVODA ZA D'RVESPOVLAKNESTI PLOSKOSTI – GR. SLIVNITSA, S FILT'R-PRESA),
M. Staneva.
Trudove Vodosnabdyavane, Kanalizatsya, Sanitavna Tekhnika, Vol. 11, No. 2, p 79-89, 1975. 4 fig, 6 ref, 1 tab. English summary.

Descriptors: *Sludge treatment, *Dewatering, *Pulp wastes, Wastes, Industrial wastes, Activated sludge, Sludge, Sludge disposal, Coagulation, Lime, Iron compounds, Chlorides, Sulfates, Wood wastes, Filters, Thermal capacity, Filters, Filtration, Waste treatment, Iron chloride, Iron sulfate, Filter press.

At the Slivnitsa (Bulgaria) wood fiberboard mill, the primary and excess activated sludge separated from the purified effluent is dumped into drying basins. This method is ineffective. Experiments have been conducted with a model of the Soviet FPAKM filter press to determine the possiblity of using this apparatus for dewatering the sludge. The experiments were conducted with thickened excess sludge, and its mixtures with primary sludge and primary sludge from which particles larger than 3-3.5 mm had been removed. The materials to be dewatered were treated with coagulants (ferric chloride and sulfate, or lime, added in amounts of up to 7%, based on sludge dry solids), and wood shavings were added in an amound equal to the dry solids weight to improve the efficiency of the filter. The data obtained indicated that pressure filtration is a suitable dewatering means. Optimum conditions for an efficiency of 23 kg dry solids/sq m/hr include addition of 3.5-4.0% ferric chlorida and a pressure of 7-8 atmospheres. The moisture content of the dewatered sludge under these conditions is 73-75%. The caloific value of the drysolids is 380-4300 kcal/kg. An industrial process for sludge dewatering on the FPAKM filter press (preferably one of 25 sq m surface area instead of two filters 10 sq m each) was developed on the basis of the laboratory data. (Stapinski-IPC)
W78-11921

DISPOSAL OF AEROBICALLY DIGESTED SLUDGE,
Little Blue Valley Sewer District, Independence, MO. Interim Treatment Plant.
For primary bibliographic entry see Field 5D.
W78-11930

TOWN ABANDONS TERTIARY SEWAGE PLANT.
For primary bibliographic entry see Field 5D.
W78-12005

STALLED SLUDGE TALKS SPUR COURT ORDER.
Engineering News-Record, Vol 201, No 4, p 19, July, 1978.

Descriptors: *Sludge disposal, *Biodegradation, *Treatment facilities, *Legal aspects, *Judicial decisions, Ultimate disposal, Negotiations, Sewage sludge, Sludge treatment, Municipal wastes.

The District of Columbia has been ordered by the federal district courts to construct a sludge composting plant to treat the 850 tons/day of wet sludge produced by Washington and three other counties. The city has claimed that a composting facility will produce particulate emissions exceeding federal limits and release a lung disease-related fungus that would present a health hazard to patients in a nursing home 2,000 ft from the site. EPA has reported that no data has yet been presented to support these claims. The sludge is currently transported to the three countries for burial, composting, or land application; negotiations had centered on the ultimate location for disposal of the sludge. The $2 million composting facility will be constructed at Washington's Blue Plains waste water treatment plant. (Lisk-FIRL)
W78-12031

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2H.
W78-12038

RUNOFF AS A FACTOR IN EUTROPHICATION OF SURFACE WATERS IN RELATION TO PHOSPHORUS MANURING,
Institute for Soil Fertility, Groningen (Netherlands).
G. J. Kolenbrander.
Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the 'Instituto Sperimentale Agronomico', Modena, Italy, Sept. 20-24, 1976, p 181-196. (1976) 2 fig, 6 tab, 14 ref.

Descriptors: *Water pollution sources, Eutrophication, *Phosphorus, *Agricultural runoff, *Farm wastes, *Waste disposal, *Land application, Netherlands.

Because phosphorus is the only element essential to algal growth, the phosphorus load to Holland's surface waters needs to be reduced in order to improve water quality. The phosphorus load resulting from runoff from agricultural land receiving manure fertilization is examined. In Holland, runoff during the growing season is of minor importance because the water storage capacity of the topsoil is usually sufficient to absorb rainfall amounting to 20-35 mm/day. Only arable and grassland clay soils that are impermeable or poorly drained may result in some runoff on 1-5 days a year. When the soil is frozen during the winter, about 25 mm of precipitation may accumulate and reach surface waters in the spring as meltwater. Such runoff may amount to 0.04 - 0.08 kg Pt per ha per year, depending upon the soil type and the amount of phosphorus applied. Manure surpluses produced in regions with sandy soils should be utilized on marine clay soils because they have a high phosphorus adsoption capacity. Winter application of manure to grassland must be considered a potential danger to the quality of surface water. (Rowe-East Central)
W78-12056

PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL,
Institute for Soil Fertility, Groningen (Netherlands).
R. G. Gerritse.
Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the 'Istituto Sperimentale Agronomico,' Modena, Italy, Sept. 20-24, 1976, p. 257-266. (1976) 2 fig, 4 tab, 8 ref.

Descriptors: *Slurries, Phosphorus compounds, Water pollution, Groundwater pollution, Soil profiles, *Farm wastes, *Swine wastes, Land application, Soil adsorption, *Soil retention(Wastes).

Phosphorus in animal wastes, which in some agricultural areas are applied to the soil in excessive amounts, is a potential pollutant of surface and groundwater. Retention of inorganic phosphate in the soil is determined by the adsorption characteristics of the soil. The main factors influencing adsorption in the soil are organic matter, aluminum and iron content, specific surface area of the soil and soil pH. To be able to evaluate inorganic phosphorus movement in the soil properly, columns of undisturbed soil of 80 cm length have been set up under unsaturated flow conditions and treated with the equivalent of 800 m3/ha of pig slurry (7% dry matter). Phosphorus, chloride and phosphatase activity are monitored in the column effluent, resulting from a simulated rainfall of about 1 cm/day. Preliminary results indicate that organic phosphorus compounds move almost as fast as chloride. Chloride breakthrough in the column effluents occurred after one montgh and organic phosphorus broke through less than a week later, and reached concentrations of 1-2 mg P/litre. The organic phosphorus compounds in the effluent were mainly (70-80%) of high molecular weight, as has also been found for organic P in solution in pig slurry. Inorganic P in the effluent has not significantly increased and is of the order of 0.001-0.1 mg P/liter. After about 1-2 years the soil profile will be analyzed for inorganic and organic phosphorus and phosphatase activity. On the basis of various parameters, a computer model of phosphate transport in the column will be made and the results of simulation compared with practice. (Merryman-East Central)
W78-12057

WATER POLLUTION BY LIVESTOCK EFFLUENTS,
Institut de Recherches Chimques, Tervuren (Belgium).
For primary bibliographic entry see Field 5B.
W78-12058

AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY,
West of Scotland Agricultural Coll., Auchincruive, (Scotland).
For primary bibliographic entry see Field 5D.
W78-12059

FARMYARD MANURE AND CROP PRODUCTION IN DENMARK,
Askov Experimental Station (Denmark).
For primary bibliographic entry see Field 5G.
W78-12060

PATHOGEN CONSIDERATIONS FOR LAND APPLICATION OF HUMAN AND DOMESTIC ANIMAL WASTES,
Agricultural Research Service, Beltsville, MD.
J. D. Menzies.
In: Soils for Management of Organic Wastes and Waste Waters, Chapter 22, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p 574-585. 17 ref.

Descriptors: *Farm wastes, Municipal wastes, Pathogenic bacteria, Public health, *Land application, Animal health, Waste disposal.

Recycling of animal manures directly in pasturing or by spreading manure from barns and feedlots on the land is an historically accepted practice. The land is also being used more and more for disposal of municipal wastes. Organic wastes from human or domestic animals inevitably contain pathogens. Consequently, certain safeguards should be observed. Basic guidelines for applica-

tion of municipal wastes are: (1) Present regulations protecting domestic water supplies should be maintained. (2) In using sewage sludges on land, properly operated anaerobic digestion, secondary activation, lagooning, or liming to pH 11.5 or above should be sufficient treatment for reducing pathogens to a safe level. (3) Untreated raw sludges and raw effluent water should not be used in food crop production until more is known about this hazard. (4) Composted sludges should be considered to be sufficiently free of pathogens to be used for crop and food production. (5) Raw sewage effluent should be safe for sprinkling on land where public access is controlled and suitable buffer zones are provided to take care of aerosol drift. (6) Effluent from properly operated secondary treatment plants or lagoon systems should be considered safe to use on grains, forage and other animal feed crops. (7) Sewage effluent should not be sprinkled on human food crops. (8) Surface application of sewage sludges or effluent should be done with reasonable precautions to prevent surface runoff into open water. In terms of land application of animal wastes, a number of studies have shown that it is a good precautionary practice to restrict animals from sprayed pastures for a week or 10 days of sunny weather after application. This exposure to heat, ultraviolet radiation, and drying is generally lethal to Salmonella, fecal coliforms, and probably viruses. (Merryman-East Central)
W78-12062

LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS,
Arizona Univ., Tucson.
W. H. Fuller, and T. C. Tucker.
In: Soils for Management of Organic Wastes and Waste Waters, Chapter 17, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p 472-489. 6 tab, 31 ref.

Descriptors: *Farm wastes, Municipal wastes, Industrial wastes, Arid lands, Environmental effects, Air pollution, Ground water pollution, *Waste disposal, *Organic wastes, Plant wastes, *Land application.

Aridity may be described as a comparison between water supply and water need. Water supply is relatively easy to measure. Water need, which refers primarily to potential evapotranspiration, is more difficult to evaluate. Chemically, arid land soils are neutral to alkaline in pH and high in salts. Animal manures in arid regions probably differ from those in humid regions more than other waste materials. Moisture content of wastes and also the leaching associated with rainfall are less prominent in arid than in humid lands. The custom of housing animals in exposed and unpaved corrals and feedlots results in the manures mixing with sand and soil. For manures to be beneficially used on soils in crop production, special management practices must be used to avoid the following problems: (1) excessive salt hazard, (2) high loading rates, (3) accumulation of unfavorable levels of trace and heavy metals, (4) potential disease problems, and (5) high levels of Na and K in proportion to Ca plus Mg. The nature of other wastes (including plant wastes, municipal solid wastes, sludges, city effluent, and industry waste streams) must also be taken into account in arid regions. At present, organic waste and waste water management in arid region soils of the United States is based on limited research. Water pollution and air pollution potential must be examined. While many of these wastes and waste waters may be beneficially applied to arid lands due to nutrient and moisture content, wise management systems must be utilized to avoid any detrimental conditions that may arise from such applications. (Merryman-East Central)
W78-12063

SLURRY PROBLEMS IN RELATION TO POLLUTION OF SURFACE WATERS,
Queen's Univ., Belfast (Northern Ireland).
For primary bibliographic entry see Field 5G.
W78-12067

DAIRY WASTE DISPOSAL,
For primary bibliographic entry see Field 5G.
W78-12068

GUIDELINES FOR MANURE USE AND DISPOSAL IN THE WESTERN REGION, USA,
Agricultural Research Service, Brwaley, CA. Imperial Valley Conservation Research Center.
B. Meek, L. Chesnin, W. Fuller, R. Miller, and D. Turner.
Bulletin 814, Agricultural Research Center, Washington State University, 1975. 18 p, 10 fig, 21 tab, 50 ref.

Descriptors: Chemical properties, Physical properties, Biological properties, Water pollution, Odor, Dust, Salinity, *Farm wastes, *Waste disposal, Western United States, *Land application, Flies, Ammonia toxicity, Guidelines.

Although the variety of climates in the Western Region of the United States suggests a variety of techniques for pollution control and effective manure handling, the great proportion of manure is being recycled to the land as fertilizer and soil amendments. Guidelines for land application are given which will encourage the efficient use of manures in crop production. Physical, chemical, and biological properties of various types of manure are discussed. Water pollution in relation to land application of manures is discussed. Problems associated with overuse (salinity, ammonia toxicity, and oversupply of elements and trace elements) are examined. Guidelines are given for applying manure to warm irrigated regions (more than 6,000 annual degree days), to cold irrigated regions (less than 6,000 annual degree days), to dryland regions, and to humid regions. (Merryman-East Central)
W78-12074

WHAT TO DO WITH ANIMAL WASTES ... RECYCLING,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5G.
W78-12085

USE OF FLUID COWSHED MANURE IN FISH PONDS,
Agriculture Research Organization, Dor (Israel). Fish and Aquaculture Station.
G. L. Schroeder.
Bamidgeh, Vol. 26, No. 3, p 84-96, 1974. 6 fig, 5 tab, 4 ref.

Descriptors: Fish ponds, Fishkills, Biochemical oxygen demand, Chemical oxygen demand, Dissolved oxygen, *Farm wastes, *Israel, Refeeding, Cattle manure, Fish growth, Dry matter.

Manure is often used as a fertilizer for fish ponds. The decay of the manure in the pond consumes dissolved oxygen (D.O.) and can lower the D.O. to a level at which fish kill by anoxia occurs. To determine the effects of fluid cowshed manure on fish ponds, the cycles of D.O., abundance and protein content of natural foods, and fish growth were studied in a group of ponds receiving varied amounts of manure. The manure was analysed for 1 day and 5 day biological oxygen demand (BOD1, BOD5) at pond temperature, chemical oxygen demand (COD), and percent dry matter. No foods or fertilizers other than manure were added to the ponds. Determining BOD1 of the manure at pond temperature consistently allowed prediction of the maximum amount of oxygen that decay of manure would use and the maximum overnight reduction of D.O. in the pond water due to the added manure. This permitted calculation of the amount of manure that could be added to a pond without hazard of causing anoxia. For a given source of manure, the percent of dry matter was a fair indicator of BOD1. Abundance of natural foods (zooplankton and chironomides) was greater in ponds receiving manure than in non-manured ponds. The zooplankton had a 56% protein content on a dry weight basis. For rates of about 5,000 fish per hectare preliminary data indicate that growth of carp was 25% to 100% faster in manured ponds than in non-manured ponds. With no supplemental food, in manured ponds, carp stocked at 18 gm averaged a growth rate of 3.3 gm/day for 40 days during the summer. Carp stocked at 180 gm averaged a growth of 4.0 gm/day during March. (East Central Univ)
W78-12088

NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12089

CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE,
Colorado State Univ., Fort Collins.
J. L. Smith, D. B. McWhorter, and R. C. Ward.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 350, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/2-77-117, June, 1977. 47 p. 11 fig, 15 tab, 4 ref.

Descriptors: Liquid wastes, Fertilizers, Groundwater pollution, Nutrients, Salts, Heavy metals, Odor, Insects, Agricultural runoff, Aesthetics, Economics, *Farm wastes, *Waste disposal, *Dairy wastes, *Injection, Bacteria, Site selection.

The research has involved the development and evaluation of an efficient, economical, continuous subsurface injection machine. The application site was instrumented so the quality of water percolating beneath the injection zone could be measured. Wells located around the sites were used to monitor groundwater quality. Soil samples were taken periodically to determine nutrients, salts, heavy metal concentrations, and bacteria movement and survival. Major environmental problems were increased soil salinity and movement of fecal coliform to the groundwater. Both of these problems can be eliminated by proper management and site selection. Subsurface injection is economically feasible when compared with other methods of land application. Although capital costs are greater for subsurface injection, labor costs are significantly reduced. Other advantages of subsurface injection are elimination of odors, insects, and visual pollution and minimization of runoff pollution. (East Central)
W78-12092

PROCESS FOR CONDITIONING SEWAGE SLUDGE.
For primary bibliographic entry see Field 5D.
W78-12098

5F. Water Treatment and Quality Alteration

THE DULUTH EXPERIENCE--ASBESTOS, WATER, AND THE PUBLIC,
Minnesota Dept. of Water and Gas, Duluth.
D. L. Peterson.
Supplementary notes: Journal of the American Water Works Association, Vol. 70, No. 1, p. 24-28 (January, 1978).

Descriptors: *Minnesota, *Lake Superior, *Asbestos, *Water pollution treatment, Utilities, Oligotrophy, Water sources, Filtration, Construction, Potable water, Pollutant identification, Municipal waters.

In 1973 the Environmental Protection Agency (EPA) announced the finding of numerous asbestos-like particles in Duluth tap water which originated from Lake Superior. The EPA advised residents to find an alternative source of drinking water since it was feared the particles might be carcinogenic. The amosite fibers that were found in an unsafe concentration seem to have originated from the dumping of tailings from a taconite-iron-ore benefication plant. The discovery spurred city officials to begin planning of a conventional filter plant to alleviate the problem. After an initial deadlock on the question of which filteration system to use, the EPA conducted tests and then recommended a process that would achieve acceptable results. The article chronicles various actions taken in the courts and the predictable public outcry concerning the crisis. The difficulties inherent in the financing of the new water treatment plants are discussed along with various construction scheduling problems encountered prior to final completion. The article stresses the inability of the public to accept the necessary time delays in dealing with a problem of this magnitude. (Quarles-Florida).
W78-11321

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN: SUMMARY REPORT.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11475

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX C: PLAN FORMULATION.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11478

WASTEWATER MANAGEMENT STUDY CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX D: DESCRIPTION AND COST OF ALTERNATIVES.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11479

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX G: VALUATION.
Corps of Engineers, Chicago, IL. Chicago District.
For primary bibliographic entry see Field 5D.
W78-11481

COLD-CLIMATE WATER/WASTEWATER TRANSPORTATION AND TREATMENT -- A BIBLIOGRAPHY,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W78-11574

DEVICE FOR REGULATING DRINKING WATER,
Okazaki Mfg., Co. Ltd., Kawagoe (Japan).
T. Okazaki.
U.S. Patent No. 4,077,862, 12 p, 12 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 968, no 1, p 274, March 7, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Potable water, Electrolysis, Electrodes, Water softening.

A device for regulating drinking water comprises an electrolyzer which is divided into a negative electrode chamber and a positive electrode chamber by an unglazed protion. Positive and negative electrodes are energized by direct current for a prescribed period of time to separate water into two components having hydroxyl radical in different densities by electrolysis and electroendosmose. A heating element in the hollow space of the negative electrode warms the water in the electrolyzer at each time of electrolysis and results in water softening. (Sinha - OEIS)
W78-11939

TREATMENT OF SULFIDE-BEARING WATERS WITH CHLORINE DIOXIDE,
Olin Corp., New Haven, CT. (Assignee).
C. I. Smeck.
U.S. Patent No. 4,077,879, 7 p, 3 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 968, No 1, p 279, March 7, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Taste, Odor, Water pollution effects, Sulfides, Petroleum industry.

Naturally occurring taste, odor and solids problems are often found in water systems. One particularly difficult water system problem involves the removal of various sulfide compounds which are generally undesirable for most water uses. In addition to the putrid odor problems which occur with the presence of sulfides, these sulfides often cause serious disruption to industries using sulfide-containing water systems due to sulfide compound build-up and blockage. The sulfides are particularly problematic in systems containing sulfate-reducing bacteria which feed on sulfate compounds and produce the undesirable sulfides. It has now been discovered that if chlorine dioxide is added in specified critical amounts and at critical rates of addition free sulfur formation is avoided and sulfide content is reduced (and also a reduction or removal of the problem bacteria, if present). (Sinha - OEIS)
W78-11941

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
CIBA-GEIGY Corp., Ardsley, NY. (Assignee).
J. Haase, Q. Bowes, and R. F. Wurster.
U.S. Patent No. 4,079,001, 10 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 968, No 2, p 653, March 14, 1978.

Descriptors: *Patents, *Water purification, *Water pollution treatment, *Waste water treatment, Industrial wastes, Color, Bleaching wastes, Adsorption, Water reuse.

A process is provided for the purification of industrial effluents, in particular the decolorisation of waste water occurring in the textile, paper and leather industry and in the manufacture of fluorescent brighteners and dyes, for example filtrates, residual liquors, rinsing and wash waters. The process consists in bringing the effluents into contact with an adsorption material that contains a carrier which has been pretreated with a precipitate of a basic, nitrogenous polymeric compound with an activated clay mineral. The effluents to be purified are brought in undiluted form into contact with the adsorption material which can be used after a pH adjustment, e.g. from 2 to 7, especially 3 to 5. On account of the broad applicability of the adsorption material, it is possible to meet the present ever more urgent demand for saving fresh water by a partial to complete recirculatin of residual or waste liquors. (Sinha - OEIS)
W78-11945

HEALTH ASPECTS OF WATER REUSE IN CALIFORNIA,
California State Dept. of Health, Berkeley.
J. Crook.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 601-610, August 1978. 1 fig, 1 tab, 19 ref.

Descriptors: *Water reuse, *Waste water(Pollution), *Sewage treatment, *Health hazards, *Public health, Standards, Water quality, Reclamation, Environmental engineering, California, Regulation, Disease.

The activities of the State of California Department of Health pertaining to wastewater reclamation and reuse are considered. The historical sequence of regulation development in California and the rationale for specific policies and standards deemed necessary to assure public health protection are described, as is the current status of reuse in terms of numbers of wastewater reclamation facilities, types of reuse, and quantities of wastewater reused. Also, a relatively poor record of sewage treatment plant reliability is documented. The potential for human illness or disease from chemical and biological contaminants associated with wastewater reclamation is presented, both from the standpoint of water quality and operational procedures. The health risks associated with direct reuse for potable purposes are presented, with emphasis on treatment, reliability, and potential chronic health effects attributable to trace organic constituents. (Bell-Cornell)
W78-12044

TRIHALOMETHANES AND VIRUSES IN A WATER SUPPLY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-12045

5G. Water Quality Control

THE PORT OF OAKLAND DECISION: CALIFORNIA OIL SPILL LEGISLATION GETS WATERED DOWN,
For primary bibliographic entry see Field 6E.
W78-11301

EXISTING WATER LAWS AND INDUSTRY PRACTICES: THEIR CONTRIBUTION TO THE WASTE OF WATER,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6E.
W78-11302

OIL POLLUTION LAW AND THE LIMITATION OF LIABILITY ACT: A MURKY SEA FOR CLAIMANTS AGAINST VESSELS,
Kelley, Drye and Warren, New York.
For primary bibliographic entry see Field 6E.
W78-11305

A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS,
Agricultural Research Service, Watkinsville, GA.
For primary bibliographic entry see Field 5B.
W78-11308

OIL AND WATER,
For primary bibliographic entry see Field 6E.
W78-11311

REFLECTIONS ON WASHINGTON'S COASTAL ZONE MANAGEMENT PROGRAM,
Washington State Dept. of Ecology, Olympia. Shoreline Div.
For primary bibliographic entry see Field 6E.
W78-11313

COMMON LAW V. STATUTORY POLLUTION ABATEMENT: THE TEXAS ATTORNEY GENERAL'S DILEMMA,
For primary bibliographic entry see Field 6E.

V78-11314

POLYCHLORINATED BIPHENYLS TOXIC POLLUTANT EFFLUENT STANDARDS,
Environmental Protection Agency, Washington, DC.
Federal Register, Vol. 42, No. 22, p. 6532-6555 February 2, 1977).

Descriptors: *Toxins, *Polychlorinated biphenyl, Water pollution effects, Administrative decisions, *Aquatic environment, Chemicals, Pollutants, Toxicity, Water pollution effects, Administrative decisions, *Aquatic environment, Chemicals, Pollutants, Toxicity, Water pollution, Public health, Chemical wastes, Inorganic compounds, Industrial wastes, Pollutant identification, Water pollution sources, Administrative agencies, Regulations, Federal government, Federal Water pollution control act, Decision making.

In order to meet requirements of the amended Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) has prohibited the discharge of Polychlorinated Biphenyls (PCBs). PCBs are used primarily as insulating fluids in electrical equipment. However, substitutes are available and are being developed. Control technology is also available. Before reaching the decision to prohibit discharge, the EPA conducted comprehensive studies on PCBs. Toxic or adverse effects were found in bacteria, phytoplankton, Fish and aquatic invertbrates, birds, and mammals. Very low exposure was sufficient to cause toxic effects in mammals. These effects have relevance for humans. PCBs have been implicated as a cause of the occupational disease chlorance, and have been associated with a number of carcinogenic effects. among their physical properties, PCBs are resistant to metabolic degradation and have a long life in the environment. They are transported in solution, in the air with vapor, or in the tissues of animals. They also have the tendency to be bioaccumulated or bioconcentrated in the tissues of aquatic organisms, so that the level of PCBs in their bodies is higher than that in the ambient water. (Malefatto-Florida)
W78-11319

A CRITICAL APPRAISAL OF PROPOSED CHANGES TO THE 1972 WATER POLLUTION CONTROL ACT,
New York State Dept. of Environmental Conservation, Albany.
H. H. Bagley.
Civil Engineering--American Society of Civil Engineers, Vol. 47, No. 11, p. 66-69 (November, 1977).

Descriptors: *Federal Water Pollution Control Act, *Future planning(Projected), *Water pollution control, *Water quality control, Permits, Standards, Administration, Economic efficiency, Management, Non-structural alternatives, Regional development, Governmental interrelations.

Modifications of the 1972 Water Pollution Control Act (WPCA) will likely be influenced by proposals from the federal Environmental Protection Agency (EPA), the National Commission on Water Quality (NCWQ) Report, and the 1976 Needs Survey. EPA proposals have included limiting federal grant eleigibility for local sewage facilities, imposing 'non-compliance fees' on violating private point source discharges and transferring part of EPA's construction grants management functions to the states. Of these proposals the author asserts that limiting federal grants would defeat sewage facilities construction plans, that 'non-compliance fees' would not be as economically beneficial as currently mandated pollution abatement measures, and the state construction grant management would speed up processing and avoid duplication. The NCWQ proposal to extend the 1983 'best available technology' goal for treatment of industrial discharges is unnecessary, according to the author. However, the NCWQ recommendation to provide stable federal funding for local treatment works was favored. Two other suggestions offered in the article were that the method of raising revenue for operation and maintenance of local sewage treatment works should be left to local option, and that the user charge requirement should be deleted from the WPCA. (Baumback-Florida).
W78-11322

A MULTI-FACETED, MULTI-AGENCY DETECTION, RESEARCH AND ENFORCEMENT PROGRAM.
For primary bibliographic entry see Field 6E.
W78-11324

ORE MINING AND DRESSING EFFLUENT GUIDELINES--TO BPT OR NOT TO BPT,
American Mining Congress, Washington, DC.
J. R. Walpole.
Rocky Mountain Mineral Law Institute, Vol. 23, p. 353-384 (1977).

Descriptors: *Federal Water Pollution Control Act, *Design standards, *Monitoring, *Regulation, Administrative agencies, Standards, Water quality standards, Permits, Law enforcement, Institutional constraints, Cost-benefit analysis, Industrial wastes.

In 1973 the Environmental Protection Agency (EPA) promulgated effluent guidelines, pursuant to the Federal Water Pollution Control Act, for the ore mining and dressing point source category. It was then apparent that tremendous differences of opinion existed between the EPA and the regulated industries regarding the accuracy of essential technical information and calculations. Eleven lawsuits challenging the regulations were filed. Consequently, the EPA suspended its regulations in 1976 after meeting with industry representatives. At the writing time of this article, the EPA had indicated its intent to revise the ore mining regulations, although it still had not promulgated revised guidelines. This paper reviewed how the regulations were developed, including the activities of the EPA, consulting firms hired by the Agency and the mining companies affected by the regulations. One section of the paper proposed guidelines for regulated industries. Suggestions included: (1) when a large segment of the industry is affected, a central organization should be designated to monitor the program in detail; (2) industry representatives should encourage meetings and discussions with EPA personnal; and (3) comprehensive industry comments should be submitted to the EPA when allowed. (Baumbach-Florida).
W78-11326

QUALITY V. QUANTITY: THE FEDERAL WATER POLLUTION CONTROL ACT'S QUIET REVOLUTION IN WESTERN WATER RIGHTS ADMINISTRATION,
Debevoise and Libeman, Washington, DC.
J. C. Muys.
Rocky Mountain Mineral Law Institute, Vol. 23, p. 1013-1040 (1977).

Descriptors: *Federal Water Pollution Control Act, *Governmental interrelations, *Water supply, *Water rights, Legislation, Water pollution state jurisdiction, Prior appropriation, Decision making, Cost-benefit analysis, Water demand, Water utilization.

The 1972 Federal Water Pollution Control Act (FWPCA) Amendments have posed problems for administration of water rights in the arid western states. Effluent guidelines established by the Environmental Protection Agency (EPA) for thermal discharge have necessitated the use of water cooling systems which consume significantly more water for their operation than do other cooling systems. The author proposes that the existing local agencies which administer the non-point source pollution control program as specified by the FWPCA, should also be permitted to vary EPA proposed effluent limitations. The local agency would be able to balance local considerations such as lack of water against thermal and other water quality needs. Another problem concerns how to accomodate a particular effluent limitation into the schedule of water rights appropriations where it is agreed that the particular limitation is appropriate even though it increases consumptive use. The author asserts that users should have to aquire the increased water rights either by : (1) a new appropriation where unappropriated water is available; (2) purchase; or (3) condemnation. (Baumbach-Florida).
W78-11328

ENFORCING THE FEDERAL WATER RESOURCE SERVITUDE ON SUBMERGED AND RIPARIAN LANDS,
Department of Justice, Raleigh, NC. Eastern Div.
For primary bibliographic entry see Field 6E.
W78-11334

CHANGES IN SEEPAGE RATE FROM AN UNLINED CATTLE WASTE DIGESTION POND,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
F. E. Robinson.
Transactions of the ASAE, V. 16, No. 1, p. 95-96, Jan.-Feb., 1973. 2 fig., 7 ref.

Descriptors: *Seepage, Conductivity, Nitrates, *Farm wastes, *Cattle wastes, *Waste digestion pond, *Groundwater pollution.

Solid and liquid wastes from 24 cattle were emptied into an unlined pit that was approximately 4 feet deep, 19 feet wide, and 77 feet long. The soil in the area of this pit was alluvial with layers of clay loam, silty clay loam, and clay to 5.5 feet, with a water saturated 6-inch of fine sandy loam at the 5.5 feet depth. The water table in the sand strata was sampled for conductivity and nitrate content prior to filling the pond. Sampling procedures were set up which allowed a comparison of conductivity and nitrate levels in the pond and the sand strata beneath the pond after the pond was put into use. The initial 4.4 in./day seepage rate dropped to 0.220 in. in 3 months and to 0.119 in./day in 6 months. Dilution of the groundwater around the pond was most rapid during the first 3 weeks, suggesting that the major seepage rate reduction took place during this period. Nitrate addition to the groundwater was about 0.427 lb/animal/year after 3 months and about 0.259 lb after 6 months. (Merryman-East Central).
W78-11335

HOUSE-SENATE COMMITTEE COMPROMISES ON PL 92-500,
For primary bibliographic entry see Field 6E.
W78-11337

THE IMPLICATIONS OF SURFACE AND SUBSURFACE MINING POLICY FOR GROUNDWATER PROTECTION IN PENNSYLVANIA,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Mine Drainage Control and Reclamation.
D. R. Thompson.
Water and Sewage Works, Vol. 124, No. 12, p. 70-71 (December, 1977).

Descriptors: *Pennsylvania, *Groundwater, *Water pollution treatment, *Acid mine water, Water quality control, Water pollution, Coal mine wastes, Mine drainage, Legislation, Judicial decisions, Dewatering, Water quality standards.

Pennsylvania is living with problems created 150 years ago. Most of its anthracite mining occurred before its geology and groundwater systems were understood. Today old mines divert groundwater through a maze of complex, interconnected tunnels. At present it is difficult to determine the impact on groundwater of past and present mining efforts. More geochemical and hydrological studies are needed. Several state and federal laws currently deal with the problems of pollution from coal mine acid drainage. As of 1965, all coal mines have been required to have permits based upon approval of their drainage and waste disposal systems. In 1970, the Pennsylvania legislature dictated that all mines had to be sealed water tight upon closure. Two later U.S. Supreme Court decisions stated that an operating mine was responsible for all acid mine drainage into Pennsylvania waterways, including mine drainage from abandoned mines. Other policies directed at the coal industry include: (1) sub-water table mines must be dewatered, with the discharged water being treated where needed; (2) water accumulated in surface mines must be pumped and treated; and (3) all discharges from operation must meet the water quality criteria of recipient streams. (Baumbach-Florida)
W78-11339

THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMAL WASTE IN BOISE VALLEY, IDAHO,
Boise State Univ., ID.
L. L. Mink, C. M. Gilmour, S. M. Beck, J. H. Milligan, and R. L. Braun.
In: Proceedings of the Third National Ground Water Quality Symposium, Environmental Protection Agency Report EPA-600/9-77-014, June, 1977, p 55-69. 11 fig, 9 tab, 30 ref.

Descriptors: *Feedlots, *Management, Chemical properties, Soil profiles, *Sites, *Land disposal, *Idaho, *Groundwater pollution, Application rates.

Environmental effects of feedlot location and related land disposal operations can be minimized if proper knowledge of hazardous conditions are known and appropriate protective steps taken. Common guidelines often do not apply because of differing physical characteristics of local areas. Analyses of various parameters within a soil profile beneath a feedlot revealed none of the chemical constituents present in high concentrations below the 23-foot depth. In areas where shallow ground water was less than 5 feet from the surface, the ground water was found to be affected by the feedlot. Other hazardous areas in feedlot location are flood-prone areas, areas of surface bedrock, and areas of excessive slope. For land disposal operations, loading rates and frequency of application of feedlot waste should be adjusted in accordance with soil permeability, depth to ground water, and irrigation practices to minimize detrimental effects on ground-water quality. (East Central)
W78-11340

PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED: QUANTITIES, PROCESSES, AND SOURCES,
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 5B.
W78-11341

REMEDIES IN ADMIRALTY FOR OIL POLLUTION,
Duncan, Brown, Weinberg and Palmer, Washington, DC.
S. E. Roady.
Florida State University Law Review, Vol. 5, No. 3, p 361-380 (Summer, 1977).

Descriptors: *Oil spills, *Remedies, *Penalties(Legal), *Legislation, Oceans, Oil pollution, Florida, Jurisdiction, Trespass, Negligence, Legal aspects, Damages.

The recent spate of oil spills has increased the possibility of shoreline property owners seeking to recover damages for tankers' oil pollution. This article attempts to explore the admiralty remedies available to owners residing in states which lack the statutory protection afforded Floridians by the Florida Pollutant Spill Prevention and Control Act. After reviewing relevant cases, it is concluded that the current state of admiralty law should spur concerned beachowners in Georgia, Alabama, California and Louisiana to sponsor legislation similar to the Florida act. An examination of current admiralty law reveals that modern identification techniques, coupled with the availability of the legal doctrine of 'res ipsa loquitur,' increase the probability of a private party successfully establishing liability on the part of the offending vessel and its owners. However, the prospects of avoiding limitation of liability problems remain uncertain. Unless the claimant can rely upon a statutory right of direct action against the insurer of the vessel, the cause of action may not be successful. The article also examines the federal and other states' responses to the problem. (Quarles-Florida)
W78-11342

DESKOVICH V. WATER POLICY AND SUPPLY COUNCIL (SANITARY LANDFILL SUBJECT TO AGENCY REGULATION).
For primary bibliographic entry see Field 6E.
W78-11346

PARKING MALL ASSOCIATES V. WATER POLICY AND SUPPLY COUNCIL OF THE DIVISION OF WATER RESOURCES OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION (ADMINISTRATIVE AGENCY CAN ASSESS TIME LIMITS FOR COMPLIANCE WITH PERMIT CONDITIONS).
For primary bibliographic entry see Field 6E.
W78-11347

UNITED STATES OF AMERICA V. SLADE, INCORPORATED (OWNER OF OIL SPILLING TANKER ASSESSED CIVIL PENALTIES AND CLEANUP COSTS).
For primary bibliographic entry see Field 6E.
W78-11349

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RAILROAD COMPANY V. UNITED STATES (CLEANUP COSTS OF OIL SPILL CAUSED BY BURGLAR RECOVERABLE FROM UNITED STATES).
For primary bibliographic entry see Field 6E.
W78-11351

MOE V. DIVISION OF STATE LANDS (THE POWER OF THE DIVISION OF STATE LANDS TO GRANT FILL PERMITS FOR SUBMERGED LANDS).
For primary bibliographic entry see Field 6E.
W78-11355

WETLANDS AND RIPARIAN RIGHTS.
For primary bibliographic entry see Field 6E.
W78-11356

STATE, DEPARTMENT OF ENVIRONMENTAL PROTECTION V. EXXON CORP. (LANDOWNER'S LIABILITY FOR PREVIOUS USE OF THE LAND).
For primary bibliographic entry see Field 6E.
W78-11360

MODELING PHOSPHORUS CYCLING IN LAKE SEBASTICOOK NEWPORT, MAINE,
Maine Univ. at Orono. Dept. of Mathematics.
For primary bibliographic entry see Field 5C.
W78-11368

VIRAL CONTROL OF NUISANCE BLUE-GREEN ALGAE,
California Univ., Riverside. Dept. of Plant Pathology.
P. R. Desjardins, M. B. Barkley, S. A. Swiecki, and S. N. West.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 052, Price codes: A03 in paper copy, A01 in microfiche. Contribution 169, Water Resources Center, University of California, Davis, May 1978 (California Water Resources Center Project UCAL-WRC-W-496) 29 p, 12 fig, 1 tab, 58 ref. OWRT B-176-CAL(4).

Descriptors: *Cyanophyta, *Algal control, Aquatic algae, Biocontrol, Nuisance algae, Methodology, Evaporation, Filtration, Viral control, Water pollution control.

The primary goals have been the development of a method for the purification of high titers of cyanophages and the development of methods for the concentration of cyanophages from large volumes of blue-green algae culture lysates or natural waters. The purification method developed is very effective for the two cyanophages studied (AS-1 and LPP-1) as it provides greater yields per volume of culture lysates than methods previously reported. It is a relatively simple method involving clarification of the culture lysate with bentonite, concentration by rotary evaporation and a final step utilizing density gradient centrifugation. Two concentration methods, rotary evaporation and high flow molecular filtration were most useful for isolating cyanophages from large volumes of clarified culture lysates or low ionic strength solutions. Although the virus recovery efficiency of these methods was not as high as desired, cyanophages recovered by these methos were infectious and stable. These methods have yet to be tested using 'natural' waters. (Snyder-Calif, Davis).
W78-11369

SELENIUM IN SOUTH DAKOTA GROUND AND SURFACE WATER,
Geological Survey, Vermillion, SD.
For primary bibliographic entry see Field 5A.
W78-11371

UNCERTAINTIES IN LAKE MANAGEMENT,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6A.
W78-11398

REGIONALIZATION OF WATER MANAGEMENT: A REVOLUTION IN ENGLAND AND WALES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6E.
W78-11452

FEEDLOT PAYS PENALTY.
Feedlot Management, V. 18, No 9, p 10, 16, Sept., 1976.

Descriptors: *Water pollution control, Regulation, *Feedlots, Iowa, Pollution abatement.

Two complaints that an Iowa feedlot owner was discharging pollutants without a permit and that he was violating an administrative order to file for a discharge permit resulted in a $5,000 fine, the largest civil penalty ruled against a feedlot owner since the initiation of the Environmental Protection Agency regulations controlling the pollution of public waterways. The penalty came from a set-

lement which pre-empted a civil trial. In addition to the $5,000 penalty, the Iowa feeder is still required to take steps to prevent discharge of pollutants from his feedlot into nearby Ashton Creek. (Merryman-East Central)
W78-11453

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE. SPECIAL REPORT II: A NON-LINEAR PROGRAMMING MODEL FOR EVALUATING WATER SUPPLY POLICIES IN THE TEXAS COASTAL ZONE,
Texas Univ. at Austin. Div. of Natural Resources and Environment.
J. F. Malina, J. S. Sherman, and R. A. Rios.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 181, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Research Applied to National Needs Program, National Science Foundation, (1976). 107 p, 48 ref. RANN GI-44363; IAC (74-75)-1001.

Descriptors: *Water supply, *Water conservation, *Water reuse, *Evaluation, *Waste water disposal, *Methodology, Water costs, Water rates, Water shortage, Water users, Water values, Pollution taxes(Charges), Texas, Models, *Zero discharge, *Non-linear program, *Coastal zone management, Corpus Christi(TX).

The Corpus Christi, Texas water supply situation may potentially constrain development. Given a reasonable economic growth rate, available municipal and industrial supplies could be exhausted in the foreseeable future. A non-linear programming model was developed and applied to determine the amount of fresh water required to satisfy future demands and to evaluate the effects of alternate methods for reducing demand on the primary source. The effects of three policies designed to reduce water demand were evaluated. These policies increased the cost of both fresh water and effluent disposal for various combinations of users under the specified conditions. A uniform increase in the cost of water for all users resulted in maximum recycle and reuse of effluents, effecting Zero Discharge of Wastewater. This uniform increase also caused the highest increase in total system cost of the three policies. Both increasing the cost for only the industrial sector and application of effluent taxes were tested. Both policies resulted in zero discharge of industrial wastewater and both failed to induce zero discharge for the system as a whole. The former policy provides no economic incentive for municipal wastewater reuse and the latter policy results in a smaller municipal demand reduction than the first two policies. (Nessa-NC)
W78-11454

NONPOINT SOURCE POLLUTION FROM AGRICULTURAL RUNOFF,
Cornell Univ., Ithaca, NY. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-11460

ECONOMIC IMPACT OF FISH TOXICANT REGULATIONS,
Northern Illinois Univ., De Kalb. Loredo Taft Field Campus.
For primary bibliographic entry see Field 6B.
W78-11484

FIRM BEHAVIOR UNDER IMPERFECTLY ENFORCEABLE POLLUTION STANDARDS AND TAXES,
State Univ. of New York at Albany. Dept. of Economics.
J. D. Harford.
Journal of Environmental Economics and Management, Vol. 5, No. 1, p 26-43, March 1978. 2 fig, 15 ref.

Descriptors: *Standards, *Pollution taxes(Charges), *Industrial wastes, *Economics, *Enforcement, *Model studies, Regulation, Governments, Industrial production, Administration, Externalities, Water pollution standards, Air pollution, Marginal cost.

The behavior of a profit-maximizing firm operating under imperfectly enforced pollution standards and pollution taxes is examined using theoretical models. Increasing the expected level of penalty associated with a standard will reduce waste release by the firm, but increasing strictness of the standard only reduces the firm's wastes if the slope of the expected fine function with respect to the size of the standards violation is increasing. Cost subsidies for pollution control expenses are useful for reducing violation of the standard and therefore the level of wastes. Under imperfectly enforceable pollution taxes the firm's marginal costs of pollution reduction are equal to the constant rate of the tax as long as the slope of the expected penalty function is increasing, implying that for a single firm the amount of pollution tax evasion is independent of the actual wastes, which are determined by the pollution tax rate. The tax evasion level is determined by equating the increase in expected penalty with respect to a unit reduction in reported wastes to the decrease in tax paid. Therefore, the general level of fines and the probability of punishment affect reported wastes but no actual wastes. Increasing the tax rate on reported wastes will reduce actual wastes, but will reduce reported wastes even more, with an implied increase in pollution tax evasion. (Lynch-Wisconsin)
W78-11485

POLLUTION CONTROL AND TECHNOLOGICAL ADVANCE: A DYNAMIC MODEL OF THE FIRM,
Duke Univ., Durham. NC. Graduate School of Business Administration.
W. A. Magat.
Journal of Environmental Economics and Management, Vol. 5, No. 1, p 1-25, 1978. 23 ref.

Descriptors: *Model studies, *Water pollution control, *Effluents, *Pollution taxes(Charges), *Technology, *Water quality standards, *Research and development, Standards, Public policy, Governments, Economics, Economic analysis, Industrial production, Labor, Pollution abatement, Regulation, Dynamic models.

Real-world dynamic comparison of effluent taxes and effluent standards, in which firms invest resources in improving both abatement and production technology, shows the two policies lead to distinctly different allocations of research and development funds and that a temporally constant effluent tax leads to an increasing effluent discharge rate for typical firms--contrary to the case of standards. Neither policy stops economic growth, but only reduces the growth rate which results from technological advance. A rising tax rate is necessary to halt growth in the effluent level through use of advancing technology. With difficult labor substitutability: (1) the constant standard induces a direction of technical advance which converges to augmentation of both abatement and production technology, while (2) the constant tax induces ever-increasing allocations to production technology and ever-decreasing allocations to effluent abatement. With easy substitutability: (1) the constant tax induces ever-increasing allocations to effluent abatement, whereas (2) the constant standard leads to a direction of technical advance which diverges toward relatively more output augmentation or toward relatively more effluent abatement, depending on the initial value of the direction. Allocation of effective research and development effort to augmentation of the two technologies appears highly sensitive to both effluent-tax time pattern and the degree of labor substitutability. (Lynch-Wisconsin)
W78-11489

CONTROLLING POLLUTION BY PRICE AND STANDARD SYSTEMS: A CLARIFICATION,
Delaware Univ., Newark. Coll. of Business and Economics.
R. F. Settle, and J. R. Thornton.
Journal of Environmental Management, Vol. 6, No. 1, p 1-7, January 1978. 3 fig, 8 ref.

Descriptors: *Pollution abatement, *Standards, *Pollution taxes(Charges), *Public policy, *Social costs, *Economics, Air pollution, Pollutants, Pricing, Damages, Externalities, Welfare(Economics), Marginal costs, Costs, Taxes.

Conventional arguments for uniform taxes on pollution emissions are evaluated and reconsidered. Baumol and Oates contend in earlier studies that the present inability to measure marginal damages and marginal abatement costs does not preclude using pollutant emission taxes as pollution control instruments. They propose selection of an acceptable concentration level for each pollutant, such as existing U.S. national air quality standards, and then taxation of each pollutant emission at a rate which would attain this acceptable level. As the system employs a uniform tax, with every firm subject to the same tax rate per unit of emission, little detailed information is required. The present authors contend that equalization of marginal abatement costs minimizes the social cost of achieving any pre-selected pollution level. Tietenberg has proposed a zonal tax system as a modification of compensate for regional variations which effect the marginal contribution of a unit of emissions. The present paper shows that not only does the case for a uniform tax depend upon a relation between emissions and pollutant concentration, but also upon a functional relationship between emissions and the damages. The ultimate goal of public policy is to minimize the social cost of achieving an acceptable level of damages, as opposed to concentration or emissions. The analysis provides both theoretical support for the current U.S. policy of varying air quality standards by region, and a theoretical justification of Tietenberg's derived decision rules to be used during the construction of a set of emission taxes. (Lynch-Wisconsin)
W78-11490

ECONOMIC ANALYSIS OF PROPOSED AND INTERIM FINAL GUIDELINES - INTEGRATED IRON AND STEEL INDUSTRY,
Temple, Barker and Sloane, Inc., Wellesley Hills, MA.
H. W. Pifer, III, and D. A. Smith.
Available from National Technical Information Service, Springfield, VA 22161, as PB-273 215, Price codes: A07 in paper copy, A01 in microfiche. Report EPA 230/1-76-048, April 1976. 141 p, 33 fig, 2 tab. 68-01-2832.

Descriptors: *Effluents, *Water pollution control, *Iron and steel industry, *Economic impact, *Water quality standards, *Costs, Economics, Standards, Operating costs, Federal Water Pollution Control Act Amendments of 1972, Model studies, Air pollution, Regulation, Planning, Baseline studies, Forecasting, Analytical techniques, Energy, Employment, Financing, Steel.

The economic impact of environmental regulations on the integrated iron and steel industry was analyzed using cost impact methodology, combined with a computer-based revenue reuirement and external financing methodology. The analysis includes an evaluation of the impact of EPA's recently promulgated phase II effluent guidelines. The foundation of the study is a policy-testing model of the steel industry, PTm(Steel). Capital expenditures to meet Phase II water effluent guidelines are likely to total $2.3 billion for the period 1975-83, of which $1.4 billion will be required to meet EPA's BPCTCA standards and $0.8 billion to meet BATEA standards. Annual operating costs should increase about 0.5% during the next decade, while the increase to the con-

sumer should be less than 1.0%. Steel operations included in this report represent over 70% of net fixed assets of major integrated steel companies during 1972-74. Assumed baseline conditions forecast domextic steel shipments of 120 million tons by 1980. Of $3.6 billion projected for capital expenditures for water pollution control equipment during 1975-83, $2.5 billion will require external financing. Capital expenditures for air pollution equipment are estimated at $3.3 billion (1975-83), with $2.1 billion requiring external financing. Short term financing is considered difficult but feasible. Effects on energy consumption, employment, communities, and balance of trade are assessed. (Lynch-Wisconsin)
W78-11491

EFFLUENT CHARGES: PERSPECTIVES AND COMPARISONS,
Carnegie-Mellon Univ., Pittsburgh, PA. School of Urban and Public Affairs.
O. A. Davis.
In: Water Pollution Control Act of 1972 Study of Effluent Charges, final report to National Commission on Water Quality, June 1976, PB-255 834. 15 p.

Descriptors: *Federal Water Pollution Control Act Amendments of 1972, *Effluents, *Pollution taxes(Charges), *Pollution rights, *Water pollution control, *Economics, Markets, Model studies, Incentives, PL 92-500, Pollution abatement, Alternative planning, Administration, Regulation, Water quality standards, Environmental economics, Economic analysis, Permits.

An evaluation of three companion papers on pros and cons of effluent charges for water pollution control under the Federal Water Pollution Control Act Amendments of 1972 concludes that effluent charges are the most appropriate control mechanism because of administrative flexibility and less-severe data requirements. Allen V. Kneese, Gardner M. Brown, Jr., and Susan Rose-Ackerman agree that market analog devices are superior to other alternatives for water pollution control, but disagree on specifics. Rose-Ackerman most strongly advocates market mechanisms as a control, Brown emphasizes limitations and problems, and Kneese takes an intermediate position. Kneese, a supporter of effluent charges, holds that a governmental authority should be responsible for determining such charges; since private property rights for water have not been established, there is no automatic mechanism for determining supply. On the demand side, however, effluent charges would produce the technology necessary to achieve the desired level of water quality. Rose-Ackerman advocates distribution of pollution rights to the highest bidder as a superior alternative to effluent charges. Once the rights are distributed a market would come into being enabling redistribution of the disposal rights. Brown describes European case histories of effluent charge systems and discusses theoretical aspects. (Lynch-Wisconsin)
W78-11492

THE CASE FOR EFFLUENT CHARGES AS PART OF A NATIONAL ENVIRONMENTAL PROGRAM,
New Mexico Univ., Albuquerque, Dept. of Economics.
A. V. Kneese.
In: Water Pollution Control Act of 1972 Study of Effluent Charges, final report to National Commission on Water Quality, June 1976, PB-255 834. 26 p.

Descriptors: *Federal Water Pollution Control Act Amendments of 1972, *Effluents, *Pollution taxes(Charges), *Water pollution control, *Economics, PL 92-500, Pollution abatement, Economic analysis, Model studies, Markets, Public policy, Alternative planning, Industrial wastes, Municipal wastes, Sewage disposal, Permits, Water quality standards, Regulation, Pricing, Environmental economics, Welfare(Economics), Incentives.

As a policy mechanism for national pollution control, a system of effluent charges would be far superior to a permit system, with exceptions such as for highly toxic wastes. A rationale for modifying present standards strategy in the short run by adding effluent charges is offered: (1) Substantial effluent charges on residuals would help induce the discharges to meet the specified compliance schedule. (2) Since a polluting activity continues to use environmental services as a factor input even after discharge standards are met, a charge for such use constitutes a continuing incentive to consider that input in decision-making, while providing funds for management of the resource. (3) Charges provide a mechanism for moving to higher or lower levels of ambient environmental quality. (4) Effluent charges appear to provide a better stimulus to technological change as they utilize the economic incentives in a market economy. This paper is divided into two sections: (1) a brief discussion of how effluent charges relate to contemporary economic theory on pollution; and (2) an analysis of the relationship between effluent charges and environmental policy. The first section, which discusses the market model, pollution problems in a market system, and pricing the environment, demonstrates that, in principle, prices for residual discharges can be determined which would result in an overall efficiency maximum. (Lynch-Wisconsin)
W78-11493

EFFLUENT CHARGES, A DISCUSSION PAPER,
Washington Univ., Seattle. Dept. of Economics.
G. M. Brown, Jr.
In: Water Pollution Control Act of 1972 Study of Effluent Charges, final report to National Commission on Water Quality, June 1976, PB-255 834. 27 p.

Descriptors: *Federal Water Pollution Control Act Amendments of 1972, *Effluents, *Pollution taxes(Charges), *Water pollution control, *Economics, PL 92-500, Pollution abatement, Economic analysis, Water quality standards, Regulation, Governments, Markets, Netherlands, France, West Germany, Hungary, Model studies, Damage functions, Environmental economics, Welfare(Economics), Permits.

Although an effluent charge system is to be preferred over standards and permits where possible, several untenable arguments have been presented in defense of such charges. In the first section of this paper seven such arguments are discussed, involving theoretical aspects of optimal charges and standards. In section two, following an evaluation of effluent charge systems in the Netherlands, France, West Germany's Ruhr region and Hungary, various aspects of effluent charges are discussed--level, which pollutants to measure, equity, administration, and user charges. Conclusions: (1) In none of the systems do prices reflect opportunity costs, because of the lack of damage function estimates. (2) It is inconclusive whether treating every firm in an industry alike in waste production increases or decreases the incentive to innovate. (3) Even if quantified damage functions were available, lack of data on pollution loads would prevent evaluation of efficiency of a particular effluent charge through use of damage functions with the charge per unit of pollution. (4) The effectiveness of these systems cannot be truly assessed since other policy instruments accompanied the charge systems. (5) Improvements in water quality cannot be directly related to the charge systems due to absence of a referent. Despite these problems of evaluation, it is clear that effluent charges can be levied and administered. Effluent charges must be used primarily as a means of protecting water quality rather than as a source of revenus. (Lynch-Wisconsin)
W78-11494

MARKET MODELS FOR POLLUTION CONTROL: THEIR STRENGTHS AND WEAKNESSES,
Yale Univ., New Haven, CT. Dept. of Economics.
S. Rose-Ackerman.
In: Water Pollution Control Act of 1972 Study of Effluent Charges, final report to National Commission on Water Quality, June 1976, PB-255 834. 34 p, 22 ref.

Descriptors: *Federal Water Pollution Control Act Amendments of 1972, *Effluents, *Pollution taxes(Charges), *Pollution rights, *Water pollution control, *Economics, Markets, Model studies, Incentives, Economies of scale, Regional analysis, PL 92-500, Pollution abatement, Alternative planning, Regulation, Water quality standards, Environmental economics, Economic analysis, Industrial wastes, Municipal wastes, Waste treatment, Permits.

To reduce water pollution as provided for in the Federal Water Pollution Control Act Amendments of 1972, a scheme is proposed under which effluent dischargers would bid for the right to emit wastes. In this way selectively introduced market mechanisms would substantially reduce costs. Pollution rights are considered a better strategy than effluent charges because: (1) they produce quicker results, (2) minimize inequities involved in river basin zonal boundaries, (3) provide a simple means of subsidizing municipalities without sacrificing market efficiency, (4) efficiently permit growth and new entry, and (5) permit rapid resolution of emergencies. Neither pollution rights nor effluent charges will develop an efficient free market in water quality without an active role by government in specifying either quantities or prices, and employing certain more direct regulatory tools. A mixed market-nonmarket approach is recommended. On river systems where joint treatment would be suitable for allocating treatment responsibilities between regional plants and individual waste producers. Where joint treatment would be inefficient, the pollution rights system appears superior to effluent charges. (Lynch-Wisconsin)
W78-11495

POINT SOURCES: NEW ECONOMIC MECHANISMS,
Toronto Univ. (Ontario). Faculty of Law.
D. N. Dewees.
Water Resources Reference Service, p 70-80, 1977. 13 ref.

Descriptors: *Point pollution, *Pollution taxes(Charges), *Regulation, *Pollution abatement, *Standards, *Economics, *Administration, Air pollution, Water pollution control, Effluents, Incentives, Political constraints, Social values, Governments, Legislation, Motivation, Technology, Legal aspects, Public policy, Alternative planning, Cost-benefit analysis, Permits, Monitoring.

Reasons why environmental quality goals are not achieved are analyzed and alternative administrative mechanisms for regulating discharges are evaluated. It is concluded that without the political will for control, no mechanisms will be successful, but if the will exists, an effluent charge will often be more effective than standards. Effluent charges are preferable in cases where emissions or effluents do not signify immediate disaster, but where costs of achieving acceptable environmental quality are high. An effluent charge with or without a free base discount has these advantages: (1) It allows collection of large amounts of money without a large number of lawsuits. (2) Delays and debates are avoided; a charge does not present a clear dividing line between meeting a standard and closing down, and if the charge is thought to be bearable by the firm--or control is impossible--the firm continues to pay. Once the inevitability of the charge is established, the best strategy for the polluter is to install the best and most economical treatment facilities that cost less than the effluent

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charge itself, which is precisely the incentive that will maximize technological progress in pollution control. The real choice is not between standards and charges, but between arguing with recalcitrant polluters or imposing large costs on them. The problems of monitoring are also discussed in this paper. (Lynch-Wisconsin)
W78-11501

ENVIRONMENT, INTERNATIONAL TRADE AND WASTE MATERIALS,
Leicester Univ. (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6G.
W78-11503

THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS,
Southeast Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5B.
W78-11505

INTERTEMPORAL ENVIRONMENTAL MANAGEMENT WITH A STORABLE POLLUTANT,
Colorado Univ., Boulder. Dept. of Economics.
D. R. Lee.
Journal of Environmental Economics and Management, Vol. 4, No. 2, p 120-128, 1977. 19 ref.

Descriptors: *Pollutants, *Pollution abatement, *Model studies, *Time series analysis, *Pollution taxes(Charges), *Storage, Economics, Decision making, Public policy, Environmental management, Optimization, Marginal costs, Social aspects, Time, Equations, Regulation.

No acceptable model exists of fixed per-unit pollution taxes based on dynamic time-pattern relationships, which will result in socially optimal generation and emission of an environmental pollutant. This suggests deficiencies in the theoretical pattern of fixed per-unit taxes which reflects the optimal marginal social cost of emission at each point in time. As a remedy, a continuous-time model is developed which allows decisions on generation and emission of an environmental pollutant to be separated in time, and the necessary conditions for the socially optimal time pattern of generation and emission are deduced and discussed. The dimension of pollution storage--the ability to separate generation and emission of a pollutant in time--has been ignored in previous dynamic extensions of static models. It is shown that the dynamic analog to the optimal fixed per-unit tax in a static context cannot be expected to motivate the socially optimal solution when pollution can be generated at one point in time and discharged later. This failure is basically the result of: (1) The polluter undervalues the total value of pollution storage capacity when he faces fixed-per-unit pollution taxes; (2) When fixed per-unit taxes are imposed the solution is indeterminate, so that many socially suboptimal solutions are as attractive to the firm as the socially optimal solution. Although this paper does not lend support for a policy of pollution taxes, it does not necessarily establish a sound foundation for critizing such a policy. (Lynch-Wisconsin)
W78-11506

ENFORCEMENT COSTS AND THE INCENTIVE TO EVADE CONTROLS ON PRODUCTION,
South Carolina Univ., Aiken. Dept. of Economics.
R. P. Terrebonne.
Journal of Environmental Economics and Management, Vol. 4, No. 2, p 129-134, 1977. 1 fig, 8 ref.

Descriptors: *Economics, *Enforcement, *Pollution taxes(Charges), *Quotas, *Pollution charges, *Evasion, Regulation, Standards, Externalities, Costs, Model studies, Equilibrium, Marginal costs.

Comparison of enforcement costs of different pollution control schemes using the approach of Buchanan and Tulloch (1975) indicates that exchangeable output quotas may involve fewer incentives to evade regulations than a per-unit tax. This conclusion, which differs from those of Buchanan and Tulloch, contradicts the widespread assumption that emission taxes would be easier to enforce than other policies. A two-step approach to externality control designed originally by Baumol is followed: (1) determine the Pareto optimal level of output, and (2) design policies to achieve that desired level of output. The comparative static model of a perfectly competitive industry assumes the industry is composed of a large number of identical firms. Each firm produces a quantity at which marginal cost is equal to price, and long-run equilibrium is achieved when average cost is also equal to price. Buchanan and Tulloch's analysis is extended by comparing three tax and quota schemes for regulating industry output. When tax evasion is permitted in the model, under each scheme identical incentives for each firm to evade regulations are generated once the number of firms reaches a new long-run equilibrium. However, incentives for evasion with exchangeable quotas before long-run equilibrium is reached depend on initial quota distribution and the way the market adjusts to equilibrium. A quota scheme can be designed in which short-run incentives to cheat are lower than with taxation. (Lynch-Wisconsin)
W78-11511

MANAGING FARMLAND TO IMPROVE WATER QUALITY,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Information.
J. Morrison.
Journal of Soil and Water Conservation, Vol. 32, No. 5, p 205-208, September-October 1977. 1 fig.

Descriptors: *Water quality control, *Black Creek Watershed Study(IN), *Soil erosion, *Cultivation, *Farm management, *Model studies, Indiana, Maumee River Basin(IN), River basins, Watersheds(Basins), Demonstration watersheds, Storms, Sedimentation, Slopes, Land use, Lake Erie, ANSWERS, Nonpoint pollution, Soil types, Nutrients, Soil conservation, Cost-sharing, Incentives.

The Black Creek Watershed Study, in progress since October 1977 in Indiana's Maumee River Basin, has focused on two basic issues: (1) the relationship between erosion in the Black Creek watershed and water quality in Black Creek, the Maumee River, and Lake Erie; and (2) the question of whether a program based on voluntary participation by landowners and cost-sharing incentives have much impact on erosion and water quality. Preliminary results indicats: (1) the relationship between erosion and water, quality, though complex, can be used as a factor in water quality management planning; and (2) voluntary compliance and cost-sharing are well-received, but it is doubtful they can be completely relied upon to meet water quality standards. the project is funded by a $2.4 million EPA grant to the Allen County Conservation District, with subcontracts to Purdue and Illinois Universities and the Soil Conservation Service. Research results, strongly geared to local soil types, slopes, and land use, are extended to eventual impact on teh Great Lakes through application of a detailed erosion and sedimentation model (ANSWERS) developed to simulate storm impact on water quality. A distributed parameter rather than statistical model, it quantitatively describes pollutant sources at all points in the watershed instead of gross erosion at the outlet. Data from small watersheds can be used to develop fundamental relationships, later integrated to describe much larger areas. The model is currently limited to effects of tillage changes, but future applications are discussed. (Lynch-Wisconsin)
W78-11523

WINTER APPLIED MANURE: EFFECTS OF ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT,
Agricultural Research Service, Morris, MN.
R. A. Young, and R. F. Holt.
Journal of Soil and Water Conservation, Vol. 32, No. 5, p 219-222, September-October 1977. 1 fig, 4 tab, 9 ref.

Descriptors: *Agricultural runoff, *Crop production, *Manure, *Fertilization, *Winter, *Soil erosion, *Water pollution sources, Snowmelt, Precipitation(Atmospheric), Minnesota, Corn(Field), Nutrients, Water pollution control, Agriculture, Cultivation, Rainfall.

Winter-applied manure reduced runoff, soil loss, and nutrient losses from plowed ground in this three-year study, not only during snowmelt as in most other research, but throughout the year. Four test plots in Minnesota were treated as follows: (1) manure applied in early winter on frozen ground; (2) manure applied in late winter on top of snow; (3) manure applied in late fall and plowed under; and (4) no manure applied. Corn wasj planted on all plots after a starter fertilizer (13-36-13) was spread at 224 kg/ha in the spring. Cultivation direction was up- and-down slope. Precipitation ranged from 52-68 cm annually, with snow accounting for 11-18%. Wintermanured corn plots averaged 42% as much runoff and 60% as much soil loss annually as unmanured corn plots; results were consistent during the study period. Nutrient losses from manured plots were lower each year than from unmanured plots. Soil loss on manured plots averaged 10.9 metric tons/ha annually, compared with an average annual loss of 20.5 metric tons/ha from the unmanured check plot and 16.5 metric tons/ ha for natural rainfall runoff plots (10 year averages). Rainfall erosion rather than snowmelt erosion accounted for 99% of these soil losses. Average runoff was 3.8 cm on the two surface-applied manured plots, 4.0 on the plowed manured plot, 8.6 cm on the natural rainfall runoff plots, and 10.1 cm on the check plot. (Lynch-Wisconsin).
W78-11524

FACTORS AFFECTING NUTRIENT LOADS IN SOME IOWA STREAMS,
Iowa State Univ., Ames. Dept. of Animal Ecology.
For primary bibliographic entry see Field 5B.
W78-11525

EFFICACY OF COPPER SULPHATE IN THE SUPRESSION OF APHANIZOMENON FLOS-AQUE BLOOMS IN PRAIRIE LAKES,
Fisheries and Marine, Winnipeg (Manitoba). Freshwater Inst.
J. Whitaker, J. Barica, H. Kling, and M. Buckley.
Environmental Pollution, Vol. 15, No. 3, p 185-194, 1978. 4 fig, 2 tab, 12 ref.

Descriptors: *Copper sulfate, *Aphanizomenon flos-aquae, *Algal control, *Algicides, *Eutrophication, *Rates of application, Lakes, Manitoba(Canada), Canada, Prairie lakes, Algae, Phytoplankton, Fish farming, Fishkill, Summerkill, Chemcontrol, Pesticide residues, Cyanophyta, Chlorophyll, Pothole lakes.

Experiments show that copper sulfate application levels recommended by Canadian agricultural authorities for suppression of blooms of the blue-green filamentous alga Aphanizomenon flos-aquae are about five times higher than necessary. A single application not higher than 40 micrograms Cu/l applied before filaments exceed 10 mm is suggested for bloom suppression. The 250 micrograms Cu/l recommended by authorities is enough to kill rainbow trout in fish-farming lakes. In these tests copper sulfate was added to five shallow eutrophic prairie lakes in the Rickson-Elphinstone area of

Manitoba at 25-360 micrograms Cu/1, and at 100-3000 mirograms Cu/1 in experimental tubes in one lake. Tests were conducted in early July in 1973-75. Blooms of A. flos-aquae are a major cause of summer mortality of trout stocks in prairie ponds (Potholes); temporary low oxygen levels (summerkill) result from the sudden death and decomposition of the blooms. Excellent algal control was achieved at all treatment concentration. Chlorophyll typically declined from 48-55 micrograms/1 to 2-4 micrograms/1 after four days, with complete elimination of A. flos-aquae. The alga generally reappeared later, but never at levels to cause summerkill. Copper concentrations returned to background levels in 8-10 days. (Lynch-Wisconsin)
W78-11527

A SUMMARY OF THE BIOGEOCHEMISTRY OF NITROGEN COMPOUNDS IN GROUND WATER,
California State Univ., Chico.
For primary bibliographic entry see Field 5B.
W78-11535

WATER POLLUTION FROM NONPOINT SOURCES,
Midwest Research Inst., Kansas City.
For primary bibliographic entry see Field 5B.
W78-11543

SIX POLLUTED LAKES: A PRELIMINARY EVALUATION OF THE TREATMENT AND RECOVERY PROCESSES,
Uppsala Univ. (Sweden). Algal Assay Lab.
S. O. Ryding, and C. Forsberg.
Ambio, Vol. 5, No. 4, p 151-156, 1976. 1 tab., 5 fig., 30 ref.

Descriptors: *Pollution abatement, *Sewage treatment, *Lakes, *Reclaimed water, *Eutrophication, *Seasonal, *Chlorophyll, *Diversion, Sampling, On-site investigations, Water pollution sources, Water pollution control, Nutrients, Water quality control, Water quality, Nitrogen, Phosphorus, Domestic wastes, *Lake Ekoln(Sweden), *Lake Sillen(Sweden).

Recovery processes of six polluted lakes were studied after reduction of nutrients. The decrease in phosphorus input due to advanced sewage treatment varied between 30-80 percent of the prediversion data. Two lakes showed improved water quality, while in two others no marked changes were observed. Two lakes showed lower transparency and higher chlorophyll values after diversion. In small, shallow and heavily polluted lakes, the annual internal phosphorus loading from the sediments varied between 20 percent and 400 percent of the external input. Restoration of lakes by removing nutrients via removal of algae is discussed. (EIS-Katz)
W78-11549

CONTROL RUNOFF FROM OPEN LIVESTOCK FEEDLOTS.
Crops and Soils Magazine, V. 30, No. 2, p 22-23, Nov. 1977. 1 fig.

Descriptors: *Agricultural runoff, *Feedlots, *Water pollution control, *Runoff control, Zero-discharge, Vegetative filters.

University of Illinois researchers are studying zero-discharge and vegetative filter systems to handle potential feedlot runoff. The zero-discharge system required cleaning solids from the settling basin and removing water from the holding ponds when necessary. A recent study indicates that potential benefits from a holding pond include nutrient value and a possible source of irrigation water. Because of seasonal nitrogen and phosphorus variation in the holding pond water, emptying ponds in the spring will provide maximum fertilizer benefits. However, ponds should also be emptied in the fall to provide capacity for winter runoff. Vegetative filter areas may prove a less costly runoff control system that requires less management. Pastures, grassed waterways, or cropland could be vegetative filter areas although current systems being studied have been constructed for this specific purpose. These are areas where runoff could be treated by settling, filtration, dilution, absorption, and infiltration. The portion of runoff that does not infiltrate into the ground will be treated by moving the vegetative filter and will not pollute surface water beyond the filter. This concept also seems to have potential for reducing sediment and other pollutant contributions to streams from agricultural non-point sources. (Merryman-East Central)
W78-11552

ENVIRONMENTAL PROTECTION REQUIREMENTS FOR SWINE OPERATIONS,
Texas Agricultural Extension Service College Station.
J. M. Sweeten.
Fact Sheet L-1302, Agricultural Extension Service, Texas A&M University, 1975, 4 p, 6 fig.

Descriptors: *Air pollution, Odor, Water pollution, Regulation, *Farm waste, Environmental quality, *Swine, Permit, Texas Water Quality Board, Environmental Protection Agency.

Summarized in this report are the State and Federal water and air pollution control regulations pertaining to swine operations. The Texas Water Quality Board (TWAB) requires a 'Certificate of Registration' for swine feeding operations with more than 50 head of hogs. This certificate stipulates no discharge of wastewater of runoff from the premises. A procedure is presented that will meet the 'no-discharge' standard. The EPA requires a permit for swine procedures of more than 2500 hogs in confinement in which the 'no-discharge' standard also appplies. A joint permit may be obtained to satisfy both state and federal agencies. The Texas Air Control Board requires a construction and operating permit on new production operations with more than 1000 head of hogs. This applies also to any existing operations that are planning to expand 100% or more in feeding capacity. The TACB also regulates odors from existing swine feeding facilities under a general nuisance regulation. The procedure for obtaining permits from the TWQB, TACB, and the EPA are presented as well. (Bates-East Central)
W78-11556

CONTROL OF THE BIOLOGICAL AVAILABILITY OF TRACE METALS TO A CALANOID COPEPOD IN A COASTAL FJORD,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-11572

ALASKA WASTEWATER TREATMENT TECHNOLOGY,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W78-11575

AN EVALUATION OF THE EFFECT OF DRAWDOWN ON THE TROPHIC STATUS OF A SMALL RESERVOIR,
Georgia Coll., Milledgeville. Center for Environmental Study and Planning.
E. H. Barman, Jr., and D. G. Baarda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 328, Price codes: A05 in paper copy, A01 in microfiche. Georgia Institute of Technology, Atlanta, Environmental Resources Center, Report ERC-01-78, January 1978. 73 p, 16 fig, 28 tab, 49 ref. OWRT A-062-GA(1), 14-31-0001-5010.

Descriptors: Reservoirs, *Drawdown, *Trophic level, *Lake restoration, *Georgia, *Lake Laurel(Geo), Dissolved oxygen, Biochemical oxygen demand, Turbidity, Sulfides, Nitrogen, Phosphorus, Iron, Phytoplankton, Biomass, Productivity, Periphyton, Eutrophication, Lake sediments, Benthic fauna, Water pollution control, Algae.

An evaluation of physical lake drawdown as a method of restoring small, eutrophic lakes and reservoirs was undertaken. Lake Laurel, a 5.4 ha reservoir in central Georgia, was drained and the sediments exposed to drying and erosion for six months. Before drawdown, determinations of dissolved oxygen, biochemical oxygen, biochemical oxygen demand, turbidity, sulfide, nitrogen, phosphorus, and iron were undertaken. Biological parameters considered were distribution and relative abundance of benthic macro-invertebrates, phytoplankton biomass, and periphyton productivity. A post-drawdown evaluation of the same parametes was undertaken during corresponding time periods. Preliminary observations indicated that Lake Laurel was eutrophic, but data obtained during both phases of the study indicate that the system is mesoeutrophic, or at most, ildly eutrophic. However, a comparison of pre- and drawdown data revealed changes in several of the categories investigated. Total phosphorus, total soluble phosporus, and ortho-phosphorus concentrations were significantly lower after drawdown. Significant reductions in phytoplankton biomass and periphyton production were observed during the summer of 1976 after drawdown. In 1977, phytoplankton biomass and periphyton production rates were near those observed before the lake was drained. Concentrations of total, soluble, and ferrous iron were also monitored. Low iron concentrations near the surface were unaffected by the manipulation; however, high levels observed near the sediments increased after drawdown. Additional experiments provided indications that there were increases in organic compounds near the sediments and decreases in the amounts of oxalate extractable iron in the sediments. No changes were observed in the other parameters. Concentrations of dissolved oxygen near the sediment interface were zero during most of the pre-drawdown phase, and these conditions persisted after drawdown. Low oxygen resulted from sediment oxygen demand rather than from conditions associated with the trophic status of the system.
W78-11576

RESEARCH NEEDS RELATING TO WATER/LAND PROBLEMS IN URBANIZING AREAS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-11578

THE EFFECTIVENESS OF CAPITAL INVESTMENTS IN THE PROTECTION OF THE NATURAL ENVIRONMENT,
M. Loiter.
Problems of Economics, Vol 20, No 4, August 1977, p 69-91. 4 ref. (Translated from Voprosy Ekonomiki, 1976, No 1).

Descriptors: *Soviet Union, *Resources development, *Pollution abatement, *Planning, *Natural resources, *Investment, Environmental effects, Social aspects, Economic development, Communism, Capitalism, Political aspects, Forecasting, Recycling, Erosion control, Capital, Five-year plans, Soil erosion, Land reclamation, Flood control.

By contrast with the ecological crisis being created in several industrialized capitalist countries because of the spontaneous exploitation of natural resources based on the private ownership of the means of production, the socialist system excludes antagonism between the goals of social production

nd the demands of ecology, which are both lirected toward preserving and improving the en- vironment. Western scientists forecasting the in- evitability of ecological catastrophe as a result of he progress of civilization in reality reflect apitalist society, whose spontaneous develop- nent brings man into conflict with nature. The lraft of the tenth Five-Year Plan (1976-80) of the Central Committee of the Communist Party of the Soviet Union for the Twenty-Fifth Party Congress pecifies the necessity of elaborating and imple- menting measures for the production of the en- vironment, and for the rational use and reproduc- tion of natural resources. Development of new technological processes to reduce and recycle waste materials is envisaged. Proposals include improvement of soil fertility; protection of soil against erosion, secondary salinzation, dehydra- tion, flooding, and waste contamination; and min- ing land reclamation. Details of the plan are described. To measure capital investment effec- tiveness, it is possible to use a valuation of natural resources based on the same principles as for determining the magnitude of capital investment, current expenditures, and effects. (Lynch-Wisconsin)
W78-11580

DETERGENT PHOSPHATE BAN.
Environmental Protection Agency, Chicago, IL. Phosphorus Committee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 903, Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-905/2-77-003, June 1977. 62 p, 9 fig, 19 tab, 9 ref. 2BA644.

Descriptors: *International Joint Commission, *Phosphates, *Detergents, *Water pollution control, *Eutrophication, *Nutrient removal, *Phosphorus, *Regulation, Nutrients, US Environmental Protection Agency, Great Lakes, Watersheds(Basins), Sewage treatment, Effluents, Domestic wastes, Industrial wastes, Fallout, Tributaries, Lakes, International commissions.

On advice of the International Joint Commission (IJC), the U.S. Environmental Protection Agency is now recommending adoption of detergent phosphorus bans in all Great Lakes basin states. This report reviews: (1) the background of phosphorus control policy, (2) advantages and disadvantages of a ban, and (3) its feasibility. In 1971, when phosphorus was recognized as the limiting nutrient for algal growth in all of the Great Lakes and most inland lakes of the region, the United States adopted a policy of relying on chemical treatment to reduce phosphorus levels in municipal sewage and industrial wastes discharged into waterways. Because this policy failed to decrease and stabilize eutrophication rates, means of reducing phosphorus loadings have been reconsidered. Under the 1972 agreement between the U.S. and Canada, a one mg/liter limit for municipal treatment plant effluents was set. Several factors have modified earlier conclusions on phosphorus loadings, including the fact that significant inputs derive from the atmosphere, tributary loadings were underestimated, and the one mg/liter achieved less than hoped for. An IJC report has urged immediate adoption of a uniform 0.5% phosphorus limit by weight for all detergents, and suggested a 0.1 mg/l effluent limit may be necessary. Data on phosphorus loadings in each of the five Great Lakes are included in this report. (Lynch-Wisconsin)
W78-11581

ENVIRONMENTAL IMPACTS OF MECHANICAL HARVESTING OF SUBMERSED VASCULAR PLANTS,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
S. R. Carpenter, and M. S. Adams.
IES Report 77, June 1977. 30 p, 1 fig, 3 tab, 106 ref. GI-39193 and BMS-75-19777.

Descriptors: *Harvesting, *Submerged plants, *Mechanical control, *Aquatic weed control, *Environmental effect, *Eutrophication, *Lake Wingra(WI), Wisconsin, Trophic level, Phytoplankton, Algae, Filamentous algae, Lakes, Macrophytes, Nutrients, Chemcontrol, Herbicides, Ecosystems, Limnology, Reviews.

Potential environental effects of macrophyte harvesting are classified and assessed, relevant literature is reviewed, and further researsch needs are indicated. Potential limnological effects include changes in :(1) the physical and chemical environment, (2) the structure of autotroph and heterotrop communities, and (3) functional aspects of the lake ecosystem (such as nutrient cycling and metabolism). Harvesting offers numerous advantages over herbicides in that: (1) it is relatively target-specific, (2) it removes the nuisance immediately, (3) deleterious side effects of toxins are avoided, (4) physical removal also removes the nutrient content of the plants from the lake, and (5) harvested material is potentially useful as mulch, fertilizer, or fodder. Harvesting offers a unique experimental opportunity to study limnological effects of the large-scale, selective removal of an ecosystem component. Data from Lake Wingra in Madison, Wisconsin, Indicate that harvesting can slow eutrophiation by decreasing accumulation rates of mineral nutrients and organic matter. A survey of the literature, however, indicates very little information on long-term effects of harvesting. In some cases filamentous algae may dominate littoral areas following harvesting. Harvesting would also free new habitat for invasion by phytoplankton, at least temporarily, but macrophyte regrowth would probably partially displace the phytoplankton. (Lynch-Wisconsin).
W78-11586

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 19-22 OCTOBER 1976, ATLANTIC BEACH, FLORIDA.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 590, Price codes: A14 in paper copy, A01 in microfiche. Miscellaneous Paper A-77-3, August 1977. 301 p, 136 fig, 60 tab, 108 ref, 2 append.

Descriptors: *Aquatic Plant Control Program, *Aquatic weed control, *Army Corps of Engineers, *Water hyacinth, *Hydrilla verticillata, *Biocontrol, *Chemcontrol, *Eutrophication, *Water pollution effects, Mechanical control, Integrated control, Eichhornia crassipes, Florida, Louisiana, South Carolina, Texas, Herbicides, Lake Conway(FL), Macrophytes, Controlled-release herbicides, Lakes, Reservoirs, Methodology, Data processing, Ecology, White amur, Ctenopharyngodon idella.

The eleventh annual meeting on the Aquatic Plant Control Research Program of the U.S. Army Corps of Engineers was held in Atlantic Beach, Florida October 19-22, 1976. Thirty-six papers are published in these proceedings. Introductory papers deal with goals of the program and an overview of research projects. Fourteen papers present district and local control program status reports. The remaining papers cover such topics as current EPA aquatic herbicide regulations; data processing; evapotranspiration; the Lake Conway (Florida) white amur biological control project; herbicide efficacy and uptake by fish; controlled-release herbicides; biological control with insects, pathogenic fungi, and fish; integrated biological-chemical-mechanical control; remote sensing and data handling. While current control methods have not resulted in satisfactory aquatic plant control, several alternative measures have yielded promising results in preliminary experiments, such as controlled-release herbicides and integration of several control agents. Studies of mechanical harvesting methods and the herbivorous fish, white amur, are continuing. Priorities of the Aquatic Plant Control Program are: (1) technology transfer, (2) research, (3) cost-sharing, and (4) planning. In 1975 research emphasis was shifted more toward meeting operational needs of field staff, especially techniques for proper use of plant-control agents. (See W78-11592 thru W78-11622) (Lynch-Wisconsin)
W78-11591

OVERVIEW OF THE U.S. ARMY CORPS OF ENGINEERS AQUATIC PLANT CONTROL RESEARCH PROGRAM,
Army Engineers Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W78-11592

CURRENT STATUS OF THE AQUATIC PLANT CONTROL PROGRAM IN TEXAS,
Army Engineer District, Galveston, TX.
C. O. Martin, and W. T. Nailon.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 19-23, 1 tab, 5 ref.

Descriptors: *Texas, *Aquatic weed control, *Water hyacinth, *Alligatorweed, *Herbicides, *Biocontrol, *Aquatic Plant Control Program, 2,4-D, Alligatorweed flea beetle, Agasicles hygrophila, Eichhornia crassipes, Alternanthera philoxeroides, Rates of application, Chemcontrol, Water pollution effects, Nutrients, Eutrophication.

The Aquatic Plant Control Program in Texas, a shared-cost arrangement between the federal government and Texas, is at present primarily directed at eradication or control of water hyacinth (Eichhornia crassipes) and alligatorweed (Alternanthera philoxeroides). Water hyacinth are treated with 2,4-D formulations applied at a maximum rate of four lbs in 100 gal water per surface acre, with spreader stickler additives to ensure adhesion to plants. Infestations are under manageable control except in parts of the north coastal work area; 28,933 acres of hyacinths have been eliminated in eight watersheds since 1970. Alligatorweed infestations have increased greatly on much of the Texas coast in recent years as a result of increased nutrient levels in basins and creation of new reservoirs. Control efforts, dependent to date on the alligatorweed flea beetle (Agasicles hygrophila), have been only partially successful due to erratic weather -- delayed winters, frequent rain, and cool spells during peak beetle growth periods. Future control efforts will integrate herbicidal treatment with continued introduction of flea beetles; herbicides will consist of the same 2,4-D formulations and rates as for water hyacinth. Current operational activities of the plant control program are concentrated in the lower portions of 10 of the 18 work areas; a table of infestations is given. The most critical areas are the Trinity and Sabine river basins, and the north coastal area. (See also W78-11591) (Lynch-Wisconsin)
W78-11593

STATUS OF RECONNAISSANCE SURVEY REPORT AND REVIEW OF AQUATIC PLANT PROBLEMS IN THE STATE OF OKLAHOMA,
Army Engineers District, Tulsa, OK.
L. M. Mason.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 24-26, 1 fig, 1 tab.

Descriptors: *Oklahoma, *Aquatic weeds, *Robert S. Kerr Lake(OK), *Eurasian water milfoil, *Aquatic Plant Control Program, Myriophyllum spicatum, Aquatic weed control, Lakes, Reservoirs, Eutrophication, Water pollution effects, U.S. Army Engineer Southwestern Division.

A 1975 reconnaissance survey report of aquatic plant infestations in lakes and navigable waterways of Oklahoma is being revised, and is expected to be resubmitted for approval by the Southwestern Division Office by May 1, 1977. The present paper also deals with infestation of Eurasian water milfoil (Myriophyllum spicatum), Oklahoma's most serious aquatic plant problem, in Robert S. Kerr Lake. M. spicatum is also present in other lakes and streams--in 1975 an estimated 8206 acres in 12 major impoundments were infested. A table enumerates acres of infestation for each lake, which are also shown on a map. In Robert S. Kerr Lake water milfoil growth was first observed in 1971; currently (1976) some 600 acres are infested, compared with 328 acres in 1975. The entire McClellan-Kerr navigation system from Tulsa to New Orleans could be infested in a short time. No control measures have been taken to date in Robert S. Kerr Lake, but methods are under investigation. Although large barge traffic may never be seriously hampered, other commercial activities, recreation, and human safety are threatened. (See also W78-11591) (Lynch-Wisconsin)
W78-11594

EAST TEXAS RESERVOIRS--AQUATIC PLANT CONTROL,
Army Engineer District, Fort Worth, TX.
E. J. Moyer.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 27-32.

Descriptors: *Texas, *Reservoirs, *Aquatic weed control, *Water hyacinth, *Alligatorweed, *Aquatic Plant Control Program, Lakes, B.A. Steinhagen Lake(TX), Sam Rayburn Reservoir(TX), Eichhornia crassipes, Alternanthera philoxeroides, Alligatorweed flea beetle, Agasicles hygrophila, 2,4-D, Herbicides, Water pollution effects, Eutrophication.

Aquatic weed problems and control measures in Texas' Fort Worth District of the Federal Aquatic Plant Control Program is reviewed. Of 17 reservoirs in the area (75% on the Trinity and Brazos River Systems), only two have weed problems serious enough to require an annual control program: Town Bluff Dam-B.A. Steinhagen Lake, and Sam Rayburn Dam and Reservoir, both located in east-central Texas. The area is characterized by erosion-prone sandy loam soils and pine forests; to the north are marsh areas. The most serious plant problems are water hyacinth (Eichhornia crassipes) and alligatorweed (Alternanthera philoxeroides). Both are problems at Steinhagen Lake, while at Sam Rayburn Reservoir water hyacinth are the primary problem. The amine formulation of 2,4-D applied at 2-4 lbs of acid equivalent/acre has been used in both lakes. Treatment in Steinhagen Lake, begun in 1963, has resulted in 85-90% control, although the original 200 acres of water hyacinth have grown to 1000-1500 acres, and there are 600 acres of alligatorweed. In Sam Rayburn Reservoir treatment was begun in 1965, but the second program was not started until 1971. There were 500 acres of water hyacinth in 1965, now increased to 2000 acres. In 1975 a cost-sharing arrangement was initiated with the federal government, and the required conversion from helicopter to boat application of herbicides did not lower effectiveness. (See also W78-11591) (Lynch-Wisconsin)
W78-11595

AQUATIC PLANT CONTROL PROGRAM IN THE ST. PAUL DISTRICT,
Army Engineer District, St. Paul, MN.
D. E. Wadleigh.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 33-34.

Descriptors: *Minnesota, *North Dakota, *Wisconsin, *Aquatic weed control, *Cyanophyta, *U.S. Army Engineer North Central Division, *Army Engineer, St. Paul District, *Aquatic Plant Control Program, Lakes, Reservoirs, Potamogeton, Vallisneria, Eutrophication, Ceratophyllum, Aphanizomenon, Algae, Herbicides, Mechanical control, Biocontrol, Enzymes, Water pollution effects.

Attempts to institute the Federal Aquatic Plant Control Program in the North Central Division of the U.S. Army Engineers were unsuccessful until recently due to lack of local interest. In the St. Paul District, which has the most active control program in the division, the most common problems concern recreational lakes and reservoirs becoming eutrophic or overgrown with rooted aquatics. Major problems are blue-green algae (Aphanizomenon) and submerged rooted plants (Potamogeton, Vallisneria, and Ceratophyllum). Because public opinion strongly opposes herbicides, most proposed solutions are mechanical or biological. Recent research at the Freshwater Biological Research Institute of the University of Minnesota showed the existence of an enzyme unique to cyanophyte and bacterial reproductions; it is hoped that manipulation of this enzyme can be used to slow or regulate the cyanophyte growth rate and reproductive cycle. The most significant advances made by the St. Paul District have been in establishing cooperative administration of the programs in North Dakota and Wisconsin. Of about 200 North Dakota lakes with significant actual or potential recreational use, about 30 have weed or eutrophication problems. A 'Plan of Approach' is being prepared in cooperation with the North Dakota Game and Fish Department. In Wisconsin, 'Plan of Approach' is also in preparation, in cooperation with the Wisconsin Department of Natural Resources. (See also W78-11591) (Lynch-Wisconsin)
W78-11596

AQUATIC PLANT CONTROL ACTIVITIES--OHIO RIVER DIVISION,
Army Engineer district, Nashville, TN.
C. W. Crews.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 35-37, 1 fig.

Descriptors: *Tennessee, *Kentucky, Army Engineer Ohio River Division, *Aquatic weed control, *Tennessee River, *Cumberland River, *Army Engineer Nashville District, *Aquatic Plant Control Program, Water lilies, Nymphaea odorata, 2,4-D, Herbicides, Rivers, Watersheds(Basins), River basins, Tennessee Valley Authority, Eutrophication, Water pollution effects.

Of four districts in the Ohio River Division of the U.S. Army Engineers, only the Nashville(Tennessee) District has been required to take part in the Aquatic Plant Control Program. The Huntington district (West Virginia) has experienced a minor problem with plant growth on wastewater treatment lagoons, but the Louisville (Ohio) and Pittsburgh (Pennsylvania) districts have been free of such problems. The Nashville District is formed by the basins of the Tennessee and Cumberland rivers. The Army Corps of Engineers is charged with the full water resource development of the Cumberland River Basin, while the Tennessee Valley Authority has primary responsibility for overall development and operations in the Tennessee River Valley. There have been no major problems with aquatic macrophytes in the Cumberland River basin of the Nashville District, and the only significant aquatic plant control consisted of application of 2,4-D to 150 acres of water lilies (Nymphaea odorata). The program was discontinued after 10 years in 1968 when infestation was stabilized and controlled. There are small but stabilized infestations of water milfoil, alligatorweed, willowweed, and cattail in numerous areas in the basin, and recently there was a slight increase in a few infested areas on one upstream storage project. Reservoir control operations and terrain probably account for the lack of problems in the Cumberland Basin compared with the Tennessee Valley. (See also W78-11591) (Lynch-Wisconsin)
W78-11597

AQUATIC PLANT PROBLEMS, LAKE SEMINOLE, U.S. ARMY CORPS OF ENGINEERS,
Army Engineer District, Mobile, AL.
A. K. Gholson, Jr.
In: Miscellaneous Paper A-77-3 August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 42-44.

Descriptors: *Aquatic weed control, *Lake Seminole(FL GA), *Water hyacinth, *Biocontrol, *Eurasian water milfoil, *Alligatorweed, *Aquatic Plant Control Program, Florida, Georgia, Lakes, Impoundments, Eichhornia crassipes, Alternanthera philoxeroides, Myriophyllum spicatum, Giant cutgrass, Hydrilla, Eelgrass, Mechanical control, Chemcontrol, Herbicides, Public health, Alligatorweed flea beetle, Agasicles hygrophila, Recreation, Hydroelectric power, Eutrophication, Water pollution effects.

Severe infestation by numerous species of submersed aquatic plants jeopardizes continued use of Lake Seminole in Florida and Georgia. About one-third of the 40,000-acre impoundment is infested, and both navigation and hydroelectric power generation (for which the project was created in 1955-57) are threatened. Small boat navigation and other recreational activities almost cease in infested areas bewteen May-November. The biological balance of the lake has been upset, including fish predato-prey relationships. Nuisance plants also pose a public health hazard, as they provide ideal habitats for organisms that transmit serious communicable diseases. The plants threaten to infest downstream areas as well, including rich oyster-producing areas of Apalachiocola Bay. A comprehensive plant control program is urgently needed, though elimination of vegetation is neither possible nor desirable. Mechanical (such as water-level manipulation), biological, chemical, and legal control measures are planned. In October 1976 acreage of various plants was estimated: Eurasian water milfoil (Myriophyllum spicatum), 8000; giant cutgrass, 4500; hydrilla, 1000; water hyacinth (Eichhornia crassipes), 800; and alligatorweed (Alternanthera philoxeroides), 50. Chemical control of hyacinth 1958-59 led to phenomenal growth of alligatorweed in the early 1960s, but the latter was successfully controlled by use of the alligatorweed flea beetle, Agasicles hygrophila. (See also W78-11591) (Lynch-Wisconsin)
W78-11599

SELECTIVE MAINTENANCE CONTROL PLAN, ST. JOHNS RIVER, FLORIDA,
Army Engineer District, Jacksonville, FL.
J. C. Joyce.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 45-48, 1 fig.

Descriptors: *Aquatic plant control program, *St. Johns River(FL), *Aquatic weed control, *Water hyacinth, *Methodology, *Analytical techniques, *Water management, *Planning, *Army Engineer Jacksonville District, 2-4-D, Herbicides, Chemcontrol, Biocontrol, Neochetina eichlorniae, Mechanical control, Eichhornia crassipes, Selectivity, Maintenance, Environmental effects, Social aspects, Florida, Rivers, Water hyacinth weevils, Eutrophication, Water pollution effects.

e process of developing a selective maintenance
rol program for water hyacinth (Eichhornia
ssipes) in the St. Johns River, Florida, is
scribed and schematically illustated. The
alytical and methodological techniques can be
ended to other localities for which a control
gram is needed. The program developed by the
ksonville District of the U.S. Army Engineer
uth Atlantic Division involves selective main-
ance spraying with the dimethylamine salt of
-D, and is designed to maintain infestation at
lower level possible while providing for public
e of the river and minimizing environmental ef-
ts. Major objectives of the program are to: (1)
velop a clear operational plan and policy, (2)
ncentrate on areas of heaviest infestation, (3)
duce total herbicide level, (4) reduce environ-
ntal impact, (5) tailor treatment to specific
eds of various sections of the river, (6) integrate
logical and mechanical methods (including use
the water hyacinth beetle, Neochetina eichhor-
ie),l and (7) schedule operations to minimize in-
ference with fish and wildlife activities and
blic access to the river. Planning involved: (1)
alysis of the environmental setting--plant popu-
ions; water body morphology; streamflow,
ter stage, and weather trends; obstructions;
tural collection points; habitats; crops; naviga-
n channels; herbicide restrictions; and public
inion. (2) Analysis of resources. (3) Design of
eliminary operational plan. (4) Initiation of the
erational pln, involving two phases: clean-up,
d routine maintenance. (Lynch-Wisconsin) (See
so W78-11591).
78-11600

ONTROL OF WATERCHESTNUT IN NEW ORK STATE,
rmy Engineer District, New York.
M. Hook.
: Miscellaneous Paper A-77-3, August 1977.
oceedings, Research Planning Conference on
e Aquatic Plant Control Program, 19-22 October
76, Atlantic Beach, Florida. p 55-59, 5 ref.

escriptors: *Aquatic Plant Control Program,
New York, *Water chestnut, *Aquatic weed con-
ol, *2,4-D, *Chemcontrol, Army Engineer New
ork District, Mechanical control, Trapa natans,
udson River, Mohawk River(NY), Lake Cham-
ain, Rivers, Lakes, Herbicides, Biocontrol,
utrophication, Water pollution effects

easures for control of water chestnut (Trapa
tans) in the U.S. Army Engineer New York Dis-
ict emphasize work in the Hudson and Mohawk
vers and portions of Lake Champlain. In-
oduced into the United States in 1884 at Collins
ake, New York to enhance asethetic and fishery
sources, the plant has spread to the Mohawk
iver by 1920, and to the Hudson River, Lake
hamplain, and the Finger Lakes by 1944. Water
estnut virtually closes off bays with impenetra-
e mats, hinders recreation, displaces desirable
ildfowl food plants, reduces near-shore habitat
r game fish, provides insect breeding grounds,
npedes flow in water supply intakes, and
roduces a dangerous sharp-spined seed. Large-
ale control efforts were begun in 1946, and in-
uded: (1) hand pulling, (2) underwater mowing
nd self-propelled barges, and (3) herbicidal spray-
g of the isopropyl ester of 2,4-D in fuel oil. After
erial spraying was replaced by spraying
om boats. In 1965 a systematic eradication pro-
am was initiated, under combinations of federal
nd state funds. A steady decline in infestations
as resulted, decreasing from 2826 acres in 1966 to
340 acres in 1976. Total contract spraying costs in
974 were $31.60/acre, including labor costs of
18.52/acre. Hand pulling costs are about
59.27/acre. An application rate of 8 lbs acid
quivalent 2,4-D/acre has proven effective,
prayed directly on leaf surfaces. (See also W78-
1591) (Lynch-Wisconsin)
78-11603

AUTOMATED PROCESSING OF APC FIELD OPERATIONS DATA,
Army Engineer District, Jacksonville, FL.
J. T. McGehee.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 61-74, 11 fig.

Descriptors: *Aquatic Plant Control Program, *Aquatic weed control, *Data processing, *Automation, *Monitoring, *Data storage and retrieval, *Computer programs, Army Engineer Jacksonville District, Florida, Methodology, Data collections, Water hyacinth, Eichhornia crassipes, Eutrophication, Water pollution effects.

A computerized data processing, storage, and retrieval system developed for the U.S. Army Engineer Jacksonville District's Aquatic Plant Contrl Program is described, and examples of weekly report forms and output are illustrated. The plant control program in the district includes 30 field crews reporting data each week. An earlier report form was modified to facilitate keypunching. The new form is organized into four sections: (1) heading, (2) personnel and equipment (rental, wages, other costs), (3) time distribution of the field unit, and (4) general (area treated, conditions, materials used, remarks). Marginal numbers define fields for keypunch operators. A computer program in COBOL was developed to process data and generate a cumulative summary. Programs flag missing or incorrect data; compile and summarize data; separate data by agency, type of field unit, and acreage; display acreage of plants treated by watershed number and cost account number; and write a monthly transaction tape containing all raw data from the cards. Before keypunching, forms are reviewed manually for errors. Provision was made for expansion, as for example multiple-digit watershed code numbers to enable later division into sections, and a numerical code to sallow addition of new plants. At present only water hyacinth are being treated by the district. (See also W78-11591) (Lynch-Wisconsin)
W78-11604

THE PROJECTED IMPACT OF WATER HYACINTH INFESTATION IN TEXAS,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 4A.
W78-11605

THE LARGE-SCALE OPERATIONS MANAGEMENT TEST (LSOMT) WITH THE WHITE AMUR AT LAKE CONWAY, ORLANDO, FLORIDA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. F. Theriot.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 87-96, 8 fig.

Descriptors: *White amur, *Biocontrol, *Aquatic weed control, *Lake Conway(FL), *Hydrilla verticillata, *Environmental effects, *Aquatic Plant Control Program, Florida, Eurasian water milfoil, Myriophyllum spicatum, Hydrilla verticillata, Ecology, Ecosystems, Lakes, Ctenopharyngodon idella, Fish, Eutrophication, Water pollution effects.

The white amur fish (Ctenopharyngodon idella), introduced into Lake Conway, Orlando, Florida, is being evaluated by the U.S. Army Engineer Waterways Experiment Station as a biological agent for control of such nuisance aquatic plants as hydrilla and Eurasian water milfoil. The test is designed not only to yield data on long-term effects of the herbivorous fish on the ecosystem, but also to predict stocking rates, sizes, and optimum time, and restocking intervals (if needed). Some objectives of the study are to determine: (1) effects of white amur on hydrilla and how to measure such effects; (2) effects of white amur on lake ecology--water quality, game fish, zooplankton, phytoplankton, reptiles, and amphibians; (3) long-range effects on the white amur, such as growth, mortality, and food habits; and (4) which waters are amenable to plant control using white amur. Lake Conway, which consists of the five pools of Lake Conway, Little Lake Conway, and Lake Gatlin, was chosen in part because its small number of inflows and outflows, and its stability of water level (2-3 ft annual variation). Three fish barriers will be erected to prevent escape of white amur. As additional protection, a monosex fish population is being developed, to be stocked in February 1977; intensive monitoring will continue for two to three years. (See also W78-11591) (Lynch-Wisconsin).
W78-11606

BASELINE DATA REPORT--LAKE CONWAY GRASS CARP PROJECT,
Florida State Game and Fresh Water Fish Commission, Orlando.
V. Guillory, R. Land, and R. Gasaway.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 97-112, 13 tab, 10 ref.

Descriptors: *White amur, *Biocontrol, *Baseline studies, *Lake Conway(FL), *Hydrilla verticillata, *Aquatic weed control, *Aquatic Plant Control Program, Ctenophyngodon idella, Fish, Florida, Species diversity, Trophic level, Life history studies, Sampling, Creel census, Abundance, Mammals, Waterfowl, Methodology, Lakes, Eutrophication, Water pollution effects.

So that effects of projected introduction of the herbivorous fish, white amur (grass carp), into Lake Conway, Florida to control the aquatic nuisance plant Hydrilla verticillata could be evaluated, baseline conditions in the lake system were studied. This report presents results from the first three months of study and describes methodology. Conclusions: (1) fish populations appear to be fairly stable according to species diverity analysis; (2) fish sampled in shoreline vegetation show higher species diversity but lower numerical abundance than fish collected in shallow, non-vegetated habitats; (3) a fairly large game fish population exists, but bluegill and redear sunfish show effects of overcrowding, with harvestable bluegill, redear sunfish, and largemouth bass in poor condition; and (4) the overall fish catch rate is low, but the predominance of bass fishermen and their low catch rates may account for the low overall rates. Evaluation of effects of white amur introduction is to be based on four techniques used in this study: (1) life history studies of fish of different trophic levels and habits (chain pickerel, bluefin killifish, bluegill, and largemouth bass); (2) fish sampling involving six methods (wegener ring, electrofishing, gill net, blocknet-rotenone, 10-ft seine, and 20 ft seine; (3) a creel survey to measure sport fishing; and (4) sampling of waterfowl and aquatic mammals by direct count. (See also W78-11591) (Lynch-Wisconsin).
W78-11607

AQUATIC MACROPHYTE SAMPLING IN LAKE CONWAY,
Florida Dept. of Natural Resources, Orlando. Bureau of Aquatic Plant Research and Control.
L. E. Nall, M. J. Mahler, and J. Schardt.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 113-122, 4 fig, 3 tab.

Descriptors: *White amur, *Lake Conway(FL), *Species composition, *Macrophytes, *Sampling,

*Biocontrol, *Aquatic Plant Control Program, Aquatic weed control, Methodology, Floral lists, Biomass, Aquatic plants, Florida, Ctenopharyngodon idella, Hydrilla verticillata, Nitella megacarpa, Vallisneria americana, Illinois pondweed, Potamogeton illinoensis, Lakes, Eutrophication, Water pollution effects.

Sampling of aquatic macrophytes in Lake Conway, Florida, is being conducted in connection with a project to introduce an herbivorous fish, white amur (Ctenopharyngodon idella), into the lake for biocontrol of Hydrilla verticillata. As very little biomass information has been collected during the first four months, this paper deals primarily with sampling methodology. An inventory of the 45 floral species found in Lake Conway is included, together with tables showing monthly species composition averages and fresh biomass of plants along transects. Objectives of the Lake Conway project are to observe: (1) changes in distribution, biomass, species composition, and condition of each plant species; (2) food preference of white amur; (3) removal rate of target species; (4) effect on desirable species, such as Vallisneria americana and Nitella megacarpa; and (5) interspecific competition among plant species while under stress from the white amur. For the macrophyte sampling 20 transects are sampled monthly at 100-m intervals. Samples are separated to species, weighed, dried, and reweighed, and reproductive structures are noted. Eighteen one-ha plots in representative areas of the lake are also sampled monthly by means of hand-removal of a 0.25-m square of vegetation in each plot by divers. Several five x five-m exclosures placed in heavily vegetated areas will serve as controls shielded from amur feeding. The most ubiquitous plant species in Lake Conway are nitella, Illinois pondweed, and Hydrilla. (See also W78-11591) (Lynch-Wisconsin).
W78-11608

BIOLOGICAL BASELINE STUDIES OF THE LAKE CONWAY, FLORIDA, SYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. L. Fox, E. C. Blancher, F. M. Koojiman, R. A. Conley, and C. P. Feerick.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 123-145, 9 fig, 10 tab, 11 ref.

Descriptors: *Lake Conway(FL), *Baseline studies, *Trophic level, *Zooplankton, *Phytoplankton, *Benthic fauna, *Aquatic Plant Control Program, Mesotrophy, Eutrophication, Florida, Lakes, White amur, Ctenopharyngodon idella, Aquatic weed control, Biocontrol, Invertebrates, Methodology, Faunal lists, Floral lists, Periphyton, Algae, Distribution, Species diversity, Nutrients, Water pollution effects.

A baseline study of zooplankton, phytoplankton, periphyton, and benthic invertebrates is being conducted as part of a program to introduce the herbivorous fish white amur (Ctenopharyngodon idella) into Lake Conway, Florida for biological control of Hydrilla verticillata. There is much biotic and abiotic variation among the five pools of the Lake Conway system. Although a firm trophic designation is impossible as yet, mean hypolimnetic oxygen concentrations Secchi disc values, and chloropyll-a levels indicate mesotrophy. Biological parameters imply the East and West Pools and Lake Gatlin are somewhat eutrophic, while the South and Middle Pools are more oligotrophic. Biota examined thus far also indicate mesotrophy, but the large biomass of submersed vascular plants and microscopic algae may reflect excessive nutrient loading. Never theless, a preliminary nutrient budget shows a loading rate characteristic of a mesotrophic lake. Various tables give species lists of the biota sampled, and abundances of several taxa are figured. Twenty-one stations were sampled. Diaptomus floridanus, Cyclops varicans and Tropocyclops prasinus accounted for 95% of all copepods collected. The Shannon-Weaver diversity index for phytoplankton was relatively constant at 3.5-4.0. To date 56 species of benthic invertebrates have been collected. (See also W78-11591) (Lynch-Wisconson).
W78-11609

BACKGROUND WATER-QUALITY ANALYSIS OF LAKE CONWAY,
Orange County Pollution Control Dept. Orlando, FL.
A. T. Sawicki.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 146-158, 16 fig, 3 tab.

Descriptors: *Lake Conway(FL), *Water quality, *Seasonal, *Parameters, *Methodology, *Aquatic Plant Control Program, Nutrients, Phosphorus, Nitrogen, Dissolved oxygen, Carotenoids, Chlorophyll, Biochemical oxygen demand, Hydrogen ion concentration, Alkalinity, Lakes, Florida, *Eutrophication, *Water pollution effects.

Water quality in Lake Conway, Florida, has been monitored comprehensively since 1972 by the Orange County Pollution Control Department (PCD). Since January 1976 monitoring has been intensified under contract with the U.S. Army Engineer Waterways Experiment Station (WES). Comparison of historical data for 1972-76 with more recent data indicates that water quality is relatively stable, varies somewhat from pool to pool in the five-pool system, and is subject to seasonal and other short-term variations. Based on a comparison of eight selected parameters for the two data sets, several conclusions are offered: (1) Alkalinity and pH have small variations in means and standard deviations, and appear not to have significant seasonal variations. (2) Water quality in Lake Gatlin (one of the five pools) varied widely between 1972-76 as indicated by large standard deviations, but for unknown reasons in 1976 water quality in Lake Gatlin appears very similar to that in Lake Conway. (3) Seasonal trends for dissolved oxygen and nonastician carotenoids seem consistent for both the 1972-76 PCD data and the 1976 WES data; there seems to be an inverse seasonal relationship between the two parameters. (4) Incomplete data may account for lack of correlation of data from the PCD and WES monitoring of other parameters--biochemical oxygen demand, phosphorus, organic nitrogen, and chlorophyll-a. (See also W78-11591) (Lynch-Wisconsin).
W78-11610

PROPOSED RELATIONSHIPS BETWEEN WHITE AMUR AND THE AQUATIC ECOSYSTEM AT LAKE CONWAY, FLORIDA,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
K. C. Ewel, and T. D. Fontaine, III.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 159-176, 12 fig, 3 tab, 16 ref, 1 append.

Descriptors: *White amur, *Biocontrol, *Hydrilla verticillata, *Simulation analysis, *Model studies, *Aquatic weed control, *Ecosystems, *Lake Conway(FL), *Aquatic Plant Control Program, Ctenopharyngodon idella, Fish, Florida, Lakes, Forecasting, Nutrients, Phosphorus, Orthophosphate, Phytoplankton, Algae, Herbicides, Submerged plants, Chemcontrol, Integrated control, Eutrophication, Water pollution effects.

A model of the Lake Conway, Florida ecosystem is being developed to predict long-term effects of the use of white amur (Ctenopharyngodon idella), an herbivorous fish, to control excessive growths of Hydrilla verticillata. Effects of the fish on hydrilla, as well as on the entire ecosystem, are being simulated. As construction of the current model was accomplished before field work was begun and only a small amount of data was available, the model represents a generalized model for a Florida lake, not specifically Lake Conway. The most important factors controlling the lake ecosystem are considered to be solar energy, water temperature, and rainfall/runoff with associated phosphorus inputs. Modelling show that: (1) White amur used as the primary agent may not achieve control of hydrilla for six years. (2) White amur in conjunction with herbicides achieve control much more rapidly. (3) If the model correctly assumes that native submersed plants derive all nutrient needs from sediments, then they are little affected by changes in hydrilla population or dissolved orthophosphate levels. (4) Native submersed plants and probably also hydrilla appear to act as nutrient pumps, leaching sediment-derived nutrients into the water, and release of nutrients from hydrilla or white amur will result in at least temporary algal blooms. An appendix includes the program listing for the simulation model. (See also W78-11591) (Lynch-Wisconsin)
W78-11611

CULTURE TECHNIQUES FOR THE PRODUCTION OF MONOSEX WHITE AMUR,
Fish Farming Experimental Station, Stuttgart, AR.
A. E. Thomas.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 177-186, 9 fig, 3 tab.

Descriptors: *Lake Conway(FL), *Monosex fish, *White amur, *Gynogenesis, *Sex reversal, *Biocontrol, *Methodology, *Aquatic Plant Control Program, Ctenopharyngodon idella, Fish, Aquatic weed control, Florida, Research equipment, Spawning, Marking techniques, Eutrophication, Water pollution effects.

Efforts to produce monosex white amur (Ctenopharyngodon idella) for control of aquatic vegetation are reviewed. Research on artificial gynogenesis since 1972 has resulted in poor survival rates. Research on another technique, sex reversal, is still in experimental stages. Gynogenesis is the development of an ovum after penetration by a spermatozoan, but with no genetic contribution from the male. The usual process is to destroy chromosomes through denaturing the DNA in the sperm with ultraviolet light. Israeli carp (Cyprinus carpio) males were used as sperm donors because any chromosomal material not destroyed by the ultraviolet radiation will produce a lethal hybrid. Newly hatched diploid fry swim upward, are carried through an overflow drain, and are collected in small trough baskets. Haploid and hybrid fry normally remain in the hatching pot, deformed and less active. Only 0-3.6% of the eggs develop into diploid fry; most become haploids with only half the normal chromosomes. In the tests haploids and hybrids died within 24 hrs; diploids developed normal, all-female grass carp. In sex reversal, diploid fry are fed male sex hormones, and fish changed to functional males while having only female sex chromosomes are mated with normal females to produce all-female offspring without the reduced survival with gynogenesis. Equipment and marking techniques are discussed, as well as fish available for the Lake Conway, Florida, white amur project. (See also W78-11591) (Lynch-Wisconsin)
W78-11612

RESPONSE OF HYDRILLA TO VARIOUS HERBICIDES,
Texas Parks and Wildlife Dept., San Antonio. State Wide Noxious Vegetation Control Program.
L. V. Guerra.

: Miscellaneous Paper A-77-3, August 1977. roceedings, Research Planning Conference on e Aquatic Plant Control Program, 19-22 October 976, Atlantic Beach, Florida. p 187-194, 7 fig, 1 b.

escriptors: *Hydrilla verticillata, *Herbicides, Chemcontrol, *Texas, *Aquatic weed control, Aquatic Plant Control Program, Rates of applica- on, Toxicity, Mortality, Aquathol, Aqua-Kleen, anvel, Hydout, Tubers, Eutrophication, Water ollution effects.

ranulated and liquid herbicides were tested on ydrilla verticillata, a serious problem in Texas in eotropical waters and slightly acid waters of deep ney woods. The objective was to rate and rank e four granulated herbicides for total effective- ess, and to evaluate liquid herbicides in various ombinations and in liquid vs inverted solutions. or granular herbicides over 90% plant destruction as achieved in 90 days, and 96.5-100% mortality as sustained for 210 days. The overall yearly verage was about 85% mortality. Liquid formula- ons were slower to react; 150 days were required o obtain 80% plant kill, which lasted only 120 ays. The overall yearly average was slightly elow 60%. Explanations for the poorer per- ormance of the liquid herbicides include acidity f the water, lower temperatures during cooler ionths, and overtreatment with granular herbi- ides. The tests indicate: (1) hydrilla can be treated ith various herbicides to achieve desired mortali- y levels; (2) timing can be programmed so that reatment of large areas coincides with peak ecreational usage; (3) ever-decreasing number of ibers show control is feasible; (4) control mea- ures used in this study can prevent wide dispersal f hydrilla when less than 2000 acres are infested; 5) soil treatment should be investigated when lants have been destroyed or are beginning to ome up. Herbicides tested included Aquathol G, qua-Kleen-20, Banvel XP, Hydout. (See also V78-11591) (Lynch-Wisconsin)
V78-11613

UPTAKE AND METABOLISM OF DIMETHYLAMINE SALT OF 2,4-D BY FISH,
Syracuse Research Corp., New York.
For primary bibliographic entry see Field 5C.
W78-11614

CHARACTERIZATION AND EVALUATION OF POLYMERS CONTAINING HERBICIDES AS PENDENT SIDE CHAINS,
Wright State Univ., Dayton, OH. Dept. of Chemis- try.
For primary bibliographic entry see Field 5C.
W78-11615

DEVELOPMENT AND EVALUATION OF CONTROLLED RELEASE HERBICIDES,
Creative Biology Lab., Inc., Barberton, OH.
G. A. Janes.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on he Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 217-220, 3 tab.

Descriptors: *Herbicides, *Controlled-release her- bicides, *2,4-D, *Polymers, *Aquatic weed con- rol, *Aquatic Plant Control Program, Diquat, Sil- vex, Fenac, Fenuron, Endothall, Bioassay, Chronicity, Temperature, Rubber, Pesticide esidues, Rates of application, Eutrophication, Water pollution effects.

Tests were conducted to establish effective dosages of controlled-release herbicide formula- tions of Diquat, 2,4-D acid, Silvex, Fenac acid, Fenuron, and Endothall. Formulations were prepared at 100%, 90%, 50%, and 25% of their respective maximum loadings in various elastomeric bases. Initial loss rate analyses in- dicate successful release of toxicants. Elastomers used were hot polymerized styrene-butadiene copolymer, cold polymerized styrene-butadiene copolymer, natural rubber, synthetic natural rubber, cis polybutadiene, and an ethylene- propylenediene terpolymer. Master-batch formu- lations and maximum loadings are given in tables. Spectrophotometric standard curves determined for 2,4-D acid, Diquat, and Silvex were used to establish loss rates of agents from each of the polymer bases at the various loading levels at 70 and 80F. A table gives release rates for 2,4-D acid at 70F from hot and cold polymerized styrene-bu- tadiene and cis polybutadiene formulations. In each case the formulations show significant con- trolled-release efficacy, and essentially all the 2,4- D from the highest loading CB rubber was released in 100 days. Early data for Diquat show excessive- ly high release. Earlier chronicity studies demon- strated the ability of Silvex, Diquat, and 2,4-D acid to destroy weeds at 0.01-0.001 ppm/day. Bioassay tests with cabomba and milfoil have shown effec- tive controlled-release treatment by Fenac and En- dothall over a 30-day period. (See also W78-11591) (Lynch-Wisconsin)
W78-11616

EFFICACY EVALUATION OF CONTROLLED-RELEASE HERBICIDES,
University of Southwestern Louisiana, Lafayette. Dept. of Plant Industry.
J. R. Barry.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program,, 19-22 October 1976, Atlantic Beach, Florida. p 221-223, 1 tab.

Descriptors: *Controlled-release herbicides, *Herbicides, *Aquatic weed control, *2,4-D BEE, *Fenac, *Copper sulfate, *Aquatic Plant Control Program, Water hyacinth, Eichhornia crassipes, Hydrilla verticillata, Egeria densa, Eurasian water milfoil, Myriophyllum spicatum, Coontail, Ceratophyllum demersum, Louisiana, Rubber, Rates of application, Eutrophication, Water pollu- tion effects.

Efficacy of eight controlled-release formulations of the herbicides 2,4-D BEE, copper sulfate, and Fenac was tested on five nuisance aquatic plant species in experimental pools. Formulations were: (1) rubber-2,4-D BEE, with CBL Number 14 ACE containing 18.7% 2,4-D BEE with a release life of two years at 10, 20, and 40 ppm; (2) rubber-copper sulfate monohydrate, with CBL Number E51 con- taining 17.5% Cu++ with a release life of 5-7 months at 25, 50, and 100 ppm; and (3) a polyethylene-Fenac wafer containing 20% Fenac acid, 70% polyethylene, and 8% iron oxide at 30 and 60 ppm. Species tested were water hyacinth (Eichhornia crassipes), Hydrilla verticillata, Egeria densa, Eurasian water milfoil (Myriophyllum spicatum), and coontail (Ceratophyllum demersum). Triplicate pools (3 m sq x 0.5 m deep) were treated with each of the for- mulations (plus a control); each pool contained 12 hyacinth plants and duplicate flats of each sub- mersed species. Pools were filled to 0.3 depth; plants were added on July 12-13, 1976, and treated with herbicides on July 29. Visual ratings were made in August, September, and October. Rubber- 2,4-D BEE eliminated M. spicatum at all rates and substantially damaged C. demersum and E. cras- sipes at 40 ppm. All species were sensitive to rubber-copper sulfate, and C. demersum was eradicated. Polyethylene-Fenac killed all M. spicatum and C. demersum plants at both rates, and egeria at 60 ppm. The rates tested appear to exceed those necessary for chronicity. (See also W78-11591) (Lynch-Wisconsin)
W78-11617

PROGRESS IN THE USE OF PLANT PARTHOGENS AS BIOLOGICAL CONTROLS FOR AQUATIC WEEDS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
R. Charudattan, T. E. Freeman, and K. E. Conway.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 224-229, 11 ref.

Descriptors: *Aquatic weed control, *Biocontrol, *Pathogenic fungi, *Cercospora rodmanii, *Acremonium zonatum, *Water hyacinth, *Aquatic Plant Control Program, Plant pathology, Eichhornia crassipes, Hydrilla verticillata, Water hyacinth rust, Uredo eichhorniae, Integrated con- trol, Neochetina eichhorniae, Water hyacinth weevils, Orthogalumnia terebrantis, Water hyacinth mite, Florida, Insects, Rusts, Pathogenic bacteria, Host specificity, Eutrophication, Water pollution effects.

Several biological control agents for water hyacinth (Eichhornia crassipes) and Hydrilla ver- ticillata are being tested at various sites; hyacinth agents included: (1) two fungal pathogens, Cer- cospora rodmanii and Acremonium zonatum; (2) water hyacinth rust, Uredo eichhnorniae; (3) two arthropods, the water hyacinth weevil (Neochetina eichhorniae), and the water hyacinth mite, Orthogalumna terebrantis; and (4) integrated control with the two insects and A. zonatum. Agents for hydrilla are mentioned only briefly in this paper. The two pathogenic fungi C. rodmanii and A. zonatum have proved successful control agents; the former is being considered for mass production and experimental releases. A. zonatum, capable of extensive damage to hyacinth by itself, is more efficacious in an integrated biological control scheme with N. eichhorniae and O. terebrantis. In south Florida interaction between the arthropods and A. zonatum occurs naturally, but existing levels of A. zonatum are too low for effective control and must be supple- mented. In integrated biocontrol experiments a combination of N. eichhorniae and A. zonatum killed all hyacinth in 52 days. Plants treated with N. eichhorniae alone were severely damaged but alive, while those treated with A. zonatum alone were moderately infected and alive. Studies of the obligate rust pathogen of water hyacinth U. eichhorniae have shown this fungus to be another significant host-specific biological control agent for water hyacinth. (See also W78-11591) (Lynch-Wisconsin)
W78-11618

PRELIMINARY RESULTS OF INTEGRATING CHEMICAL AND BIOLOGICAL CONTROLS TO COMBAT WATER HYACINTH,
Agricultural Research Service, Fort Lauderdale, FL.
B. D. Perkins.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 230-235, 6 fig, 10 ref.

Descriptors: *Water hyacinth, *Biocontrol, *Chemcontrol, *Integrated control, *2,4-D, *Water hyacinth weevils, *Aquatic Plant Control Program, Neochetina eichhorniae, Aquatic weed control, Eichhornia crassipes, Florida, Herbi- cides, Feeding rates, Eutrophication, Water pollu- tion effects.

Plots of water hyacinth (Eichhornia crassipes) in- fested with water hyacinth weevils (Neochetina eichhorniae) were selectively sprayed with 2,4-D at 2 lbs/acre in April 1976 near Fort Lauderdale, Florida to assess effects of integrated biological and chemical control of the plant. The herbicide greatly reduced hyacinth density from 61 to two plants/sq m, and slight regrowth by August (to 15 plants/sq m) was heavily attacked by increasing weevil populations. Weevils apparently were at- tracted to treated plants, possibly due to release of a kairomone from growing plant tissue. In the ex- periments six 8 x 8 m field plots were demarcated;

three were sprayed with 2,4-D, and three served as controls. Four plants inside and four plants outside the plots were sampled monthly during April-October. The density of plants outside the treated plots paralleled that inside and outside controls. Adult weevils and plants increased steadily outside controls from 0.7 to 2.4, and inside controls from 1.7 to 3.5; outside the treated plots the population decreased initially from 1.5 to 0.3, while inside it initially increased from 1.2 to 2.5, implying movement into the treated plots. The number of feeding spots on leaves followed a similar pattern. At this time many petioles inside the treated plots elongated from the 2,4-D treatment, and were heavily fed upon by adult weevils. Thereafter, the adult population decreased rapidly in the treated plots as plants deteriorated, reaching 0.3/plant by mid-September; outside treated plots the population increased to 2.9. (See also W78-11591) (Lynch-Wisconsin)
W78-11619

CONTROLLED FIELD TESTS OF SELECTED INSECTS AND PATHOGENS IN COMBINATION ON WATER HYACINTHS,
Army Engineers Waterways Experiment Station, Vicksburg, MS.
E. E. Addor.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 236-268, 11 fig, 15 ref, 1 append.

Descriptors: *Water hyacinth, *Integrated control, *Biocontrol, *Cercospora rodmanii, *Acremonium zonatum, *Arzama densa, *Neochetina eichhorniae, *Aquatic Plant Control Program, Water hyacinth mite, Water hyacinth weevils, Orthogalumna terebrantis, Tetranychus, Brownout, Insects, Eichhornia crassipes, Pathogenic fungi, Host specificity, Plant pathology, Louisiana, Lake Concordia(LA), Epiphytology, Aquatic weed control, Lakes, Eutrophicaton, Water pollution effects.

Although various combinations of four biocontrol agents tested on water hyacinth in Lake Concordia, Louisiana effectively controlled plant growth, various unanticipated experimental problems and extraneous influences made it impossible to positively evaluate the effects of each control agent. Complications included organisms found on plots to which they had not been introduced, agents not found on plots to which they had been applied, and appearance of two control organisms not part of the tests--the water hyacinth mite, Orthogalumna terebrantis, and a spider mite, Tetranychus cf. gloveri. Introduced agents were: (1) two pathogenic fungi, Cercospora rodmanii and Acremonium zonatum; and (2) two insects, the water hyacinth weevil Neochetina eichhorniae and a noctuid moth Arzama densa. Subjective evaluation of results suggests that: (1) some combination of Arzama, Neochetina, Cercospora, and Orthogalumna (all of which survived the first winter) established and sustained a debilitating epiphytotic; (2) Arzama and Neochetina apparently attack the most vigorous plants; (3) Cercospora virulence is enhanced by insect activity; (4) Orthogalumna, probably introduced with Neochetina, seems to have exerted stress on hyacinth; (5) Acremonium did not appear to contribute significantly to the epiphytotic; and (6) various fungi, bacteria, and viruses may contribute to the epiphytotic. In the tests 64 floating plot frames were stocked with hyacinth (Eichhornia crassipes) in May 1975; observations have continued through fall 1976. (See also W78-11591) (Lynch-Wisconsin)
W78-11620

REMOTE SENSING OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7B.
W78-11621

DATA MANAGEMENT SYSTEMS IN THE AQUATIC PLANT CONTROL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7C.
W78-11622

THE INDUSTRIAL WASTE STUDIES PROGRAM. SUMMARY REPORT ON THE AUTOMOBILE INDUSTRY.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 315, Price codes: A02 in paper copy, A01 in microfiche. March 1972. 7 p, 2 tab, 1 append.

Descriptors: *Automobile industry, *Industrial wastes, *Effluents, *Water pollution control, *Waste water treatment, *Standards, Environmental Protection Agency, Technology, Regulation, Pollutants, Water pollution sources, Engineering, Heavy metals, Biochemical oxygen demand, Suspended solids, Oil pollution.

Wastewater treatment technology of the automobile industry is reviewed in this summary report by the Environmental Protection Agency. Data was collected through the Industrial Waste Studies Program to develop effluent limitation guidelines. The report is based on data provided by private firms concerning wastewater involved, available control and treatment technology, and achievable effluent levels. As these data were considered inadequate for determining effluent limitation guidelines, additional data will be collected. However, certain engineering judgments regarding technically achievable effluent levels have been made by EPA technical experts, and these judgments are presented in this report, together with sources of descriptive matter and data relevant to this industry. Background data collected were published in a separate report. Tables in this summary present: (1) Two groups of significant wastewater parameters, those for which effluent levels should be established, and those for which limitation levels should be considered. (2) A list of parameters, and available treatment methods. (3) Achievable effluent levels for 11 parameters. This study was restricted to engines and vehicle assembly; all other aspects were omitted. Parameters for which achievable effluent levels are given are: BOD5, total chromium, copper, cyanide, iron, nickel, oil and grease, phenols, phosphorus, suspended solids, and zinc. (Lynch-Wisconsin)
W78-11629

MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
P. F. Pratt, S. Davis, and A. E. Laag.
Journal of Environmental Quality, V 6, No 4, p 397-402, Oct-Dec, 1977. 7 fig, 2 tab, 10 ref.

Descriptors: *Solid wastes, Irrigation, *Leaching, Cations, *Salts, Calcium, Potassium, Magnesium, Sodium, Farm wastes, *Dairy wastes.

Data from a four-year experiment with animal manures were extrapolated to a hypothetical irrigated basin to test the effects of (1) distribution of manure within the basin, (2) export of manure from the basin, and (3) water management on leaching of the salts added in irrigation waters and manures. The experimental plan had two parts. The first was a comparison of 6 treatments with animal manures, including a check treatment, each at 2 rates of application of irrigation water on Hanford soil. The second was a comparison of one manure treatment (79 metric tons of dairy manure on a dry weight basis per ha per year) on three soils at 2 irrigation rates. In all cases 3 replications were used. Plot size was 15 m by 15 m, with guard areas of the same size. The cropping sequence, consisting of barley in the winter and sudangrass in the summer, went through 4 complete cycles. Leachate volumes for the higher water treatment were about double those for the lower water treatment, except for the Hanford soil at the highest manure rate, where the difference between the 2 water treatments was only 25%. Also, the leaching volume was consistently lower for the Ramona and Domino soils than for the Hanford soils. Large amounts of Ca, K, and Mg were accumulated in the soil, but there was a net loss of Na. Practically no K moved beyond the 1.5 m depth. As the rate of manure increased, the percent leaching of the cations added in water and manures decreased. Extrapolation of the field data to a 18,200 ha irrigated basin and a production of 364,000 metric tons of dairy manure per year revealed that the amount of salt leached to groundwater in the basins could be reduced by applying the manure at relatively high rates on a fraction of the irrigated land and by export of manure from the basin. However, reductions were small in comparison to the effects of irrigation water management to obtain small leachate volumes. It might be viable to concentrate manure on soils having low water transmissivities which yield low leachate volumes with most irrigation systems. (Merryman-East Central)
W78-11632

FEDERAL GRANTS AWARDED FOR CONSTRUCTING WASTE TREATMENT FACILITIES WHICH BENEFIT INDUSTRIAL USERS.
Comptroller General of the United States, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 286, Price codes: A03 in paper copy, A01 in microfiche. Report B-166506-700508, May 1970. 34 p, 4 append.

Descriptors: *Federal government, *Grants, *Federal Water Quality Administration, *Treatment facilities, *Construction costs, *Industrial wastes, Cities, Waste treatment, Municipal wastes, Federal Water Pollution Control Act, Pollution abatement, Water pollution control, Administration, Public policy.

The Federal Water Quality Administration's (FWQA) policy of awarding grants to municipalities to help finance construction of waste treatment facilities for treatment of substantial quantities of industrial wastes was reviewed by the General Accounting Office. The review was intended primarily for gathering information on the number and amounts of construction grants. FWQA has awarded grants for facilities to treat: (1) domestic wastes only, (2) industrial wastes only, and (3) domestic and industrial wastes. Industrial plants have not been required to finance any part of construction costs of treatment facilities, and any contribution to such costs by the industry has resulted from agreements between the industry and the sponsoring municipality. Grants of up to 55% of total eligible cost are awarded by FWQA, with provision that the municipality assume jurisdiction over the facility. A partial list of projects in which industrial wastes were 50% or more of total volume of wastes showed grants of about $81 million for 381 facilities, estimated to cost about $360 million. At least 44 of the 381 facilities were designed to process 75% or more industrial wastes. In three FWQA regions, seven facilities were located which treat industrial wastes only; grants to the municipalities totalled $503,000. Factors are discussed which should be considered in determining the extent to which industry should contribute to construction costs of waste treatment facilities. (Lynch-Wisconsin)
W78-11633

THE ECONOMICS OF POLLUTION,
D. Pearce.
In: Environment and the Industrial Society, Holmes, N. (editor) Westview Press, Boulder, Colorado, 1977. p 165-190. 11 ref.

escriptors: *Economics, *Pollution abatement, Water pollution control, *Environmental conomics, *Ecology, *Methodology, Environental effects, Damage functions, Analytical chniques, Polluter-pays principle, Pollution xes(Charges), Regulation, Standards, Cost-enefit theory, Cost-benefit analysis, Aesthetics, alue.

his overview of various theories of pollution con-ol methods concludes that economics alone of-ers no answers to environmental problems, but oes provide techniques and a framework for solv-g some problems. The problems themselves raise uestions about the relevance of values upon hich economic solutions are based. Conventional conomic doctrine defines man in terms of self-in-rest, and prescribes policies based on criteria esigned to realize the aim of economic man; what xists becomes what is good. Critics argue that cologic criteria should be substituted for conomic criteria in addressing environmental roblems. A middle group accepts some limita-ons on the ability of economics to prescribe poli-ies for environmental problems, but holds that cr-eria should nevertheless be rooted in economics. his study reviews such approaches as pollution xes and pollution standards and discusses the olluter pays principle, under these headings: (1) ne nature of the economic debate, (2) conven-onal analysis, (3) free markets as a solution, (4) aking the polluter pay, (5) some criticisms of tax olutions, (6) ecology and economics, and (7) con-lusion. Among criticisms of pollution taxes is that f the intangible nature of abatement benefits, and ne possibility that people do not always translate uch losses as scenery or the lives of the members f their family into money values; values com-uted by the economist are not exhaustive. It is oncluded that many value systems cannot be ealt with using cost-benefit analysis. (Lynch-Visconsin)
W78-11634

KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA.
Calf News, V. 16, No 1, p. 16, 18, March, 1978. 2 g.

Descriptors: *Feed lots, *Recycling, Methane, Anaerobic digestion, Economics, Feasibility stu-ies, Standards, Refeeding, Protein fermentation roduct, Hamilton Standard.

Don Kaplan, feedlot operator in Bartow, Florida, s on the verge of accomplishing a feedlot system hich will: convert steer manure into a high-rotein feed, produce from the manure the power o run his plant (with excess energy to sell), and rovide an odorless, fly-free completely water-ontained feedlot with no runoff. The technologi-al input for this system is being provided to Hamilton Standard of Windsor Locks, Ct., a divi-ion of United Technologies, which has been stu-ying the anerobic fermentation process for seven ears. The Department of Energy recently warded a research grant of $938,000 to Hamilton Standard and Kaplan Industries to build the first ull-scale conversion plant for 10,000 head of cat-le at the Kaplan feedlot to produce a 25 percent rotein feed supplement called protein fermenta-ion product (PFP) and to produce methane gas. his first of three reports concerning this conver-ion plant discusses the PFP portion of the ecycling system. In a single cell anaerobic fer-entation system, the protein of the raw stock manure) is upgraded from 10 percent to roughly 3-25 percent. If PFP is considered as having 60 ercent of the protein content of cottonseed meal, t is worth about $80 per ton. One of the major easons that the Department of Energy funded the ystem, besides proving it technologically feasi-le, was to prove the economic viability so that ther feedlot operators will want such a system -- ot only because it will make them environmen-ally secure, but because they can make a profit rom it. The Hamilton Standard process costs bout $100 per head. (Merryman-East Central)
W78-11650

ORGANIC POLLUTION OF BOTTOM MUD IN THE SETO INLAND SEA AND ITS REMOVAL EXPERIMENT,
Nansei Regional Fisheries Research Lab., Hiroshima (Japan).
A. Murakami.
Bulletin of the Nansei Regional Fisheries Research Laboratory, No. 10 (1976), p. 53-72, 5 tab, 13 tab, 13 fig, 6 ref.

Descriptors: *Sediments, *Toxicity, Commercial fisheries, Water pollution, Water pollution effects, *Pulp and paper industry, *Eutrophication, Red tide, Organic matter, Organic wastes, *Dredging, Waste treatment, *Seto Inland Sea, Japan, Osaku Bay, Hiroshima Bay.

Organic pollution of bottom mud in the Seto Inland Sea has been observed near the pulp mill effluent pipe since 1950. The polluted bottom mud has been dredged by a pump. The dredged mud is treated and dewatered. The sludge is deposited on land. It is hoped that the removal of the contaminated sludge will help restore the fisheries. (EIS-Katz)
W78-11659

ENGINEERS OUTLINE WASTE DESIGN FACTORS,
R. J. Smith, T. E. Hazen, and G. B. Parker.
National Hog Farmer, p 4-6, Jan., 1974. 1 fig.

Descriptors: *Swine wastes, Waste management, Slatted floors, Oxidation ditch, Land disposal, *Farm wastes, *Design, *Waste storage, Lagoons, Aerobic conditions, Anaerobic conditions, Odor, Groundwater pollution, Crop response, Nutrients, Copper, Costs.

This article gives design factors for different manure handling systems. There are four main elements in an integrated manure handling system -- transport, treatment, storage, and land application. Three types of manure management systems are presented: (1) Slatted floor with underfloor pit storage. Advantages are: (a) simple, fairly low investment cost, (b) high retention of fertilizer nutrients, (c) suitability for small operators using batch farrowing. Disadvantages are: (a) difficult to pump out, (b) odor, (c) danger of gas poisoning during pre-pump agitation, (d) tank contents must be hauled. (2) Slatted floor with underfloor oxidation ditch. Advantages are: (a) low odor levels, (b) manure rendered sufficiently liquid to allow pumping, (c) ventilation requirements lower in winter, (d) possibilities of refeeding. Disadvantages are (a) external storage required to handle overflow, (b) continual maintenance and power cost, (c) possibility of disease transmission. Presently there are five areas of concern in relation to land disposal and nutrient loading: nitrate leaching into groundwater, excessive phosphorus and the effects on reed germination, high soil copper levels and plant uptake, excess potassium and magnesium deficient plants, and salt buildup in the soil. No swine producer should consider new facilities without first calculating how much ground is required for his final disposal area. Treated effluents are like fertilizers, and any big operator should maintain records of the amount of liquid pumped out of his system and the cumulative amounts of N, P, and K in the soil. It's anticipated that the state may require such data in the future. Based on the design criteria presented, the investment costs for a manure handling system can be estimated. (Bates-East Central)
W78-11668

CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS,
Agricultural Research Service, Chickasha, OK.
M. H. Frere, D. A. Woolhiser, J. H. Caro, B. A. Stewart, and W. H. Wischmeier.
Journal of Soil and Water Conservation, V. 32, No. 6, p. 260-264, Nov.-Dec., 1977. 6 fig., 13 ref.

Descriptors: *Management, Erosion, Leaching, *Agricultural runoff, Fertilizers, *Wates pollution control, *Federal Water Pollution Control Act Amendments of 1972, *Non-point pollution sources, Flow charts, Pesticides.

The Federal Water Pollution Control Act Amendments of 1972 require the control of nonpoint as well as point sources of pollution. Non-point sources are not discrete and identifiable. The best way of controlling pollution from these sources is not by means of a treatment plant; rather it is by land management. Methods of control can be classified into two groups: (1) methods applicable to broad areas, including education incentives, taxation, and legal penalties, and (2) farming practices that are site-specific because of climate, topography, economics, etc. A set of flow charts has been developed which assesses erosion problems and controls over large areas; evaluates erosion problems and selects physically feasible control practices for field-sized areas; assesses potential nutrient pollution from fertilizer or animal wastes, leaching, runoff, and erosion; and assesses potential pollution from pesticides. A master flow chart shows the general procedure to be followed. The scheme depends on answers to a set of sequential questions in the other flow charts. The flow charts should help user select farming practices to reduce nonpoint pollution and evaluate their consequences. (Bates-East Central)
W78-11681

AVOIDANCE CHAMBER RESPONSES OF MAYFLY NYMPHS EXPOSED TO EIGHT HERBICIDES,
Fish and Wildlife Service, Denver, CO. Fish-Pesticide Research Lab.
For primary bibliographic entry see Field 5C.
W78-11685

THE SPORT FISHERY OF THE UNCHANNELIZED AND CHANNELIZED MIDDLE MISSOURI RIVER,
South Dakota Univ., Vermillion. Dept. of Biology.
C. L. Groen, and J. C. Schmulach.
Transaction of the American Fisheries Society, Vol. 107, No. 3, p. 412-418, 1978. 1 fig., 4 tab., 25 ref.

Descriptors: *Missouri River, *Freshwater fish, South Dakota, Nebraska, Iowa, Missouri, *Fish harvest, Fish management, *Fish populations, Fish types, Fisheries, Fishing, Recreation, Dams, Tailwaters, *Channeling, Channel improvements, Carp, Channel catfish, Bass, Gavins Point Dam, *Channelized River, *Unchannelized River, Angler hours, Anler days, Annual catch, Harvest rate, Angling effort.

A catch survey of 502 km of the Missouri River was conducted from July 1, 1972 to June 30, 1973. The study area encompassed the Gavins Point Dam tailwaters (6.4 km), 84 km of unchannelized river and 412 km of channelized river. The fishery supported 412,660 angler hours (98,252 angling days) valued at $720,047. Anglers averaged 0.47 and 0.33 fish/h for annual catch and harvest rates, respectively. Catch rate includes fish not kept. The greatest angling effort and harvest occurred in the tailwaters, but the unchannelized river supported the highest annual catch and harvest rates, 0.72 and 0.50 fish/h. The unchannelized river also exceeded the channelized river in angler-hours/km, number of fish caught/km, weight harvested (kg/km) and average size of creeled fish. Sauger, channel catfish, and white bass were the most abundant species creeled in the unchannelized river compared to carp, channel catfish, and freshwater drum in the channelized section. The harvest rates indicated that the standing crop of sport fish was considerably greater in the unchannelized than the channelized river. More back-water

aquatic habitat and greater habitat diversity in the unchannelized river probably accounted for population abundance differences. (EIS-Katz).
W78-11709

UPTAKE OF WATER-SOLUBLE GASOLINE FRACTIONS AND THEIR EFFECT ON OXYGEN CONSUMPTION IN AQUATIC STAGES OF THE MOSQUITE (AEDES AEGYPTI (L.),
Vermont Univ., Burlington. Dept. of Zoology.
W. O. Berry, J. D. Brammer, and D. E. Bee.
Environmental Pollution, Vol. 15, 1978, p. 1-22. 4 tab., 9 fig., 19 ref.

Descriptors: *Oil, *Oil pollution, *Aquatic insects, Pesticides, Insecticides, Respiration, Gasoline, Aquatic amines, Dissolved oxygen, Water pollution effects, Oxygen requirements, Bioassay, Laboratory tests, Animal physiology, Animal metabolism, *Mosquitos, Aeds aegypti, Aquatic stages, Benzene, Toluene, Xylenes, Gasoline, Gasoline fractions, Mosquito larvae.

Oxygen consumption in aquatic stages of the mosquito (Aedes aegypti (L.) was measured following a 24-h pretreatment in sublethal doses of water-soluble fractions from whole gasoline or its individual components (Benzene, toluene and xylenes). A significat increase in 02 consumption occured in treated-fed larvae following exposure to water-soluble fractions from either 1 ml gasoline/liter water or a mixture of 0.2 ml benezene and 0.2 ml toluene/liter water. No significant differences in respiration were observed in either unfed larvae or fed larvae pretreated with the separate fractions or combinations of xylenes with benzene or toluene. Uptake and discharge of toluene by 4th-instar larvae were measured in solutions containing water-soluble amount of H3, toluene alone and in combination with benzene. These experiments suggest that water-soluble gasoline fractions are taken up by food particles and assimilated by the insects via feeding. The respiratory response of the larvae appears to be due to a synergistic effect of benzene and toluene that may effect coal permeability. (EIS-Katz).
W78-11710

CONTROL OF CHIRONOMIDS IN MILKFISH (CHANOS CHANOS) PONDS WITH ABATE (TEMEPHES) INSECTICIDE,
Taiwan Fisheries Research Inst., Tainan. Fish Culture Station.
S. C. Tsai.
Transactions of the American Fisheries Society, Vol. 107, No. 3, p. 493-494, 1978. 4 tab, 2 fig, 13 ref.

Descriptors: Toxicity, *Bioassay, Mortality, Aquiculture, *Phosphothioate pesticides, *Mullets, *Shrimp, Aquatic insects, Crustaceans, Parasitism, Mollusks, Copepods, Algae, Benthic flora, Fish establishment, Fish farming, Fish havest, *Aquiculture, *Chironomids, *Milkfish, Chanos, *Abate, *Temephos.

Larval chironomids (Chrionomus longilobus (Kieffer)) are serious competitors with milkfish Chanos chanos (Forskal) for benthic algae in commercial milkfish ponds in Taiwan. Chironomid larvae were effectively killed with temephos (Abate, 0,0,0', -tetramethyl 0,0'-thiodi-p-phenylene phosphorothioate) 59% emulsifiable concentrate when it was diluted 1:2,000 with seawater and applied to milkfish ponds to establish a concentration of 0.050 mg/liter of the active ingredient. This treatment did not harm milkfish and benthic algae. Residues found in the edible portions of milkfish after seven applications of Abate 50% emulsifiable concentrate ranged from 0.02 to 0.08 mg/kg, well below the 1.0 mg/liter approved by the World Health Organization for presence in human drinking water. The acute toxicity of Abate 50% EC to 13 other species of aquatic animals was determined in the laboratory. (EIS-Katz)
W78-11711

HUGE LOADS FUND WORLD'S LARGEST SEWAGE WORKS.
World Water, Vol 1, No 1, p 11, May, 1978.

Descriptors: *Sewerage, *Treatment facilities, *Loans, *Financing, *Interceptor sewers, Pumping plants, Sewage treatment, Sanitary engineering, Sewage disposal, Waste water treatment, Municipal wastes.

The world's largest sewage treatment plant, planned for Sao Paulo, Brazil, will serve a population of 5.5 million and extend sewerage to 55% of the city's 10.6 million inhabitants. The $1,240 million Sanegram project is being partially funded by the Sao Paulo Water and Sewerage Fund, the Banco Nacional de Habitacao, and by a loan for $110 million from the World Bank. The sewerage system will contain 5,500 km of collectors, 60 km of interceptors, and 10 pumping stations. The largest treatment plant will have a capacity of 63 cu m/sec; two major secondary and two smaller plants are also planned. Consulting engineers for the project are Metcalf and Eddy. (Lisk-FIRL)
W78-11756

ELIMINATION OF FECAL COLIFORM BACTERIA FROM SOIL IRRIGATED WITH MUNICIPAL SEWAGE LAGOON EFFLUENT,
Singapore Univ. Dept. of Microbiology.
R. G. Bell, and J. B. Bole.
Journal of Environmental Quality, Vol. 7, No. 2, p 193-196, April-June, 1978. 3 tab, 17 ref.

Descriptors: *Coliforms, *Sewage bacteria, *Spray irrigation, *Application methods, *Penetration, Sewage disposal, Grasses, E coli, Evapotranspiration, Enteric bacteria, Ultimate disposal, Waste water treatment, Municipal wastes.

Sewage lagoon effluent was applied by spray irrigation at a rate of about 4.5 cm/week to two Brown Cavendish loamy soil plots planted with reed canarygrass. The study was performed to examine the distribution and viability of fecal coliforms in the soil. Soil samples to a dept of 130 cm were collected weekly; fecal coliforms were enumerated after the first vegetation cutting, after the second cutting, and after a single fall irrigation. Coliforms never moved below a depth of 69 cm and were concentrated primarily within the top 8 cm of the soil. The initial 48 hrs after irrigation yielded a die-off rate of about 90%. The remaining 10% of the coliforms were diminished at a much slower rate over a period of about 2 weeks in the planted plots. Fecal coliform populations in the soil irrigated once after canarygrass harvesting remained detectable for 8 wks; the death rates of the coliforms doubled for each 10C increase in temperature. (Lisk-FIRL)
W78-11788

POLIOVIRUS REMOVAL FROM PRIMARY AND SECONDARY SEWAGE EFFLUENT BY SOIL FILTRATION,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5D.
W78-11789

SEWERAGE STUDY HITS SOUTH TAHOE AWT COSTS.
For primary bibliographic entry see Field 5D.
W78-11791

MILWAUKEE'S LAST STAND - CITY FIGHTS ADVANCED TREATMENT ORDERED IN WATER CLEANUP SUIT.
Engineering News-Record, Vol. 200, No. 22, p 13, June, 1978.

Descriptors: *Judicial decisions, *Tertiary treatment, *Lake Michigan, *Sewerage, *Overflow, Legal aspects, Water quality standards, Michigan, Illinois, Wisconsin, Great lakes region, Construction costs, Financial, Waste water treatment, Municipal wastes.

The city of Milwaukee, Wisconsin, is fighting a federal decision on a suit brought against the city of Illinois and Michigan. The decision mandated that Milwaukee construct a tertiary treatment plant to accommodate all of its municipal wastes before discharge to Lake Michigan. Milwaukee contends that the construction costs would be excessive, $1.46 billion, and that the advanced treatment plant would require 11 yrs to complete. The city also claims that storm water tunnels and detention systems to reduce the 50 overflows in the lake occurring each year should have priority over the treatment system. Since Wisconsin water quality standards are lowr than those in Illinois and Michigan, Milwaukee maintains that advanced treatment of waste water is not required; the EPA will refuse funding of the advanced waste water system and will only supply grants for treatment witin Wisconsin's standards. An Illinois official has claimed that the costs reqported by Milwaukee for the tertiary treatment are inaccurate and excessive. The court decision required that the treatment faility be completed by 1986. (Lisk-FIRL)
W78-11792

HOLLAND FIGHTS WATER POLLUTION.
For primary bibliographic entry see Field 6E.
W78-11793

THE WRC-WHERE THEY KNOW A BIT ABOUT WATER AND ARE LEARNING ALL THE TIME.
Surveyor, Vol. 4487, No. 151, p 17-19, June, 1978.

Descriptors: *Research facilities, *Sewage sludge, *Dewatering, *Anaerobic digestion, *Filtration, Oxygenation, Aeration, Soil amendments, Activated sludge, Aquatic environment, Rainbow trout, Leakage, Waste water treatment, Municipal wastes.

Waste water treatment, transport, leakage, and impact research projects have been conducted by the Water Research Center at Stevenage, England. Tests on sewage sludge have concentrated on economical methods of disposal, agricultural benefits, metal extraction, and pumping of thickened sludge with 12% solids contents. Oxygen injection into activated sludge plants and rising main sewers has been practiced as an alternative to diffused air and surface aeration. Anaerobic digestion rather than aerobic treatment has been tested as source of methane production, as an economical means of treating warm waste water, and as a method which produces less sludge. Anaerobic filtration of acetic acid-bearing wasste water has been found to reduce organics by 90-97%. Urban runoff measurement and sampling has been conducted in on-site investigations. The sensitivity of fish to pollutants, odors, and reduced dissolved oxygen concentrations has been measured using rainbow trout. Leaks have been detected in water pipes and pressurized sewage conduits with a sulfur hexafluoride injection technique. When a leak is present, the sulfur hexafluoride gas permeates to the ground surface and collects in bar holes drilled above the pipes. (Lisk-FIRL)
W78-11795

REGIONAL WASTEWATER TREATMENT SYSTEMS IN JAPAN,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5D.
W78-11814

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

RGANIC ASSIMILATION CAPACITY OF AUMEE RIVER ESTUARY AT TOLEDO, HIO,
arthview, Inc., Toledo, OH.
. R. Kunkle, and S. L. Wordelman.
urnal Water Pollution Control Federation, Vol. , No. 5, p 957-969, May, 1978. 11 fig, 4 tab, 13 f.

escriptors: *Waste assimilative capacity, Rivers, Estuaries, *Self-purification, *Dissolved oxygen emand, Biochemical oxygen demand, Model stu-es, Stratification, Storm water, Analytical chniques, Pollutant identification, Waste water eatment, Municipal wastes.

he Storm Water Management Model (SWMM) d a streamwater quality budget model evaluated e organic waste assimilative capacity of the aumee River estuary at Toledo, Ohio. A total an-ial BOD load of 5, 485, 900 kg, calculated by WMM, flows into the Maumee River through ombined and separated sewers, industrial scharges, the Bay View Water Reclamation ant, abnormal bypasses of overflows, and Swan reek. A water quality monitoring station on the ver has detected vertical stratification of dis-olved oxygen during the summer months; the ssolved oxygen flowing load deficit between the onths of June and October ranged over 3,000-300 kg/day. The streamwater budget model for etermining the assimilative capacity of the river lculated the net and gross dissolved oxygen con-entrations, the upstream and local BOD flushed, e benthic BOD deposited and exerted, the gross xygen demand, and the changes in dissolved ox-gen storage. The annual average dissolved ox-gen supply of 33,200 kg/day and the gross oxygen emand of 33,100 kg/day represented a 100 kg/day ssolved oxygen storage change. The assimila-ve capacity of the Maumee River during the mmer months varied over 7,800-27,100 kg/day, quiring an instream oxygen demand reduction nging from 7,300-16,000 ky/day. It was con-uded that if all local BOD discharges to the river ere eliminated, the dissolved oxygen concentra-on would still be below 4.0-5.0 mg/liter dissolved xygen standard set by Ohio. (Lisk-FIRL)
/78-11862

IMULATION AND DESIGN OF PUMPED TORMWATER SYSTEMS,
/indsor Univ. (Ontario). Dept. of Civil Engineer-g.
or primary bibliographic entry see Field 4A.
/78-11878

FFECT OF INTRAGRANULAR POROSITY OF OMPACTION,
linois Inst. of Tech. Chicago.
or primary bibliographic entry see Field 8E.
/78-11895

EVICE FOR REGULATING DRINKING /ATER,
kazaki Mfg., Co. Ltd., Kawagoe (Japan).
or primary bibliographic entry see Field 5F.
/78-11939

/ATER FILTRATION METHOD,
or primary bibliographic entry see Field 5D.
/78-11940

REATMENT OF SULFIDE-BEARING /ATERS WITH CHLORINE DIOXIDE,
lin Corp., New Haven, CT. (Assignee).
or primary bibliographic entry see Field 5F.
/78-11941

OMPARISON OF THE RADIOACTIVE AND IODIFIED TECHNIQUES FOR MEASUREMENT OF STREAM REAERATION COEFFICIENTS,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11977

GROUND-WATER STORAGE IN THE JOHNSON VALLEY AREA, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-11984

CULTURING AND ECOLOGY STUDIES OF THE ROTIFER POLYARTHRA VULGARIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
A. L. Buikema, Jr., J. Cairns, Jr., P. C. Edmunds, and T. H. Krakauer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 587, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/3-77-051, August 1977. 51 p, 7 fig, 16 tab, 92 ref. R800815.

Descriptors: *Laboratory animals, *Polyarthra vulgaris, Ecology, *Rotifers, *Zooplankton, *Methodology, *Cultures, Water temperature, Survival, Reproduction, Egg production, Fish diets, Light, Vitamins, Food habits, Fertility, Food webs, Bioassay.

Factors affecting successful laboratory culturing of the rotifer Polyarthra vulgaris were investigated, and a field study was conducted of the relationship between P. vulgaris and 19 chemical and physical parameters. The rotifer has important applications as a laboratory food for yellow perch and bluegills, but has never previously been cultured itself in the laboratory. Specimens were collected from Pandapas Pond, near Blacksburg, Virginia, and from Carvins Cove Reservoir, near Roanoke, Virginia, and were cultured in natural filtered water in receptacles ranging from 0.5-mm depression slides to 5-liter containers. Conclusions were: (1) keep handling to a minimum; (2) use containers which hold at least one liter; (3) use natural water that contains P. vulgaris, filtered through a 30-micro mesh net; (4) replace medium partially twice a week and totally once a week; (5) optimum light is incident illumination or 400-500 ft-c, complete light spectrum, 16L 8D photoperiod; (6) maintain an oxygen concentration near 8 ppm; (7) minimum vitamins are B12, thiamine, Biotin, and pantothenic acid; (8) food can include a mixture of Chilomonas paramecium, Cyathomonas truncatus, Bodo minimus, B. variabilis, and B. mutabilis; (9) optimum temperature is 20C; (10) some bacteria, fungi, and algae were detrimental; and (11) minimum viable population density is 40 animals/liter. Information is given on population dynamics and fertility. (Lynch-Wisconsin)
W78-12008

PESTICIDE RUNOFF LOSSES FROM SMALL WATERSHEDS IN GREAT LAKES BASIN,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5B.
W78-12009

ECONOMIC IMPACT OF PROPOSED AMENDMENT TO WATER POLLUTION REGULATIONS FOR HEXANE EXTRACTABLE MATERIALS, R74-1, 8, 9,
WAPORA, Inc., Charleston, IL.
L. W. Bates.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 184, Price codes: A09 in paper copy, A01 in microfiche. Illinois Institute of Environmental Quality Document Number 77/17, May 1977. 96 p, 2 fig, 17 tab, 53 ref, 5 append.

Descriptors: *Regulation, *Standards, *Effluent limitations, *Oil wastes, *Illinois, *Water pollution control, *Benefit-cost analysis, Waste water treatment, Industrial wastes, Economics, Costs, Effluents, Point pollution, Freon-extractable materials, Hexane-extractable materials.

The economic impact is assessed of altering the current Illinois legal limit of 15 mg/liter for total oil discharged from point sources by separately regulating polar and non-polar fractions of freon-extractable materials (FEM). The proposed standards are 15 mg/liter non-polar FEM and 15 mg/liter polar FEM. The proposition, R74-1, 8, 9, would amend Rule 408 of Chapter 3 of the Rules and Regulations of the Illinois Pollution Control Board. Three alternative scenarios were evaluated: (1) rejection of the proposed amendment and continuation of the current standard; (2) adoption of the proposed amendment and elimination of local ordinances limiting discharge of oils into sewage systems; (primary pretreatment and no biological overload of sewage systems are assumed) and (3) adoption of the proposed amendment, but with continuation of local ordinances limiting oils. No significant impact on employment, number of producers, prices, community expansion, or agriculture is likely under any of the scenarios. The incremental benefit-cost ratio would be highest in scenario number two; benefits in the form of operating and maintenance cost reductions are about five times the level of increased costs in the form of greater sewer-use expenditures and testing. Reduced costs in scenarios two and three probably would become profits rather than be passed on as lower prices. The profit increase is estimated at less than 5% for moderate to large firms, but profits of small firms could double. Damages for the three scenarios could not be qualified. (Lynch-Wisconsin)
W78-12010

EROSION OF SURFACE-MINE SPOILS,
Northeastern Forest Experiment Station, Berea, KY.
For primary bibliographic entry see Field 4D.
W78-12033

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2H.
W78-12038

PROTECTION OF SURFACE WATERS AGAINST EXCESSIVE SALINITY BY MEANS OF SALINE WASTE-WATERS DISCHARGE CONTROL,
Institute for Meteorology and Water Management, Warsaw (Poland).
A. Polujkis, and M. Zajbert.
Journal of Hydrological Sciences, Vol 5, No 1, p 69-79, 1978. 3 fig, 8 ref.

Descriptors: Surface waters, *Salinity, Protection, *Optimization, *Discharge control, Saline water, Estimating, Hydrology, Design, Economic, Cost minimization, Social aspects, Equations, Systems analysis, Simulation analysis, Mathematical models.

Water resources mineralization development has been watched in Poland since 1950 through appropriate research works and studies on protection of waters against salinity. These studies, concerned mainly with chlorides and sulphates, made it possible to launch protection of the Vistula and Odra Rivers against excessive salinity. This paper deals with the estimation methods of condition and structure of salinity and with designing principles

and optimization methods for a protection system based on the discharge control (dosing) of saline waters in defined conditions of the hydrological regime of a waste-water receiver. Discussed first are: the harmfulness of water salinity for river biocoenosis and water management; and methods of surface water protection against salinity. Considered next is the optimal operation of dosing-retention reservoirs. Objectives include cost minimization and the maximization of system functioning effectiveness. It is concluded that the amount of costs is not the utlimate selection criterion; the optimum solution should consider several social factors, such as economic difficulties or sanitary accounts and natural aspects, e.g., the technical solution effect on biocoenotic changes in water. (Bell-Cornell)
W78-12040

STOCHASTIC PROGRAMMING MODEL FOR WATER QUALITY MANAGEMENT IN A RIVER,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 5D.
W78-12041

HEALTH ASPECTS OF WATER REUSE IN CALIFORNIA,
California State Dept. of Health, Berkeley.
For primary bibliographic entry see Field 5F.
W78-12044

STORAGE-TREATMENT MIXES FOR STORMWATER CONTROL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W78-12046

OPTIMIZATION OF WASTE REMOVAL FOR WIDE SHALLOW RIVERS,
Drexel Univ., Philadelphia, PA. Dept. of Civil Engineering.
J. W. Eheart, E. F. Joeres, and J. A. Hoopes.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 593-600, August 1978. 2 fig, 1 tab, 4 ref.

Descriptors: *Rivers, *Water pollution control, *Optimization, *Water quality, Constraints, Outfalls, Standards, Channels, Waste treatment, Linear programming, Dissolved oxygen, Biochemical oxygen demand, Planning, Waste disposal, Streeter-Phelps model, Cost minimization.

A two-dimensional water quality management model is presented for rivers where quality constraints are stated for only a portion of the channel cross section defined as a 'clearlane'. The model is applicable for discharges into rivers when dilution by lateral mixing and/or degradation by aerobic decay result in allowable concentrations over a portion of the channel. The problem is to determine the allocation of waste treatment investments that will offer the minimum costs, maximum equity to polluters, and maximum protection of the aquatic environment. The methodology utilizes linear programming and the Streeter Phelps model. Results are presented for an example involving five outfall discharges along a river with four different configurations of the physical situation comprising different channel shapes and mixing assumptions. The water quality strategies are shown to be dependent on the physical nature of the receiving river and the definition of the clearlane. (Bell-Cornell)
W78-12047

COMPARISON OF TANGIBLES AND INTANGIBLES,
Caldwell Connell Engineers, Melbourne (Australia).
I. G. Wallis.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 625-637, August 1978. 2 fig, 2 tab, 17 ref, append.

Descriptors: *Water resources development, *Waste water(Pollution), *Preferences(Water rights), *Cost-benefit analysis, *Analytical techniques, Environmental engineering, Regions, Planning, Projects, Economic analysis, Game theory, Judgement, Water quality, Aesthetics.

Three techniques are described for comparing the tangible and intangible costs and benefits involved in wastewater management projects. The three methods are: (1) engineering judgement; (2) cost-benefit analyses; and (3) preference analysis. A game used in interviews to establish preferences is described and the interpretation of the results of the game is covered. It is concluded that each technique requires a degree of subjective judgement, but the development and cautious use of preference analysis as part of the evaluation of tangible and intangible costs and benefits is recommended. (Bell-Cornell)
W78-12048

ANIMAL WASTES AND NON-POINT POLLUTION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
E. C. Collins, Jr.
In: Non-point Sources of Water Pollution, Proceedings of a Southeastern Regional Conference, May 1-2, 1975, p 101-113. 2 fig, 5 tab, 7 ref.

Descriptors: Water pollution, *Non-point pollution, *Agricultural runoff, Pollutant sources, Economics, *Farm wastes, *Livestock wastes, *Poultry wastes, Land application.

The degree of control required for non-point pollution from animal wastes should be based on the relative importance of the various non-point sources in specific locations and on what is technically and logically controllable. In many cases it appears that it may be difficult to distinguish between pollution from farm animal wastes and natural, or 'background', levels of pollution. So, even if significant effort were expended to absolutely eliminate pollution from farm animal wastes, little or no change may be noted in stream quality. In many cases it can be argued as to whether or not all non-point sources can be controlled or eliminated. If collection and treatment is anticipated, it should be remembered that the costs associated with conventional waste-treatment systems are prohibitive, especially when compared with the economics of land disposal and nutrient utilization of animal wastes. (East Central Univ.)
W78-12053

ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY,
Purdue Univ., Lafayette, IN. Dept. of Animal Sciences.
A. L. Sutton.
Journal Paper No. 6508, Dept. of Animal Sciences, Purdue Agricultural Experiment Station, 1977, p. 81-90. 24 ref.

Descriptors: Water pollution, *Groundwater pollution, *Non-point pollution sources, *Feedlots, *Agricultural runoff, Leaching, Pasture, Management, Nutrients, Bacteria, *Farm wastes.

Research concerning the potential effect of livestock production as a non-point source of water pollution is discussed. Research results have been quite variable and sometimes conflicting. Livestock operations can contribute to non-point source water pollution by: runoff from manured land, leaching nutrients from manured land, leaching nutrients from earthen feedlots, and pasture management systems. Potential pollutants include nitrogen components, phosphorus, inorganic salts, solids, organic matter and certain bacterial organisms. Research has shown that applications of animal manure to frozen ground, to ground with vegetative cover or to rough plowed ground, in some cases, can affect the quality of surface runoff. Proper management practices and common sense can significantly reduce the threat of surface runoff contamination. If livestock manure is managed wisely with applications to cropped land at rates that the growing plants can utilize available nutrients, there will be minimal nutrient buildup and downward movement in the soil and minimum leaching into groundwater. Feedlot and soil type are important considerations in avoiding a possible leaching of nutrients into groundwater from earthen feedlots. Virtually no research has been conducted on the influence of pasture systems on non-point water pollution. Good management is the best insurance against pollution of water from pasture and range systems of livestock production. Very little research has been conducted in the Midwest under Indiana climate and soil conditions. (Merryman-East Central)
W78-12054

COST EFFICIENCIES OF LARGE-SCALE INTEGRATED DAIRY PRODUCTION AND WASTE MANAGEMENT SYSTEMS,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
S. C. Matulich, H. F. Carman, and H. O. Carter.
California Agriculture, Vol 32, No 3, p 8-10, March, 1978. 2 fig, 1 tab.

Descriptors: Regulation, Dairy industry, Model studies, Economics, Anaerobic digestion, Incineration, Washington, *Farm wastes, *Waste management, *Chino Basin(Wash), Composting, Refeeding

The impact of waste control regulations on the cost structure and future economic viability of dairies in the Chino Basin east of Los Angeles is discussed. Fourteen single-parlor dairies with capacities ranging from 375 to 1200 cows for two milking shifts were modeled. Short-run average costs were estimated for each of these model dairies. A combination of single-parlor dairies into multiple-parlor configurations yielded 15 more dairies in the 1200 to 3600 cow range. Four waste disposal treatment processes were analyzed as having 'good' volume reduction, stabilization, and resource recovery capabilities. Three of these -- composting, anaerobic digestion, and refeeding -- are biological processes; the fourth, incineration, is a physical/chemical process. Both semi-automated milking systems and group-feeding programs offer potential efficiencies for large-scale diaries. The dry lot/incineration system was the least-cost diary housing/waste diposal alternative considered. According to the analyis presented, enforcement of environmental quality controls need not raise the costs of dairy production in the long run. (Merryman-East Central)
W78-12055

FARMYARD MANURE AND CROP PRODUCTION IN DENMARK,
Askov Experimental Station (Denmark).
A. Dam Kofoed.
In: Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research on Effluents, organized by the 'Instituto Sperimentale Agronomico', Modena, Italy, Sept. 20-24, 1976, p 29-43. (1976) 3 fig, 8 tab, 2 ref.

Descriptors: Solid wastes, Liquid wastes, Confinement pens, Water pollution, Air pollution, Legal aspects, Economics, *Farm wastes, *Denmark, *Land application.

In Denmark for many years the use of 20-30 t/ha solid farmyard manure and 10-15 t/ha liquid manure on root crop fields every third and fourth year was a common practice. Manure was applied to crops which showed the greatest ability to utilize them and size of herds were based on the amount of food grown in the field. However, confinement feeding is becoming more predominant. Such feeding is accompanied by inherent problems. Concentrated animal production has left some farms completely without organic manure and others with a surplus. The handling of solid and liquid wastes from intensive animal production forms a considerable expense factor and with the possibility of making up for losses of nutrients from the field by application of commercial fertilizers, the farmer has less interest in careful storing of solid and liquid manure and thus there is a potential risk of pollution of surface waters. Buying feeds for confined animals released the livestock owners from dependence on the land for crop production. This means that in such a system of animal production the animal manure tends to be a waste product, difficult to dispose of in an economic way. A handling system for animal wastes which gives the best utilization of their plant nutrients at the same time may be the best security against a potential pollution of air and surface water. This means that animal manure must be incorporated into the soil soon after spreading and that it should be spread in limited amounts and in the right season for the crops which are utilizing the plant nutrients. With the increasing awareness of the public with regard to pollution of the environment from agricultural sources, Denmark must expect restrictions to be imposed which will protect that environment. (Merryman-East Central)
W78-12060

FUTURE DIRECTION OF WASTE UTILIZATION,
California Univ., Riverside.
P. F. Pratt, M. D. Thorne, and F. Wiersma.
In: Soils for Management of Organic Wastes and Waste Waters, Chapter 25, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p 620-634. 6 ref.

Descriptors: Municipal wastes, *Farm wastes, *Recycling, *Groundwater recharge, Public health, Odor, Crop response, *Water pollution control, Pathogenic bacteria, *Land disposal, Refeeding, Groundwater pollution, Nutrients.

A report of the Council of Agricultural Science and Technology (CAST) dealing with use of sewage sludges and animal manures in agriculture summarized the problems that limit their use as follows: (1) Animal manures and sewage sludges are bulky low-grade fertilizers of variable composition. (2) These materials cannot be transported more than a few tens of miles before the costs of transportation exceed their fertilizer value. (3) Difficult on-farm management problems are created by their physical properties. (4) Animal manures and sewage sludges contain soluble salts that can limit their use in arid irrigated areas. (5) The undesirability of leaching of soluble salts may limit their use on some croplands. (6) Sewage sludges contain heavy metals that are retained in soils and might accumulate to the point where they are toxic to some plants. (7) Incompletely treated sewage sludges contain pathogenic bacteria, viruses, and parasites that represent a public health risk to farm workers and the public via the food chain. (8) Odors and associated nuisances create conflicts between urban and rural residents and the farmers of adjacent croplands where sludges and manures are used. (9) The use of sewage sludges on cropland is inhibited by sociological resistance. (10) Government agencies require monitoring of both crop and water quality if sewage sludges are to be used. (11) The practice of refeeding animal manures in inhibited by the concern for possible transmission of pathogens and undesirable organic residues into foods. (12) There are no meaningful guidelines, for using sewage sludges on cropland or manures as feed ingredients, that can be interpreted on a regional basis or in terms of local situations and needs. The CAST Report also outlined actions that can promote sewage sludge and animal manure use. Methods other than land spreading meriting consideration as a means of utilizing municipal and animal wastes include: use of animal manure as feed, use of animal manure for energy or fuel, use of effluents in ground-water recharge and use of sewage sludge as a source of metals. Trends for the use of animal wastes and municipal wastes are predicted. (Merryman-East Central)
W78-12061

PATHOGEN CONSIDERATIONS FOR LAND APPLICATION OF HUMAN AND DOMESTIC ANIMAL WASTES,
Agricultural Research Service, Beltsville, MD.
For primary bibliographic entry see Field 5E.
W78-12062

LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 5E.
W78-12063

OPTIMIZATION OF RUNOFF DETENTION FOR NONPOINT POLLUTION CONTROL,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
L. B. Baldwin.
Paper No. 78-2049, Presented at American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 13 p. 1 fig, 3 tab, 7 ref.

Descriptors: *Nonpoint pollution sources, Model studies, Grazing, *Florida, Economics, *Runoff control, Wetland detention, Farm wastes, *Agricultural runoff.

Interest in the utilization of wetlands to capture nutrients in agricultural drainage has led to proposals that beef ranches on high water table soils in Florida preserve native wetland vegetation in lieu of planting improved pastures. While the effectiveness of wetland nutrient capture is not known, the economic impact of the proposed practice on ranching can be assessed. Linear programming has been used to optimize income under requirements for runoff detention. (East Central)
W78-12064

FEEDLOT POLLUTION CONTROL GUIDELINES,
Texas A and M Univ., College Station.
J. M. Sweeten.
Texas Agricultural Extension Service, Texas A&M University, 1974. 12 p, 4 fig.

Descriptors: *Feedlots, *Texas, *Regulation, Water pollution control, Air pollution, Management, Farm wastes.

The state and federal requirements for water pollution control and solid waste management for feedlot operations are discussed. Also presented are some guidelines to use in obtaining necessary permits for feedlot operation: (1) With engineering assistance, prepare preliminary plans for the feedlot and waste handling system. (2) Arrange an on-site meeting involving agency representatives, the engineer and the owner to decide what controls are needed. (3) Prepare final plans for the feedlot waste management system, incorporating decisions and agreements reached in step 1. (4) Submit application forms and documents to the regulatory agencies. (5) Publicize public hearings on each application as desired. (6) Attend public hearings, represented by attorney and engineer. (7) Accompanied by legal and technical representatives, attend state board meetings at which applications are considered for adoption. (8) Initiate construction in accordance with terms and conditions of permits. In general, feedlots with over 1000-head capacity must obtain permits prior to construction. Air pollution control guidelines are also enclosed. (Bates-East Central University)
W78-12065

SLURRY PROBLEMS IN RELATION TO POLLUTION OF SURFACE WATERS,
Queen's Univ., Belfast (Northern Ireland).
J. S. V. McAllister.
In: Semaine D-Etude Agriculture et Environnement, Copte-Rendu Des Seances, September 2-6, 1974. p 134-143, 5 tab, 11 ref.

Descriptors: *Slurries, Water pollution control, *Farm wastes, *Waste disposal, Waste management, *Land spreading, Literature reviews, Disease organisms.

The amount of slurry which can be safely spread on land depends on three factors: soil type, cropping system, and climate. A literature review is given concerning problems with land spreading of such wastes. Surface waters may be polluted when farm wastes such as slurry or silage effluent are able to gain rapid access to watercourses. Spreading wastes on land which is very wet, very dry with large cracks or which has porous backfill over field drains allows such rapid access to watercourses. Direct pollution of water may occur from silos of manure storage and housing areas when effluent passes through cracks or joints in well-made concrete structures and subsequently into drains. Waters may also be directly contaminated by disease organisms during the spreading of slurry either by direct runoff or by aerosol action. All farm effluents are rich in nutrients and have potential for causing eutrophication and secondary pollution. (Rowe-East Central)
W78-12067

DAIRY WASTE DISPOSAL,
P. Pattison.
Journal of Agriculture, Vol. 119, No. 6, p 32-33, 35, 1969. 3 fig.

Descriptors: *Dairy wastes, *Farm wastes, *Waste disposal, Water pollution control, *New Zealand.

The waste disposal system chosen by the individual farmer depends upon the amount and dilution of the waste, stocking rate, farm size, farm's soil characteristics and topography, the requirements of any permit issued to protect the receiving waters, the effectiveness of the present system, and the finance available. A New Zealand dairy wastes committee considers spray irrigation, under good management, to be generally the most effective and satisfactory means of disposal of dairy shed wastes. It may also be the most economical. Under some circumstances, salmonella has been found on pasture more than 60 days after spraying, however. The animal health division of the Department of Agriculture recommends that after spraying on pasture the maximum possible withholding period be observed before cows are again grazed, even under favorable conditions. Other systems in use include pumping with spreaders, ponding, and large sumps in conjunction with manure distribution and drains. Pumping with spreaders is less effective on wet soils and the thick layer of material associated with this method can possibly assist the spread of salmonella, leptospirosis, mastitis and other diseases of this nature. This method may also damage pasture and stimulate weed growth. Under some circumstances a well designed lagoon system can provide a satisfactory means of disposal, but it may be a costly choice in the long term. Disadvantages of a pond system are the possible pollution of groundwater and odor nuisance if the pond is not operat-

ing effectively. If the ponds are close to watercourses there could be pollution through seepage and, in some instances, fine particles of waste may eventually seal the soil and leave a sump type of ponding area which would eventually overflow, possibly creating a pollution problem. Use of large sumps in conjunction with manure distribution can enable a farmer to distribute waste on those areas that he considers will obtain the most benefit. A problem associated with this system is that in wet weather, it will probably be difficult to use wheeled vehicles because of the damage to roadways and pastures. A well designed and properly maintained sump system will cost almost as much as a spray disposal scheme to install and take more time to clean out. (Merryman-East Central)
W78-12068

PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT NUTRIENT, SEDIMENT, AND PATHOGEN SOURCES,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
J. A. Moore, C. A. Onstad, M. A. Otterby, H. L. Person, and D. B. Thompson.
University of Minnesota and ARS-USDA, North Central Soil Conservation Research Center, Morris, Minnesota, May, 1977. 223 p, 3 fig, 4 tab, 834 ref.

Descriptors: *Nonpoint pollution sources, Water pollution, *Minnesota, Nutrients, Sediment, Pathogenic bacteria, Farm wastes, *Model studies, Waste composition, *Agricultural runoff.

This report reviews the literature related to sources and transport of nutrients and sediment from agricultural lands and the literature related to survival and transport of pathogens from animal wastes; identifies and evaluates current predictor models as tools for assessing the effect of erosion and fertilizers on surface water quality in Minnesota; and identifies and assembles data sources anticipated to be necessary in evaluating the effects of animal waste, commercial fertilizers, soil losses and sedimentation upon surface water quality in Minnesota. (Merryman-East Central)
W78-12069

DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL,
Agricultural Research Council, Compton (England). Inst. for Research on Animal Diseases.
D. A. Haig.
Journal of the Science of Food and Agriculture, Vol. 23, p 795, 1972.

Descriptors: *Farm wastes, *Pathogens, *Human diseases, Diseases, *Bacteria.

In order to make livestock waste management easier, many livestock owners have turned to handling the wastes in slurry form. Linked to slurry management is the danger that pathogenic organisms may be present. Preliminary experiments have revealed that while the pathogenic organisms examined did not appear to multiply in slurry held under static conditions, the organisms could persist for up to 12 weeks. Subsequently, it was found that under conditions of intense aeration the viability of salmonellas decreased more rapidly, presumably due to the rise in pH which accompanied aeration. Experiments have been done to examine the effects of applying salmonella contaminated slurry on pasture. Under the conditions of the tests, a strain of S dublin persisted for only 7 or 8 days on the higher levels of pasture but could persist for considerably longer periods (12 weeks) in the soil. The survival of the organisms was apparently dependent on such factors as grass cover, sunlight, temperature and rainfall. Calves allowed to graze pasture contaminated with slurry containing 10(6) organisms/ml became infected within a few days. When the rate of contamination was lowered to 10(3) ml, none became infected. In a subsequent trial calves were allowed to graze an acre of pasture which had been contaminated 1 week before with 10(5) salmonellas/ml. Continuous testing of the pasture was carried out. While organisms were present at grass levels below 1 in (25.4 mm) for at least one month, none could be detected in the upper portion of the grass and none of the animals became infected. (Merryman-East Central)
W78-12072

PRESENT SITUATION AND PROBLEMS ON ENVIRONMENTAL PROTECTION AND CONSOLIDATION IN JAPAN,
Tokyo Univ. of Agriculture and Technology (Japan). Chemistry Lab.
K. Ishimaru.
In: Symposium on Animal Research, Proceedings of a Symposium on Tropical Agriculture Researches, Oct. 1973. Tropical Agriculture Research Series No. 7, Tropical Agriculture Research Center, Ministry of Agriculture and Forestry, Tokyo, Japan, Aug 1974, p 147-162. (1974) 1 fig, 25 tab.

Descriptors: Odor, *Water pollution control, Physical treatment, Chemical treatment, Waste treatment, *Farm wastes, *Japan, Livestock wastes, Legal aspects, Physical properties, Chemical properties, Fertilizers, Land application.

In recent years, changes in the Japanese diet have resulted in an increased demand for meat products. Over the last ten years, the number of farms in Japan has decreased while numbrer of animals per farm has increased at an unprecedented pace. This intensification of meat production has resulted in vast accumulation of animal wastes which must be managed in compliance with the Basic Law Environmental Pollution Control of Japan. Animal wastes are involved in two categories: offensive odors and water pollution. The methods prescribed for controlling offensive odors are: (1) closure of barn, (2) dilution of odor, (3) masking, (4) rinse, (5) chemical treatment, (6) oxidation, (7) absorption, (8) thermal decomposition, (9) microorganism treatment-biological method, (10) soil treatment. In treating animal waste to prevent water pollution, several factors must be considered before a treatment plant is constructed. They are: (1) precautions in disposing of effluent, (2) sources of water for dilution, (3) type of surrounding area, (4) size of available land, (5) configuration of ground, (6) weather conditions, (7) cost of treatment plant and treatment itself, and (8) treatment methods (machine, electronics, microbiology and chemistry). In using these animal wastes as fertilizers, the following conditions should be considered: (1) size of farm, (2) quality and composition of soil, (3) kind of crops, (4) form and decay-rate of fertilizer, (5) collection and treatment, (6) transportation and distribution, and (7) environmental and sanitation problems. (Bates-East Central)
W78-12073

INTERRELATIONSHIPS BETWEEN ANIMALS AND ENVIRONMENT IN HIGH-INTENSITY LIVESTOCK PRODUCTION,
Eidgenoessische Technische Hoxhaxhulw, Zurich (Switzerland). Inst. of Animal Production.
F. L. Hays, and W. Bianca.
Agriculture and Environment, vol. 2, p 311-331, 1975. 2 fig, 71 ref.

Descriptors: Confinement pens, *Feedlots, *Farm wastes, Waste disposal, *Livestock wastes, Animal health, Metabolic wastes, Land application, Refeeding.

Various ways in which animals and environment influence each other under conditions of high intensity production are presented. In high-intensity production, large amounts of animal waste products are generated which pollute the environment and are harmful to animal health and production. Three cycles were determined for the animal/environment relationship. These were: (1) A primary cycle which covers metabolic waste products, particularly heat, water vapor, carbon dioxide, methane, feces, and urine, as well as the effects of these agents on the animals. These effects include: sweating, panting, hyperthermia, eye irritation, and respiratory tract irritation. (2) A secondary cycle comprised of those metabolic waste products which have been broken down and transformed from feces and urine, such as hydrogen sulfide and ammonia. These gases may cause inflammation of mucous membranes, pulmonary oedema, dyspnea, gastro-intestinal disturbances, haemorrhages and eventually depression of growth rate and milk yield. (3) A third cycle which covers the agents that have been eliminated from the indoor environment to the outdoor environment. These include chemicals from liquid maure and pathogenic microorganisms. These agents enter the groundwater, the soil, and the plants. They may return to the animals with the feed and drinking water with toxic effects. A reduction of such adverse effects of animal wastes products may be attempted by the following means: (1) by keeping an optimal balance between livestock and crop management, (2) by choosing optimal sizes of animal production units in relation to their mutual distances, and (3) by recycling, by using (suitably treated) manure as animal feed. (Merryman-East Central)
W78-12077

A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND -- PART I,
S. L. Willetts.
Environmental Pollution Management, Vol. 4, No. 6, p 265, 267, 271, 273, Nov./Dec. 1974.

Descriptors: *Model studies, Soil amendments, Fertilizers, Nitrogen, Slurries, Costs, *Farm wastes, *England, *Transport system(Water), Manure bank, Application rates.

The purpose was to examine the feasibility of a transport system in England that would relieve the overabundance of animal wastes and the pollution hazard associated with this excess in the West while at the same time improving the soil structure of the heavily fertilized East. The English county redistribution model was based on the successful operation of a similar system in the Netherlands in which the Dutch 'manure bank' takes manure from regions of overproduction at a nominal charge to the producer and then sells it to regions of poor soil structure. The English model classified counties, based on agricultural statistics, or either arable, grass or mixed. A low mileage network of transporting the maure was then worked out based on the maximum application of 50-60 units N/acre as manure or slurry on grassland counties; 40 units manurial N/acre for arable counties; and 40-50 units N/acre as manure for the mixed counties. This model provides for the prevention of pollution by maure from intensive animal production regions, plus it benefits the arable East which has almost reached the maximum N fertilization limits using inorganic fertilizers. (See also W78-12079) (Bates-East Central)
W78-12078

A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND -- PART 2,
S. L. Willetts.
Environmental Pollution Management, Vol. 5, No. 1, p 13-16, Jan/Feb, 1975. 3 tab, 8 ref.

Descriptors: Water pollution, *Waste treatment, Waste disposal, Drying, Slurries, Soil amendments, *England, Cattle wastes, Swine wastes, *Farm wastes, Poultry wastes, Refeeding.

The purpose was to demonstrate how the drying of wet manure from the western part of England may help in the solution of farm waste disposal problems. Several types of dryers were discussed:

mechanical dryers (presses and centrifuges), heat dryers, flash dryers, drum dryers, ring dryers, fluid bed dryers, attritor dryers, and microwave dryers. The cost of producing the dry product for each dryer, at optimum operation, will depend upon: (1) required final moisture content, (2) moisture content of input, (3) length of working day, (4) capital cost of the machine, (5) fuel costs during operation, (6) power requirements, (7) supervisory staff requirements. Poultry manure, after drying, would be the best source for possible uses as a product. Cow slurry, pig slurry, farmyard manure, and sewage sludge were also tested. DPW makes and excellent fertilizer and soil conditioner. As a protein source, DPW is comparable to cereals so it could be used as a feedstuff. These possible uses are not met with much enthusiasm at present. Also, the bulk of manure causing problems in waste disposal is the wet cow slurry in the western regions, and this is uneconomical to dry. However, DPW is a saleable product and would contribute to the alleviation of water pollution. (See also W78-12078) (Bates-East Central)
W78-12079

NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
F. J. Sowden, and F. R. Hore.
Canadian Journal of Soil Science, Vol. 56, No. 3, p 223-231, Aug. 1976. 3 fig, 3 tab, 16 ref.

Descriptors: *Waste storage, Nutrients, *Nitrates, Ammonium, Phosphates, Leaching, Overflow, *Agricultural runoff, Groundwater pollution, *Nitrogen, Path of pollutants, *Farm wastes, Manure pit.

No evidence of serious groundwater contamination by excess nutrients from solid manure storage areas that had been used for over 30 yr at the Experimental Farm, Ottawa was found in an investigation that was carried out over a period of 4 yr. One storage area was on a concrete base and the other was located on a gravel base. The water table was usually above the 275-cm depth at both sites. Two unused shallow dug wells less than 250 m from the storage areas were not contaminated by nitrate, ammonium or phosphate. Water from piezometers installed at 275- and 425-cm depths near the gravel base storage area was always low in nitrate and ammonium, but sometimes appreciable levels of nitrate were found in water from a 122-cm deep piezometer. Water from piezometers installed at 122- and 275-cm depths near the concrete base storage area usually contained nitrate and ammonium. Water from piezometers installed 213 and 241 m from the storage areas in the direction of groundwater flow contained little nitrate or ammonium. The conditions prevailing in the area and the variation in the nitrate content of the groundwater during the seasons suggested that much of the nitrate originating from the storage area was denitrified at or near the water table. (East Central Univ)
W78-12080

AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY,
Agricultural Research Service, Beltsville, MD. Agricultural Engineering Research Div.
R. G. Yeck.
Presented at Pur-O-Sphere Convention, Kiamesha Lake, New York, March 22, 1971, 10 p.

Descriptors: *Agriculture, *Feedlots, *Water pollution control, Air pollution, Odor, Toxicity, Cost sharing, Proteins, Algae, *Farm wastes, Waste management, Land disposal, Nitrates, Agricultural Stabilization and Conservation Service, Farmers Home Administration, Refeeding, Ensiling.

Feedlot production of animals has led to problems with waste management. Such wastes are causing air and water pollution problems. Animal wastes entering surface water supplies may decrease potability, may cause excess aquatic growth, and may destroy their recreational potential. The moving of city dwellers into areas containing feedlots has caused odor to become an eminent problem. Due to economic advantages of commercial fertilizers, land disposal no longer seems to be the answer to animal waste disposal. Also, there are many times of the year when land isn't available and the wastes must be stored. Stored wastes spread on lands often add to odor nuisances. Additionally, there is a limit to the loading rate. Grasses receiving too many nitrates can become toxic to grazing animals. Research has identified techniques that reduce the quantity of wastes that are eroded from feedlots. These include detention ponds and interception terraces. Action programs that have been initiated to implement research findings include cost sharing programs by the Agricultural Stabilization and Conservation Service, technical and advisory assistance from the Soil Conservation Service, educational programs by the extension service, and some loans by the Farmers Home Administration. Alternative for animal waste disposal that are under study include: (1) processing of animal wastes by heat treating or ensiling and then refeeding them to animals and (2) biological separation of protein from wastes with insects and reclaiming nutrients through harvest of algae. (Merryman-East Central)
W78-12081

WATER QUALITY AND THE FARM POND,
Department of Agriculture, Lethbridge (Alberta).
J. R. Allan.
Canada Agriculture, Vol. 22, No. 2, p 3-4, Spring, 1977. 2 fig.

Descriptors: *Farm ponds, Water quality, *Agricultural runoff, *Feedlots, Water pollution control, Farm wastes, Non-point pollution sources.

With growing urban populations, there is pressure on agriculture to produce more food on less land. Marginal land that once acted as a buffer between cultivated land and aquatic environments is often now cultivated. Thus, the lakes, ponds and canal systems can now receive increased amounts of nutrients from the drainage of fertilized upland, grazed grassland, the farmyard, feedlot waste drainage and livestock watering. This in turn stimulates excessive aquatic vegetation and deteriorates the quality of water. Control of this depends on managing the level of nutrients reaching the farm pond. This can be done by constructing pond and drainage canals according to guidelines set out by the Prairie Farm Rehabilitation Administration. These include a shelterbelt or tree line with the area between it and the pond being grassed. This helps contribute to the water supply, acts as a biological filter to retain the excess nutrients and prevents soil erosion. The pond or canal must be fenced to keep livestock out. This prevents bank destruction, soil erosion, and phosphorus and nitrogen enrichment of the water by animal wastes. If the pond is kept clean, it can be stocked with fish, or used for irrigation, swimming, and general farm use. It is very critical that terrestrial weed seeds from plants growing on the canal banks are prevented from entering the water and being spread on fields during irrigation. (Bates-East Central)
W78-12082

CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WASTES: I. NITROGEN TRANSFORMATIONS,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 5B.
W78-12083

WHAT TO DO WITH ANIMAL WASTES ... RECYCLING,
Michigan State Univ., East Lansing.
R. L. Maddex.
Electricity on the Farm, Vol. 44, No. 7, p 6-9, July, 1971. 1 fig.

Descriptors: *Waste disposal, Water pollution, Odor, Air pollution, Aesthetics, *Land disposal, Drying, Separation techniques, Waste storage, Lagoons, Aerobic conditions, Anaerobic conditions, *Farm wastes, Ponds, Stacking.

Livestock wastes contribute to or cause the three following types of pollution: (1) contamination of surface and ground water, (2) odor and/or air pollution, and (3) visual unsightliness. The general methods of waste disposal are: (1) surface, and (2) bacterial decomposition. Perhaps the best solution presently available is a combination of bacterial decomposition and surface disposal that will provide good control of pollution to surface and groundwater, eliminate or minimize odors, and avoid the visible appearance of polluted land. Other methods of waste handling such as drying, separation of the solids by screens, or plowing down waste as it is distributed are really methods of processing which, at present, are not economically practical for the vast majority of livestock operations. Each method of manure handling has some characteristics that identify its benefits or limitations for an individual farm operation. The major characteristics are: (1) daily manure distribution, (2) farmstead storage -- periodic distributions: (a) liquid manure storage, (b) stacking, (3) ponds or lagoons: (a) aerobic, (b) anaerobic. Two variations of the ponding or lagooning method that combat odor problems and/or reduce structure size are: (1) anaerobic lagoons with mechanical aerators, (2) retention basin (pond) plus lagoon. (Merryman-East Central)
W78-12085

PREVENTING POLLUTION WHILE EXPANDING THE LIVESTOCK INDUSTRY IN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
J. N. Dornbush, and J. M. Madden.
In: Symposium Proceedings: South Dakota's Environment - Its Pollution and Preservation, South Dakota State University, April 13, 1971, p 15-19. (1971) 4 fig, 3 tab.

Descriptors: *Feedlots, *South Dakota, *Livestock, *Water pollution control, Management, Cost sharing, Regulation, Agricultural runoff, Climate, Diversion, *Farm wastes, Terraces, Debris basins, Detention ponds.

A great deal has been learned in the past several years concerning the magnitude and control of pollution from feedlots. It appears that the overall pollution problem from livestock feeding operations may not be as critical in South Dakota as has been assumed in other areas. Climatic factors appear favorable; nevertheless, feedlots poorly located with excessive drainage may be expected to cause serious pollution, especially to lakes. Information and assistance is available to plan the construction of practical, economical pollution control facilities, and cost-sharing for the construction is available. There now appears to be little excuse for delaying a program to prevent pollution with all planned construction for expansion of the feeding industry. (East Central Univ)
W78-12087

USE OF FLUID COWSHED MANURE IN FISH PONDS,
Agriculture Research Organization, Dor (Israel). Fish and Aquaculture Station.
For primary bibliographic entry see Field 5E.
W78-12088

NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.

J. E. Dixon, G. R. Stephenson, A. J. Lingg, D. V. Naylor, and D. D. Hinman.
Paper No. 77-4049, Presented at American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 31 p, 4 tab, 49 ref.

Descriptors: Cattle, Water pollution, Nutrients, Microorganisms, Agricultural runoff, *Farm wastes, *Nonpoint pollution sources, Barnlot-pasture operations, Range operations.

Cow-calf operations might be classified as: (1) a barnlot-pasture operation, and (2) a range operation often involving confined wintering. Public Law 92-500 addresses control of pollution with special emphasis for nonpoint source control beginning in 1977. The cow-calf operation as a whole and the wintering operation, particularly the range-type, fits the definition of a nonpoint source. Data available indicate the range-type of confined wintering most probably will contribute little to the nutrient and chemical load of a stream, but could contribute to microorganism contamination of the stream. The barnlot-pasture operation would contribute all three types of pollutants to a stream. Microorganisms as a pollutant from range-type wintering operations might be overemphasized because they may be the only discernable pollutant. Their direct effect on individual people can be quite severe, and there is a potential latent effect because, under some conditions, the microorganisms have an extended life in manure. There seems to be no data from which to directly prepare guidelines for management of cattle wintering operations to minimize nonpoint pollution. Using related data, it seems a prime management factor would be to minimize erosion and sediment load which would also lower nutrient losses. Based on data from feedlots, it might be expected that the characteristics of the hydrological event will influence the loss of pollutants to a greater extent than the slope of the land or the density of cattle. Winter conditions involving snowfall and thawing will most likely add more to the pollution load of streams from cattle winter operations than rainfall and summer-like conditions. When evaluating a cattle wintering operation as a potential nonpoint source, the background or 'natural' pollution load should be considered. Furthermore, the evaluation of data from samples of runoff should consider the location of the sampling point in relation to the source, the dilution of pollutants, and the sampling time in relation to the hydrograph. Space allocation of cattle in wintering can range from 0.15 to 51 square meters/kilogram of live animal weight. A realistic range of values for the dry manure defecated upon these wintering areas might be 0.36 to 123 metric tons/hectare. The concentration and quantity of pollutants from cattle wintering areas is not known. (East Central Univ)
W78-12089

ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
K. L. Campbell, D. A. Graetz, and R. A. Nordstedt.
Paper No. 77-4048, Presented at American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 14 p. 4 fig, 1 tab, 4 ref.

Descriptors: Cattle, Management, Confinement pens, Lagoons, *Agricultural runoff, *Soil water movement, Groundwater pollution, Chemical properties, *Farm wastes, *Environmental effects, Pasture, Semi-confinement, *Flatwood soils.

The overall environmental impact of more intensified animal production techniques must be examined. In this study, beef cows and their calves were produced at the following stocking rates: (1) pasture (5400 m2 per cow-calf unit), (2) semi-confinement (680 m2 per cow-calf unit), and (3) confinement (18.6 m2 per cow-calf unit). A natural forest area was included in the study for comparison with the other systems. All three production systems, as well as the forest area, were on sandy, high-water-table flatwoods soils. Cattle in the confinement system were on concrete while the others were on bahiagrass - white clover pasture. Wastes from the confinement system were handled by a combination retention basin - lagoon. Runoff from the other systems was through natural drainage-ways. Water quality measurements included chemical oxygen demand, pH, specific conductivity, and forms of nitrogen and phosphorus. Hydrologic measurements included precipitation, evaporation, surface runoff, water table levels, and lateral groundwater movement around the lagoon. Water quality was measured in surface runoff, soil solution, and groundwater. Losses of nutrients in surface runoff were minimal throughout the two-year period due partially to low rainfall. Nutrient concentrations in runoff also were relatively low. Soil solution and groundwater quality were very similar in the pasture and forest areas. Soil solution and groundwater quality also were very similar in the semi-confinement area except for a nitrate buildup in the top 1.2 m. No significant water quality changes were observed in the confinement area during the study. No serious water quality impacts are apparent from this study; however, the semi-confinement area especially needs further study under more normal precipitation conditions to determine if water quality problems are likely to occur. (East Central Univ)
W78-12090

ENVIRONMENTAL PROTECTION AGENCY VS. ROBERT R. DETERS; FABIAN J. DETERS; MARCELLUS J. DETERS; ALVIN L. DETERS; WILLIAM H. DETERS, JR.; AND NORMA MARIE DETERS WEIMAN.
PCB 72-260, Illinois Pollution Control Board, Nov. 8, 1972, 3 p.

Descriptors: Water pollution, *Regulation, *Illinois, Odor, Turbidity, *Farm wastes, Legal aspects, Dairy wastes, Cattle wastes, Feedlot runoff, Environmental Protection Act, Illinois Pollution Control Board.

The Environmental Protection Agency (EPA) filed a complaint against Robert R. Deters, Fabian J. Deters, Marcellus J. Deters, Alvin L. Deters, William H. Deters, Jr., and Norma Marie Deters Weiman, with the Illinois Pollution Control Board. The EPA alleged that the Deters operated their dairy farm in such manner as to cause the discharge of dairy product wastes and cattle lot runoff into a roadside ditch to an unnamed tributary of Curtis Creek so as to cause water pollution, in violation of Section 12(a) of the Environmental Protection Act and also to cause odor and turbidity to such a degree as to create a nuisance, in violation of Rule 1.03 (c) of the Illinois Sanitary Water Board Rules and Regulations SWB-14 and also Rule 203 (a) of the Illinois Water Pollution Regulations (adopted March 7, 1972). Hearing was held on September 20, 1972 at which time the parties filed a Stipulation of Facts wherein the respondents admitted to the allegations in the complaint. It was ordered that the respondents shall cease and desist from all violations found in the Illinois Pollution Control Board Opinion after January 22, 1973. It was ordered that the respondents pay to the State of Illinois by December 15, 1972 the sum of $5,000 as a penalty for the violations found in the proceeding. (Bates-East Central)
W78-12091

CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5E.
W78-12092

POULTRY WASTE MANAGEMENT ALTERNATIVES: A DESIGN AND APPLICATION MANUAL,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
J. H. Martin, and R. C. Loehr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 176, Price codes: A10 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-77-204, Oct. 1977, 202 p, 72 fig, 39 tab, 18 ref.

Descriptors: *Poultry wastes, Waste management, Design, Economics, Fertilizers, *Farm wastes, High-rise, Undercage drying, Oxidation ditch, Odor control, Biological oxidation, Waste stabilization, Refeeding.

Changes in the egg production industry during the past 20-30 years have produced waste management problems which threaten both water and air quality. Results from a number of research studies have identified two processes -- aerobic biological stabilization and drying -- that provide both odor control and the reduction of the water pollution potential of these wastes. In this manual, the theoretical concepts underlying each poultry waste management approach are discussed, and process design methodologies are presented. Included are design examples to illustrate the application of design methodologies. A discussion of the impact of design decisions on performance characteristics and computer programs to assist in the process design for each alternative are also presented. Both high-rise, undercage drying and aeration systems are compared to identify relative merits and provide economic projections. Odor control and plant nutrient conservation capabilities as well as refeeding potential for both alternatives are discussed. (East Central)
W78-12093

FEEDLOT RUNOFF CONTROL FROM POINT/NON-POINT SOURCES.
American National Cattlemen's Association.
American National Cattlemen's Association, Special Report, 1975, 24 p. 2 fig.

Descriptors: Legal aspects, *Agricultural runoff, *Non-point pollution sources, Water pollution, Model studies, Economics, NPDES, *Feedlot runoff, Runoff control.

The National Cattlemen's Association appointed a special committee to evaluate the point/non-point sources National Pollutant Discharge Elimination System (NPDES) exemption-court order. Information presented includes: (1) Definition of 'Concentrated Animal Feeding Operations', (2) Comments on Hydrologic Model to Predict Quantity and Quality of Feedlot Runoff, (3) Economic Impact of BPT and BAT vs. Size, (4) Recommendations on Effluent Limitations, (5) Recommendations for Land Application of Manure, and (6) Administrative Devices. (Merryman-East Central)
W78-12097

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
Proceedings, Volume II, June 26-28, 1978, University of Waterloo, Ontario, Canada, 1978. 470 p, 128 fig, 49 tab, 366 ref. McBean, E. A., Hipel, K. W., and Unny, T. E., Eds.

Descriptors: *Risks, *Reliability, Water resources, *Analytical techniques, *Stochastic

processes, *Streamflow, *Hydraulic structures, *Decision making, *Reservoir operation, *Hydrology, Failure(Mechanical), Probability, Simulation analysis, Optimization, Statistical methods, Bayesian analysis, Planning, Management, Methodology, Mathematical models, Systems analysis, Equations, Uncertainty.

The papers presented at this Symposium emphasize the application of systems analysis techniques to the problems of risk and reliability in water resources operations, planning, and management. Volume II contains those articles concerned with: stochastic modeling of flows; the failure of hydraulic structures; decision theory analyses; uncertainties in low and high flow estimates; extreme events; and finally reservoir management. Numerous analytical techniques for dealing with problems of probability--simulation analyses, statistical methods, Bayesian analyses, optimization techniques, graphical methods, and Markov processes--are presented by many authors from Canada and the United States, a number from England and West Germany, and a few from other European countries, South America, and the Far East. Many of the articles present highly detailed illustrations. (See W78-10094 and W78-11387 thru W78-11419) (Bell-Cornell)
W78-11386

BIVARIATE PDF FOR FLOOD RISK EVALUATION IN CASE OF UNSTEADY FLOW,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
S. Bruk, and S. Prohaska.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 471-479, 1978. 5 fig, 1 ref.

Descriptors: *Risks, *Floods, *Evaluation, *Unsteady flow, Hydrographs, River systems, Flood damage, Hydrologic data, Computer programs, Flood protection, Probability, Flood peak, Flood volume, Sava River(Yugoslavia), Cost-benefit analysis, Systems analysis.

The modern concept of adjustment to flood hazards instead of classical flood control emphasizes the need for an adequate definition of the level of flood protection, based on a realistic evaluation of the flood risk. The widely-used practice of defining floods by a single parameter--the peak discharge--and evaluating the flood risk through its probability or return period tends to cause an oversizing of the flood protection structures. This may lead to wrong decisions at the planning stage, because of the distortion of the cost-benefit analysis. An improvement of flood risk evaluation can be achieved by defining the floods by two parameters: the peak flood and the flood volume. A bivariate PDF can be used to determine the probability of the flood event. A calculation method is briefly outlined using the log-normal PDF for that purpose. Further research is needed to examine the sensitivity of the method and to estimate the limits of confidence. (See also W78-11386) (Bell-Cornell)
W78-11387

TAIL BEHAVIOUR OF RIVERFLOW PROBABILITY DENSITIES,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11388

THEORETICAL MODELS OF HYDROLOGIC PARAMETERS USING DERIVED DISTRIBUTION TECHNIQUES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-11389

IMPACT OF EXTREMAL DISTRIBUTIONS ON ANALYSIS OF MAXIMUM LOADING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-11392

ALLOWANCE FOR RISK AND UNCERTAINTY IN THE OPTIMAL DESIGN OF HYDRAULIC STRUCTURES,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-11393

LANDSLIDE POTENTIAL AND PROBABILITY CONSIDERING RANDOMNESS OF CONTROLLING FACTORS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W78-11394

DETERMINATION OF HYDRAULIC RESISTANCE FOR A DAM-BREAK WAVE BY COMPARISON OF THEORY AND EXPERIMENTS,
Technische Univ., Munich (West Germany). Inst. of Hydraulics and Hydrology.
For primary bibliographic entry see Field 8B.
W78-11395

HYDROLOGIC AND GEOMORPHIC CHANGES IN A RIVER BASIN INDUCED BY A DAM BREAK,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-11396

SHOULD WE TRY TO MEASURE RISK OR SHOUL WE ASSESS IT IN SOME OTHER WAY,
Waterloo Univ. (Ontario). Dept. of Statistics.
G. A. Barnard.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 629-637, 1978. 1 ref, append.

Descriptors: *Risks, *Statistical methods, *Probability, Forecasting, Decision making, Equations, Bayesian methods, Management, Assessment, Climatological data, Systems analysis.

Considered are problems arising from recent developments in statistical forecasting and decision methodology. DeFinetti's analysis of the concept of personal probability is discussed alongside other mathematical approaches. A warning is given against the uncritical adoption of 'Bayesian' methods of assessing risk in so far as they may lead us into the fatal mistake of neglecting the importance of collecting more climatological data. (See also W78-11386) (Bell-Cornell)
W78-11397

UNCERTAINTIES IN LAKE MANAGEMENT,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, and I. Bogardi.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 638-661, 1978. 4 fig, 3 tab, 51 ref.

Descriptors: *Decision making, *Lakes, *Management, *Uncertainties, Water levels, Water quality control, Eutrophication, Statistical methods, Equations, Systems analysis, Mathematical models, Bayes approach, Markov matrix, Probability density functions, Lake Balaton(Hungary), Water lease.

The various uncertainties faced in the management of large lakes are classified within the framework of a discrete-time system model. Two illustrative problems are considered: (1) the trade-off between maintaining a high water level to satisfy social requirements and a low water level to minimize possible damage by wind-induced waves; and (2) control of nutrient input into a lake to avoid eutrophication. Lake Balaton, Hungary is used as the illustrative example. The types of uncertainty considered in detail encompass natural, model, and informational. Natural uncertainty consists in hydrologic input (wind, rainfall, etc.) or nutrient input. Natural uncertainty is encoded in the form of probability density functions (pdf) of random variables describing hydrologic events. Model uncertainty consists, for example in the choice of pdf describing the occurrence of natural events or in the choice of empirical model to describe sediment yield. Informational uncertainty comprises two aspects: sample or parameter uncertainty, and economic uncertainty. Sample uncertainty originates from our uncertain knowledge of the parameters of pdf describing natural processes, especially pronounced in the case of bivariate processes. A Bayes approach makes it possible to derive an optimum decision under sample uncertainty and to calculate the expected value of perfect information and the worth of sample information. Another case of very high sample uncertainty is found in lake level control, for which a transition matrix of monthly inflows must be estimated from very sparse data. Sensitivity of the decision to estimates of this Markov matrix is investigated, and other types of uncertainties are briefly discussed. (See also W78-11386) (Bell-Cornell)
W78-11398

APPLYING DECISION THEORY TO FISHERY MANAGEMENT PROBLEMS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
S. O. Russel.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 662-673, 1978. 6 fig, 15 ref.

Descriptors: *Decision making, *Fisheries, *Management, *Probability, Assessment, Effects, Pollution, Flood control, Salmon, Real time, Bayesian analysis, Mathematical models, Systems analysis.

Decision theory provides a framework for analysis and a set of concepts which would seem to be applicable to many resource management problems. But real problems are nearly always complex and it is difficult to capture the essence of the problem without becoming submerged in detail. This paper summarizes several studies of the application of decision theory to problems associated with fishery management problems in British Columbia. The approach taken was to try to model the decision process however roughly, and then to progressively refine the model (in other words, to start with a simple model and add complexity only as required). The first stage simple models are presented and subsequent steps are discussed. Examples include decision making on the target escapement for which to aim with a particular salmon run in a particular year--a simple Bayesian analysis--and a procedure for obtaining and combining subjective estimates of probabilities--an essential step in a formal analysis of many resource management decision problems. The decision model involves using as input a utility curve for the catch in the current year, a probabilistic relationship between the target escapement and the number of returning adults in the cycle year and a forecast of the size of the run in the current year, as well as computing the escapement with the

maximum expected utility which should be the target. (See also W78-11386) (Bell-Cornell)
W78-11399

SIMPLIFICATION OF ANALYSES UNDER UNCERTAINTY-WHEN TO IGNORE UNCERTAINTIES AND EXTREME VALUES,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
P. H. Byer.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 675-696, 1978. 4 fig, 3 tab, 9 ref.

Descriptors: *Decision making, *Water resources, *Screening models, *Uncertainty, *Extreme values, Planning, Evaluation, Effects, Multiple-purpose reservoirs, Dams, Probability, Equations, Mathematical models, Systems analysis, Certainty.

Uncertainty is pervasive in water resources planning. Consideration of the uncertainties and extreme values of an attribute makes the evaluation of alternative plans more realistic through also more complicated. The need and basis for deciding which uncertainties and extreme values to explicitly consider in an evaluation are discussed. A model for screening uncertainties is presented. It is based upon calculating, using decision analysis concepts and first-order estimates of utilities and probabilities, an estimate of the upper bound on the expected effect on the results of an evaluation of assuming certainty, rather than uncertainty, about the levels of an attribute. An application of the model to the problem of planning a hypothetical multipurpose dam and reservoir system illustrates its practicality and usefulness. Similar decision analysis concepts are used to discuss the basis for screening the extreme values of an attribute from an evaluation. It is shown that both the probabilities and the utilities of extreme values should be considered when screening them. (See also W78-11386) (Bell-Cornell)
W78-11400

STOCHASTIC MODEL OF A FLOOD FORECAST-RESPONSE PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4A.
W78-11401

POSTERIOR DISTRIBUTION OF THE PARAMETERS OF THE PEARSON TYPE III DISTRIBUTION; AN APPLICATION TO DESIGN FLOOD SERIES ANALYSIS,
Chile Univ., Santiago.
For primary bibliographic entry see Field 2E.
W78-11402

THE RELIABILITY OF LOW FLOW REGIONAL EQUATIONS IN BRITISH COLUMBIA,
Water Survey of Canada, Vancouver (British Columbia). Planning and Studies Section.
For primary bibliographic entry see Field 2E.
W78-11403

WET AND DRY PERIODS IN REGIONAL WATER EXCHANGE,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
Z. Sen.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 748-761, 1978. 1 fig, 16 ref.

Descriptors: *Wet seasons, *Dry seasons, *Regions, *Water exchange, Hydrologic aspects, Assessment, Droughts, Analytical techniques, Risks, Equations, Systems analysis, Theory or runs, Multivariate runs.

An effective assessment of water potential and related human activities of a region can be achieved on the basis of hydrologic, meteorologic, geologic, topographic, and socio-economic characteristics of that particular region. However, this paper specifically aims to investigate hydrologic variables with an emphasis on regional drought and consequently water exchange possibilities. In drought alleviation, there exist two major controls: namely, storage of water during wet periods in reservoirs and regional water exchange among various water resources, if possible. Herein, simple analytical expressions of joint properties of droughts at two or more sites are derived and their use in a regional water exchange scheme is discussed. The basis of the analytical procedure is the theory of runs which exploits not only the serial but also mutual properties of hydrologic sequences at distinct sites. Finally, general risk expressions of regional drought of a given duration are derived and tables for simple risk calculations are provided. In addition, a procedure is given which is useful to decide whether or not distinct but concurrent sequences are serially as well as mutually independent. (See also W78-11386) (Bell-Cornell)
W78-11404

STOCHASTIC MODELS OF EXTREME FLOWS AND THEIR APPLICATION TO DESIGN,
Montreal Univ. (Quebec). Ecole Polytechnique.
For primary bibliographic entry see Field 2E.
W78-11405

THE DISTRIBUTION OF THE EXTREME OF A MIXTURE RANDOM VARIABLE WITH APPLICATIONS IN HYDROLOGY,
Utah State Univ., Logan. Dept. of Applied Statistics and Computer Science.
For primary bibliographic entry see Field 2E.
W78-11406

ANALYSIS OF EXTREME EVENTS IN STATIONARY DEPENDENT SERIES,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 2E.
W78-11407

A NONPARAMETRIC APPROACH TO THE ANALYSIS OF EXTREME HYDROLOGIC EVENTS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11408

A NON-GAUSSIAN STOCHASTIC MODEL FOR DESIGN-EXTREMES OF WATER RESOURCES SYSTEMS,
Technical Univ. of Lisbon (Portugal).
For primary bibliographic entry see Field 2E.
W78-11409

ON THE PREDICTION OF EXTREME FLOWS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11410

INCORPORATION OF FORECASTED TOTAL SEASONAL RUNOFF VOLUMES INTO RESERVOIR MANAGEMENT STRATEGIES,
Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11411

OPTIMAL DESIGN OF RESERVOIRS IN HYDROPOWER SYSTEMS WITH EXPLICIT CONSIDERATION OF RISK,
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11412

DIRECTIONS OF SECURITY FOR THE OPERATION OF A HYDROELECTRIC POWER STATION WITH NON STEADY FLOW, (ARTICLE IN FRENCH),
Quebec Dept. of Natural Resources Water General Management.
For primary bibliographic entry see Field 8C.
W78-11413

DESCRIPTIVE PROPERTIES OF HYDROLOGY MODELS FOR THE EXPLICIT STOCHASTIC OPTIMIZATION OF MULTI-RESERVOIR OPERATIONS,
Alcan Smelters and Chemical Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 4A.
W78-11414

THE RELIABILITY OF SAND DEWATERING BEDS FOR SLUDGE MEASURED BY THE PERFORMANCE INDEX,
Clark (Edward E.), Miami, FL.
For primary bibliographic entry see Field 5D.
W78-11415

APPLICATION OF FEATURE PREDICTION MODEL IN HYDROLOGIC TIME SERIES SYNTHESIS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11416

A SYSTEMS APPROACH TO RISK ANALYSIS FOR AN EARTH DAM,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 8D.
W78-11417

INCREASED RELIABILITY OF LOW WATER ANALYSES THROUGH SIMULATION OF TIME SERIES,
Coblenz Federal Inst. of Hydrology (West Germany).
For primary bibliographic entry see Field 2E.
W78-11418

CRITICAL DROUGHT REVISITED,
University of Western Ontario, London. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W78-11419

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE. SPECIAL REPORT II: A NON-LINEAR PROGRAMMING MODEL FOR EVALUATING WATER SUPPLY POLICIES IN THE TEXAS COASTAL ZONE,
Texas Univ. at Austin. Div. of Natural Resources and Environment.
For primary bibliographic entry see Field 5G.
W78-11454

A PARAMETRIC STUDY OF THE VALUE OF HYDROLOGICAL INFORMATION FOR IR-

RIGATION AND HYDROPOWER MANAGEMENT OF THE FEATHER RIVER,
Econ, Inc., Princeton, NJ.
For primary bibliographic entry see Field 4A.
W78-11456

NONCONVEXITY AND OPTIMAL EXHAUSTION OF RENEWABLE RESOURCES,
For primary bibliographic entry see Field 6C.
W78-11498

BALANCING ECOLOMIC AND ENVIRONMENTAL OBJECTIVES,
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 6B.
W78-11500

OPTIMAL DESIGN OF REGIONAL WASTEWATER SYSTEMS: A FIXED-CHARGE NETWORK FLOW MODEL,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 5D.
W78-12043

COMPARISON OF TANGIBLES AND INTANGIBLES,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5G.
W78-12048

NONCOMPUTER OPTIMIZATION OF SINGLE-SOURCE NETWORKS,
Visvesvaraya Region Coll. of Engineering, Nagpur (India).
For primary bibliographic entry see Field 4A.
W78-12050

6B. Evaluation Process

GENERAL PLAN IMPLEMENTATION: THE GROWTH-PHASING PROGRAM OF SACRAMENTO COUNTY,
California Univ., Davis. Inst. of Governmental Affairs; and California Univ., Davis. Inst. of Ecology.
R. A. Johnston, S. I. Schwartz, and T. L. Klinkner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 072, Price codes: A05 in paper copy, A01 in microfiche. Environmental Quality Series No. 27, April 1977. 65 p, 6 tab. (California Water Resources Center Project UCAL-WRC-W-487).

Descriptors: *Planning, *Regional development, *Land use, Economic efficiency, Legislation, Management, *California, *Sacramento(Calif).

Land use planning is rapidly becoming the focus of local government efforts to manage the environment. The authors here examine in detail the implementation of the 1973 General Plan for Sacramento County, California. The report begins with an analysis of the 1973 general plan and contrats it with the earlier plan adopted in 1965. The chief goals of the 1973 plan are agricultural preservation and services efficiency. The plan achieves these goals through the redesignation of 67,000 acres of land from urban to permanent agricultural classification and through the use of growth phasing in the form of an agricultural classification and through the use of growth phasing in the form of an agricultural-urban reserve category for outlying lands. In general, implementation is determined to be effective, with the exception of a rezoning problem in a portion of the county where large lot 'hobby farms' were developed under the earlier plan.(Snyder-Calif, Davis)
W78-11364

DEVELOPMENT OF A REGIONAL INFORMATION SYSTEM FOR HYDROLOGIC MODELING,
Maryland Univ. College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W78-11379

COMPARATIVE ANALYSIS AND CRITIQUE OF THE INSTITUTIONAL FRAMEWORK FOR WATER RESOURCES PLANNING AND MANAGEMENT: CANADA, UNITED STATES, AND MEXICO,
Colorado Univ., Boulder. Dept. of Economics.
For primary bibliographic entry see Field 6E.
W78-11382

TRANSFER OF WATER RESOURCES KNOWLEDGE - AN ASSESSMENT,
North Carolina Water Resources Research Inst.
For primary bibliographic entry see Field 10F.
W78-11384

RECREATION--MARINE PROMISE.
University of Southern California, Los Angeles. Sea Grant Program.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 415, Price codes: A11 in paper copy, A01 in microfiche. Proceedings, Discussion and Overview of the National Conference on Marine Recreation, Newport Beach, CA, October 2-4, 1975, 232 p. Anderson, S.H. (editor).

Descriptors: *Marine biology, *Public lands, *Public rights, *Coastal engineering, *Recreation, *Coastal areas, Wildlife, National lakeshores, Beach erosion, Environmental control, Outdoor recreation, Boating, *Marine sanctuaries, *Water space competition, *Marine recreation, *Coastal management, *Recreation management, Biological baseline data requirements, Marine management, Inland waters.

This study of recreational uses of the marine environment is a compilation of the proceedings, discussion, and overview of the National Conference on Marine Recreation held in Newport Beach, California during October, 1975. The sponsors of the conference identified the need to resolve adequately conflicting uses of our coastal environment and provide for increased uses of this environment for recreational purposes. The conference covered such topics as the protection and allocation of marine environment resources, the research and education in coastal area protection problems, and the people's right to use these marine areas for recreation. The general purpose of the conference was to identify critical recreation uses and develop a national policy to deal with these uses without destroying the quality of the marine environment. The National Oceanic and Atmospheric Administration (NOAA) is the national body charged with providing guidelines and setting policy tones for state and local authorities to follow. Other areas needing further elucidation and integration with recreational uses included industrial responsibility in resolving the negative impacts of their activities on the marine environment, and basic research to determine the effects of human interaction and technological alterations on coastal areas. (Coan-NC)
W78-11451

REGIONALIZATION OF WATER MANAGEMENT: A REVOLUTION IN ENGLAND AND WALES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6E.
W78-11452

ANALYSIS OF SUPPLY AND DEMAND OF URBAN ORIENTED NON-RESERVOIR RECREATION.
Army Engineer District, Sacramento, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-036 990, Price codes: A06 in paper copy, A01 in microfiche. Prepared for U.S. Army Engineer Institute for Water Resources, Kingman Building, Fort Belvoir, VA, November 1976, 103 p, 2 appendices, IWR Research Report 76-R2.

Descriptors: *Data collections, *Recreation facilities, *Methodology, *Testing procedures, *Use rates, Management, Planning, Cities, Demand, Benefits, Analytical techniques, Estimated benefits, Evaluation, *Recreation use prediction, Urban oriented recreation.

The objectives of the study were to develop a data base on use and users of urban recreation facilities which are water related but not reservoir projects, and to prepare estimating equations which produce supportable use and demand estimates. The research is one phase of a more comprehensive Corps effort to develop methodologies, procedures and guidance for estimating the use and benefits of non-reservoir projects. As explained in Appendix B of this report, the analysis and methodology developed through this phase of research needs to be replicated and validated in other locations to ensure general applicability. Follow-up research designed to provide the necessary replication is programmed, but the results will not be available for several years. In the interim, this report's methodology is applicable in planning situations having similar resource and population characteristics, and other important parameters in recreation use prediction and benefit estimation. Parts II and III of the report contain a detailed account of the data base used in the study, the methods of collecting these data, and the analytical procedures followed in developing various recreation use prediction models. Part IV deals with the actual application of the models in use prediction and benefit evaluation. (Nessa-NC)
W78-11457

FIRST ANNUAL REPORT TO THE CONGRESS OF THE UNITED STATES ON LEVEL B PLANNING.
Water Resources Council, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-11458

SECOND ANNUAL REPORT TO THE CONGRESS OF THE UNITED STATES ON LEVEL B (SECTION 209) PLANNING.
Water Resources Council, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-11459

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: REPORT.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11470

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX B--WATER SUPPLY, DEMAND AND DEFICIT.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11471

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX C--ENGINEERING FEASIBILI-

TY OF ALTERNATIVE WATER SUPPLY PROJECTS.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11472

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME I--EFFECTS OF WATER SUPPLY DEFICITS IN THE WASHINGTON METROPOLITAN AREA.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11473

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHWESTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME II--SOCIO-ECONOMIC IMPACT STUDY OF ALTERNATIVE WATER SUPPLY SYSTEMS,
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11474

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN: SUMMARY REPORT.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11475

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX A: BACKGROUND INFORMATON.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11476

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MANAGEMENT-APPENDIX B: BASIS OF DESIGN AND COST AND DATA ANNEX APPENDIX B: BASIS OF DESIGN AND COST.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11477

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX C: PLAN FORMULATION.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11478

WASTEWATER MANAGEMENT STUDY CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX D: DESCRIPTION AND COST OF ALTERNATIVES.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11479

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX E: SOCIAL-ENVIRONMENTAL EVALUATION.
Corps of Engineers, Chicago, IL. Chicago District.
For primary bibliographic entry see Field 5D.
W78-11480

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX G: VALUATION.
Corps of Engineers, Chicago, IL. Chicago District.
For primary bibliographic entry see Field 5D.
W78-11481

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX H: PUBLIC INVOLVEMENT/PARTICIPATION PROGRAM.
Corps of Engineers, Chicago, IL. Chicago District.
For primary bibliographic entry see Field 5D.
W78-11482

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX I: COMMENTS.
Corps of Engineers, Chicago, IL. Chicago District.
For primary bibliographic entry see Field 5D.
W78-11483

ECONOMIC IMPACT OF FISH TOXICANT REGULATIONS,
Northern Illinois Univ., De Kalb. Loredo Taft Field Campus.
S. Vogl, and R. Vogl.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 063, Price codes: A03 in paper copy, A01 in microfiche. IIEQ Document No. 76/16, August 1976. 46 p, 17 tab, 33 ref. 20.071.

Descriptors: *Piscicides, *Fish control agents, *Economic impact, *Illinois, *Permits, *Administrative agencies, Variance, Regulation, Illinois Pollution Control Board, Water pollution control, Herbicides, Pesticides, Costs, Governments, Administration, Jacksonville Lake(IL), Lakes, Poisons, Economics.

Proposed amendment R75-7 to Rule 203(h) on toxic substances of Chapter 3 of the Illinois Pollution Control Board's Rules and Regulations, which would eliminate the required variance for applying any aquatic toxicant to State waters, could save public and private sectors $122,289.90 annually. Under the existing regulation, costs of obtaining a variance (including a public hearing) total $2385.88 per fish kill. With the proposed change the cost to the applicant and the State for application of a fish toxicant would amount to $236, a savings of $2147.88 per permit. With approximately 141 fish toxicant permits issued annually, and assuming 5.5% come to hearing, the savings would be $117,154.90. Costs for obtaining a variance for application of an aquatic herbicide are now $368; this would drop to $238 with the proposed change. Savings on the approximately 40 annual herbicide permits would be $5135. Water quality would still be protected under the proposed amendment. Total savings, while significant, would not have a measurable effect on local government, agriculture, or commerce and industry. The principal impact would be on owners of the 73,010 private lakes, who would save $115-650 per application. For the 623 publicly owned lakes, savings could reach $2148 per permit. Lake Jacksonville was used as a case study in this report. (Lynch-Wisconsin)
W78-11484

WATER USE IN SOUTHWEST FLORIDA -- AN ECONOMICS REVIEW,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6D.
W78-11486

ECONOMIC IMPACT OF NEW YORK'S GREAT LAKES SPORT FISHERIES,
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
T. L. Brown.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 164-166, October 1977. 2 tab, 4 ref.

Descriptors: *New York, *Sport fishing, *Economic impact, *Salmonids, *Fish establishment, Lake Ontario, Lake Erie, St. Lawrence River, Salmon River(NY), Great Lakes, Lakes, Rivers, Niagara River, Fishing, Recreation, Fisheries, Fish hatcheries, Mirex, Lampreys, Diseases, Salmon.

Though still in a developmental stage, New York's Great Lakes salmonid fisheries have greatly improved the state's sport fishing resources and have had a significant economic impact. By 1974 stocking reached about 1.4 million coho and chinook salmon, complemented by 800,000 lake, brown, rainbow, and steelhead trout. The Great Lakes system of lakes Erie and Ontario, the Niagara River, and New York's portion of the St. Lawrence River and tributaries provided about 2.9 million angler days of fishing in 1973 (18% of the state total). Fishermen spent some $10.2 million at the fishing site (25% of the state total), and an additional $6.5 million enroute (21% of the state total). As the salmonid fisheries mature, the Great Lakes system is expected to account for an even larger proportion of New York's total angler days. A statewide estimate for all expenditure items in 1973, including estimates for licenses and major equipment purchases, was $12.88 per angler day, compared with a national average in 1970 of $7.02. The out-of-state component of total fishing trips for a 12-mi stretch of the Salmon River rose from 1% in 1973 to 9% in 1975, and overnight stays increased from 11% to 31%. Total expenditures on the river rose from $61,000 to $444,000 over the same period. Problems of sea lamprey control, disease, and mirex contamination have hampered development of the Lake Ontario fishery. (Lynch-Wisconsin)
W78-11487

ECONOMIC MEASUREMENT OF ENVIRONMENTAL DAMAGE,
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 6G.
W78-11488

DAILY FLUCTUATIONS IN CAMPGROUND USE: AN ECONOMETRIC ANALYSIS,
Oregon State Univ., Corvallis. Dept. of Economics.
R. A. Oliveira, and G. C. Rausser.
American Journal of Agricultural Economics, Vol. 59, No. 2, p 283-293, May 1977. 3 tab. 25 ref.

Descriptors: *Camping, *Recreation demand, *Model studies, *Econometrics, *Time-series analysis, *Forecasting, Recreation facilities, Camp sites, Economics, Seasonal, Diurnal, Fluctuations, ARIMA models, Box-Jenkins time-series analysis, Household production, Use rates.

Daily use fluctuations of campgrounds are analyzed in terms of recreation demand theory and time-series forecasting. Theoretical use functions are specified as the reduced form of a demand and supply system, where derived demand for campground use is based upon the household production approach to consumer demand theory. Two types of empirical models are used: (1) a pooled cross-section and time-series single equation econometric model; and (2) autoregressive-integrated-moving-average (ARIMA) models, fitted using the time-series analysis technique of Box and Jenkins. Results showed that daily campground use levels over a season can be modelled with some success, and econometric predictions were more accurate than ARIMA predictions. The econometric model was based on a casual reduced-form use model, and estimated coefficients agreed with the expected casual relationships; the overall model provided relatively more rigorous support for previous recreation research findings. ARIMA provided a time-series model to compare with the more complex and difficult-to-estimate econometric model, and although ARIMA provides no information on causal factors of campground use, it is relatively easy to employ and is useful in structuring the lag relationship of an econometric model. Campground charac-

teristics used in the econometric model included number of units, toilet facilities, swimming-fishing-boating facilities, elevation, and precipitation. (Lynch-Wisconsin)
W78-11496

BALANCING ECOLOMIC AND ENVIRONMENTAL OBJECTIVES,
Georgia Univ., Athens. Inst. of Natural Resources.
R. M. North, W. P. Neely, and R. L. Carlton.
Proceedings, Forty-second North American Wildlife Conference, p 190-202, 2 fig, 2 tab, 13 ref. (1977).

Descriptors: *Decision making, *Goal programming, *Multiple-objective planning, *Model studies, *Economics, *Environmental effects, Trade-offs, Alternative planning, Objectives, Recreation, Navigation, Florida, Cross Florida Barge Canal, Canals, Public policy, Conflict, Cost-benefit analysis, Planning, Analytical techniques, Surrogate-worth tradeoff method.

The current state of multiple-objective planning for water resources is reviewed, and the reconciliation of noncommersurable value necessary for balancing environmental and economic impacts is described and demonstrated. Decision-making and performance evaluation models have been enriched by adding multiple-objective criteria, permitting specification of a separate objective function for each of several goals. The coefficients, or measurement criteria, need not necessarily be commensurate or even explicitly converted to a common denominator. Matrices of trade-off functions need only be developed, and may be stated in primitive barter terms. Although the neoclassical theory of utility maximization embraced the concept of satisfaction through diversity, this concept became obscured in modern decision theory. Multiple-objective programming models are discussed, including the environmental evaluation system (EES), and application of goal programming is illustrated by the Cross Florida Barge Canal restudy. In the latter, a set of operational alternatives were defined, each of which would produce a different mix of economic and environmental outputs (goal achievements). The preferred solution could then be described in terms of 'highest and best use' alternatives, with weights established on the basis of technical parameters. The main purpose of goal programming is to replace the inadequate benefit-cost ratio. (Lynch-Wisconsin)
W78-11500

THE GROWTH OF ECONOMIC VALUES IN PRESERVATION: AN ESTUARINE CASE STUDY,
Oregon Univ., Eugene. Dept. of Economics.
J. M. Freidman.
Coastal Zone Management Journal, Vol. 3, No. 2, p 171-181, 1977. 1 tab, 18 ref.

Descriptors: *Estuaries, *Preservation, *Wildlife conservation, *Coos Bay(OR), *Cost-benefit analysis, Oregon, Economics, Social benefits, Forecasting, Economic justification, Decision making, Social values, Wetlands, Wildlife habitats, Economic impact, South Slough(Coos Bay OR), Sanctuaries, Ecosystems.

Establishment of the United States' first estuarine wildlife sanctuary on the south slough of Coos Bay, Oregon, is found to be socially beneficial when growth in the value of estuarine services is included in the analysis. Even assuming theoretically no systemic economic changes, the value of the south slough as an estuarine sanctuary is greater than the value of not preserving it; net social benefits of preservation are positive, equal to at least $2.5 million minus $1.6 million (the known minimum value of social benefits minus the estimated value of social costs from preservation). This paper considers several key economic issues of environmental preservation in an estuarine context in four sections: (1) estimation of the value of developing the estuary; (2) identification of the net social benefit principle for comparing development to ecological, cultural, recreational, aesthetic, historic, and economic services provided by preservation; (3) exploration of the growth of preservation values in the context of various discount rates; and (4) observations on the public value of approval of the preserve. The services provided by an estuarine sanctuary make it a store of public values, which are likely to increase over time because of growth in: (1) the population demanding estuarine services; (2) willingness to pay for such services; and (3) actual quality and quantity of services which are provided by a protected natural system. (Lynch-Wisconsin)
W78-11502

ENVIRONMENT, INTERNATIONAL TRADE AND WASTE MATERIALS,
Leicester Univ. (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6G.
W78-11503

INTERNATIONAL COMPETITIVE DISPLACEMENT FROM ENVIRONMENTAL CONTROL, THE QUANTITATIVE GAINS FROM METHODOLOGICAL REFINEMENT,
Wisconsin Univ.-Madison. Dept. of Economics.
J. H. Mutti, and J. D. Richardson.
Journal of Environmental Economics and Management, Vol. 4, No. 2, p 135-152, 1977. 2 fig, 20 ref, 1 append.

Descriptors: *International economics, *International trade, *Pollution abatement, *Regulation, Economics, Methodology, Equilibrium, Analytical techniques, Partial equilibrium, General equilibrium, Competition, Environmental control, Displacement, Model studies, Polluter-pays principle, Subsidies, Forecasting.

Relative merits are evaluated for increasing the sophistication of methodologies for estimating international competitive displacement of U.S. industries because of unilateral environmental controls by the federal government. Four approaches derived from the literature are evaluated, covering a range of refinement from partial equilibrium through intermediate approaches to general equilibrium. The approaches include: (1) demand-oriented industry-by-industry approaches (partial equilibrium); (2) demand-oriented comprehensive approaches (intermediate); (3) demand-oriented 'macro-orthodox' approaches (general equilibrium); and (4) supply-demand oriented 'classical' approaches (general equilibrium). In general, a carefully specified general equilibrium approach is worth the added effort, and provides considerably more information than a casually specified partial equilibrium or intuitive approach. U.S. data was used in evaluating the models, first under a polluter-pays scheme, then under subsidy-tax financing. Under both polluter-pays and subsidy financing schemes, moving from the simplest case to the intermediate model results in quite different industry projections. Including macroeconomic factors appears particularly important in the classical setting. It is further concluded that a general equilibrium approach is beneficial for predicting effects of any shock to the domestic cost of primary factors which reduces international competitiveness and displaces domestic producers. (Lynch-Wisconsin)
W78-11507

RESEARCH NEEDS RELATING TO WATER/LAND PROBLEMS IN URBANIZING AREAS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 236, Price codes: A05 in paper copy, A01 in microfiche. Special Report No. 8, (UILU-WRC-78-0008), June 1978, 78 p, Patricia C. Welsh, editor. Proceedings of the Annual Meeting of the Water Resources Center, University of Illinois at Urbana-Champaign, May 16, 1978. OWRT A-999-ILL(6).

Descriptors: *Urbanization, *Urbanizing areas, *Conferences, *Research priorities, Illinois, Drainage, Water supply, Groundwater, Flood management, Storm runoff, Planning, Water quality, Community development.

Urbanizing areas often experience problems in obtaining an adequate supply of water treatment and distribution, and in ensuring that wastewater is adequately treated so as to protect the environment and, in some cases, to permit its reuse. These inherently complex problems are being made more difficult to solve by the continuing increase in the number and type of pollutants present and by the strong demand for a high-quality environment. These proceedings present assessments of the problems and of the research needed to solve them as discussed by consultants and governmental agency personnel during a one-day workshop sponsored by the Water Resources Center at the University of Illinois at Urbana-Champaign. The presentations cover topics such as groundwater and surface water supplies, drainage, flood management, the quality of storm runoff water, and planning methods as these issues affect both samll communities and major urban areas.
W78-11578

FEDERAL-STATE WATER USE RELATIONS IN THE AMERICAN WEST: AN EVOLUTIONARY GUIDE TO FUTURE EQUILIBRIUM,
Arizona. Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6E.
W78-11579

FISH, WILDLIFE, AND RECREATIONAL VALUES OF MICHIGAN'S COASTAL WETLANDS,
Eastern Michigan Univ., Ypsilanti. Dept. of Geography and Geology.
For primary bibliographic entry see Field 2H.
W78-11752

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

FIRM BEHAVIOR UNDER IMPERFECTLY ENFORCEABLE POLLUTION STANDARDS AND TAXES,
State Univ. of New York at Albany. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11485

POLLUTION CONTROL AND TECHNOLOGICAL ADVANCE: A DYNAMIC MODEL OF THE FIRM,
Duke Univ., Durham. NC. Graduate School of Business Administration.
For primary bibliographic entry see Field 5G.
W78-11489

CONTROLLING POLLUTION BY PRICE AND STANDARD SYSTEMS: A CLARIFICATION,
Delaware Univ., Newark. Coll. of Business and Economics.
For primary bibliographic entry see Field 5G.
W78-11490

EFFLUENT CHARGES: PERSPECTIVES AND COMPARISONS,
Carnegie-Mellon Univ., Pittsburgh, PA. School of Urban and Public Affairs.
For primary bibliographic entry see Field 5G.

W78-11492

THE CASE FOR EFFLUENT CHARGES AS PART OF A NATIONAL ENVIRONMENTAL PROGRAM,
New Mexico Univ., Albuquerque, Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11493

EFFLUENT CHARGES, A DISCUSSION PAPER,
Washington Univ., Seattle. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11494

MARKET MODELS FOR POLLUTION CONTROL: THEIR STRENGTHS AND WEAKNESSES,
Yale Univ., New Haven, CT. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11495

GRAIN AND FERTILIZER MOVEMENTS IN RESPONSE TO WATERWAY USER CHARGES,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
A. R. Bunker.
Illinois Agricultural Economics, Vol. 17, No. 1, p 19-26, January 1977. 4 fig, 5 tab.

Descriptors: *Grains(Crops), *Fertilizers, *Marketing, *Use rates, *Inland waterways, *Logan County(IL), Illinois, Simulation analysis, Barges, Transportation, Locks, Dams, Railroads, Trucking, Pricing, Model studies, Cost recovery.

A linear programming model, based on a 1973 survey of grain elevators and fertilizer distributors in and near Logan County, Illinois, was used to analyze effects on marketing patterns of various levels of waterway user charges on barges. User charges were also related to waterway operation and maintenance costs, and investment costs for Lock and Dam 26 at Alton, Illinois, were related to grain and fertilizer movements. Marketing and transportation of grain and fertilizer changed only slightly at operation and maintenance cost-recovery charge levels. Higher charges caused substantial switching from truck-and-barge to rail shipments, and sometimes caused major changes in the quantity of shipments through certain locations, but only small increases in the total marketing and transportation bill resulted. Major destinations for grain in the country were the Illinois River (primarily for barge transport to the Louisiana Gulf) and Decatur, Illinois, for processing. Trucks carried 78% of the grain in 1973, compared with 22% for railroads. The basic (or optimal) solution generated by the analysis requires movement of 617,754 tons of grain and 66, 408 tons of fertilizer, with total marketing and transport costs of $9.51 million; 536.1 million net ton-miles of traffic are generated, of which 88% is carried by barges, 8% by rail, and 4% by truck. (Lynch-Wisconsin)
W78-11497

NONCONVEXITY AND OPTIMAL EXHAUSTION OF RENEWABLE RESOURCES,
T. R. Lewis, and R. Schmalensee.
International Economic Review, Vol. 18, No. 3, p 535-552, October 1977. 2 fig, 20 ref, 2 append.

Descriptors: *Renewable resources, *Natural resources, *Optimization, *Exhaustion, *Economics, *Resource exploitation, Model studies, Discount rates, Fixed costs, Harvesting, Nonconvexity.

A model of optimal renewable resource exploitation shows that even with a low discount rate, conditions necessary for optimality may be satisfied by permanent abandonment of the resource after finite time. Even when a continuous-harvesting policy of the classical type also exists, satisfying the same necessary conditions, that path may not be optimal. With large fixed cost nonconvexities making harvesting at very low rates unprofitable, it may be better to exhaust the resource after finite time. The presence of nonconvexities can radically alter the nature of the optimal resource management strategy. One connot be sure without numerically evaluating alternative payoffs that continuous harvesting will be superior to abandonment. When the discount rate is low, the possible optimality of abandonment seems counter-intuitive. A key assumption of the analysis--that harvesting cannot be resumed once ceased--may not always be realistic; in some cases the cost of resuming harvesting might more logically be assigned a finite costant. Whenever neither continuous harvesting nor abandonment is optimal, all optimal policies are cyclical; after finite time the stock size enters an interval that it never leaves thereafter. When the lower bound of the interval is reached, harvesting is suspended until the stock has grown to the upper bound, at which point harvesting is resumed to draw down the stock again. (Lynch-Wisconsin)
W78-11498

WATER CONSUMPTION UNDER PEAK-RESPONSIBILITY PRICING,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.
For primary bibliographic entry see Field 6D.
W78-11499

POINT SOURCES: NEW ECONOMIC MECHANISMS,
Toronto Univ. (Ontario). Faculty of Law.
For primary bibliographic entry see Field 5G.
W78-11501

INTERTEMPORAL ENVIRONMENTAL MANAGEMENT WITH A STORABLE POLLUTANT,
Colorado Univ., Boulder. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11506

INTERNATIONAL COMPETITIVE DISPLACEMENT FROM ENVIRONMENTAL CONTROL, THE QUANTITATIVE GAINS FROM METHODOLOGICAL REFINEMENT,
Wisconsin Univ.-Madison. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-11507

ENFORCEMENT COSTS AND THE INCENTIVE TO EVADE CONTROLS ON PRODUCTION,
South Carolina Univ., Aiken. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11511

THE EFFECTIVENESS OF CAPITAL INVESTMENTS IN THE PROTECTION OF THE NATURAL ENVIRONMENT,
For primary bibliographic entry see Field 5G.
W78-11580

THE ECONOMICS OF POLLUTION,
For primary bibliographic entry see Field 5G.
W78-11634

DESIGN 'EFFECTIVE' COST-EFFECTIVE SYSTEMS,
For primary bibliographic entry see Field 5D.
W78-11856

6D. Water Demand

DELTA PRESERVATION OR DELTA RIPOFF. AN ANALYSIS OF THE CALIFORNIA DELTA PROTECTION ACT,
California Dept. of Justice, Sacramento.
For primary bibliographic entry see Field 6E.
W78-11304

PRIMARY SOURCES OF SOUTHERN CALIFORNIA'S WATER SUPPLY: HISTORICAL DEVELOPMENT AND SUFFICIENCY IN TIME OF DROUGHT,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 3B.
W78-11325

INTERSTATE TRANSFERS OF WATER AND WATER RIGHTS--THE SLURRY ISSUE,
Davis, Graham and Stubbs, Denver, CO.
C. O. Martz, and S. L. Grazis.
Rocky Mountain Mineral Law Institute, Vol. 23, p. 33-70 (1977).

Descriptors: *Water rights, *Water transfer, *Pipelines, *Slurries, Jurisdiction, Water supply, State governments, Diversion, Water demand, Legislation, Appropriation, Competing uses.

Public demands for interstate transfer of water are growing in number and intensity. In response to these demands, states are increasingly raising jurisdictional barriers to water exportations. The right of a state to preempt the use of water either directly by legislative proscriptions on extraterritorial diversions, or indirectly by narrow definitions of lawful beneficial uses, has become a controversial issue. This issue is posed in sharp relief by recent coal slurry pipeline proposals which are focused upon in this article with emphasis on jurisdictional aspects. Another important issue to be resolved is whether the state in which a diversion is made can assert such dominion over the water source as to prohibit its delivery in interstate commerce. There appears to be little legal precedent to resolve these problems. It is suggested that the availability of water in particular cases will depend upon the character of state constitutional reservations and the strengths of local interests in protecting indigenous resources for the use of the source states. It is concluded that pipelines will be favored over the states as to appropriations that predate restrictive state legislation. (Quarles-Florida).
W78-11327

ANALYSIS OF SUPPLY AND DEMAND OF URBAN ORIENTED NON-RESERVOIR RECREATION.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 6B.
W78-11457

WATER USE IN SOUTHWEST FLORIDA -- AN ECONOMICS REVIEW,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
G. D. Lynne, and C. F. Kiker.
Economics Report No. 82, University of Florida, Gainesville, November 1976. 70 p, 3 fig, 37 tab, 32 ref, 1 append.

Descriptors: *Florida, *Economics, *Water shortage, *Water allocation(Policy), *Water users, *Water utilization, Water supply, Water demand, Agriculture, Industrial production, Mining, Domestic water, Irrigation, Pricing, Consumptive use, Water consumption(Except consumptive use).

A survey of southwest Florida, where water has become a scarce resource, showed that production

of goods and services accounts for 85% of water use in the area, compared with 15% for consumptive activities. Overall water use was estimated at 750 gal/resident/day in 1970. Major uses are mining and agricultural irrigation, which accounted for 56-67% of total water use in 1969-70; a large percentage is concentrated in Hillsborough and Polk Counties, an area of severe supply problems. Three major use classes were identified: (1) agricultural production (crop and livestock), (2) commercial and industrial production, and (3) direct consumption (personal use, cooking, cleaning, car washing, and lawn irrigation). About one-third of all farms had irrigated land, using 58 billion gallons of water on 274,000 acres in 1969; total agricultural use was 64 billion gallons. A significant portion is used directly by consumers for nonessential activities. Pricing policies for water resources should be considered an alternative to policies that lead to free water for all. Emphasis should be placed on allocation to mining and agricultural production as they are major uses, though direct consumer use should not be totally ignored. This study relied mostly on data for 1969-72, supplemented by data from 1949-68. (Lynch-Wisconsin)
W78-11486

DAILY FLUCTUATIONS IN CAMPGROUND USE: AN ECONOMETRIC ANALYSIS,
Oregon State Univ., Corvallis. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-11496

WATER CONSUMPTION UNDER PEAK-RESPONSIBILITY PRICING,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.
J. E. Flack, and G. J. Roussos.
Management and Operations, Vol. 70, No. 3, p 121-126, March 1978. 10 tab, 5 ref.

Descriptors: *Denver, *Pricing, *Water rates, *Peak-responsibility pricing, *Water supply, *Water demand, Colorado, Water users, Water meters, Model studies, Hanke-Davis model, Capital costs, Costs, Water consumption(Except consumptive use), Economics, Rates, Municipal water.

Effects on water consumption of peak-responsibility pricing, one of three alternative rate structures under study by Denver (Colorado) Water Department, are predicted using a modified Hanke-Davis seasonal-peak pricing model. If properly structured, peak-responsibility pricing can reduce water consumption and offers as attractive alternative to the present pricing system. Peak-responsibility pricing reduces the peak load and thus defers expenditures for future capacity expansion. An alternative system assumes that capacity costs should be levied only a utilization at a peak if the same type of capacity serves all users. The purpose of peak-load pricing is to make those customers responsible for the peaks pay for the extra-capacity costs. Because all three alternatives depend on the price elasticity of demand, it was necessary to assume the water system was completely metered; in fact, Denver is a mix of metered and unmetered customers. Capital costs were spread throughout the year and applied seasonally to the actual extent they contribute to extra-capacity cost. Treatment and storage facility costs, designed on the basis of maximum day, were apportioned at 37% base costs and 63% extra-capacity costs. Costs of pumping, transmission, and distribution facilities, designed on the basis of maximum hour, were apportioned at 22% base costs and 78% extra-capacity costs. Both two- and three-month peak seasons were considered. (Lynch-Wisconsin)
W78-11499

SOURCE, USE, AND DISPOSITION OF WATER IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
S. D. Leach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 126, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 78-17, April 1978. 90 p, 11 fig, 21 tab, 25 ref.

Descriptors: *Florida, *Water utilization, *Water supply, *Surface waters, *Groundwater, Estuaries, Irrigation water, Industrial water, Municipal water, Livestock, Domestic water, Electric power production, Consumptive use, Freshwater, Saline water.

On the average, 18,420 million gallons of water was withdrawn for use in Florida each day in 1975--an increase of 3,107 million gallons per day (Mgal/d) rate since 1970. The 1975 daily total was made up of 11,502 million gallons of saline water and 6,918 million gallons of freshwater. The saline water supply, largely surface water, was pumped from tidal estuaries. Only 95.3 Mgal/d--less than 1 percent--was obtained from wells. The freshwater supply was almost equally divided between surface water (52 percent) and ground water (48 percent). Virtually all the saline water was used for thermoelectric power generation. Only 63 Mgal/d of saline water was used for all other industrial purposes. The largest user of the freshwater was for irrigation--2,868 Mgal/d. The remaining use of freshwater amounted to 1,698 Mgal/d for thermoelectric power generation; 1,146 Mgal/d for public supply; 940 Mgal/d for industrial use other than thermoelectric power generation; and 266 Mgal/d for rural domestic and livestock use. Irrigation, the largest user of freshwater, also is responsible for the greatest consumption, 1,332 Mgal/d or about half the water applied. Included in the quantity of water consumed by irrigation is that part of the conveyance loss made up of evapotranspiration--estimated at 109 Mgal/d. The remainder of the conveyance loss is returned to the ground water reservoir for reuse by seepage from the canals. (Woodard-USGS)
W78-11983

6E. Water Law and Institutions

THE PORT OF OAKLAND DECISION: CALIFORNIA OIL SPILL LEGISLATION GETS WATERED DOWN,
J. M. Lecklikner.
Golden Gate University Law Review, Vol. 7, No. 2, p. 499-534 (Winter, 1977).

Descriptors: *California, *Oil spills, *Legislation, *Judicial decisions, Oil pollution, Local governments, Legal aspects, Water pollution, Negligence, Water quality, Penalties(Legal), Pollution taxes(Charges).

The California Supreme Court recently had the opportunity to interpret state legislation addressing the problem of oil pollution. The case arose out of an oil spill in the Oakland Estuary which precipitated an action by the Califronia Attorney General pursuant to the state Water Code. The Court's holding greatly advanced environmental protection by establishing that governmental entities that pollute cannot avoid responsibility for their actions. However, the case set environmentalists back by rejecting strict liability as the standard of care for onshore oil polluters and by setting a $6000 maxium allowance for daily discharge damages. It is still not clear whether or not state courts will adopt the narrow approach taken in this case. The Supreme Court's holding is totally lacking in policy considerations, focusing instead upon grammar, syntax and definitions contained in the pertinent statutes. It is therefore difficult to assess the impact of the holding. The article concludes that California now has few safeguards to protect its water environment. Effective regulation of onshore facility oil polluters has been stymied by the Court's requirement of the state to prove negligence or intentional harm--an almost impossible task. (Quarles-Florida)
W78-11301

EXISTING WATER LAWS AND INDUSTRY PRACTICES: THEIR CONTRIBUTION TO THE WASTE OF WATER,
California State Dept. of Water Resources, Sacramento.
R. B. Robie, and M. J. Steinberg.
Los Angeles Bar Journal, Vol. 53, No. 3, p. 164-174 (September, 1977).

Descriptors: *Water utilization, *California, *Water conservation, *Water rights, Water users, Groundwater, Appropriation, Regulation, Water resources, Prescriptive rights, Surface waters, Comprehensive planning.

Some major water law doctrines and water purveying practices encourge the waste of water or at least discourage conservation. This article highlights some of these legal doctrines and industry practices in California. The Commission to Review California Water Rights Law is expected to consider many of these complex problems. Presently, most of the water used in the state is subject to no administrative regulation. Conservation has become more important with the recent drought. The article considers the establishment of guidelines for implementation of state constitutional principles to be of primary importance. This should enable courts and agencies to implement the law more effectively. Clarification of the limits of reasonable use will also inform water users what is expected of them. More efficient administrative regulation of water resources is necessary. The conjunctive use of surface and groundwater should be promoted and equitable allocations of water should be used. Applicants for water permits need to be required to demonstrate appropriate conservation efforts. Some industry practices should be reconsidered. If water use is shown to have cost elasticity, rate structures should be modified to correlate more closely with usage. (Quarles-Florida)
W78-11302

WATER RATIONING: THE VIEW FROM MARIN COUNTY,
Marin Municipal Water District, CA.
T. Thorner.
Los Angeles Bar Journal, Vol. 53, No. 3, p. 176-184 (September, 1977).

Descriptors: *Water conservation, *Water shortage, *California, *Rationing(Water), Water rates, Water demand, Water utilization, Water resources, Droughts, Economics, Environmental effects, Water users.

The current California drought has brought about a surprising willingness of people to carry out water conservation and rationing in innumerable ways. These practices are expected to continue after the drought ends. Water rationing is a mandatory program to limit water use, whereas water conservation is generally a voluntary program to minimize unnecessary resource consumption. This distinction has become blurred in California during the drought. The Marin Municipal Water District has been a testing ground for water conwervation and rationing programs. This article traces the steps taken by the District's Board of Directors to achieve tremendous water savings. The legal basis of the District's power to restrict water use is examined. The various water rationing programs that the District utilized at various times are explored. Voluntary rationing has no sanctions and consists only of appeals to consumers. Mandatory rationing with restrictions or mandatory rationing by allotments is also available. Price incentive rationing adjusts water rates so that those who fail to con-

serve water get higher bills. Types of enforcement are explained as well as bans on new water hookups. (Quarles-Florida)
W78-11303

DELTA PRESERVATION OR DELTA RIPOFF. AN ANALYSIS OF THE CALIFORNIA DELTA PROTECTION ACT,
California Dept. of Justice, Sacramento.
G. K. Wilkinson.
Los Angeles Bar Journal, Vol. 53, No. 3, p. 152-162 (September, 1977).

Descriptors: *California, *Water supply, *Water users, *Water rights, Legislation, Water resources development, Droughts, Water conservation, Water demand, Water distribution(Applied), Water utilization, Water delivery.

The severity of the present drought in California has revived the Sacrameno-San Joaquin Delta Protection Act (Act). This legislation authorized the California Water Resources Development System for the State Water Project (SWP). Three cases are pending which challenge the efforts of the California Department of Water Resources and the State Water Resources Control Board to deal with the water shortage issue. Central Valley water users claim the state must export more water from the Delta to benefit Valley farms. The opposing side views the Act as requiring the cessation of exports until the Delta is fully serviced. This article suggests that a median of these two views should be applied. It suggests that the Act requires protection of the Delta equivalent to the protection that would have existed absent the SWP and federal Central Valley project. A higher level of protection is available if public interest requires it. The act does not create a vested right to water released for storage in the SWP. Delta interests should have the opportunity to obtain such water, but it should be purchased and then only when it is reasonable to do so. (Quarles-Florida)
W78-11304

OIL POLLUTION LAW AND THE LIMITATION OF LIABILITY ACT: A MURKY SEA FOR CLAIMANTS AGAINST VESSELS,
Kelley, Drye and Warren, New York.
F.E. Sisson, III.
Journal of Maritime Law and Commerce, Vol. 9, No. 3, p. 285-341 (April, 1978).

Descriptors: *Oil spills, *Oil pollution, *Water Quality Act, *Penalties(Legal), Ships, Legal aspects, Florida, Legislation, Insurance, Oceans, Federal Water Pollution Control Act, Compensation.

The 1851 limitation of Liability Act (LLA) still affords shipowners protection from extensive claims of parties injured by or as a result of their vessel. Liability cannot exceed the amount of value of the interest of such owner in such vessel, and its freight, provided the owner lacks privity or knowledge relating to the cause of the loss. Since the LLA's enactments, the group of possible victims has grown to include entire beachfront communities in the case of an oil spill. Naturally, potential damage of this type could prove much greater than the salvage value of one vessel afer such an incident. With the increasing frequency of oil spills, the need for new oil pollution laws became apparent. Appropriate federal legislation was adopted as well as various state legislation. Florida's tough Oil Spill Prevention and Control Act was upheld in the Supreme Court. however, there is an extreme need to clarify the interrelationships among federal law, state law and the LLA which all relate to the issue of oil spill liability. This article attempts to identify the conflict present and stresses the need for legislative clarification. (Quarles-Florida)
W78-11305

FEDERAL APPROPRIATION AND THE RECLAMATION ACT OF 1902,
P. E. Hofmeister.
Nebraska Law Review, Vol. 57, No. 2, p. 403-441 (1978).

Descriptors: *Federal Reclamation Law, *Federal-state water rights conflicts, *National Water Commission, *Water rights, Reclamation, California, Unappropriated water, Beneficial use, Water utilization, Water demand, Reclamation states, Prior appropriation.

Recent litigation has renewed the dispute involving state control over federal reclamation projects in the arid Western states. Western states use the doctrine of prior appropriation in distributing water rights. This requires that the water be put to a beneficial use which is determined by state authority. When the federal government is the appropriator, the question is raised as to whether the federal government is bound to comply with conditions imposed by the state. The latest interpretation of Section 8 of the reclamation act was delivered in United States v. California. The court held that the Bureau of Reclamation must comply with state law, but the state must grant the permit with no requirement that the Bureau comply with state conditions if there is unappropriated water available. This article explores the problems generated by this opinion, and suggests the solution reached by the court is not a satisfactory one. A more just result might be reached through legislation proposed by the National Water Commission which suggests that the federal government recognize and follow state water law as long as it is consistent with federal purposes. (Quarles-Florida)
W78-11306

INTERNATIONAL AQUIFER MANAGEMENT: THE HUECO BOLSON ON THE RIO GRANDE RIVER,
Waterloo Univ. (Ontario).
J. C. Day.
Natural Resource Journal, Vol. 18, No. 1, p. 163-179 (January, 1978). 4 fig.

Descriptors: *Equitable appointment, *Groundwater resources, *Mexico, *Texas, Political aspects, Groundwater basins, Water resources development, Comprehensive planning, Coordination, Aquifer management, Water supply, Water demand.

The Hueco Bolson is a groundwater reservoir share by the United States and Mexico. As demand increases, joint management and international cooperation is needed to avoid potential groundwater conflicts. Studies are needed to estimate available resources, projected population and per capita consumption in each country. Management alternatives limiting water appropriation to practical sustained yields of local surces should ensure that each country receives an equitable amount of groundwater by compensating for major international drawdown induced by each country in the other. Further investigation is needed on the potential to mine aquifers during dry periods and to replenish them during wet years without impairing the existing freshwater reosurce by salinization, other contaminants, or aquifer subsidence. A major obstacle to cooperation appears to be Texas laws which regard groundwater as a resource belonging to individual property owners. The individual owners are entitled to unlimited pumping even if such action should deplete reserves or impair water quality. In order to achieve ground-water management cooperation, politically feasible alternatives to groundwater control in the Texas part of the Hueco Bolson must be explored and implemented. (Baumbach-Florida)
W78-11309

SCIENCE, SOVEREIGNTY AND THE THIRD LAW OF THE SEA CONFERENCE,
Lewis and Clark Coll., Portland, OR. Natural Resources Law Inst.
R. Winner.
Ocean Development and International Law Journal, Vol. 4, No. 3, p. 297-329 (1977).

Descriptors: *Law of the sea, *Oceans, *Conferences, *Research and development, Treaties, International law, Mining, Exploration, United Nations, International waters, Regulation, Future planning(Projected).

Among the many fields of endeavor that will be affected by the outcome of the Third United Nations Conference on the Law of the Sea is marine scientific research. This article examines how proposed treaties would affect such research. The major aspects of the treaties would: inpose substantial restrictions on the conduct of marine scientific research; impose a foundation of regulations and consent powers for over one-third of the ocean; avoid a patchwork of coastal state regulations; and restrain overly territorialist states. In the formulating of the treaties developed research states battled developing coastal states with the outcome favoring the latter. There are still widespread differences on the issues of deep seabed mining and consent powers over research in coastal areas, which indicate a final treaty may be years away. The author suggests it is unlikely a workable, widely supported treaty will be agreed upon. Nevertheless, the negotiations are said to have benefited international Law by paving the way for increased regulation and pre-arranged agreements between nations with respect to marine scientific research. (Spector--Florida)
W78-11310

OIL AND WATER,
G. E. Studds.
Trial, Vol. 13, No. 3, p. 43-47 (March, 1977).

Descriptors: *Oil spill, *Oil pollution, *Compensation, *Damages, *Ships, Coast Guard regulations, Coasts, Transportation, Negligence, Storage tanks, Oil, Oil wells, Fishing, Oil industry, Commercial fishing, Resources, Offshore platforms, International waters, International law, Natural resources.

Oil spill liability laws are urgently needed to provide a system of compensation for damages to fishing resources, related industry, and affected individuals. Presently, the Coast Guard has no authority to investigate spills of oil or to obtain compensation for cleanups. Recent tragic spills point out the need to: (1) set high standards of liability for those transporting oil within 200 miles of our shore; (2) require the posting of a bond equal to liability before allowing a vessel to enter our waters; and (3) create a quick and equitable mechanism for those damaged to obtain compensation. In this article, a United States Congressman describes how his proposed bill would require domestic and foreign vessel owners to obtain federal certificates of responsibility which would demonstrate their ability to meet the costs of an oil spill. The bill would also set liability limits for deepwater ports, and for offshore oil production, storage and transportation facilities. In addition, it would create a fund which would compensate claimants and then proceed to seek reimbursement from the spiller. The author argues that the United States must proceed unilaterally to protect its natural resources and economy from devasting oil spills because international standards will not be stringent enough. (Spector-Florida)
W78-11311

THE ORIGINS OF THE 200-MILE OFFSHORE ZONES,
Johns Hopkins Univ., Washington, DC. Ocean Policy Project.
A. L. Hollick.

American Journal of International Law, Vol. 71, No. 3, p. 494-500 (July, 1977).

Descriptors: *Law of the sea, *Fishing, *South America, *International law, United Nations, Conferences, History, International waters, Jurisdiction, Coasts, Resources, Regulation.

On March 1, 1977 the United States extended its fisheries jurisdiction limit from 12 to 100 miles offshore. This move--expected for many years--further universalized the 200-mile limit. Many other nations had already claimed a 200-mile territorial sea and negotiations are under way at the Third United Nations Law of the Sea Conference to establish 200-mile economic zones worldwide and negotiate resulting conflicts. This article traces the historical origins of the 200-mile limit. The author presents an interesting analysis of the chronological history of this limit's acceptance around the world from when it was first declared by Chile in 1947 up to the 1977 United States declaration. It originated due to the concerns of a weak Chilean whaling industry and in mistaken interpretation of a 1939 security zone declaration issued by then President of the United States Franklin Roosevelt. It grew through economic and political necessity to the point where today the Law of the Sea Conference must come to grips with virtually worldwide application. (Spector-Florida)
W78-11312

REFLECTIONS ON WASHINGTON'S COASTAL ZONE MANAGEMENT PROGRAM,
Washington State Dept. of Ecology, Olympia. Shoreline Div.
R. Mack.
Coastal Zone Management Journal, Vol. 3, No. 4, p. 325-330 (1977).

Descriptors: *Legislation, *Washington, *Management, *Shore pollution, Coasts, Permits, Regulation, State jurisdiction, Comprehensive planning, Public benefits, Water resources development, Environmental effects.

On June 1, 1976 the Secretary of Commerce approved the Washington (state) Coastal Zone Management Program (WCZMP) which created a cooperative partnership between the state's Department of Ecology and its local governments. The WCZMP requires and defines in detail a planning program and a regulatory permit system, both of which are initiated at the local level and are subject to state overview. The WCZMP covers all lakes more than 20 surface acres in size, all streams with a mean annual flow of more than 20 cubic feet per second, all marine waters and lad up to 200 feet inland therefrom, and all marshes, bogs, swamps, and tidal waters. This article lists features which contributed to the success of the WCZMP and cautiously predicts the successful enactment of similar state laws encouraging coastal zone management. Contributing features listed include: public concern (evidenced by petitions to the legislature); public support; public involvement; state executive branch support; and continuing legislative overview. The article also traces selected features of the 1971 Shoreline Management Act, which the WCZMP was patterned after. These iclude local emphasis, state responsibility where the localities fail to act, a regulatory program, and integration of state and local management processes. (Spector-Florida)
W78-11313

COMMON LAW V. STATUTORY POLLUTION ABATEMENT: THE TEXAS ATTORNEY GENERAL'S DILEMMA,
South Texas Law Journal, Vol. 18, No. 3, p. 557-571 (1977).

Descriptors: *Texas, *Pollution abatement, *Common law, *Administrative agencies, Air pollution, Water pollution, Water quality, Legislation, Legal aspects, State governments, Water law, Regulation.

The responsibility for the protection of the general public in the maintenance of the quality of the environment in Texas has always rested with the state attorney general. This article concludes that this responsibility should continue under the attorney general's authority despite the discretionary powers of several state agencies with the authority to abate pollution. The attorney general's power originates with the common law right of the sovereign to abate a public nuisance. However. Texas law now gives the Department of Natural Resurces and Air Control Board power to direct the attorney general go to bring suit to abate water and air pollution. This article explores the question of whether the attorney general retains his common law power to abate or whether that rights is preempted by legislation which grants the power to bring pollution abatement suits in the state agencies. The historical background of the attorney general's power is examined along with the purpose and intent of pertinent legislative acts. The exercise of the common law powers is discussed, as is enforcement of the air and water pollution abatement acts. (Quarles-Florida)
W78-11314

GROUNDWATER PROTECTION IN THE CHRISTINA BASIN,
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
For primary bibliographic entry see Field 4B.
W78-11315

SOLVING THE PROBLEM OF THE DEEP SEABED: THE INFORMAL COMPOSITE NEGOTIATING TEXT FOR THE FIRST COMMITTEE OF UNCLOS III,
New York University Journal of International Law and Politics, Vol. 9, No. 2, p. 177-201 (Fall, 1976).

Descriptors: *Law of the sea, *International law, *United Nations, *Ownership of beds, Treaties, Continental shelf, Fishing, Technology, International waters, Oceans, Exploitation, Resources development.

In the realm of international discussion of seabed regulation, the task has become to devise forms of ocean enterprise providing incenives for entrepreneurs to undertake operations while safeguarding the international community. At the same time, countries that cannot be enterpreneurs because of their geographical, financial or technical positions should be actively associated with the exploitation of oceanbed resources. The United Nations' First Committee is very close to agreement on implementation of the above standard. This would probably preserve the seabed for the benefit of all mankind and avoid international conflict over the seabed exploitation issue. A sufficient number of states are expected to accept this proposal in order to avoid utter chaos. If the proposition fails, the future of the seabed will become uncertain. National legislation purporting to grant seabed mining rights might shape international law until some future international control. The situation at hand arose because customary international law was outrun by technolgical change. The authors strongly urge mankind to seize this moment, that has made itself available to shape their own destiny. (Quarles-Florida)
W78-11316

PUMPING BILLIONS INTO THE DESERT--THE CASE AGAINST THE CENTRAL ARIZONA PROJECT,
D. Hanson.
Audubon, Vol. 79, No. 3, p. 133-145 (May, 1977).

Descriptors: *Dams, *Colorado River Basin, *Water distribution(Applied), *Arizona, Deserts, Water supply, Water rights, Water storage, Dam design, Environment, Administrative agencies, Indians, Indian reservations, Water pollution, Water policy, Water demand, Irrigation, Evaporation, Rivers, River basin development.

The Central Arizona Project (CAP) is one of 19 water projects that President Carter ordered reviewed prior to new spending. Arizona's surface and groundwater resources, and its desert characteristics are discussed along with a brief history of water use, regulation, and econimics. The federal Bureau of Reclamation (BOR) conceived the CAP to meet increasing water demand by tapping the Colorado River. Prior to the CAP receiving Congressional athroization, the issue of water rights among the Colorado River basin states was resolved by the United States Supreme court in Arizona v. California, resulting in the allocation of specific quantities of Colorado River flow to each state. The design of the CAP is outlined and compared with past BOR irrigation projects. Water quality and pollution consequences are discussed. The article criticizes the following benefits claimed for the CAP: (1) increased water supply for agriculture; (2) community growth; (3) hydroelectric power; (4) reduced unemployment; and (5) money for Indians. The author concludes that the following considerations support major design changes in the CAP: inundation of Indian lands; potential dam failure; adverse enfironmental impacts; high costs; and availability of engineering alternatives and water convservation technology. (Hoofman-Florida)
W78-11317

THE FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976: STRUCTURE AND FUNCTION OF A CONTIGUOUS ECONOMIC ZONE,
A. S. Anderson.
Texas International Law Journal, Vol. 12, p. 331-353 (Spring, 1977).

Descriptors: *Boundary disputes, *Commercial fishing, *Fish conservation, *International law, *Law of the sea, Adadromous fish, Coasts, Continental margin, Fish, Fish management, Foreign countries, Legal aspects, Legislation, International waters, United States, Water law, Water policy, Water rights.

The Fishery Conservation and Management Act of 1976 unilaterally created a fishing zone which extends the jurisdiction of the United States to a line two hundred miles from the baseline of the territorial sea of the United States. It is expected that the adoption by the United States of this exclusive economic zone will greatly accelerate the worldwide trend toward doing the same. Congress expressed its determination that pressure from foreign fishing fleets and the ineffectiveness of international fishery agreements have contributed to the problem of overfishing. Congress approved the Act despite the possiblity that unilaterally created economic zones violate international law. Certainly such action conflicts with the well-established principle that fishing is a traditional freedom of the open sea. In view of the fact that almost all nations favor an exclusive zone delimitation of 200 miles, a claim that such a unilaterally created zone is illegal is moot at best. Such unilateral action may very well obstruct international cooperation, but the exclusive economic zone may also offer the most realistic option around which to build a world consensus on oceanic resources. (Jordan-Florida)
W78-11318

POLYCHLORINATED BIPHENYLS TOXIC POLLUTANT EFFLUENT STANDARDS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11319

A CASE ANALYSIS OF POLICY IMPLEMENTATION: THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969,
Arizona Univ., Tucson. Inst. of Government Research.
H. J. Cortner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 679. Report NSF-RA-E-75-178 May, 1975. 32 p.

Descriptors: *Environmental control, *Judicial decisions, *Legislation, *Analysis, Project post-evaluation, Administrative decisions, Decision making, Water resources, Political aspects, Environment, Comprehensive planning.

The 1969 National Environment Policy Act (NEPA) was not only implemented by the 'proper administration' but also be legislation, private interest groups, the president, and the courts. This article focuses on the interactions of these political actors in NEPA's implementation process, with special emphasis on the Lake Powell (California) Research Project. That region was experiencing converging demands for water and energy resource development, preservation of scenic features, expansion of recreational facilities, and economic development. The requirements for the preparation of Environmental Impact Statements under NEPA affected decision-making for management of the region's energy resources. Because of presidential and congressional oversight--specifically a failure to interpret the Act and to specifically direct its enforcement and implementation--and because environmentalist groups were anxious to have implemented what they perceived NEPA to be, the courts assumed an active role in NEPA's implementation. The judicial activism brought with it an over-emphasis of procedure over substance, however, resulting in a significant gap between NEPA's statutory intent and its actual policy performance. NEPA has had only a modicum of success at creating and maintaining environmental integrity and reforms in environmental dicision-making. (Spector-Florida).
W78-11320

THE DULUTH EXPERIENCE--ASBESTOS, WATER, AND THE PUBLIC,
Minnesota Dept. of Water and Gas, Duluth.
For primary bibliographic entry see Field 5F.
W78-11321

A CRITICAL APPRAISAL OF PROPOSED CHANGES TO THE 1972 WATER POLLUTION CONTROL ACT,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5G.
W78-11322

LAW OF THE SEA BECALMED,
Council on Foreign Relations, Washington, DC.
J. T. Swing.
Oceans, Vol. 9, No. 6, p. 62-63 (November, 1976).

Descriptors: *Resources development, *Oceans, *United Nations, *Conferences, International law, Regional economics, Decision making, Negotiations, Relative rights, Resource allocation, Law of the sea, Mining.

The fourth substantive negotiating session of the Third United Nations Conference on the Law of the Sea ended with many issues unresolved. Negotiations were most seriously split over how to control the extraction of deep sea-bed minerals. Developed nations insisted upon secured access as essential to the large capital investments that will be required for production. Developing countries favored a monopolistic authority with control over marketing to protect the economics of developing land-based mineral producting states. The developing countries defeated or compromise 'dual access' proposal which would have assured industrialized states access to one-half of the mineral nodule fields while leaving the balance of the sites to be developed by the new international Seabed Authority. Unresolved 200-mile economic zone issue included: (1) whether zone area would remain high seas except for the specified economic rights granted to coastal states; (2) whether all scientific research in the zones would require prior coastal state consent; and (3) what measure of access to resources and transit rights within the zone would be granted to landlocked states. Negotiations on international dispute settlement mechanisms were also unresolved. (Baumbach-Florida).
W78-11323

A MULTI-FACETED, MULTI-AGENCY DETECTION, RESEARCH AND ENFORCEMENT PROGRAM.
Sea Technology, Vol. 18, No. 10, p. 10-17, 49-50 (October, 1977).

Descriptors: *Administrative agencies, *Oceans, *Pollution abatement, *Comprehensive planning, Inter-agency cooperation, Regulation, Law enforcement, Exploration, Water pollution control, Standards, Research and development, Water policy.

An array of governmental agencies is involved in detection, cleanup and research aspects of ocean pollution. The Environmental Protection Agency administers an ocean dumping permit system and expects to have drastically reduced all ocean sewage sludge dumping by 1981. The U.S. Coast Guard helps enforce the permit system by monitoring and spot checking permittees. The Coast Guard is also responsible for coordinating the cleanup of oil spills and other polluting disasters. The Energy Research and Development Administration is involved in determining the effects of energy production along the United States' shorelines and the continental shelf. Assessing the effects of a major oil spill is primarily the responsibility of the National Oceanic and Atmospheric Administration (NOAA). NOAA is charged with monitoring and predicting the probable effects of dumping on the ocean environment, and is also investigating the environmental impact and amount of yield of possible future manganese nodule mining operations from deep ocean beds. Defense agencis are also involved in the clean ocean effort. The U.S. Navy is currently altering ships and upgrading equipment with the aim of eliminating all international discharge of koil and oily wastes. (Baumbach-Florida).
W78-11324

PRIMARY SOURCES OF SOUTHERN CALIFORNIA'S WATER SUPPLY: HISTORICAL DEVELOPMENT AND SUFFICIENCY IN TIME OF DROUGHT,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 3B.
W78-11325

ORE MINING AND DRESSING EFFLUENT GUIDELINES--TO BPT OR NOT TO BPT,
American Mining Congress, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11326

INTERSTATE TRANSFERS OF WATER AND WATER RIGHTS--THE SLURRY ISSUE,
Davis, Graham and Stubbs, Denver, CO.
For primary bibliographic entry see Field 6D.
W78-11327

QUALITY V. QUANTITY: THE FEDERAL WATER POLLUTION CONTROL ACT'S QUIET REVOLUTION IN WESTERN WATER RIGHTS ADMINISTRATION,
Debevoise and Libeman, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11328

ENVIRONMENTAL LAW: GOVERNMENTAL SUSPENSION OF OUTER CONTINENTAL SHELF OIL DRILLING OPERATIONS,
J. T. Latting.
Oklahoma Law Review, Vol. 30, No. 4, p. 930-937 (Fall, 1977).

Descriptors: *Offshore platforms, *Drilling, *Oil wells, *Resources development, Continental shelf, Oil, Exploration, Leases, Regulation, Environmental effects, Oil pollution, Administrative decisions.

In 1953 Congress enacted the Outer Continental Shelf Lands Act which authorized the Secretary of the Interior to grant oil and gas leases on submerged lands of the outer continental shelf to the highest qualified bidder. In 1968 Union Oil, in bidding competition with other major oil companies, was granted a lease in Santa Barbara (California) Channel and subsequently installed two offshore drilling platforms there. After permission to erect a third platform was granted, the infamous oil blowout occurred on one of the first two platforms. After the completion of environmental studies, the Secretary continued a previous suspension of various leases and withdrew permission to erect the third platform. Four major oil companies filed suit to set aside and enjoin future interference by the Secretary. This article explores the major issue of the suit-the power of the Secretary to regulate oil and gas leases under the Act. After discussing the disposition of the case, the article concludes with an examination of the implications of offshore oil development. It suggests that there are better ways to discourage offshore development than to unjustly inflict great economic loss on oil companies. (Quarles-Florida).
W78-11329

PUBLIC BEACH ACCESS: A GUARANTEED PLACE TO SPREAD YOUR TOWEL,
Spessard L. Holland Law Center, Gainesville, FL.
F. E. Maloney, D. Fernandez, A. R. Parrish, and J. M. Reinders.
University of Florida Law Review, Vol. 29, No. 5, p. 853-880 (Fall, 1977).

Descriptors: *Public access, *Beaches, *Public rights, *Local governments, Recreation, Beach erosion, Land development, Adverse possession, Federal government, State government, Eminent domain, Prescriptive rights.

Greater protection of the right to secure public beach access is needed in the legal system. This is the conclusion of this article which notes that the public's right to the foreshore is diminishing as upland and drysand areas become more developed. The burden of securing greater public access rests largely on local governments until state and federal governments provide sufficient funds to purchase an adequate supply of public beaches. A model Beach Access Ordinance is provided to aid local governments in securing such access. The disappearance of public beaches is blamed on erosion as well as increased private control. Only Texas and Oregon have passes strong state legislation to protect public beach rights. As background to the model ordinance, the discussion focuses on common law theories supporting public beach rights, state and federal legislation, and the 'taking' issue. This last area is especially relevant in the area of mandatory dedication of land by developers prior to subdivision plat approval. The common law theories examined include custom, dedication, prescription and the public trust doctrine. (Quarles-Florida).
W78-11330

A LEGAL REGIME FOR THE ARCTIC,
B. J. Feder.

Ecology Law Quarterly, Vol. 6, No. 4, p. 785-829 (1978).

Descriptors: *Arctic Ocean, *Law of the sea, *Environmental effects, *Resources development, Oil, Economics, International law, International waters, Exploitation, Climates, Continental shelf, Antarctic.

The law of the sea is the dominant legal regime of the Arctic Ocean. Recently, the potentially vast resources available in the Arctic has resulted in an increasing interest in this area. The efforts of the law of the Sea Conference to rewrite the law of the sea coincide with the growing interest. The unique environmental hazards of resource exploitation in the Arctic raises doubts about including in the new legal regime formulated at the Conference. The Conference has tended to emphasize control and development of the oceans as an economic resource with less concern for environmental issues. The first section of this article discusses the physical and environmental characteristics of the Arctic, and Arctic, and concludes that the ocean there is at most quasi-oceanic in character. Part two examines the traditional law of the sea and its application to the Arctic region with emphasis on environmental implications. The creation of a special Arctic legal regime based on environmental protection principles is urged. An outline of such a regime's structure is included and obstacles to this type of agreement are identified. (Quarles-Florida).
W78-11331

THE THIRD UNITED NATIONS' CONFERENCE ON THE LAW OF THE SEA: THE 1977 NEW YORK SESSION,
Miami Univ., FL. School of Law.
B. H. Oxman.
American Journal of International Law, Vol. 72, No. 1, p. 57-83 (January, 1978).

Descriptors: *United Nations, *Law of the sea, *International law, *Conferences, Oceans, Exploitation, Internal water, Navigation, Fisheries, Continental shelf, Treaties, International waters.

The sixth session of the Third United Nations' Conference on the Law of the Sea was held in 1977. Although the controversy over the deep seabeds issue has threatened to collapse the Conference, participants are on the verge of agreement on the entire law of the sea excepting this issue. After a brief comment on deep seabeds, this article explores other important issues including: (1) internal waters, the territorial sea, and the contiguous zone; (2) straits used for international navigation and archipelagic states; (3) the exclusive economic zone; (4) scientific research; (5) dispute settlement; (6) fisheries; (7) delimitation; (8) enclosed and semi-enclosed seas; and (9) the continental shelf. The article conclused with a summary of the progress conference has made. The Conference dealt with the geographic scope of the territorial sea, continental shelf, and high seas, reducing the area of the latter by one third. The Conference provided for unimpeded transit for international navigation. It further established a 200-mile economic zone with coastal state jurisdiction over the continental margin beyond this. Precise rules were established in the field of environmental law and provisions for binding arbitration to settle disputes were set forth. (Quarles-Florida).
W78-11332

LAW OF THE SEA-DEVELOPING COUNTRIES' CONTRIBUTION TO THE DEVELOPMENT OF THE INSTITUTIONAL ARRANGEMENTS FOR THE INTERNATIONAL SEA-BED AUTHORITY,
United Nations Secretorial New York. Office of Legal Affairs.
A. O. Adede.
Brooklyn Journal of International Law, Vol. 4, No. 1, p. 1-42 (Fall, 1977).

Descriptors: *Law of the sea, *International commissions, *Ownership of beds, *United Nations, Oceans, Mineral industry, Continental shelf, Resources, Resources development, Exploitation, Exploration, Mining.

Reservation of the sea-bed and ocean floor underlying the high seas beyond the limits of national jurisdiction for peaceful purposes has been an issue of United Nations' concern. The increased exploration and exploitation of these mandated the formulation of a just legla framework to allow these activities to benefit mankind. This article looks briefly at the work of the United Nations in this area since 1967. It then proceeds to explore the most recent developments of the third United Nations Law of the Sea Conference in designing the institutional arrangements for an international sea-bed authority. There is particular focus upon developing countries'i contributions in this area. The establishment of an authority of this type was a unique exercise. The organization will not only regulate countries involved in sea-bed exploitation, but it will also actively carry on the business of exploiting the sea-bed resources on behalf of mankind. This latter role makes the authority unlike any previous international authority and therefore impossible to pattern after any traditional model. (Quarles-Florida).
W78-11333

ENFORCING THE FEDERAL WATER RESOURCE SERVITUDE ON SUBMERGED AND RIPARIAN LANDS,
Department of Justice, Raleigh, NC. Eastern Div.
B. H. Johnson.
Duke Law Journal, Vol. 1977, No. 2, p. 347-388 (May 1977).

Descriptors: *Federal Water Pollution Control Act, *Rivers and Harbors Act, *Federal jurisdiction, *Law enforcement, Legislation, Regulation, Penalties(Legal), Legal aspects, Pollution taxes(Charges), Court decisions, Water conservation, Water management(Applied).

As presently construed, the 1899 Rivers and Harbors Appropriation Act and the 1972 Federal Water Pollution Control Act Amendments together create federal easements over most of the waters of the United States. Enforcement of these easements, however, has proved complex. Administrative and judicial enforcement proceedings have tended to resolve each case on an ad hoc basis. Minor violations of the acts are more apt to result in costly litigation than serious violations which require extensive corrective work simply because administrative agencies lask the means to deal effectively with the minor violations. Legislation is required to correct this situation. By giving the U.S. Army corps of Engineers and the Environmental Protection Agency the authority to impose and collect civil penalties for certain classes of minor violations, a great deal of largely unnecessary litigation could be eliminated. Administrative restoration and cease-and-desist orders, and self-help procedures should also be considered. The range of judicial remedies is broad enough, however, they should be applied in a consistent manner. This author suggests establishing the remedial injuction as the preferred remedy. Then, judicial delineation of appropriate exceptions would accomodate both uniformity and fexibility needs. (Baumbach-Florida).
W78-11334

HOUSE-SENATE COMMITTEE COMPROMISES ON PL 92-500,
R. Roberts.
Water and Sewage Works, Vol. 124, No. 12, p. 1, 4, 55. (December, 1977).

Descriptors: *Water quality standards, *Law enforcement, *Waste water treatment, *Water policy, Federal Water Pollution Control Act, Legislation, Regulation, Water reuse, Waste water reclamation, Alternative planning, Administration, Economic justification.

This committee conference bill was due for submission to the House and Senate at the time of its description in this paper. Its major provisions responded to legal, technological and administrative needs engendered by the 1972 laws. It included a five year extension of the federal grant program for municipal waste treatment plants. It followed the recommendations of the National Commission on Water Qualtiy in requiring that higher than 1977 treatment requirements for conventional type industrial waste be justified in terms of the higher costs involved. It specified which toxic substances would warrant imposition of the higher 1983 or even 'zero discharge' standards. A modification of the grant evaluating system permitted routine administration of the program by qualified states. Since only 35 percent of municipalities had met 1977 requirements for secondary sewage treatment, the bill provided for time extensions where federal funds had been unavailable. Communities which emphasize recycling, reclaiming and reuse of water would be eligible for 85 percent federal share of project costs, rather than the 75 percent in the case of conventional treatments. (Baumbach-Florida)
W78-11337

UNDERGROUND INJECTION ON LIQUID WASTE CAN BE ENVIRONMENTALLY SOUND,
Texas Water Quality Board, Austin.
J. W. Mullican.
Water and Sewage Works, Vol. 124, No. 12, p. 62-63 (December, 1977).

Descriptors: *Injection wells, *Waste disposal wells, *Underground waste disposal, *Texas, Waste disposal, Ultimate disposal, Regulation, Water pollution control, Design standards, Permits, Groundwater resources, Monitoring.

With proper safeguards, man-made waste can be disposed of in sealed underground wells. This process, called 'injection', is regulated in Texas by the Texas Water Quality Board (TWQB) in accord with the Texas Water Code. The TWQB issues permits after thorough engineering and geological evaluations are made of the waste character, well design, construction, operation and monitoring program. Certain of the drilling completion and testing phases are witnessed by the Board's technical staff. TWQB policy is to permit injection only after reasonable alternative methods have been evaluated and found to be less desirable in terms of environmental protection and dependability. State law allows injection only if: (1) the installation is in the public interest; (2) no existing rights will be impaired; (3) with proper safeguards, both ground and surface fresh waters can be adequately protected from pollution. The TWQB conducts routine inspections of permitted operations. In addition, each permittee must keep records of: surface injection pressures, volume injected, injection rates, periodic well tests. In the event a permit is cancelled or the well is abandoned, the permittee must submit for approval plans for plugging and abandoning the well. (Baumbach-Florida)
W78-11338

THE IMPLICATIONS OF SURFACE AND SUBSURFACE MINING POLICY FOR GROUNDWATER PROTECTION IN PENNSYLVANIA,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Mine Drainage Control and Reclamation.
For primary bibliographic entry see Field 5G.
W78-11339

REMEDIES IN ADMIRALTY FOR OIL POLLUTION,
Duncan, Brown, Weinberg and Palmer, Washington, DC.

For primary bibliographic entry see Field 5G.
W78-11342

B&W CONSTRUCTION, INC. V. CITY OF LACEY (CITY LIABLE FOR PROPERTY VALUE DECLINE IN INVERSE CONDEMNATION SUIT).
577 P. 2d 583-588 (Wash. Ct. App. 1978).

Descriptors: *Washington, *Property values, *Condemnation, *Storm runoff, Condemnation value, Damages, Sewers, Effluents, Eminent domain, Percolation, Bogs, Penalties(Legal).

Defendant, a Washington municipal government, sought review of a judgment awarding damages to plaintiff property owner as a result of the construction of a municipal sewer system that discharged effluent onto plaintiff's land. Defendant widened a road near plaintiff's property and constructed a storm sewer system nearly the entire length of the road. Some of plaintiff's land is on high ground with good percolation and slow runoff, with the remainder being a peat bog. Plaintiff contended that as a direct result of the new storm sewer an increased amount of rainfall is captured and discharged directly onto the peat bog. This discharge resulted in a change in the quality and depth of water in the peat bog so that the property on higher land lost its value as a potential lakefront subdivision, and peat extraction was made more difficult. Defendant contended that plaintiff failed to produce sufficient evidence. Affirming defendant's liability, the Court of Appeals held that a plaintiff in an inverse condemnation suit need only show a decline in property market value and need not prove a substantial injury. Liability for damages may include injury to property not actually taken. (Quarles-Florida)
W78-11343

FLORIDA COASTAL MAPPING ACT.
Fla. Stat. secs. 177.25 through 177.40 (1977).

Descriptors: *Florida, *Mapping, *Coastlines, *Standards, High water mark, Low water mark, Shores, Comprehensive planning, Administration, Research and development, Regulation, Boundaries(Property).

The Florida Coastal Mapping Act authorized the state's Department of Natural Resources (DNR) to: (1) coordinate a comprehensive coastal mapping program; (2) develop permanent records of tidal surveys and maps of the state's coastal areas; and (3) develop uniform specifications and regulations for tidal surveying and coastal mapping. DNR was directed to hold local public hearings on all proposed maps. Subsequently, DNR is to approve proposed maps, with or without amendments, or to withdraw them for further study. As shorelines change, DNR on its own initiative or upon notification of conditions, may authorize the production of revised maps. The Act further mandated that the establishment of local tidal datums and the determination of mean high-water and mean low-water lines shall be made in accordance with standards and procedures specified in the Act and in accordance with supplementary DNR regulations. No new map or survey purporting to establish local tidal datums or to determine the mean high or low-water line shall be admissable as evidence in Florida unless made according to the Act. (Baumbach-Florida)
W78-11344

WATER CONSERVATION COMMISSION.
N.D. Cen. Code Ann. secs. 61-02-01 through 61-02-74 (1960), as amended (Supp. 1977).

Descriptors: *North Dakota, *Legislation, *Water conservation, *Administrative agencies, Water quality control, Permits, Regulation, Law enforcement, Adoption of practices, Water resources development, Project planning.

The North Dakota Water Conservation Commission regulates, supervises, investigates, constructs, maintains and controls any system of works involving: (1) waters within the state; (2) flood control; or (3) water pollution prevention. Specific approval must be obtained from the Commission before any irrigation project or dam of certain size is built. Water rights granted by the State Engineer are subject to the Commission's approval. The powers and duties of the Commission are defined by state statutes. Fourteen sections of the State Water Commission Statute are contained as revised in the 1977 statutory supplement. For example, members of the Commission shall now be compensated while attending meetings at the same daily rate as are members of the legislative council. The Commission may now establish rules and regulations governing local financing of water development projects in which the state participates in cooperation with the United States, with political subdivisions or with local governmental entities. And, the Commission's prior approval is no longer required for the construction of municipal water supply, or municipal and industrial waste discharge facilities. (Baumbach-Florida)
W78-11345

DESKOVICH V. WATER POLICY AND SUPPLY COUNCIL (SANITARY LANDFILL SUBJECT TO AGENCY REGULATION).
157 N.J. Super. 89, 384 A. 2d 534-558 (1978).

Descriptors: *New Jersey, *Permits, *Landfills, *Obstruction of flow, Garbage dumps, Water pollution, Flood routing, Administrative agencies, Regulation, Legislation, Decision making, Adjudication procedure.

Plaintiff appealed a Water Policy and Supply Council (Council) decision which: (1) denied plaintiff a stream encroachment permit for construction of a sanitary landfill; and (2) ordered the removal of fill which had already been placed without the permit. Plaintiff argued that his landfill was not within the regulatory scope of the applicable state statute. He asserted that his landfill was not a 'structure within the ordinary highwater mark of a stream' and that the Council's permit denial, which was predicated on the landfill's effects should flooding occur, was not within the Council's designated concern for 'preserving the channel'. In reversing the Council's determination and remanding it with instructions, the appellate court ruled that the applicable statute did not allow the Council to weigh the effects of proposed structures on local flood capacity. However, under the statute, that part of the landfill which contributed debris to the river was a 'structure within the highwater mark'. Therefore, to the extent that the existing landfill violated that statute or any applicable regulations thereunder, the Council could order removal or repair. (Baumbach-Florida)
W78-11346

PARKING MALL ASSOCIATES V. WATER POLICY AND SUPPLY COUNCIL OF THE DIVISION OF WATER RESOURCES OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION (ADMINISTRATIVE AGENCY CAN ASSESS TIME LIMITS FOR COMPLIANCE WITH PERMIT CONDITIONS).
157 N.J. Super. 169, 384 A. 2d 857-859 (1978).

Descriptors: *New Jersey, *Permits, *Administrative agencies, *Landfills, Administrative decisions, Water management(Applied), Project planning, Regulation, Decision making, Land development, Flow characteristics, Rivers.

Upon appellant firm's failure to comply with conditions of its conditional permit for landfill placement, respondent Water Policy and Supply Council (Council) rescinded the conditional permit. Council subsequently reinstated the conditional permit and extended the time for compliance. On appeal, appellant asserted that the Council's imposition of the time limit without any additional hearing violated appelant's due process rights. The Council contended that the implied power to limit the time within which conditions placed upon permits must be completed is inherent and necessary for the execise of its statutory powers. Affirming the Council's power to impose such time limits, the appellate court noted that time limits are necessary because the character of water courses changes over time, and the interests of other property owners and the public may similarly change over time. In light of a recent state attorney general's opinion stating that appellant permittee has the right to administratively apply for a time extension, appellant's due process rights had not been violated by the Council's failure to hold a hearing when the extended time limit was set. (Baumbach-Florida)
W78-11347

JOHNSON V. WHITTEN (RESULTING DAMAGE FROM SURFACE WATER DRAINAGE OBSTRUCTION NOT ACTIONABLE).
384 A. 2d 698-702 (Me. 1978).

Descriptors: *Maine, *Surface runoff, *Obstruction to flow, *Damages, Drainage water, Repulsion(Legal aspects), Natural flow doctrine, Relative rights, Barriers, Flood damages, Associated costs, Riddance(Legal aspects).

Plaintiffs upper landowners appealed a trial court decision denying them damages for flooding which allegedly resulted when defendant landowner deposited fill on his own land, thus interfering with and damming the natural drainage from plaintiff's land. In affirming the denial of damages, the appellate court held that: (1) there is no liability arising from the obstruction or diversion of the natural drainage of surface water, even if it damages neighboring property; (2) watercourses, on the other hand, cannot be stopped up or diverted to the injury of other proprietors; (3) the issue of whether defendant property owner impeded a watercourse instead of mere surface water was not open for consideration in this case since it was neither raised in the plaintiff's initial complaint nor tried by implied consent of the parties; and (4) plaintiffs also could not recover damages under a state nuisance statute because the statute was intended to apply to actions relating to navigable waters and not to surface water obstruction cases. (Baumbach-Florida)
W78-11348

UNITED STATES OF AMERICA V. SLADE, INCORPORATED (OWNER OF OIL SPILLING TANKER ASSESSED CIVIL PENALTIES AND CLEANUP COSTS).
447 F. Supp. 638-646 (E.D. Tex. 1978).

Descriptors: *Oil spills, *Damages, *Federal Water Pollution Control Act, *Penalties(Legal), Disasters, Water pollution sources, Associated costs, Cost repayment, Pollution taxes(Charges), Law enforcement, Chemical analysis, Gas chromotography.

The United States brought suit against the owner of a tanker barge for the cost of cleaning up an oil spill. The defendant barge owner denied that the spilled oil was from its barge. In ruling for the government, the court held that the responsibility of the defendant for the oil spill was established by evidence of substantial hull damage to the barge and by gas liquid chromatography tests identifying the spilled oil as that from defendant's barge. By its failure to clean up the oil it spilled defendant became liable to the United States, pursuant to the 1972 Federal Water Pollution Control Act Amendments (FWPCA) for the full cost of cleanup operations. Pursuant to the FWPCA, defendant became liable for an additional civil penalty because of its discharge of a harmful quantity of oil into the

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avigable waters of the United States. The WPCA requires that the penalty shall not be assed unless the offender is given notice and an pportunity to be heard. Since the defendant in is case neither requested nor attended such a earing, the court ruled defendant was not denied ue process by the assessment of the penalty. Baumbach-Florida)
78-11349

OXILL V. METRAILER (DAMAGES AND IN-UNCTIVE RELIEF AWARDED FOR RAINAGE OBSTRUCTIONS).
58 So. 2d 986-993 (La. Ct. App. 1978).

Descriptors: *Louisiana, *Surface runoff, Obstruction to flow, *Penalties(Legal), Drainage ater, Repulsion(Legal aspects), Natural flow octrine, Relative rights, Barriers, Flood amages, Associated costs, Damages.

Where two estates are situated so that waters flow aturally from the above situated estate through he below situated estate, a legal duty arises on the ower estate to receive those waters which natually flow through it. Such a duty is called a servitude' and the estate burdened by the servitude is called the subservient estate. The estate benefited by the servitude is the dominant estate. When a servitude to receive naturally flowing waters exists on an estate, its proprietor is not at iberty to raise a dam or otherwise obstruct this natural running of water. In this case, defendant subservient estate owner appealed a judgment compelling him to pay damages to the plaintiff dominant estate owner for defendant's obstruction of natural drainage from the cominant estate onto defendant's subservient estate. The appellate court affirmed the damages award and additionally awarded injunctive relief to the dominant estate owner. In support of the injunctive relief granted, the court cited recent cases establishing that owners of dominant estates will be awarded injunctive relief even though the cost of cure may be substantial, unless a very exceptional situation is presented. (Baumbach-Florida)
W78-11350

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RAILROAD COMPANY V. UNITED STATES (CLEANUP COSTS OF OIL SPILL CAUSED BY BURGLAR RECOVERABLE FROM UNITED STATES).
575 F. 2d 839-843 (Ct. Cl. 1978).

Descriptors: *Reimbursable costs, *Federal Water Pollution Control Act, *Oil spills, Water pollution sources, Water pollution treatment, Cleaning, Associated costs, Cost repayment, Water policy, Non-structural alternatives, Water pollution control.

Oil spilled into a nearby stream when valves to large fuel oil tanks on plaintiff's property were left open during a burglary. Plaintiffs cleaned up the oil spill, then sought to be reimbursed by the United States for the cleanup costs pursuant to the Federal Water Pollution Control Act, (FWPCA). The FWPCA provides for cleanup recovery when a spill is caused solely by the act of a third party. The Government argued that plaintiffs were not entitled to recovery because by failing to deter the break-in they were partially responsible for the spill. In granting plaintiffs recovery the court ruled that plaintiff had taken reasonable precautions to prevent such third party meddling in that: (1) building doors had been barred; (2) oil tank valves were closed and each valve handle had been removed; (3) a perimeter fence and outside lighting had been installed. The government also asserted that plaintiff should not recover because of plaintiff's failure to prepare a Spill Control and Countermeasure Plan as recommended by Federal Regulations. The court found that this factor alone did not show that plaintiff failed to exercise reasonable care. (Baumbach-Florida)
W78-11351

PUGET SOUND GILLNETTERS ASSOCIATION V. UNITED STATES DISTRICT COURT (FISHING RIGHTS APPORTIONED ACCORDING TO INDIAN TREATIES UPHELD).
573 F. 2d 1123-1136 (9th Cir. 1978).

Descriptors: *Washington, *Relative rights, *Fishing, *Treaties, Resource allocation, Indian reservations, Legal aspects, Federal jurisdiction, State jurisdiction, Reservation doctrine, Public rights.

Non-Indian petitioners appealed a District Court apportionment of fishing rights between treaty Indians and non-Indians. In affirming that apportionment, the Court of Appeals held that under the applicable treaties, the state and the Indian tribes stand in similar positions as holders of quasi-sovereign rights in fishery. Comparisons between the number of treaty and non-treaty fishers, or the quantity of fish each category has an opportunity to take, were irrelevant under the law. The treaty tribes had reserved their preexisting rights to fish and they continue as sovereign entities to hold those reserved rights. The non-treaty fishers' right to take fish is purely derivative of the states' sovereign rights to the fish. Thus the non-treaty fishers were bound to take only the state's share of the apportioned fish. Furthermore, the allocation of fishing rights between treaty Indians and non-Indian fish catchers was not a denial of equal protection, since the classification was not an impermissable racial classification, but rather was based upon tribal sovereignty. (Baumbach-Florida)
W78-11352

AVONDALE IRRIGATION DISTRICT V. NORTH IDAHO PROPERTIES, INC. (NON-CONSUMPTIVE WATER RIGHTS RESERVED BY THE FEDERAL GOVERNMENT BUT ONLY FOR SPECIFIC PURPOSES).
577 P. 2d 9-24 (Idaho, 1978).

Descriptors: *Idaho, *Water rights, *National forests, *Competing uses, Irrigation districts, Federal government, Non-consumptive use, Water utilization, Watershed management, Natural flow, Flow, Watersheds(Basins).

These cases--consolidated on appeal--raise common issues concerning federal reserved water rights for non-consumptive use to the natural flow of streams in national forests. In the first action, private parties sought to adjudicate their water rights in three creeks. Defendant United States contended the federal reservation doctrine established its non-consumptive water rights to the entire natural flow of the creeks from the point where they arise in the national forest to their point of exit. The other action consisted of several irrigation districts adjudicating water rights in Hayden Lake and its tributaries. The United States Asserted a reserved non-consumptive right in this action also. Affirming one case and reversing the other, the Idaho Supreme Court held: (1) the national forests were created to preserve a perpetual supply of timber and to protect watersheds and the resultant water flow, so that any non-consumptive water rights reserved by the United States were limited to amounts necessary for those purposes; and (2) if the natural flow ever exceeds the minimum flow necessary for timber management and watershed protection, the United States must quantify its water rights and prove its claim as to the excess. (Quarles-Florida)
W78-11353

MARKIEWICZ V. SALT RIVER VALLEY WATER USERS' ASSOCIATION, (LIABILITY OF ASSOCIATION FOR WATER ESCAPE DAMAGE IS A JURY QUESTION).
576 P. 2d 517-530 (Ariz. Ct. App. 1978).

Descriptors: *Arizona, *Flood damage, *Storm runoff, *Adjudication procedure, Damages, United States, Floods, Diversion, Negligence, Spillways, Canal embankments, Floodgates.

Plaintiffs, Arizona homeowners, sought review of a lower court's grant of a directed verdict for defendants, the Salt River Valley Water Users' Association and Salt River Project Agricultural Improvement and Power District. Plaintiffs suffered severe property damage as a direct result of water escaping from the Arizona Canal which is operated by defendant Association as agent for the District. Defendant Association controls water flow into the Canal, attempting to carry off as much storm runoff as possible. Despite precautions, the capacity of the canal is sometimes exceeded so that it overflows the south bank. To prevent erosion of the canal bank the Association installed spillways in the south bank. Plaintiffs' property was damaged when a storm of unusual severity resulted in several breaks in the south bank. Reversing, the Arizona Court of Appeals held: (1) the Association was not immune from suit; (2) the Association could not be held strictly liable where the diversion could be regarded as a natural feature of the land; and (3) a jury could find the Association's failure to improve the gate as negligence and that such negligence caused at least part of damages. (Quarles-Florida)
W78-11354

MOE V. DIVISION OF STATE LANDS (THE POWER OF THE DIVISION OF STATE LANDS TO GRANT FILL PERMITS FOR SUBMERGED LANDS).
569 P. 2d 675-677 (Or. App. 1977).

Descriptors: *Oregon, *Landfills, *Permits, *Conservation, Navigable waters, Administrative decisions, Industries, Legislation, Water resources, Recreation, Transportation, Fish, Economics, Land reclamation, Fisheries, Land development, Administrative agencies, Habitats, Rivers.

Petitioners sought review of an order of the director of the Division of State Lands granting a permit to fill submerged lands. Petitioners contended that the granting of the permit was contrary to the statutory standards set forth in ORS 541.625. The director granting the issuance of the permit admitted in the order that if sound principles of conservation were applied the permit request should be denied. However, the director insisted that circumstances existed in terms of both money and effort which allowed issuance. Examination of the fact situation revealed that the applicants for the permit were in the process of filling submerged land for the purpose of developing an industrial park. Much of the work had been completed with only twenty acres remaining to be filled when the statute at issue was passed. The permit sought concerned the remaining twenty acres. The Court of Appeals of Oregon held that the director clearly exceeded his authority by issuing the permit. The court found that administrative agencies have only the powers granted to them by statute. Consequently, the permit should not have been issued. (Quarles-Florida)
W78-11355

WETLANDS AND RIPARIAN RIGHTS.
Md. Code Ann. secs. 9-101 through 9-501 (1974), as amended (Supp. 1976).

Descriptors: *Maryland, *Legislation, *Dredging, *Permits, Decision making, State governments, Penalties(Legal), Maps, Administrative agencies, Boundaries(Property), Land development, Regulation, Local governments, Ecology, Wetlands, Legal review, Water law.

Dredge or fill licenses require a hearing in the local subdivision affected. After the hearing, the Board shall determine whether the license is in the best interest of the state. The Board shall take into account ecological, economic, developmental, recreational and aesthetic values in considering each application. Each license shall be written and for consideration, and may contain any terms or

conditions which the Board deems necessary. A hearing may be waived for fill areas less than 300 feet in length and not more than ten feet channelward of the mean high water line. The secretary if charged with delineating the landward boundaries of wetlands and showing the boundaries on maps of each political subdivision. Decisions of the circuit court may be appealed to the Court of Special Appeals. In addition to the administrative penalties provided, violation of regulations under this title are misdemeanors, punishable as provided for by law. Judicial review is limited to an assessment of whether the administrative determination was arbitrary and capricious. (Molloy-Florida)
W78-11356

CHY COMPANY V. STATE WATER RESOURCES CONTROL BOARD (UNEXERCISED RIPARIAN RIGHTS ON SAME PRIORITY AS EXERCISED RIPARIAN RIGHTS).
145 Cal. Rptr. 146-150 (1978).

Descriptors: *California, *Water rights, *Water allocation(Policy), *Riparian rights, Streams, Administrative decisions, Administrative agencies, Water resources, Riparian land, Priorities, Beneficial use, Judicial decisions, Competing uses.

Defendant, California Water Resources Control Board, appealed a trial court decision for plaintiff, riparian claimants. In compliance with the California Water Code a California city filed a petition with the Board for a determination of the rights of various claimants to the waters of the Soquel Creek Stream System. After investigation and hearings the Board determined and allocated the right to various water amounts among the riparian claimants. The claimants objected to the Board's action on the grounds that: (1) the Board lacked power to quantify riparian rights not now being used; (2) the Board erred in placing unexercised riparian rights below appropriative rights; and (3) unexercised riparian rights should be placed on the same priority as exercised riparian rights. After the trial court sustained the riparian claimants' contention in all respects, the Board appealed. Affirming the trial court, and Court of Appeals concluded that the state constitution protects present and future riparian rights from infringement, to the extent that such rights are exercised in a manner which is both reasonable and beneficial and to which riparian land may be adaptable. (Quarles-Florida)
W78-11357

OCEAN DUMPING.
Code of Federal Regulations, Title 40, Parts 220-226, Sections 220.1-226.4 (July 1, 1977). p 470-484.

Descriptors: *Oceans, *Pollution abatement, *Waste disposal, *Legislation, Solid wastes, Sewage, Fisheries, Wastes, Dredging, Permits, Regulation, Federal government.

Federal regulations governing ocean dumping are herein set forth. Procedures and criteria are established for the issuance of permits by the federal Environmental Protection Agency pursuant to this Act. Criteria to be applied by the U.S. Army Corps of Engineers in its review of activities involving the transportation of dredged material for the purpose of ocean dumping is also established. Except as authorized by this Act or permits issued pursuant to it, no person shall transport any material for the purpose of dumping it into ocean waters. The scope of the Act's effect is set forth along with its relationship to international agreements. Several exclusions to the Act are set forth including: fish wastes, to an extent; fisheries resources; vessel propulsion and fixed structures; and emergencies to safeguard life at sea. The categories of permits issued include: (1) general; (2) emergency; (3) interim; (4) research; and (5) permits for incineration at sea. The authority to issue permits is designated as the Administrator. There is some delegation of this power to regional administrators, who also have the authority to review Dredged Material Permits issued by the Corps of Engineers. (Quarles-Florida)
W78-11358

BASIN ELECTRIC POWER COOPERATIVE V. STATE BOARD OF CONTROL (APPROPRIATOR'S RIGHT TO TRANSFER WATER USE DENIED).
578 P. 2d 557-576 (Wyo. 1978).

Descriptors: *Wyoming, *Consumptive use, *Water rights, *Beneficial use, Water utilization, Irrigation, Legislation, Natural use, Appropriation, Return flow, Diversion, Administrative decisions.

The primary issue of these consolidated appeals involved the right to transfer certain historic, closed-basin return flows. The appeals resulted when the State (Wyoming) Board of Controls refused to grant plaintiff appropriator's petition to change the use of acquired water appropriations. Petitioner sought to change the appropriations from agricultural to industrial use. Petitioner contended the amount of water consumptively used--its maximum seasonal entitlement--should be increased by the return flows below the topographic divide. Petitioner bases this contention on the theory that this amount was a necessary part of the irrigation and that it was historically lost to the Laramie River system. The Board concluded that these closed-basins return flows had not been beneficially, consumptively used below the divide and could not be transferred whether or not they return to the system. Affirming the Board's decision, the Wyoming Supreme Court held that water in excess of the amount actually used for irrigation and which had historically gone to waste could not be transferred in use or place of use because the appropriator had no right to such excess water. (Quarles-Florida)
W78-11359

STATE, DEPARTMENT OF ENVIRONMENTAL PROTECTION V. EXXON CORP. (LANDOWNER'S LIABILITY FOR PREVIOUS USE OF THE LAND).
376 A. 2d 1339-1350 (N.J. Super. Ct. 1977).

Descriptors: *Oil, *Water pollution, *Subsurface drainage, *New Jersey, Pollution abatement, Subsurface waters, Groundwater, Oil pollution, Water quality, Federal Water Pollution Control Act, Flow, Legislation, Runoff, Legal aspects, Regulation, Industries, Oil spills, Oil industry.

The State Department of Environmental Protection brought an action for injunctive relief and summary judgment against defendant manufacturing corporation for nuisance and for violation of a state statute proscribing the discharge of petroleum products into waters of the state. The defendant sought dismissal of the complaint. The defendant alleged that prior to its acquisition of the property, previous owners had used the property for the refining, storing and transshipping of oil and that as a result of this use, the soil was saturated with oil. In addition, the defendant alleged that the groundwaters of the area were contaminated before it acquired the land. The Superior Court held that the defendant did not discharge oil into the waters of the state within the meaning of the statute. The court found that the simple ownership of land did not impose strict liability on the defendant since the statute did not eliminate the causation requirement. To hold the defendant liable, the defendant must show both an act and causation. The court then dismissed the action for nuisance holding that defendant's use was not a nuisance and that defendant's failure to remedy the existing spillage was not actionable. (Beamer-Florida)
W78-11360

GENERAL PLAN IMPLEMENTATION: THE GROWTH-PHASING PROGRAM OF SACRAMENTO COUNTY,
California Univ., Davis. Inst. of Governmental Affairs; and California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 6B.
W78-11364

COMPARATIVE ANALYSIS AND CRITIQUE OF THE INSTITUTIONAL FRAMEWORK FOR WATER RESOURCES PLANNING AND MANAGEMENT: CANADA, UNITED STATES, AND MEXICO,
Colorado Univ., Boulder. Dept. of Economics.
C. W. Howe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 108, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, October 1977. 95 p, 3 fig, 5 tab, 34 ref. OWRT C-6116(5214)(1).

Descriptors: *Institutions, Planning, Evaluation, Water law, Organizational structure, Management, *Canada, *United States, *Mexico, *International commissions, *Institutional constraints.

An analytical scheme is established for assisting in the design and evaluation of a country's water planning and management institutions. The framework consists of (1) a taxonomy of the major components of the institutional framework and (2) an evaluation procedure based on performance criteria and design characteristics. The institutional frameworks for Canada, the United States, and Mexico are described, including the relevant international institutions. An assessment of these three countries is then made.
W78-11382

REGIONALIZATION OF WATER MANAGEMENT: A REVOLUTION IN ENGLAND AND WALES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
D. A. Okun.
Applied Science Publishers, Ltd., London, England, 1977, 32 tables, 20 fig, Glossary.

Descriptors: *Capital costs, *Flood protection, *Financing, *Water law, *Water pollution control, *Water quality, *Water management(Applied), Discharges(Water), Effluents, Fisheries, Measurement, Surface drainage, Sewage disposal, Water quality standards, *England, *Wales, Water authorities, Water Act, Water quality management, *Regionalization, Abstractions, Department of the Environment, Water Resources Board, Peak charging.

This historical account of English and Welsh attempts to provide regional water resource management begins with the Water Act of 1945 and ends in 1974 with the complete reorganization of the water supply industry. Water management, prior to 1960, was primarily addressed to problems of meeting water demand the cheapest way possible. Amenity issues were introduced around 1963 with the creation of the Water Resource Board (WRB) under the Water Resources Act (WRA) of 1963. Here, the use of rivers for navigation, the use of reservoirs to regulate river flows, and the use of water for various abstractions and discharges showed the interrelationship of water quality and water quantity with the needs for amenity and recreation. Efforts after 1963 concentrated on consolidation and regionalization of the Water Authorities' (WAs) jurisdictions and controlling water pollution through legally enforceable standards of water purity. Central problems surrounding the implementation of plans to regionalize the Water Authorities were financing pollution control efforts and waste water treatment, and charging equitable rates for the use of water services. Efforts at water supply management in the U.S. are

eviewed and the relevance of reorganization in ngland and Wales is applied to the situation. Coan-NC)
W78-11452

IRST ANNUAL REPORT TO THE CONGRESS OF THE UNITED STATES ON LEVEL B PLANNING.
Water Resources Council, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 111, Price codes: A03 in paper copy, A01 in microfiche. 1973, 35 p, 2 tab, 2 fig.

Descriptors: *Federal Water Pollution Control Act, *Planning, *Water quality, *River basins, *Water resources planning, *Water resources development, Land use, Water supply, Methodology, Boundaries(Surfaces), Priorities, Personnel, River basin commissions, Water Resources Planning Act, Management, *Section 209, *Level B planning, Water Resources Council.

Section 209 of the Federal Water Pollution Control Act Amendments of 1972 mandates the preparation of Level B plans for all regions or river basins in the country. The purpose of this report is to describe an approach for carrying out the 209 Program. The study concludes that because of time constraints it has not been possible in this first report to develop a listing of all studies to be accomplished, to delineate explicitly the areal boundaries of specific studies, to establish priorities among potential study areas, to suggest a sequence for the accomplishment of the studies, or to propose specific funding levels or estimate the personnel requirements of the studies. Furthermore, the priority of studies on a geographic basis cannot be determined until Section 208 planning boundaries are delineated and prioritized. Level B priorities must be linked to Section 208 priorities. Subsequent reports will identify specific areas for Level B studies, recommend priorities, and suggest a time-phased sequence for their accomplishment. The results of studies under the Water Resources Council and River Basin Commission as well as the recommendations of the Governors will be utilized as the basis for establishing priorities. (Nessa-NC)
W78-11458

SECOND ANNUAL REPORT TO THE CONGRESS OF THE UNITED STATES ON LEVEL B (SECTION 209) PLANNING.
Water Resources Council, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 112, Price codes: A02 in paper copy, A01 in microfiche. 1974, 9 p.

Descriptors: *Federal Water Pollution Control Act, *Planning, *Water quality, *River basins, *Water resources planning, Land use, Water supply, Methodology, Boundaries(Surfaces), Priorities, Personnel, River basin commissions, Data, State government, Water Resources Planning Act, Water resources development, Management, *Level B planning, *Section 209, *Implementation, Water Resources Council.

This report describes the new approach to Level B planning (Section 209, Federal Water Pollution Control Act Amendments of 1972) adopted by the Water Resources Council (WRC) on October 17, 1973. The main characteristics of the new Level B approach are that: studies are to address all major issues requiring new and mid-term (15 to 25 years) solutions and are to identify major data gaps, unmet needs, and requirements for additional studies in implementation of Level B plans; states will have a strong participating and leadership role; federal funding will be minimal; states must delineate components of the study objectives that relate to state needs; local, state and federal commitments on water and land resources should not be made without considering the inseparable nature of water quality, water quantity and land management problems; water quality programs will be better integrated and more balanced; land use, coastal zone management and rural area development efforts will be supported; the study is limited to two years; the study will cost approximately $750,000 to $1,000,000; and River Basin Commissions (RBCs), where organized, will fill a leadership role, but states will be expected to be partners in Level B planning and would provide leadership in predetermined geographical and functional areas. (Nessa-NC)
W78-11459

ECONOMIC IMPACT OF FISH TOXICANT REGULATIONS,
Northern Illinois Univ., De Kalb. Loredo Taft Field Campus.
For primary bibliographic entry see Field 6B.
W78-11484

APPROPRIATIVE WATER RIGHTS AND THE EFFICIENT ALLOCATION OF RESOURCES,
Kentucky Univ., Lexington.
H. S. Burness, and J. Quirk.
California Institute of Technology, Division of the Humanities and Social Sciences, Social Science Working Paper No. 157, April 1977. 32 p, 8 ref. EX-76-G-03-1305.

Descriptors: *Resource allocation, *Water law, *Water rights, *Appropriative doctrine, *Economic efficiency, *Competition, Legal aspects, Riparian rights, Rivers, Lakes, Surface waters, Priorities, Equilibrium, Economics, Consumptive use, Beneficial use.

In absence of a competitive market for the purchase and sale of water rights the appropriative doctrine leads to inefficient water use. Inefficiency results from unequal sharing of risks among waterway users; senior appropriators bear less risk than junior appropriators. Whereas introduction of a competitive market in water rights and use of diversion facilities eliminates allocative inefficiencies, increasing returns in construction and maintenance of diversion facilities interferes with establishment of competitive markets in leasing diversion capacity, and monopoly problems can arise in the market for water rights as well. Limitations on entry can lead to further problems associated with a suboptimal investment in diversion capacity. In general eastern states rely on the riparian doctrine as the basis for water law, while western states have adopted the appropriative doctrine. Under the former, each property owner fronting on a lake or stream has a right to unimpaired use of the waterway; rights are only usufructuary, and severe restrictions are placed on 'reasonable' diversions. Under the appropriative doctrine the right to a certain amount of water is established and maintained only through use; water rights can be lost through usage lapse or change in the nature of usage. The right enables the holder to physically consume the water in beneficial use. Rights seniority is based on chronological order. (Lynch-Wisconsin)
W78-11504

FEDERAL-STATE WATER USE RELATIONS IN THE AMERICAN WEST: AN EVOLUTIONARY GUIDE TO FUTURE EQUILIBRIUM,
Arizona. Univ., Tucson. Office of Arid Lands Studies.
M. H. Jamail, J. R. McCain, and S. J. Ullery.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 309, Price codes: A08 in paper copy, A01 in microfiche. Arid Lands Resource Information Paper, No. 11. June 1978. 155 p, 166 refs. OWRT W-245(7819)(1).

Descriptors: Colorado River, Colorado River Basin, Federal-state water rights conflicts, Political aspects, Political constraints, Water resources, Boulder Dam, Water resources development, Colorado river compact, Boulder Canyon Project Act, Federal project policy, Mexican water treaty, Arizona, Colorado, Utah, Nevada, New Mexico, California, Southwest U.S., State jurisdiction, Federal jurisdiction, Reservation doctrine, Water rights, Federal reclamation law, Salinity, Cost repayment, Regulatory politics, Distributive politics, U.S. Bureau of Reclamation, Central Arizona Project, Colorado River Basin Salinity Control Act.

Federal-state relations in the field of water resources development in the Colorado River Basin are examined through a review of the literature. A framework is set out in which water policy development in the states of the Colorado River Basin (Arizona, Colorado, Wyoming, California, Nevada, Utah, and New Mexico) can be explained. Distributive, redistributive, and regulatory politics are defined as the three arenas in which water policy discussions take place. After this model is explained, development of water projects and policies in the Basin is explored. Beginning with the Reclamation Act of 1902, defined as the asis of Federal water policy, the Colorado River Compact, the Boulder Canyon Project Act, the Colorado River Storage Project, the Central Arizona Project, the Mexican Water Treaty of 1944, and the Colorado River Basin Salinity Control Act. The 1977 Carter administration's proposal to take water politics out of the distributive arena is examined and the authors conclude that the administration yielded on most of its proposed reforms to avoid a repetition of the 1977 confrontation with the Congress, and because western states' governors were united in the face of possible Federal encroachment, They point out that although the distributive arena is the one most beneficial to the states, the latter must recognize their dependence on Federal financial resources.
W78-11579

DETERGENT PHOSPHATE BAN.
Environmental Protection Agency, Chicago, IL. Phosphorus Committee.
For primary bibliographic entry see Field 5G.
W78-11581

MILWAUKEE'S LAST STAND - CITY FIGHTS ADVANCED TREATMENT ORDERED IN WATER CLEANUP SUIT.
For primary bibliographic entry see Field 5G.
W78-11792

HOLLAND FIGHTS WATER POLLUTION.
Industrial Engineering, Vol. 10, No. 5, p 42-43, May, 1978.

Descriptors: *Treatment facilities, *Automation, *Computers, *Aeration, *Instrumentation, Measurement, Anaerobic digestion, Odor, Sludge treatment, Flotation, Water quality, Waste water treatment, Municipal wastes.

Several of the Netherlands's 519 waste water treatment plants are described. The Eindhoven plant can treat waste water from a population of 750,000; sewage is transported to the facility through a 27.6 mile-long pipeline. The treatment plant's operatios are controlled by a computer which collects plant data, performs impact and fluctuation calculations, and controls pipe flowsand pumping operations. An underwater plant planned in Rotterdam will discharge fumes through a pipeline to a destructor. A number of plants utilize a patented water-jet aeration treatment system that simultaneously oxygenates and mixes the waste water. The Dutch State Mines have constructed an aeration system to convert organic wastes as well as inorganicnitrogen compounds into nitrogen. An industrial anaerobic digester has been designed by the Central Sugar Works. Some plants employ electro-flotation processes, sludge drying techniques, or sludge fermentation tanks for methane gas production. An

automatic water pollution monitoring network collects data on water quality from a number of sources and issues short- and long-term alarms when quality is below normal. (Lisk-FIRL)
W78-11793

DEVELOPING NATIONS FACE PROBLEMS IN WATER AND WASTEWATER MANAGEMENT,
For primary bibliographic entry see Field 5D.
W78-11796

PROCEEDINGS OF THE FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE, 1963.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 2J.
W78-11898

ECONOMIC IMPACT OF PROPOSED AMENDMENT TO WATER POLLUTION REGULATIONS FOR HEXANE EXTRACTABLE MATERIALS, R74-1, 8, 9,
WAPORA, Inc., Charleston, IL.
For primary bibliographic entry see Field 5G.
W78-12010

ENVIRONMENTAL PROTECTION AGENCY VS. ROBERT R. DETERS; FABIAN J. DETERS; MARCELLUS J. DETERS; ALVIN L. DETERS; WILLIAM H. DETERS, JR.; AND NORMA MARIE DETERS WEIMAN.
For primary bibliographic entry see Field 5G.
W78-12091

FEEDLOT RUNOFF CONTROL FROM POINT/NON-POINT SOURCES.
American National Cattlemen's Association.
For primary bibliographic entry see Field 5G.
W78-12097

6F. Nonstructural Alternatives

BIVARIATE PDF FOR FLOOD RISK EVALUATION IN CASE OF UNSTEADY FLOW,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 6A.
W78-11387

SHOULD WE TRY TO MEASURE RISK OR SHOUL WE ASSESS IT IN SOME OTHER WAY,
Waterloo Univ. (Ontario). Dept. of Statistics.
For primary bibliographic entry see Field 6A.
W78-11397

ANNOTATIONS OF SELECTED LITERATURE ON NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
H. J. Owen.
March 1977, 95 p.

Descriptors: *Non-structural alternatives, *Planning, *Bibliographies, *Flood plains, *Management, Land use, Floodproofing, Flood plain zoning, Publications, Abstracts, Water resources planning, Flood plain management, Corps of Engineers.

This document is based on a comprehensive literature review of nonstructural flood plain management measures. Nonstructural measures include flood proofing of structures; land use regulation of potential flood hazard areas and, in some cases, regulation of runoff contributing areas; permanent evacuation from the flood plain of damageable activities; and temporary evacuation and emergency preventive actions based on predetermined preparedness plans. The evaluation process that leads to selection of nonstructural measures requires assessments of more site-specific flood loss reduction components than do the more traditional structural measures. Such assessments must be made with less well known economic, social, institutional, and legal consequences. These annotations will be helpful in determining which publications dealing with nonstructural measures are potentially useful and which are redundant. The report contains an index of various types and aspects of nonstructural measures. This document will assist Corps of Engineers and other water resources planners by reducing the time required for literature search. (Nessa-NC)
W78-11455

FLOOD PLAIN INFORMATION: MANTUA CREEK, GLOUCESTER COUNTY, NEW JERSEY, CHESTNUT BRANCH AND EDWARDS RUN.
Army Engineer District, Philadelphia, PA.
For primary bibliographic entry see Field 4A.
W78-11461

FLOOD PLAIN INFORMATION STUDY: SHENANGO AND MAHONING RIVERS, LAWRENCE COUNTY, PENNSYLVANIA -- SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11462

FLOOD PLAIN INFORMATION STUDY: SEWICKLEY CREEK AND JACKS RUN, HEMPFIELD TOWNSHIP, PENNSYLVANIA--SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11463

FLOOD PLAIN INFORMATION: WEST FORK RIVER, HARRISON COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11464

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, CATTARAUGUS COUNTY, NEW YORK.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11465

FLOOD PLAIN INFORMATION: HOBBLE CREEK, SPRINGVILLE, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11466

FLOOD PLAIN INFORMATION: LOGAN RIVER, LOGAN, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11467

FLOOD PLAIN INFORMATION: BLACKSMITH FORK AND SPRING CREEK, MILLVILLE, UTAH.
Army Engineer district, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11468

SPECIAL FLOOD HAZARD INFORMATION REPORT: NORRIS CREEK AND TRIBUTARIES, ABBEVILLE, SC.
Army Engineer District, Savannah, GA.
For primary bibliographic entry see Field 4A.
W78-11469

INTEGRATING ECOLOGICAL AND SOCIAL CONSIDERATIONS INTO URBAN FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James, A. C. Benke, and H. L. Ragsdale.
Water Resources Research, Vol 14, No 2, April 1978, p 177-184. 3 fig, 4 tab, 15 ref. OWRT B-082-GA(3). 14-31-0001-4070.

Descriptors: *Flood control, *Floodplains, Ecological aspects, Social aspects, *Urban flood control.

A well-planned flood control program requires integration of diverse sets of information to develop alternative remedial measures for public discussion and selection. Although procedures for the required hydrologic studies, engineering designs, and economic analyses are readily available, procedures for assessing effects on the natural environment and on social aspects are still being developed. This paper illustrates one approach to integrating all this information in comparing alternatives, using the Proctor Creek watershed in Atlanta, Georgia, as an example. The illustration begins with a program such as might be formulated by available planning methodology from hydrologic, economic, and engineering data. The illustration continues with suggestions on how to collect meaningful social suitability data from a questionnaire designed to document public perceptions and preferences, ecological data from natural areas in the floodplain, and data relating the effects of the floodplain land use to the well-being of the community. A procedure for integrating these considerations with the established analyses into alternatives presented for public discussion and decision making is then illustrated. Suggestions are also made on how the selected flood control program can be most successfully implemented.
W78-12014

6G. Ecologic Impact Of Water Development

REFLECTIONS ON WASHINGTON'S COASTAL ZONE MANAGEMENT PROGRAM,
Washington State Dept. of Ecology, Olympia. Shoreline Div.
For primary bibliographic entry see Field 6E.
W78-11313

ENVIRONMENTAL LAW: GOVERNMENTAL SUSPENSION OF OUTER CONTINENTAL SHELF OIL DRILLING OPERATIONS,
For primary bibliographic entry see Field 6E.
W78-11329

ECONOMIC MEASUREMENT OF ENVIRONMENTAL DAMAGE,
Organization for Economic Co-Operation and Development, Paris (France).
K. G. Maler, and R. F. Wyzga.
1976. 151 p. $7.00.

Descriptors: *Environmental effects, *Environmental damage functions, *Environmental economics, Economic impact, *Measurement, *Welfare(Economics), *Planning, Damage functions, Economics, Alternative planning, Decision making, Damages, Methodology, Analytical techniques, Manuals, Social impact, Public health, Amenity, Wildlife.

This handbook covers theoretical and practical aspects of environmental damage functions, which are estimates of the relationship between given levels of environmental quality and monetary estimates of the environmental damage associated with those levels. The conceptual framework is that of standard neoclassical welfare economics; it is assumed that damage to be estimated is that perceived by those who currently suffer the damage.

onetary damage is defined as the least amount ecessary to compensate those who suffer from a ange in the environmental quality (i.e., the com-nsating variation). While neither an exclusive r a perfect tool, monetary damage estimates are eful for organizing and summarizing information environmental effects in a way which facilitates tional decision-making. The handbook has seven apters: (1) introduction, (2) damage functions, d the environment, (3) economic fundamentals d definitions, (4) classification of damage, (5) timation of financial losses, (6) estimation of sses of amenity, and (7) recommendations and nclusions. Types of damage considered include man health, fauna, flora, natural resources, aterials, and climate and weather. Several ethods of applying monetary values to physical mage are disoussed. It is concluded that the rect method gives the best results for most types financial loss where necessary data are availa-e. (Lynch-Wisconsin)
78-11488

NVIRONMENT, INTERNATIONAL TRADE ND WASTE MATERIALS,
eicester Univ. (England). Public Sector conomics Research Centre.
. Grace, R. K. Turner, and I. Walter.
iscussion paper No. 76-08, Presented at meeting lovember 1976, of Southern Economic Associa-on, Atlanta, Georgia. 66 p, 16 fig, 5 tab, 13 ref.

escriptors: *International trade, *Environmental ffects, *Wastes, *Recycling, *Marketing, Regulation, *Public policy, Prices, Materials, econdary materials, Developing countries, Raw aterials, Export, Marginal return, Waste paper, Vater pollution control, Air pollution.

nternational economic dimensions of recycling re outlined and a conceptual and empirical link is stablished between national and international narkets for secondary materials, using waste aper for illustration. Assuming that international rade in waste products is free and that barriers to nowledge and economic distance are overcome, hen international market prices will determine the economics of recycling within a particular country. International prices will tend to en-courage recycling in some countries and discourage it in others, but the overall volume of recycling and the stability of markets for recycled materials will be greater with internatonal trade and diversification than without it. International trade allocates secondary materials where their marginal product--and hence prices--is highest, thereby providing economic and environmental gains to both users and suppliers. Other dimen-sions include: (1) Increased recycling can improve a country's balance of payments, exports of secondary or raw materials, and currency exchange rate. (2) Governmental regulation of basic commodities markets could substantially in-crease price incentives for recycling, and interna-tional commodity price stabilization would benefit the secondary materials sector. (3) Recycling of-fers an alternative to foreign sources of raw materials. (4) Export controls may yield short-term economic gains, but at potentially significant long-term economic and environmental cost. (Lynch-Wisconsin)
W78-11503

WHAT NORTH SEA OIL MIGHT COST FISHE-RIES,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W78-11721

A 'PEOPLE-COUNTER' FOR UNSURFACED WETLAND FOOTPATHS,
Glasgow Univ., (Scotland). Dept. Geography.
For primary bibliographic entry see Field 4C.
W78-11754

THE CONSERVATION OF WETLAND HABITATS FOR WATER FOWL IN SOUTHERN AFRICA,
Wildlife Society of Southern Africa, Pinetown; and Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
E. A. Zaloumis, and P. le S. Milstein.
Supplement to African Wildlife. Vol 29, No 1, Autumn, 1975. 11 p, 1 fig, 20 ref.

Descriptors: *Africa, *Wetlands, *Waterfowl, *Marsh management, Ducks, Swans, Geese, Habitats, Floodplains, Marshes, Water level fluctuations, Habitat improvement, Wildlife management, Wildlife, *Southern Africa, Vleis, Refuges.

Due to climatic vagaries, limited size and occurrence of wetlands in Southern Africa, and the nomadic behavior of indigenous waterfowl, waterfowl in Southern Africa are more dependent on these wetlands than is the case in northern regions. South African wetlands are divided into five broad zones: (1) Winter Rainfall Zone wetlands are limited in area, shallow, tend to be brackish or saline, and are generally not very fertile. (2) Occasionally flooded depressions, usually with rich saline and alkaline substrates, provide temporary wetlands in the Arid Zone. (3) Highveld Zone wetlands are chiefly shallow pans and depressions. They are important areas for brooding waterfowl. (4) Tropical zone wetlands are primarily the thousands of square kilometers of shallow lakes, swamps, and floodplains associated with the Zambezi River system. (5) Vast floodplains occur in the East Coast Zone. Artificial wetlands should be undertaken as a prerequisite to the preoposed establishment of an international system of wetland refuges. The survey should follow the proven lines of Project Mar. The major share of the establishment of such a refuge system should fall on state organizations, but complementary assistance could be provided by local authorities, privarte individuals, and syndicates of gamebird hunters. (Stihler-Mass)
W78-11759

THE MUSSEL WATCH,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W78-11957

7. RESOURCES DATA

7A. Network Design

ILLINOIS DATA CATALOG (PRELIMINARY PRINT).
Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 7C.
W78-11631

NONCOMPUTER OPTIMIZATION OF SINGLE-SOURCE NETWORKS,
Visvesvaraya Region Coll. of Engineering, Nagpur (India).
For primary bibliographic entry see Field 4A.
W78-12050

7B. Data Acquisition

PRELIMINARY RUNOFF AND STREAMFLOW PREDICTIONS IN THE HUMBOLDT RIVER BASIN BASED ON SNOW DISTRIBUTION MEASUREMENTS FROM SEQUENTIAL SATELLITE IMAGERY,
Nevada Univ. System, Reno. Renewable Natural Resources Div.
For primary bibliographic entry see Field 4A.
W78-11366

THE INVENTORY AND DISTRIBUTION OF WATER AND ASSOCIATED LAND RESOURCES IN THE GARRISON/DEVILS LAKE REGION OF ND: AN APPLICATION OF RESOURCE DATA ACQUIRED BY ERTS,
North Dakota Univ., Grand Forks. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W78-11373

ICE SHEET TOPOGRAPHY BY SATELLITE ALTIMETRY,
EG and G Washington Analytical Services Center, Inc., Rockville, MD.
For primary bibliographic entry see Field 2C.
W78-11422

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA, REPORT,
Colorado School of Mines, Golden, Dept. of Geology.
For primary bibliographic entry see Field 7C.
W78-11439

EARTH RESOURCES DATA ACQUISITION SENSOR STUDY, PERIOD: DECEMBER 1, 1974-MAY 31, 1975,
Alabama Univ., Huntsville. School of Graduate Studies and Research.
For primary bibliographic entry see Field 5A.
W78-11443

CALIBRATION OF SELECTED INFILTRATION EQUATIONS FOR THE GEORGIA COASTAL PLAIN,
Agricultural Research Service, Beltsville, MD. Plant Physiology Inst.
For primary bibliographic entry see Field 2G.
W78-11449

REMOTE SENSING OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
L. E. Link, Jr., and K. S. Long.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 269-288, 8 fig, 4 tab, 4 ref.

Descriptors: *Remote sensing, *Aquatic weed control, *Mapping, *Monitoring, *Measurement, *Aerial photography, *Aquatic Plant Control Program, Aquatic plants, Species composition, Multispectral scanners, Side-looking radar, Thermal scanners, Infrared radiation, Model studies, Lakes, Reservoirs, Louisiana, Mississippi, South Carolina, Satellites, Films, Water hyacinth, Hydrilla verticillata, Egeria densa, Duckweed, Eutrophication, Water pollution effects.

Use of remote sensor systems for mapping the distribution and character of aquatic plants for control purposes is under study at the U.S. Army Engineer Waterways Experiment Station. The project covers: (1) problem definition, (2) literature review, (3) systems description, (4) model studies, and (5) field studies. Remote sensor imagery includes spectral properties (image tones), pattern properties (groupings of image tones), and association properties (knowledge of the site on the part of the interpreter). Basic types of remote sensing systems are: (1) aerial photography, including multispectral scanners; (2) thermal-infrared systems; and (3) radar or microwave systems (side-looking radar). Aerial photography, Landsat multispectral scanners, and side-looking radar systems appear to offer the greatest potential; thermal-IR sensors are probably the least useful. A computerized mathematical model of relationships between photographic remote sensors and environmental

factors was developed to evaluate performance of various filmlfilter combinations. An example of output is given. Several field studies to verify model predictions and acquire information on extent and composition of aquatic plant species were conducted April-September 1976 at: (1) Lake Boeuf, Louisiana; (2) Lake Theriot, Louisiana; (3) Ross Barnett Reservoir, Mississippi; and (4) Santee-Cooper Reservoir (Lake Marion), South Carolina. Future studies are described. (See also W78-11591) (Lynch-Wisconsin)
W78-11621

COMPARISON OF MANUAL (GRAB) AND VACUUM TYPE AUTOMATIC SAMPLING TECHNIQUES ON AN INDIVIDUAL AND COMPOSITE SAMPLE BASIS.
National Fielld Investigations Center-Denver, CO. Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 633, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA/330/1-74/001, September 1974. 40 p, 2 fig, 5 tab, 2 append.

Descriptors: *Sampling, *Research equipment, *Grab samplers, *Automatic samplers, *SERCO automatic samplers, *Monitoring, Performance, Vacuum automatic samplers, Methodology, Waste water treatment, Water quality control, Water pollution control, Automatic control, Manual control, Suspended solids.

Comparison of a manual grab sampler with a SERCO vacuum-type automatic sampler showed the two were equivalent on a composite sample basis, but not on an individual grab sample basis. Comparisons were made using total solids, total suspended solids, and volatile suspended solids at a wastewater treatment plant. Samples collected manually were lower in concentration than automatic samples on an individual grab sample basis, but it was not possible to determine which sampling method reflected true wastewater conditions. The positioning of the probe on the SERCO sampler (upstream, downstream, or lateral) did not affect results, with one exception: the upstream vs the lateral positions were not equivalent for volatile suspended solids in individual grab samples. It was concluded that this parameter was not satisfactory for the statistical comparison. Sample collection frequency on a composite basis over a six-hour period was not significant; samples collected every 15 min were compared with samples collected hourly. Since it was possible that solids could vary with depth, and the automatic sampler collects at depth while the manual sampler collections include surface sampling, a special manual sampler was constructed to collect at the same depth as the automatic sampler. The special sampler yielded results equal to the manual sampler in all comparisons. (Lynch-Wisconsin)
W78-11630

IMPROVED PLANKTON NET BUCKET,
Nalco Environmental Sciences, Northbrook, IL.
G. F. Carpenter.
The Progressive Fish Culturist, Vol 40, No 2, p. 8, 1978. 1 fig.

Descriptors: *Plankton, Zooplankton, Phytoplankton, *On-site investigations, *Surveys, Laboratory equipment, Nets, *Methodology, Sampling, *Plankton net bucket, Plankton nets.

A plankton net bucket for environmental studies is described. This design overcomes many of the deficiencies of other designs. (EIS-Katz)
W78-11727

SUBMERGED PERIPHYTON SAMPLER,
Virginia State Water Control Board, Richmond.
R. W. Ayers, and D. H. Treacy.
The Pregressive Fish Culturist, Vol 40, No 2, p. 81, 1978. 1 fig, 2 ref.

Descriptors: *Algae, On-site investigations, *Periphyton, Monitoring, Laboratory equipment, *Methodology, Sampling, Benthos, Submerged periphyton sampler.

A submerged periphyton sampler that is suitable for use in streams is described. It is a desirable alternative to floating type periphyton samplers. (EIS-Katz)
W78-11728

FUNNEL TRAP FOR COLLECTING LITTORAL AQUATIC INVERTEBRATES,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
G. A. Swanson.
The Progressive Fish Culturist, Vol 40, No 2, p. 73, 1978. 1 fig, 3 ref.

Descriptors: *Aquatic insects, *Laboratory equipment, *Benthos, Invertebrates, On-site investigations, Crustaceans, Zooplankton, Fish food organisms, *Methodology, *Littoral aquatic invertebrates, Insect trap, Funnel trap.

A funnel trap is described that collects littoral aquatic invertebrates without gathering detritus. In the vertical position it is quantitative. (EIS-Katz)
W78-11734

LOW-COST, LARGE-VOLUME AIR SUPPLY FOR EXPERIMENTAL TANKS,
Ohio State Univ., Columbus. Museum of Zoology.
R. Crunkilton, and W. LeGrande.
The Progressive Fish Culturist, Vol 40, No 2, p. 75-76, 1978.

Descriptors: *Laboratory equipment, *Methodology, Laboratory techniques, *Laboratories, Aeration, Aquaria, Pumping, Pumps, Dissolved oxygen, Oxygenation.

A low-cost, large-volume air blower to supply aeration to a large number of experimental tanks is described. (EIS-Katz)
W78-11736

FLOW-THROUGH COLLECTION BUCKET FOR LARVAL FISH,
Tennessee Valley Authority, Norris. Div. of Forestry, Fish and Wildlife Development.
L. F. Graser.
The Progressive Fish Culturist, Vol 40, No 2, p 78-79, 1978. 1 fig, 1 tab, 8 ref.

Descriptors: *Juvenile fish, Juvenile growth stage, Freshwater fish, *On-site investigations, *Surveys, Laboratory equipment, Zooplankton, Nets, Methology, Sampling, *Collection bucket, *Larval fish.

A flow-through collector for larval fish is described. The collector minimizes damage to larva during collection and handling, allows thorough washing to ensure complete removal of all fishes, provides quick and secure attachment to and removal from net, provides ready access for efficient removal of detritus and weeds an is economical and simple to construct from commonly available materials. (EIS-Katz)
W78-11746

ORGANIC CONTAMINANTS IN WATER.
For primary bibliographic entry see Field 5A.
W78-11757

DIRECT ANALYTICAL PROCEDURE FOR DETERMINATION OF VOLATILE ORGANIC ACIDS IN RAW MUNICIPAL WASTEWATER,
Technion-Israel Inst. of Tech., Haifa. Environmental Engineering Lab.
For primary bibliographic entry see Field 5A.
W78-11836

COMPUTER CONTROL SYSTEM FOR WATER AND WASTEWATER TREATMENT PLANTS,
Hitachi Ltd. (Japan).
M. Kashiwagi, S. Mori, and T. Harada.
Hitachi Review, Vol 27, No 3, p 146-152, 1978. 10 fig, 7 ref.

Descriptors: *Analog computers, *Digital computers, *Data storage and retrieval, *Instrumentation, *Control systems, Optimization, Computer models, Data processing, Programming languages, Treatment facilities, Automation, Supervisory control(Power), Electronic equipment, Waste water treatment, Municipal wastes.

Hitachi, Ltd., of Japan has developed the AQUAMAX-80 computer control series and AQUADIC, the supervisory control computer subsystem, for use in water and waste water treatment plants. The AQUAMAX-80 series permits shifts from centralized to distributed systems, from hardware to software systems, and from simple to total or optimum control; it provides continued localized control in the event of supervisory system shut-down. Three models are available in the series. The A analog control model for small plants has a graphic panel which provides cathode-ray tube (CRT) display for plant monitoring and data logging. The C model offers microcomputerized control, light emitting diode display (LED), CRT, and a high-speed telemeter and telecontrol system (signal transmission unit). The computerized supervisory F system provides CRT and LED display, high-speed data transmission, and optimum operation and prediction controls. All series are equipped with Hitachi's telemetry system, data concentrating boards, and motor control centers. The AQUADIC system provides: a data base for analog, fault, and other information; standard programs for water and waste water treatment plants; analog, digital, and pulse input; digital and analog output; CRT formats; sequential fill-in-the-form logging; and an automatic reports generator. The color CRT and special keyboard provide the operator-machine interface for displaying equipment, instrument, and piping details. A typical computerized dissolved oxygen control system designed for an activated sludge plant provides feedback and feed forward control, nonlinear compensation for valve position-air flow rate, and feedback valve position compensation. (Lisk-FIRL)
W78-11843

SUBSURFACE CAVITY DETECTION: FIELD EVALUATION OF RADAR, GRAVITY, AND EARTH RESISTIVITY METHODS,
Southwest Research Inst., San Antonio, TX.
L. S. Fountain.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Reserch Record 612, Transportation Record Board National Academy of Sciences, Washington, D.C., p 38-46, 1976. 7 fig, 14 ref.

Descriptors: *Geophysics, *Exploration, *On-site tests, *Subsurface investigations, *Florida, *Alabama, Surveys, Subsidence, Radar, Instrumentation, Resistivity, Gravity studies, Gravity, Gravimeters, Methodology, Evaluation, On-site investigations, Caves, Earth resistivity, Ground penetrating radar.

Graity, ground-penetrating radar, and earth resistivity profiling as subsurface cavity detection methods were evaluated experimenally and compared in three geological environments. Verification test showed that the gravity measurements located large carvernous areas but did not detect mud-filled troughs; the radar detected air-filled cavities at depths up to 4.6 m (15 ft) at one site, but only penetrated 3 m (10 ft) with inconclusive results at a second site, and could not resolve 0.6-m (2 ft) diameter vertical cylindrical cavities at another. Earth resitivity measurements using a pole-dipole electrode arrangement located cavities

at all sites, indicating targets at depths up to 25 m (80ft). Both air-filled cavities, including vertical cylinders, and mus-filled troughs were detected by using the resistivity technique, which gave accurate depth and size resolution. A large mud-filled trough was detected at a 90m (30-ft) depth that extended below 30.5 m (100 ft). The earth resistivity technique was capable of delineating the irregularities of the bedrock at the soil-rock interface. (See also W78-11865) (Humphreys-ISWS).
W78-11871

COMPARISON OF THE RADIOACTIVE AND MODIFIED TECHNIQUES FOR MEASUREMENT OF STREAM REAERATION COEFFICIENTS,
Geological Survey, Bay St. Louis, MS. Water Resources Div., and Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11977

ELUTRIATOR/MICROCOSM SYSTEM PILOT MODEL AND TEST,
Naval Ocean Systems Center, Kailua, HI.
For primary bibliographic entry see Field 5C.
W78-12000

7C. Evaluation, Processing and Publication

DEVELOPMENT OF A REGIONAL INFORMATION SYSTEM FOR HYDROLOGIC MODELING,
Maryland Univ. College Park. Dept. of Civil Engineering.
J. D. Fellows, and R. M. Ragan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 112, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center, University of Maryland, College Park, Technical Report No. 46, 1978. 21 p, 13 fig, 2 tab, 2 ref. OWRT A-039-Md(1), 14-34-0001-7044.

Descriptors: Hydrology, *Urban hydrology, Hydrologic modeling, Water resources, Planning, *Regional analysis, *Model studies, *Information systems.

Many of the models used in the water resources decision making process require parameters that are defined in terms of geomorphic (e.g. land cover, soils, etc.) characteristics of the watershed. When large areas are involved it is difficult and time consuming to develop a quantitative measure of the needed information. Methods are needed to encode and store this information in a computerized data base that can be easily accessed on a watershed basis. A hydrologic data management system was developed and used to transform soil map information into a georeferenced digital data base format stored on a disc file. The data management system was designed for planning groups that need a jurisdictional wide information base. Such groups would require frequent utilization of the one time encoded data base.
W78-11379

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-11386

BIVARIATE PDF FOR FLOOD RISK EVALUATION IN CASE OF UNSTEADY FLOW,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 6A.
W78-11387

DIRECTIONS OF SECURITY FOR THE OPERATION OF A HYDROELECTRIC POWER STATION WITH NON STEADY FLOW, (ARTICLE IN FRENCH),
Quebec Dept. of Natural Resources Water General Management.
For primary bibliographic entry see Field 8C.
W78-11413

THE RELIABILITY OF SAND DEWATERING BEDS FOR SLUDGE MEASURED BY THE PERFORMANCE INDEX,
Clark (Edward E.), Miami, FL.
For primary bibliographic entry see Field 5D.
W78-11415

ANALYSIS OF HYDROLOGIC DATA USING PEARSON TYPE III DISTRIBUTION,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 2E.
W78-11423

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA, REPORT,
Colorado School of Mines, Golden, Dept. of Geology.
K. Lee, G. L. Prost, D. H. Knepper, D. L. Sawatsky, and D. Huntley.
Available from the National Techical Information Service, Springfield, VA 22161 as N76-28593, Price codes: A00 in paper copy, A01 in microfiche. Final Report, Remote Sensing Report 75-7, December 1975. 320 p, 78 fig, 12 tab, 38 ref, 9 append. NASA NAS9-13394.

Descriptors: *Remote sensing, *Geology, *Mineralogy, *Water resources, *Satellites(Artificial), *Colorado, Photography, Data processing, Mapping, Surveys, Petrology, Mining, Surface waters, Groundwater, Hydrogeology, Evaluation, Analytical techniques, Skylab.

Skylab photographs are superior to ERTS images for photogeologic interpretation primarily because of improved resolution. Similarly, S190B photos provide more geologic advantage over good color photography; S190B stereo color photos, where available, provide maximum geologic information. All major geologic structures can be recognized on Skylab photographs. Large folds, even those with very gentle flexures, can be mapped accurately and with confidence. Bedding attitudes of only a few degrees are recognized. Mineral deposits in Central Colorado may be indicated on Skylab photos by lineaments and color anomalies, but positive identification of these features is not possible. Water resource studies can use Skylab photography for interpretation of drainage, hydrogeology, and groundwater flow. S190A stereo color photography is adequate for defining drainage divides that in turn define the boundaries and distribution of groundwater recharge and discharge areas within a basin. Skylab S190B stereo photography has sufficient resolution to map hydrogeologic units and structures that may be sufficient for regional studies. Aircraft photography and field work are still necessary to produce an accurate hydrogeologic map. (Sims-ISWS)
W78-11439

LAKE ONTARIO ATLAS: INTERNAL WAVES,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 2H.
W78-11448

FLOOD PLAIN INFORMATION: MANTUA CREEK, GLOUCESTER COUNTY, NEW JERSEY, CHESTNUT BRANCH AND EDWARDS RUN.
Army Engineer District, Philadelphia, PA.
For primary bibliographic entry see Field 4A.
W78-11461

FLOOD PLAIN INFORMATION STUDY: SHENANGO AND MAHONING RIVERS, LAWRENCE COUNTY, PENNSYLVANIA -- SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11462

FLOOD PLAIN INFORMATION STUDY: SEWICKLEY CREEK AND JACKS RUN, HEMPFIELD TOWNSHIP, PENNSYLVANIA--SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11463

FLOOD PLAIN INFORMATION: WEST FORK RIVER, HARRISON COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11464

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, CATTARAUGUS COUNTY, NEW YORK.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11465

FLOOD PLAIN INFORMATION: HOBBLE CREEK, SPRINGVILLE, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11466

FLOOD PLAIN INFORMATION: LOGAN RIVER, LOGAN, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11467

FLOOD PLAIN INFORMATION: BLACKSMITH FORK AND SPRING CREEK, MILLVILLE, UTAH.
Army Engineer district, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11468

SPECIAL FLOOD HAZARD INFORMATION REPORT: NORRIS CREEK AND TRIBUTARIES, ABBEVILLE, SC.
Army Engineer District, Savannah, GA.
For primary bibliographic entry see Field 4A.
W78-11469

HYDROLOGIC INVENTORY AND EVALUATION OF NEVADA PLAYAS,
Nevada System Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2H.
W78-11573

AUTOMATED PROCESSING OF APC FIELD OPERATIONS DATA,
Army Engineer District, Jacksonville, FL.
For primary bibliographic entry see Field 5G.
W78-11604

DATA MANAGEMENT SYSTEMS IN THE AQUATIC PLANT CONTROL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. A. Parks.

In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 289-298, 10 fig.

Descriptors: *Data processing, *Aquatic weed control, *Lake Conway(FL), *Lake Concordia(LA), *Stocking, *Harvesting, *Aquatic Plant Control Program, White amur, Ctenopharyngodon idella, Florida, Louisiana, Water hyacinth, Eichhornia crassipes, Model studies, Lakes, Mechanical control, Biocontrol, Data storage and retrieval, Data collections, Aqua-Trio, Eutrophication, Water pollution effects.

Data management systems developed for each of four research projects of the U.S. Army Engineers Aquatic Plant Control Research Program are described. The projects are: (1) Lake Conway, Florida, white amur fish stocking test; (2) Lake Concordia, Louisiana, water hyacinth biological control experiments; (3) white amur stocking rate model (connected with the Lake Conway project); and (4) mechanical plant harvesting component of the Aqua-Trio system. The three major elements in a data management system are collection, storage, and retrieval/display. A workable system should encompass five factors: precision, correct form, completeness, timeliness (scheduling), and adequate identification. Each current project is described, with illustrations of system design. The Lake Conway project required a system able to respond to data demands from many sources and simultaneously provide information pertinent to particular aquatic plant problems. Strong lines of communication among contractors, data coordinator, and users were essential. At Lake Concordia the scope of the test was very limited, and data demands less complex than at Lake Conway. The white amur stocking rate model required two-phased data management dealing with: (1) data as input for model formulation, and (2) data produced. The mechanical plant harvesting project is a time-dependent operation; data on each load from pickup to disposal can be displayed as tables or charts, and compared and analyzed. (See also W78-11591) (Lynch-Wisconsin)
W78-11622

ILLINOIS DATA CATALOG (PRELIMINARY PRINT).
Illinois Inst. for Environmental Quality, Chicago.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 682, Price codes: A11 in paper copy, A01 in microfiche. June 1972, IIEQ Document No DB-1. 231 p.

Descriptors: *Illinois, *Data collections, *Information exchange, *Information retrieval, *Planning, *Catalogs, Water resources, Air resources, Human resources, Land resources, Publications, Environmental impact, Maps.

A catalog of 212 collections of Illinois data is specifically geared to needs of environmental planning. The scope of this first edition is limited to data files regularly updated by state agencies, and does not include files produced by federal, local, or private organizations. Emphasis is on statewide rather than local data. The catalog is also limited to mappable data; information pertaining to general aspects of the state is not included. Data which has lost its geographic character is likewise not included, and raw or unprocessed data files are emphasized. Entries are arranged by subject within four classifications: (1) human resources, (2) land resources, (3) water resources, and (4) air resources. For each entry the data type, geographic area covered, and update frequency are followed by a narrative description of the contents of the data file, origin of the information, and references to publications based on the data. An address for ordering publications is given, and accessibility restrictions are noted. A guide to more complete information is provided, as well as the name, address, and telephone number of the agency and person having custody of the data. Indices of agencies and subjects are included. (Lynch-Wisconsin)
W78-11631

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WILLCOX AREA, COCHISE AND GRAHAM COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
L. J. Mann, N. D. White, and R. P. Wilson.
Water Resources Investigations 78-60 (open-file report), April 1978. 3 sheets, 8 ref.

Descriptors: *Maps, *Groundwater, *Water wells, *Water levels, *Water quality, Dissolved solids, Fluoride, Aquifers, Hydrographs, Water level fluctuations, Pumping, Water yield, *Arizona, *Willcox area(Ariz), Cochise County, Graham County.

The Willcox area includes about 1,500 square miles in southeastern Arizona. The main use of ground water is for irrigation. For 1954-75, the estimated ground-water pumpage exceeded 100,000 acre-feet per year, and for 1967-75, ground-water pumpage averaged about 300,000 acre-feet per year. Ground-water withdrawals have resulted in general water-level declines in most of the developed part of the area. Information shown on the maps includes change in water level (1963-75), irrigated area, depth to water, well depth, altitude of the water level, and distribution of dissolved solids and fluoride. Hydrographs of water levels in selected wells and a table of historical pumpage are included also. (Woodard-USGS)
W78-11967

MAPS SHOWING GROUND-WATER CONDITIONS IN THE YUMA AREA, YUMA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
D. W. Wilkins.
Water-Resources Investigations 78-62 (open-file report), April 1978. 3 sheets, 6 ref.

Descriptors: *Maps, *Groundwater, *Saturated soils, *Drainage wells, *Pumping, Water wells, Irrigation, Water levels, Water quality, Specific conductivity, Fluorides, *Arizona, Yuma County.

In the Yuma area, Arizona, ground water is pumped mainly for the drainage of waterlogged land and for irrigation. In 1975 about 255,000 acre-feet of ground water was withdrawn, of which about 158,000 acre-feet was pumped for drainage of waterlogged land. For 1915-75, about 4,568,000 acre-feet was withdrawn, of which 2,387,000 acre-feet was pumped for drainage. Information shown on maps includes change in water level (1970-75) and irrigated area; depth to water and altitude of the water level; and specific conductance and fluoride concentration. A table of historical pumpage is included. (Woodard-USGS)
W78-11968

MAPS SHOWING GROUND-WATER CONDITIONS IN THE EASTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA AND PINAL COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
R. L. Laney, P. P. Ross, and G. R. Littin.
Water-Resources Investigations 78-61 (open-file report), April 1978. 2 sheets, 14 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water levels, *Water quality, Water utilization Irrigation, Water level fluctuations, Maps, *Arizona, *Salt River Valley area(Ariz), Maricopa County, Pinal County.

In 1976 about 1.68 million acre-feet of ground water was pumped in the Salt River Valley, Ariz. Since 1923, more than 73 million acre-feet has been withdrawn, which has resulted in a general decline in water levels. Water levels in the eastern part of the Salt River Valley area have declined as much as 420 feet. Information on the maps includes altitude of the water level, depth to water, change in water level (1923-76), and irrigated area. Hydrographs of the water level in selected wells, a table of historical pumpage, and a brief discussion of the chemical quality of the ground water are included also. (Woodard-USGS)
W78-11969

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WESTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA COUNTY, ARIZONA--1977,
Geological Survey, Tucson, AZ. Water Resources Div.
P. P. Ross.
Water-Resources Investigations 78-40 (open-file report), March 1978. 2 sheets, 18 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water levels, *Water quality, Water utilization, Irrigation, Water level fluctuations, Maps, *Arizona, *Salt River Valley area, Maricopa County.

In 1976 about 1.68 million acre-feet of ground water was pumped in the Salt River Valley. Since 1923, more than 73 million acre-feet has been withdrawn, which has resulted in a general decline in water levels. Water levels in the western part of the Salt River Valley area have declined as much as 350 feet. Information on the maps includes altitude of the water level, depth to water, change in water level (1923-77), and irrigated area. Long-term hydrographs of the water level in selected wells, a table of historical pumpage, and a brief discussion of the chemical quality of the ground water are included also. (Woodard-USGS)
W78-11970

AVAILABILITY OF GROUND WATER IN THE PISCATAQUA AND OTHER COASTAL RIVER BASINS, SOUTHEASTERN NEW HAMPSHIRE,
Geological Survey, Concord, NH. Water Resources Div.
J. E. Cotton.
Water-Resources Investigations 77-70 (open-file report), 1977. 1 sheet, 7 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Aquifers, *Coastal Plains, *New Hampshire, *Maps, Water wells, Water yield, Water quality.

This map (scale 1:125,000) is a preliminary assessment of the availability of ground water in the Piscataqua and coastal river basins in New Hampshire. It is a generalization of several hydrogeologic factors and provides a guide for ground-water exploration, which is useful in water- and land-use planning. The best aquifers in the basin are deposits of stratified sand or sand and gravel of Pleistocene age. Large aquifers of this type occur in places in the major river valleys and in interstream areas within the coastal plain. Ground water is generally of good chemical quality. Iron and manganese in concentrations greater than the recommended limits for drinking water suggested by the U.S. Public Health Service, however, are not uncommon. (Woodard-USGS)
W78-11971

FLOODS IN WESTERN NORTH CAROLINA, NOVEMBER 1977 - A LESSON FOR THE FUTURE,
North Carolina Water Resources Research Inst., Raleigh; Geological Survey, Raleigh. Water Resources Div.; and North Carolina Dept. of Natural Resources and Community Development, Raleigh.
For primary bibliographic entry see Field 2E.
W78-11973

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3A: SOUTHWEST FLORIDA - SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 715, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report FL-77-3A, May 1978. 613 p, 12 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Elevation, Lakes, Reservoirs, Data collections, Sites, *Southwest Florida.

Water resources data for the 1977 water year in Florida consist of discharge records for 271 streams, stage-only records for 223 streams, elevations for 228 lakes, 66 crest-stage partial records, and water level measurements for 828 wells. Water quality data for approximately 680 surface sites and 930 wells are included. The data in this volume for southwest Florida include discharge records for 93 streams, stage-only records for 24 streams, elevations for 109 lakes, miscellaneous measurements, crest-stage partial records for 14 streams, and water quality data for approximately 315 surface water sites. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-11974

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3B: SOUTHWEST FLORIDA - GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 529, Price codes: A24 in paper copy, A01 in microfiche. Water-Data Report FL-77-3B, May 1978. 596 p, 19 fig, 1 tab, 49 ref.

Descriptors: *Florida, *Hydrologic data, *Groundwater, *Water quality, Water analysis, Water temperature, Chemical analysis, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year in Florida consist of discharge records for 271 streams, stage-only records for 223 streams, elevations for 228 lakes, 66 crest-stage partial records, and water level measurements for 828 wells. Water quality data for approximately 680 surface sites and 930 wells are included. The data in this volume for southwest Florida include water level measurements for 828 wells and water quality data for approximately 500 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-11975

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 4: NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 768, Price codes: A23 in paper copy, A01 in microfiche. Water-Data Report FL-77-4, June 1978. 573 p, 46 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Northwest Florida.

Water resources data for the 1977 water year in Florida consist of discharge records for 84 streams, stage only records for 223 streams, elevations for 228 lakes, water level measurements for 828 wells, and crest-stage partial records for 66 streams. Water quality data for approximately 605 streams and 932 wells are included. The data in this report for northwest Florida include discharge records for 61 streams, stage only records for 46 streams, elevations for 27 lakes, water level measurements for 131 wells, crest-stage partial records for 29 streams, water quality data for 35 streams and 151 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-11976

WATER-QUALITY RECORDS FOR THE HUBBARD CREEK WATERSHED, TEXAS, OCTOBER 1974 - SEPTEMBER 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11981

SELECTED HYDROLOGIC DATA, CAMAS PRAIRIE, SOUTH-CENTRAL IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
H. W. Young, R. L. Backsen, and K. S. Kenyon.
Open-file report 78-500, July 1978. 70 p, 4 fig, 5 tab.

Descriptors: *Hydrologic data, *Groundwater, *Surface waters, *Water quality, *Basic data collections, Aquifer characteristics, Drillers logs, Water wells, Water levels, Hydrographs, Streamflow, Flow rates, Water analysis, Chemical analysis, *Idaho, *Camas Prairie(Idaho).

This report presents data collected during a 1-year study of the water resources of Camas Prairie, Idaho. Included are records of wells, discharge measurements of streams, hydrographs of water levels in wells, water-quality data, and drillers' logs of wells. The data are conveniently made available to supplement an interpretive report, which will be published separately. (Woodard-USGS)
W78-11982

GEOHYDROLOGIC DATA FROM THE JEMEZ MOUNTAINS AND VICINITY, NORTH-CENTRAL NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
F. W. Trainer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 221, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-131, January 1978. 146 p, 7 fig, 11 tab, 81 ref.

Descriptors: *Geothermal studies, *Thermal springs, *Hydrogeology, *Energy transfer, *Baseline studies, Powerplants, Data collections, Water temperature, Logging(Recording), Geophysics, Wells, Chemical analysis, New Mexico, *Jemez Mountains, *Rio Grande rift, *Sierra Nacimiento, Los Alamos County, Rio Arriba County, Sandoval County, Santa Fe County.

The Jemez Mountains volcanic region, on the west margin of the Rio Grande rift in north-central New Mexico, is the site of studies for power development from geothermal heat. This report summarizes geohydrologic data to provide background information relative to the geothermal exploration and to investigate the usefulness of hydrology in assessment of the geothermal resource. Eleven tables present chemical, temperature, discharge, and other data for springs, wells, and streams. Accompanying figures show locations of the data points and present temperature profiles and geophysical logs for selected wells. (Woodard-USGS)
W78-11986

FLOOD PROFILES FOR CYPRESS CREEK, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. R. Murphy, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 128, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 78-8, April 1978. 29 p, 7 fig, 9 tab, 16 ref.

Descriptors: *Flood profiles, *Flood plain zoning, *Floods, *Flood plains, *Flood peak, Planning, Land development, Analytical techniques, Florida, *Cypress Creek, *Hillsborough County, *Pasco County, *Step-backwater analysis.

Flood profiles are included for selected recurrence-interval floods in west-central Florida for a 27-mile reach of Cypress Creek, for a 4-mile tributary reach, and for a 1.2-mile distributary reach. The procedure for constructing flood profiles is based on flood heights computed in a step-backwater analysis using the following data: 2-, 2.33-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year flood-peak discharges; data for 53 Cypress Creek channel cross sections, 11 tributary cross sections, and 7 distributary cross sections (including roughness coefficients); and stage-discharge relations. Computed flood heights are judged to be generally accurate to plus-or-minus 0.5 foot. Flood data presented can be used to delineate areal extent of flooding on topographic maps. This information can be used by local governmental agencies to control flood-plain development. (Woodard-USGS)
W78-11987

8. ENGINEERING WORKS

8B. Hydraulics

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-11386

IMPACT OF EXTREMAL DISTRIBUTIONS ON ANALYSIS OF MAXIMUM LOADING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, and M. Bryson.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 558-574, 1978. 7 fig, 1 tab, 7 ref.

Descriptors: *Hydraulic structures, *Flood magnitude, *Failure(Mechanical), *Reliability, Hydrologic data, Texas, Statistical methods, Safety, Estimating, Random loading, Statistical distribution, Equations, Systems analysis.

The tail end of more common statistical distribution of random loading can be shown to be approximately by either Gumbel Type I or Gumbel Type II extremal distributions. The ratio between the magnitude of a loading for a certain return period n sub 1 and the magnitude of a loading for another return period n sub 2 can be estimated by a simple relationship such as ln n sub 1/ln n sub 2 if the Gumbel Type I distribution is used. If the Gumbel Type II distribution is used, this same ratio is rather large because the Type II distribution is the distribution of the quantity whose logarithm has the Type I distribution. Hydrologic data collected

from Texas are used to illustrate the enormously different values resulting from using the two distributions with insufficient data. Many graphical solutions are given to express the relationship between the estimations of magnitudes of loadings and the parameters in the extremal distribution. Some practical limits on the ratio between the magnitude of loading with one return period and the magnitude of loading with another return period are established for Gumbel Type I distribution. General discussions are given on the following items: (1) alternate measures of reliability; (2) load distributions; and (3) extremal value distributions. (See also W78-11386) (Bell-Cornell)
W78-11392

ALLOWANCE FOR RISK AND UNCERTAINTY IN THE OPTIMAL DESIGN OF HYDRAULIC STRUCTURES,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
W. E. Watt, and K. C. Wilson.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 575-591, 1978. 4 fig, 5 ref.

Descriptors: *Hydraulic structures, *Risks, *Optimization, *Design, *Economic efficiency, Hydrologic aspects, Costs, Flood control, Probability, Equations, Mathematical models, Systems analysis, Damages, Loss minimization, Value maximization, Logarithmic model.

An optimal strategy for the design of hydraulic structures has been derived for use on a regional basis. Continuous functions for investment cost and probable damage cost are set up in a generalized form with parameters which depend on region and type of structure. The adoption of economic efficiency as the optimization criterion leads to an expression for the optimum design return period under conditions of 'perfect knowledge' or pure risk. The analysis is then extended to the 'real world' case in which uncertainties in the economic and hydrologic parameters in the relation for optimum return period lead to an overall uncertainty in estimating the optimum. It is found that, in general, the economic loss resulting from an underdesign caused by this uncertainty is greater than that for an equivalent overdesign and hence the 'real world' design return period should exceed the estimated value assuming 'perfect knowledge'. This increase is related to the degree of uncertainty and is expressed in terms of design factor. For the case of hydrologic uncertainty, this design factor is given in terms of the period of observed flow record. Illustrative examples are provided for two cases--major coastal protection works and a small project for river channel improvement. (See also W78-11386) (Bell-Cornell)
W78-11393

DETERMINATION OF HYDRAULIC RESISTANCE FOR A DAM-BREAK WAVE BY COMPARISON OF THEORY AND EXPERIMENTS,
Technische Univ., Munich (West Germany). Inst. of Hydraulics and Hydrology.
P-G. Franke, and W. Stahlin.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 609-615, 1978. 3 fig, 5 ref.

Descriptors: Hydraulics, *Flood waves, *Resistance, Water levels, Channels, Dams, Steady flow, Failure(Mechanical), Equations, Experiments, Theory.

A flood wave resulting from a sudden water release is most precisely calculated using the characteristic method with a free grid modified in the region of the wave front where the negative characteristics become steeper in the positive x-t-plane. For a horizontal, prismatic channel, exact values for the water level and the flow velocity can only be obtained if the hydraulic resistance is known. For a steady flow, the respective coefficient of resistance is usually determined by measuring the losses of energy. Generally this 'steady' coefficient of resistance is taken into account also for a rapidly varying unsteady flow. The investigations described herein show by a comparison of theory and experiment that this is not correct. A good agreement between the computation and the measured values can be obtained for the trajectory of the wave front as well as for the water level by using a reduced coefficient of resistance. The experimental investigations were made in a horizontal, rectangular test channel in the Institute of Hydraulics and Hydrology of the Technical University of Munich. (See also W78-11386) (Bell-Cornell)
W78-11395

HYDROLOGIC AND GEOMORPHIC CHANGES IN A RIVER BASIN INDUCED BY A DAM BREAK,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Y. H. Chen, D. B. Simons, and A. Molinas.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Canada, June 26-28, 1978, p 616-625, 1978. 4 fig, 11 ref.

Descriptors: *Geomorphology, *Dams, *Failure(Mechanical), Hydrology, Changes, *Prediction, Effects, River basins, Hydraulic structures, Outflow, Floods, Reservoirs, Sediment discharge, Discharge(Water), Equations, Flood damage, Channels, Analytical techniques.

Dams rarely fail, but they may do so due to human error or because of rare hydrological or geological events, such as severe floods and earthquakes. Dam failure may cause loss of human life and extensive property damage. The damage induced by a dam breach is caused mainly by the tremendous forces exerted by the suddenly released flow that can destroy everything in its way. Also, sediments transported from the reservoir and channel can deposit on the floodplain causing additional damage to property. In order to reduce this damage, it is necessary to preassess the hydrologic and geomorphic changes in the river basin in case the dam fails. Herein, basic hydraulic and geomorphic principles are utilized to assess the effects of dam failure on the outflow discharge, river stage, sediment transport, and changes in channel dimensions and river form. The relations developed can serve as a guide to predict the possible hydraulic and geomorphic changes caused by failure of a dam. The prediction method presented determines maximum stage recognizing that the channel can add to the roughness diffusing the flow. Further research is needed to modify existing methods. (See also W78-11386) (Bell-Cornell)
W78-11396

A SYSTEMS APPROACH TO RISK ANALYSIS FOR AN EARTH DAM,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 8D.
W78-11417

SIZE DETERMINATION OF PARTLY FULL CONDUITS,
Stone and Webster Engineering Corp., Boston, MA. Hydraulic Div.
Y. G. Mussalli.
Journal of Hydraulic Division, American Society of Civil Engineers, Vol 104, No HY7, Proceedings Paper 13862, p 959-974, July 1978. 13 fig, 2 tab, 9 ref.

Descriptors: *Air-water interfaces, *Flow control, *Free surfaces, Pipes, Surface runoff, Vibrations, Hydraulics, Mathematical studies, Equations, *Air-water interactions, Pipe design, Sealing, Water tunnels.

The transition from partly full to full pipe (sealing) is accompanied by vibrations of the structure and surging of the flow. The experimental study was done in a 4-in (100-mm) square conduit with three different circular bends, with various deflectors, and with various concentrations of aair. Sealing depends on the Froude number of the flow. To maintain partly full flow, more space is needed above the water-flow area with an increase of Froude number. With short-tube control, the ratio of the radius of curvature along the center line to the bend diameter and the deflector thickness at the crown of the bend determine the water-flow area in the horizontal conduit. Ventilation of the horizontal conduit delays sealing, while aeration of the water flow hastens sealing. With weir control, waves on the flow surface hasten sealing, and highly aerated flow delays sealing. Ratios of radius of curvature to the bend diameter larger than 2.0 were recommended since they generate fewer waves. (Lee-ISWS)
W78-11433

SIMULATION AND DESIGN OF PUMPED STORMWATER SYSTEMS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11878

WELL STIMULATION AND SYSTEMS FOR RECOVERING GEOTHERMAL HEAT,
I. Sheinbaum.
U.S. Patent No. 4,079,590, 10 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 861, March 21, 1978.

Descriptors: *Patents, *Geothermal studies, *Geophysics, *Borehole geophysics, Heat flow, Temperature, Thermal conductivity.

To overcome the disadvantage of deep pumps and to otherwise increase the ability to remove heat energy from the earth, a fluid is injected into the well in accordance with this invention to contact the heat energy within the earth and to act as a carrier of that heat to a system above the surface. In a well containing a hot fluid such as water, that has been heated by the heat within the earth, the injected fluid acts as a primer to stimulate the flow of the hot fluid from the well. The primer fluid or injected fluid is vaporized, the vapors thus formed mix with the hot fluid in the well and reduce the density of the column of well fluid in the well casing, which causes a pressure differential that forces this fluid from the well. The action of well stimulation may also be used to clean well deposits such as sand and other solids from the well. The flowed mixture of vaporized primer fluid and hot geothermal fluid, which may be both vapor and liquid, is used as a heat transfer fluid that is passed through a power extracting gas expansion device. The transfer of heat advantageously takes place in a direct contact heat exchanger where the mixture directly contacts a working fluid. (Sinha - OEIS)
W78-11948

8C. Hydraulic Machinery

DIRECTIONS OF SECURITY FOR THE OPERATION OF A HYDROELECTRIC POWER STATION WITH NON STEADY FLOW, (ARTICLE IN FRENCH),
Quebec Dept. of Natural Resources Water General Management.
N. K. Gidas.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water

esources.' E.A. McBean, et al. (Eds.), University f Waterloo, Waterloo, Canada, June 26-28, 1978, 889-908, 1978. 8 fig, 17 ref.

escriptors: *Hydroelectric power, Underground powerplants, *Design criteria, Computer programs, *Simulation analysis, Risks, *Reliability, Equations, Mathematical odels, Operations research, Prediction, Surge hamber, Tailrace tunnels, Geometric characeristics.

he criteria used in the design of a particular type f surge chamber and tailrace tunnels have been efined for an underground hydroelectric power tation. A simulation study has been made of the ow in the tailrace arrangement. This paper escribes a computer program based on the equaons for a non-steady flow produced by a total and nstantaneous stop of the discharge of the power tation; the program permits one to predict the sks and reliability of the operation of the power tation in function of the geometric characteristics f the tailrace structure and the hydraulic condions of the flow. Some of the results obtained rom the computer have been completed with the elp of experimental results. (See also W78-11386) Bell-Cornell)
V78-11413

NINE PUMP INSTALLATION FOR WESSEX WATER AUTHORITY.
Water Services, Vol 82, No 987, p 293-294, May, 978.

Descriptors: *Pumps, *Pumping plants, *Sewage reatment, *Sludge treatment, *Intakes, Filtration, Hydraulic design, Impellers, Hydraulic equipnent, Treatment facilities, Design data, Waste vater treatment, Municipal wastes.

Nine New Haden pumps, installed at the Kinson Sewage Disposal Works in Wessex, England, can ccommodate a flow rate of 10,800 cu m/day. Three type 37 unchokeable pumps with 15 hp 960 pm motors can each pump 216 cu m/hr of raw unscreened sewage at the sewage works inlet. They re equipped with single channel or double nchokeable impellers and pump against a total ead of 8.15 m. Two type 36 semi-unchokeable umps equipped with double channel shrouded impellers are used to move sludge from humus tanks o the sewage works inlet at a rate of 108 cu m/hr. These pumps have 10 hp, 1450 rpm motors that perate against a head of 13.37 m. Four type 36 emi-unchokeable pumps recirculate waste water o rotary bed filters. Each pump is equipped with a 5 hp, 960 rpm motor, operating at a rate of 234 cu n/hr against a head of 7.6 m. (Lisk-FIRL)
W78-11807

PREFAB PUMPING STATIONS.
Consulting Engineer, Vol 42, No 7, p 43, July, 1978.

Descriptors: *Pumping plants, *Plastics, *Concrete structures, *Pumps, *Sewers, Pipelines, Intakes, Outlets, Valves, Equipment, Electric power, Waste water disposal, Municipal wastes.

Sweden's Pumpex AB has designed a range of prefabricated sewage pumping stations with capacities rated up to 75 liters/sec. The pumping stations are supplied completely equipped in diameters of 2-2.5 m and heights of 2.2-5.2 m to accommodate the design depths of mains. The fiberglass-reinforced polyester tanks are equipped with pumps, pipework, valves, control system, and ladder. Installation comprises bolting the station to a concrete platform laid at the base of an excavation; the station is then connected to the inlet and outlet of the pumping main and to a power supply. Motor units may be removed and pump volutes may be attached through a steel plate at the base of the station. The stations may be purchased with options such as a radiator, platforms, lighting, and water heater; prices for the pumping stations start at 2,000 pounds sterling. (Lisk-FIRL)
W78-11811

MIXING FIXED-SPEED PUMPS TO VARIABLE FLOWS,
Dillon (M. M.) Ltd., London (Ontario).
G. Goldschmidt.
Journal Water Pollution Control Federation, Vol 50, No 7, p 1733-1741, July, 1978. 6 fig, 2 ref, 2 append.

Descriptors: *Pumping, *Pumps, *Mathematical models, *Critical flow, *Pumping plants, Hydraulic design, Inflow, Storage tanks, Variability, Cycles, Control, Sewerage, Waste water treatment, Municipal wastes.

Mathematical models investigated the adaptation of fixed speed screw pumps to variable storm water flows in collection chambers at lift stations. The objectives of the study were to match pumping and system parameters to the ranges of collection chamber inflows, to calculate a suitable control cycle, and to determine the cycle time between sequential pump starts when inflow exceeds the capacity of a pump. Other studies considered the critical inflow for minimum cycle time, the relationship between the water level in the tank and the pump discharge capacity, and the minimum storage volume required for a minimum pump cycle time under any inflow variation. Multiple pump operating sequences were determined by equations which calculated the distance between the control levels for the on and off pumps, the liquid level in the collection chamber above the off control level, the minimum recommended cycle time of the pump, and the pumping capacities of the pumps at the on and off control levels. The temporary trial storage volume heights were calculated for each pump. The combined pumping capacities were matched to the volume inflow rate. The critical inflows for minimum pump cycle time were derived from the volume flow rate, the portion of inflow exceeding pumping capacity at the on control level, the critical inflow parameter, the minimum cycle time and the area of the collection tank. (Lisk-FIRL)
W78-11849

WASTE-WATER CENTRIFUGAL DECANTERS FOR SEWAGE TREATMENT PLANTS.
Sulzer Technical Review, Vol 50, No 4, p 179, 1978.

Descriptors: *Centrifugal pumps, *Sewage sludge, *Dewatering, *Sludge treatment, *Rotors, Flocculation, Hydraulic design, Hydraulic equipment, Design data, Sludge disposal, Treatment facilities, Municipal wastes.

The ZDA series of municipal waste water centrifugal decanters, manufactured by Escher Wyss, offers minimal flocculant consumption with optimum concentrate purification. The decanter produces a dewatered sewage sludge that is suitable for direct storage or application to agricultural land as an organic fertilizer. The dewatered sludge may also be dried further and incinerated. Rotor diameters of 360, 500, 630 mm are available; the ZDA-50 model has a maximum nominal capacity of 18 cu m/hr. Escher Wyss can supply the centrifugal decanters with adjustable, fixed or in-service controllable speeds to operate the solids discharge screw. The centrifugal decanters are also suitable for chemical and mining industrial applications. (Lisk-FIRL)
W78-11911

WIND OR WATER OPERATED POWER PLANT,
N. Cohen.
U.S. Patent No. 4,079,264, 10 p, 26 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 968, No 2, p 732, March 14, 1978.

Descriptors: *Patents, *Energy, Energy conversion, Electric power production, Flow, Winds, Hydrodynamics, Equipment.

A fluid operated power generating system comprises a power producing unit or an array of such units adapted to be positioned in a flow of fluid. Each unit includes end walls configured to cause fluid to flow in a rectilinear path and has a passage leading from a lateral inlet to a lateral outlet. The through passage defines a constricted zone causing the velocity of the fluid passing through to increase and the pressure of the fluid to drop in the constricted zone. A rotary device is in communication with the constricted zone and the pressure differential in the zone rotates the device. While the fluid operated system is primarily in connection with wind power, those skilled in the art of aero dynamics and hydrodynamics will readily be able to adapt at least some of the described systems to use with liquids, such as river currents and tides. The only essential requirement being the presence of a flow or stream of fluid into which the power producing units are placed. (Sinha - OEIS)
W78-11947

SMALL CONTRACTORS TAKE ON TOUGH PIPE PLACEMENT.
For primary bibliographic entry see Field 5D.
W78-11956

SUBMERSIBLE SEWAGE PUMPS.
Pollution Engineering, Vol 10, No 6, p 95, June, 1978.

Descriptors: *Pumps, *Sewage, *Wet wells, *Submergence, *Equipment, Viscosity, Turbidity, Sumps, Pumping, Impellers, Equipment, Construction materials, Waste water treatment, Municipal wastes.

The Hyr-O Pumps Division of Wylain, Inc. has developed a new line of non-clog submersible sewage pumps. The 4-inch S4N Series pumps were designed for high efficiency wet well pumping in the intermediate range and lower capital costs. The units have the capacity to pump grease, dirt, raw sewage, and solids up to 3 inches in diameter. The S4N Series accommodates capacities up to 580 gal/min with head sizes up to 56 ft. The two-vaned impeller is constructed of cast iron and balanced to ensure clog-free, quiet, vibrationless performance. The pumps are suitable for liquids with pH values in the range of 6-9; the submersible units can also accommodate specific gravities in the 0.9-1.1 range and viscosities in the range of 28-35 Saybolt seconds universal. (Lisk-FIRL)
W78-12036

8D. Soil Mechanics

LANDSLIDE POTENTIAL AND PROBABILITY CONSIDERING RANDOMNESS OF CONTROLLING FACTORS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
T. J. Ward, R-M. Li, and D. B. Simons.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 592-608, 1978. 6 fig, 4 tab, 28 ref.

Descriptors: *Landslides, *Probability, *Monte Carlo method, *Simulation analysis, *Groundwater, *Geotechnical model, *Slope stability, Numerical analysis, Safety factors, Failure(Mechanical), Estimating, Methodology, Rainfall, Sensitivity analysis, Equations, Computer models, Systems analysis.

Geotechnical models of slope stability can be used to provide a numerical method for determining landslide potential and probability. Landslide potential is based on the factor of safety computed from an infinite slope limit equilibrium model. After sensitivity analyses, the equilibrium model can be used to determine landslide probability or the probability that the computed factor of safety will be less than or equal to one. A landslide probability, or the chance that a landslide will occur, is needed in conjunction with a landslide potential in order to account for uncertainty in the variables that comprise the model. Assumed frequency distributions for the variables influence the computed probability and must be chosen carefully to avoid underestimation of the chance of failure. Because landslides are often associated with high precipitation which produces fluctuations in groundwater level, probable storm magnitude also should be examined; changes in groundwater level have a nonlinear effect on landslide probability, indicating reasons why a slight fluctuation in groundwater level may trigger landslide probability. Simple groundwater models can be used to define this probability in terms of rainfall return periods. Landslide potential and probability delineation provide the land use planner or forest engineer with a useful method of hazard analysis. Potential delineation indicates relative hazards betweem sites while probability accounts for uncertainty in the model variables. (See also W78-11386) (Bell-Cornell)
W78-11394

A SYSTEMS APPROACH TO RISK ANALYSIS FOR AN EARTH DAM,
Utah Water Research Lab., Logan.
D. S. Bowles, L. R. Anderson, and R. V. Canfield.
Supplemental article; Abstract only (p 626), in: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 3 fig, 2 tab, 8 ref, 13 p. (Reprint available from author).

Descriptors: *Failure(Mechanical), *Hydraulic structures, *Earth dams, Safety, *Risks, Projects, Decision making, Equations, Estimating, Systems analysis.

From time to time the failure of a dam will focus public attention on the subject of dam safety. Regardless of the care taken in the siting, design, and construction of a dam, some residual level of risk of a catastrophic failure of the structure will remain. The event that causes the failure may be of natural origin (e.g., flood, earthquake), it may be related to the structure itself (e.g., uneven settlement, embankment slips), or it may be related to human error (e.g., incorrect operation, acts of war). The techniques of risk-based design have not been developed for, and applied to earth dam projects. These techniques involve the identification and estimation of risks, and the taking of risk reduction or risk acceptance actions using a decision analysis framework. The paper presents an event-outcome-exposure-consequence path approach to risk analysis for earth dams. The proposed approach will make use of additional data as it becomes available during the life of an earth dam project and will handle 'total risk' rather than risk associated with only a single failure mechanism. (See also W78-11386) (Bell-Cornell)
W78-11417

DAMS ON PERMAFROST,
G. F. Biyanov.
CRREL Draft Translation 555, November 1976. 234 p, 125 fig, 18 tab, 108 ref. Translated from Energiya, Moscow (USSR), 1975. 184 p.

Descriptors: *Dams, *Permafrost, *Cold weather construction, *Frozen ground, Earth dams, Rockfill dams, Construction, Structures, Hydraulic structures, Dam construction, Spillways, Permeability, Infiltration, Percolation, Thawing, Freezing, Temperature, Engineering, Civil engineering, *USSR.

Problems of building dams of natural materials on permafrost under severe climatic conditions in the Far North were discussed on the basis of experience in this country and abroad. Cases of damage to dams and sluice-ways and its repair were described. Requirements for surveys, planning, and research in connection with building water-related structures on permafrost were presented. The book was intended for engineers specializing in water engineering matters and can be useful to students in institutions of higher learning and technical schools. (Sims-ISWS)
W78-11435

APPROXIMATE METHOD OF CALCULATING THE TEMPERATURE STEADY STATE OF WATER-PERMEABLE DAMS,
A. P. Stavovskiy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 653, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 598, February 1977. 7 p, 1 fig, 1 tab, 4 ref. Translated from Russian.

Descriptors: *Earth dams, *Cold regions, *Infiltration, *Groundwater movement, Reservoirs, Temperature, Frozen ground, Permafrost, Thawing, Dams, Structures, Hydraulic structures, Water-permeable dams.

In permafrost areas, in addition to water impermeable dams, use is made of water permeable dams. The thermal conditions of these dams have been studied under the conditions of the planar problem. On the basis of the functions available for determining the temperature steady-state of water-permeable dams, this paper proposed dependencies, utilizing N.K. Girinskiy's hydrodynamic functions. (Sims-ISWS)
W78-11436

METHOD FOR THE STUDY OF INFILTRATION UNDER FIELD CONDITIONS: FIRST RESULTS,
For primary bibliographic entry see Field 2G.
W78-11437

APPROXIMATE CALCULATION OF THE THERMAL REGIME OF RESERVOIRS FORMED BY A FROZEN DAM,
A. I. Pekhovich, L. I. Kudoyarov, and V. M. Zhidkikh.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 540, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 662, November 1977. 13 p, 3 fig, 4 ref. Translated from Izvestiya Vsesoiuzni Nauchno-Issledovatel'skii Institut Gidrotekhniki, Vol 192, p 146-153, 1972.

Descriptors: *Reservoirs, *Water temperature, *Cold regions, *Structures, Dams, Frozen ground, Ice, Earth dams, Model studies, Mathematical models, Cold regions, Cold weather construction, Temperature, Heat, Analytical techniques.

The task of building frozen structures involves a number of problems, one of which is knowing the thermal regime of the part of the reservoir which is in contact with the dam, since it constitutes a warm interface with the frozen dam and foundation. The goal of this paper was to provide a general scheme and practical method for calculating the thermal regime of a reservoir, taking into account the thermal interaction with the dam and the foundation and examining the possibility of regulating the thermal regime of the structure. (Sims-ISWS)
W78-11438

DESIGNATIONS OF EXCAVATION CHARACTERISTICS FOR MATERIALS IDENTIFIED IN FIELD INVESTIGATIONS,
Tennessee State Dept. of Transportation, Nashville. Div. of Soils and Geologic Engineering.
For primary bibliographic entry see Field 4B.
W78-11875

PORE STRUCTURE OF SELECTED HAWAIIAN SOILS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State. Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 2G.
W78-11876

INSULATED ROAD STUDY,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
For primary bibliographic entry see Field 2C.
W78-11877

HYDRAULIC CONDUCTIVITY OF ROCKFILL,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-11896

8E. Rock Mechanics and Geology

EFFECT OF INTRAGRANULAR POROSITY ON COMPACTION,
Illinois Inst. of Tech. Chicago.
S. K. Saxena, and C. Hendrikson.
Journal of the Geotechnical Division, American Society of Civil Engineers, Vol 104, No GT8, Proceedings Paper 13965, p 1053-1059, August 1978. 3 fig, 4 ref.

Descriptors: *Compaction, *Porosity, *Density, Limestones, Granules, Landfills, Voids, Specific gravity, Effects, Equations, Dry density, Intragranular porosity.

The variation in intragranular porosity of limestones often does not allow the specified compaction standards to be fulfilled. The problem has caused embarrassment to engineers and loss of time and money to owners. In this paper, the effects of the intragranular porosity on the maximum dry density of a compacted fill were presented. Charts were presented depicting the influence of intragranular porosity and specific gravity on the maximum dry densities. (Visocky-ISWS)
W78-11895

8F. Concrete

ANSWERING MECCA'S SEWERAGE PRAYERS.
For primary bibliographic entry see Field 5D.
W78-11798

8G. Materials

IMPACT OF EXTREMAL DISTRIBUTIONS ON ANALYSIS OF MAXIMUM LOADING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-11392

SIZE DETERMINATION OF PARTLY FULL CONDUITS,
Stone and Webster Engineering Corp., Boston, MA. Hydraulic Div.
For primary bibliographic entry see Field 8B.

78-11433

OMPRESSIBILITY CHARACTERISTICS OF OMPACTED SNOW,
old Regions Research and Engineering Lab., anover, NH. Applied Research Branch.
or primary bibliographic entry see Field 2C.
78-11442

TANDARD UNITS SOLVE SEWAGE TANK CCESS PROBLEM.
urveyor, Vol 151, No 448A, p 26, May, 1978.

escriptors: Basins, *Storm runoff, *Storm ains, *Cleaning, *Bridge design, Cantilevers, ngineering structures, Aluminum, Channels, onstruction materials, Storage tanks, Unerground structures, Waste water treatment, Mucipal wastes.

tephens and Carter of Brentford, Middlesex, England, custom designed an access walkway for the nderground sewage balancing tanks at a treatent plant in Amersham, England. The unerground basins, which are employed during eak and storm periods, require periodic cleaning. he four pentagonal tanks have bases which slope own to central channels; this configuration made ccess and footing difficult. The walkway is contructed of Climalloy components connected by luminum sections. The access unit spans the cenral channel of the basin and is held in position by he counterbalance of the splayed castors at each orner; the unit is 3.05 m long, and 1.35 m wide. he span has aluminum decks which are adjustale up to maximum height of 2.76 m. The unit is obile and can be used in all four balancing tanks. Lisk-FIRL)
V78-11677

OME THOUGHTS ON PIPELINES PAST, RESENT AND FUTURE,
E. N. Andrews.
ublic Health Engineer, Vol. 6, No. 3, p 151-157, 978. 3 fig, 1 tab, 6 ref.

Descriptors: *Concrete pipes, *Steel pipes, *Metal ipes, *Plastic pipes, *Clay pipes, Sewerage, Water supply, Drainage systems, Construction naterials, Corrosion resistance, Pipeline, Plastics, Engineering structures, Waste water treatment, Municipal wastes.

The properties and applications of iron, steel, plastic, concretes, clay, and pitch fiber pipes are reviewed for use in sewerage, water supply, gas and oil transport, drainage, and industrial structures. High-speed spun concrete pipes provide a high crushing strength, high density, corrosion resistance, smooth concentric bores with abrasion resistance, and accurately-formed jointing surfaces. Fiberglass is often used in place of steel for reinforcing concrete pipes. Gas lines are typically constructed of cast or ductile iron, polyethylene, or steel; water supply pipes can be constructed of a variety of materials such as iron, concrete, asbestos, polyvinyl chloride, polyethylene, and reinforced plastics. Rigid pipes, such as asbestos cement, gray cast iron, clay, and concrete, support the entire trench and the superimposed material or traffic load; flexible pipes transfer the vertical load of the soil to a horizontal plane which is supported by the trench walls. Pipeline manufacturing faults, design errors, environmental conditions, and installation and operational problems contribute to pipeline failure; soil surveys, groundwater sampling, water monitoring, and stress testing are recommended to prevent pipe failures. (Lisk-FIRL)
W78-11799

THE LAYING OF UNDERWATER POLYETHYLENE PIPELINES USING THE ATMOSPHERIC COUNTERPRESSURE METHOD (DAS VERLEGEN VON SEELEITUNGEN AUS POLYATHYLENROHREN IM LUFTGEGENDRUCKVERFAHREN),
H. G. Ursprung.
Gas- und Wasserfach, Wasser-ABwasser, Vol. 119, No. 5, p 262-266, May, 1978. 5 fig.

Descriptors: *Plastic pipes, *Submergence, *Sewerage, *Pressure, *Flooding, Plastic deformation, Buoyancy, Resistance, Stress, Atmospheric pressure, Graphical analysis, Model studies, Pipelines, Municipal wastes, Underwater.

An atmospheric counterpressure method was developed for emplacement of tubular polyethylene pipes in deep water or in unstable ground without subjecting the pipe to bending stresses or tension. Conditions affecting polyethylene pipelines in deep water or in unstable ground cannot be adequately controlled by calculating the unit stress of the material. Consideration of all internal and external pressures on the pipe material at the moment of sinking is recommended to prevent unnecessary stress. The counterpressure technique of sinking the pipe was developed mathematically and graphically from the parameters: horizontal and vertical water resistance, work of pipe weight, buoyancy, energies of the air and flooded water columns, the length of the flooded water column, the allowable impact, and the sinking velocity. Input of these factors into an atmospheric counterpressure model permits control of the flooded pipe's movement during sinking operations. (Lisk-FIRL).
W78-11800

DISPATCHER SIGNALIZATION OF OPERATIONAL DISTURBANCES IN SEWER SYSTEM PUMP STATIONS (AID FOR DESIGNERS) (DISPETCHERSKAYA SIGNALIEATSIYA O NARU SHENII NORMAL'NOGO REZHIMA RABOTY KANALIZATSIONNYKH NASOSNYKH STANTSII) (V POMOSHCH' PROEKTIROVSHCHIKU),
A. S. Ivashkov.
Vodosnabzhenie i Sanitarnaia Tekhnika, No. 3, p 34-35, 1978. 2 fig.

Descriptors: *Instrumentation, *Monitoring, *Pumping plants, *Remote sensing, *Data transmission, Flooding, Electric power failure, Warning systems, Transmission lines, Hyrologic data, Networks,, Sewerage, Waste water treatment, Municipal wastes.

A relay-type signalization network using telephone cable has been developed for transmitting data on operational disturbances in sewer system pumping stations. The distance over which the signal can be transmitted ranges from 5 to 15 km, depending on the diameter of telephone wire employed (0.5-1.2 mm). The system can notify operators of a variety of conditions, encompassing flooding of the pumping station, power losses, and other pumping plant defects. (Takacs-FIRL)
W78-11801

FLUID TREATMENT WITH PLASTICS PASTA.
For primary bibliographic entry see Field 5D.
W78-11809

EFFECTIVENESS OF BACKWASHING FOR WASTEWATER FILTERS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 5D.
W78-11816

METHODS FOR CHECKING THE OPERATION OF ACTIVATED-SLUDGE WASTEWATER TREATMENT PLANTS AND FOR DETERMINING DESIGN CRITERIA FOR NEW TREATMENT FACILITIES (MODSZEREK ELEVENISZAPOS SZENNYVIZTISZTITO TELEPEK UZEMENEK ELLENORZESERE, UJ TELEPEK TERVEZESI ADATAINAK A MEGHATAROZASARA),
Fovarosi Csatornazasi Muvek, Budapest (Hungary).
For primary bibliographic entry see Field 5D.
W78-11837

HYDRAULIC ANALYSIS OF MODEL TREATMENT UNITS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5D.
W78-11855

EVALUATION OF FREEZE-THAW DURABILITY OF STABILIZED MATERIALS.
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
M. R. Thompson, and B. J. Dempsey.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification: Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 62-70, 1976. 9 fig, 1 tab, 14 ref.

Descriptors: *Freeze thaw tests, *Laboratory tests, *Model studies, *Durability, *Illinois, Soils, Gravels, Soil amendments, Testing procedures, Evaluation, Design criteria, Strength of materials, Paving, Crushed stone.

A suggested procedure for evaluating the freeze-thaw durability of stabilized materials was developed. Pertinent background information and previous related studies were summarized. The residual strength concept was used in the suggested evaluation procedure. Quantitative characterization of cyclic freeze-thaw action, freeze-thaw testing procedures and techniques, durability criteria, and construction influences were considered. Detailed data were presented for Illinois conditions, and the applicability of the proposed procedure was illustrated. It was demonstrated that current technology is sufficient to develop a realistic approach for evaluating the freeze-thaw durability of stabilized materials. (See also W78-11865) (Humphreys-ISWS)
W78-11874

CORROSION IN CLOSED WHITE WATER SYSTEMS,
Institute of Paper Chemistry, Appleton, WI.
For primary bibliographic entry see Field 5C.
W78-11919

LASER MADE FOR PIPE-LAYING.
Surveyor, Vol 151, No 4484, p 26, May, 1978.

Descriptors: *Tracking techniques, *Pipelines, *Remote sensing, *Sewerage, *Equipment, Electronic equipment, Gradiation, Construction, Instrumentation, Pipes, Waste water treatment, Municipal wastes.

The 1055 Dialgrade laser, developed by Spectra-Physics Ltd. of St. Albans, Hertsfordshire, England, is equipped with two axis level compensation for rapid, automatic leveling in pipe emplacement. During set-up, the laser is rough-levelled; after the initial set up, the laser automatically levels, plus or minus 5 degrees within one minute. The laser moves right or left over a plus or minus 4 degree range and over, plus or minus 3 degrees in a perpendicular direction. Push button level controls are located on the back of the unit which has a viewing telescope for following the beam. The laser automatically levels in a 6-inch diameter pipe with a grade of 9% when the unit's rubber bumpers are removed; the laser is centrally aligned with the rubber bumpers in 8-inch diameter pipes with diameters of 10-15 inches; in larger pipes or flat-

bottomed manholes, a trivet mounting is used. The laser is equipped with a signal light and a warning system to inform the operator of adjustment requirements. (Lisk-FIRL)
W78-11955

8I. Fisheries Engineering

INSTREAM FLOW AND THE REPRODUCTIVE EFFICIENCY OF SOCKEYE SALMON,
Washington Univ., Seattle. College of Fisheries.
J. Stober, R. E. Narita, and A. H. Hamalainen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 071, Price codes: A07 in paper copy, A01 in microfiche. Fisheries Research Institute, Report FRI-UW-7808, June 1978. 124 p, 21 tab, 39 fig, 60 ref. OWRT B-065-WASH(1), 14-31-0001-6132.

Descriptors: *Instream flow, Water diversion, *Sockeye salmon, Density-dependent mortality, Fry production, Flood effects, *Egg densities, Samples, *Fish management, Environmental effects, Stream habitat, *Reproduction(Fish), *Juvenile growth stage, *Growth rates, Washington, Cedar River(Wash).

The factors controlling reproduction and early development of sockeye salmon included the effects of augmented low flows, uncontrolled floods and density-dependent mortality. Density-dependent mortality due to redd superimposition occurred on a static spawning area where about 50 percent of the potential eggs were deposited. A higher egg deposition efficiency of about 80 and 100 percent occurred on reaches where spawning area accumulated with an increase in discharge. Substrate scouring due to a flood (249.3 m to the 3rd power/sec) reduced egg/alevin densities by 50.6 and 96.6 percent on two reach types sampled. The presmolt-to-spawner ratio ranged from 5.8 following the flood to 20.2 following augmented low flow and no flood. Fry production in 1976 and 1977 was 1.75 X 10 to the 6th power respectively, representing survival rates of 0.81 and 8.1 percent. A sustained flood loss of 42 percent of the spawning habitat coupled with a 22 percent increase in escapement appears to have increased the density-dependent mortality and reduced the contribution of the early spawners to the total fry production. These results should help to establish an efficient escapement goal for the Cedar River sockeye and find application on salmon streams affected by hydroelectric or diversion projects where stream discharge can be managed to maximize spawning area to benefit fish production. (See also W78-11362)
W78-11361

PRESPAWNING MORTALITY AND THE REPRODUCTIVE EFFICIENCY OF CEDAR RIVER SOCKEYE SALMON (SUPPLEMENTAL REPORT),
Washington Univ., Seattle. College of Fisheries.
Q. J. Stober, S. Crumley, and R. S. McComas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 055, Price codes: A04 in paper copy, A01 in microfiche. Fisheries Research Institute, Report FRI-UW-7809, June 1978. 53 p, 16 fig, 10 tab, 14 ref. OWRT B-065-WASH(2), 14-31-0001-6132.

Descriptors: *Prespawning mortality, *Sockeye salmon, Flood effects, Egg densities, Samples, *Spawning habitat, Environmental effects, *Fish management, Density-dependent mortality, Instream flow, *Mortality, *Reproduction(Fish), *Washington, *Cedar River(Wash).

An escapement of 410,000 sockeye salmon was monitored during the fall of 1977 in the Cedar River. A large prespawning mortality apparently due to infestation of the fish with the parasitic copepod, Salmincola, was observed. This resulted in an estimated differential mortality of about 119,813 females and an effective survival of 117,987 females. The total maximum effective escapement was estimated at 290,187 sockeye. The amount of area spawned in the 28.8 km of river below Landsburg remained approximately the same in 1976 and 1977 at 60,000 m squared, while the total escapement increased about three times. This strongly indicated a sustained reduction in the spawning habitat following a severe (249.3 m to the 3rd power/sec) December 1975 flood. Reduction of the spawning habitat as a result of major floods may necessitate an adjustment in the escapement goal. Extensive mass spawning and a large prespawning mortality prevented reliable estimates of the potential egg densities on the spawning reaches where hydraulic egg samples were collected. For these reasons the efficiency of egg deposition could not be adequately determined. Intragravel mortality occurred at similar times and levels as found during the 1976 spawning season. Flood losses of 49 and 86 percent of the egg-alevins were found on two reaches following a discharge of 116 m to the 3rd power/s in December 1977. (See also W78-11361).
W78-11362

LONG RANGE MOVEMENT AND HOMING BY LARGEMOUTH BASS (MICROPTERUS SALMOIDES) IN A THERMALLY ALTERED RESERVOIR,
Wake Forest Univ., Winston Salem, NC. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11675

OLFACTORY IMPRINTING AND HOMING IN SALMON,
Wisconsin Univ.-Madison. Dept. of Zoology.
A. D. Hasler, A. T. Scholz, and R. M. Horrall.
American Scientist, Vol. 66, p 347-355, 1978. 3 fig, 1 tab, 61 ref.

Descriptors: *Salmonids, *Fish migration, Fish behavior, Juvenile growth stage, Migration, Life history studies, Fish physiology, Salmon, Fish hatcheries, Fish management, Anadromous fish, Trout, Fish reproduction, *Imprinting.

The olfactory hypothesis for salmon homing has three basic tenets: (1) because X of local differences in soil and vegetation of the drainage basin, each stream has a unique chemical composition and, thus, a distinctive odor; (2) before juvenile salmon migrate to the sea they become imprinted to the distinctive odor of their home stream; and (3) adult salmon use this information as a cue for homing when they migrate throughh the home-stream network to the home tributary. A summary is presented of recent experiments in which salmon have been artificially imprinted to a synthetic chemical, veryifying the olfactory hypothesis for salmon homing. (EIS-Katz)
W78-11676

TEMPERATURE AND WATER VELOCITY EFFECTS ON THE SWIMMING PERFORMANCES OF YOUNG-OF-THE-YEAR STRIPED MULLET (MUGIL CEPHALUS), SPOT (LEIOSTOMUS XANTHURUS), AND PINFISH (LAGODON RHOMBIDIES),
North Carolina State Univ., at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11704

CULTURING AND ECOLOGY STUDIES OF THE ROTIFER POLYARTHRA VULGARIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5G.
W78-12008

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

THE WRC-WHERE THEY KNOW A BIT ABOUT WATER AND ARE LEARNING ALL THE TIME.
For primary bibliographic entry see Field 5G.
W78-11795

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BIBLIOGRAPHY ON THE EFFECTS OF PRESCRIBED BURNING AND MAMMAL AND WATERFOWL UTILIZATION OF WETLANDS: ANNOTATED LITERATURE SEARCH WITH SELECTED ABSTRACTS,
Fish and Wildlife Service, Annapolis, MD. Div of Ecological Services.
F. W. Rutkosky.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 117, Price codes: A03 in paper copy, A01 in microfiche. June 1, 1978, 45 p.

Descriptors: *Burning, *Marsh management, *Muskrats, *Bulrush, *Canada goose, *Grazing, *Scirpus species, Wildlife management, Waterfowl, Tidal marshes, Coastal marshes, Habitat improvement.

This bibliography was compiled as a preliminary study product for ongoing studies of marsh loss occurring at Blackwater National Wildlife Refuge, in Cambridge, Maryland. It includes 176 references which have been indexed, of which 47 have been abstracted. Prescribed burning practices and grazing by muskrat, nutria and geese are potential factors to be considered in the determination of remedial measures. (Bastress-FWS)
W78-11385

ANNOTATIONS OF SELECTED LITERATURE ON NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
For primary bibliographic entry see Field 6F.
W78-11455

USE OF BIOLOGICAL INDICATOR ORGANISMS TO QUANTITATE ORGANOCHLORINE POLLUTANTS IN AQUATIC ENVIRONMENTS - A REVIEW,
Uppsala Univ. (Sweden). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-11540

COLD-CLIMATE WATER/WASTEWATER TRANSPORTATION AND TREATMENT -- A BIBLIOGRAPHY,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W78-11574

ILLINOIS DATA CATALOG (PRELIMINARY PRINT).
Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 7C.
W78-11631

BIOASSAYS-PROCEDURES AND RESULTS,
Research Triangle Inst., Research Triangle Park, NC.

or primary bibliographic entry see Field 5A.
78-11834

0D. Specialized Information Center Services

RANSFER OF WATER RESOURCES NOWLEDGE - AN ASSESSMENT,
orth Carolina Water Resources Research Inst.
or primary bibliographic entry see Field 10F.
78-11384

0F. Preparation Of Reviews

RANSFER OF WATER RESOURCES NOWLEDGE - AN ASSESSMENT,
orth Carolina Water Resources Research Inst.
. S. Grigg.
vailable from the National Technical Informa-on Service, Springfield, VA 22161 as PB-286 132, rice codes: A05 in paper copy, A01 in microfiche. NC-WRRI Report No. 132, July 1978. 85 p, 5 fig, ref, 5 append. OWRT T-0012(6709)(1).

escriptors: *Research priorities, *Research anagement, *Technology transfer, *Knowledge ansfer, Management, *Information exchange.

ater resources knowledge transfer seeks to ake best use of scientific and technical informa-on in water management. It is an important rocess in water research management because its itcome determines the effectiveness of entire rograms. The report contains an analysis of the roblem in the water sector, a general overview of e 'technology transfer' question, presentation of nceptual models for transfer, and recommenda-ons for policy changes. The genesis of the report es in the planning and organization of the Second ternational Conference on Transfer of Water esources Knowledge. The Conference was held summer, 1977, at Fort Collins, Colorado. Con-rence Proceedings are issued separately contain-g 98 specific papers on knowledge transfer. iger-NC St)
78-11384

SE OF BIOLOGICAL INDICATOR ORGAN-MS TO QUANTITATE ORGANOCHLORINE OLLUTANTS IN AQUATIC ENVIRONMENTS A REVIEW,
ppsala Univ. (Sweden). Dept. of Zoology.
or primary bibliographic entry see Field 05A.
78-11540

UBSIDENCE OVER MINES AND CAVERNS, OISTURE AND FROST ACTIONS, AND LASSIFICATION.
or primary bibliographic entry see Field 04B.
78-11865

EOLOGIC INDICATORS OF CATASTROPHIC OLLAPSE IN KARST TERRAIN IN MISSOU-,
issouri Dept. of Natural Resources, Rolla. Div. Geology and Land Survey.
or primary bibliographic entry see Field 02F.
78-11870

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SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 11, NUMBER 24
DECEMBER 15, 1978

W78-12101--W78-13000
CODEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 24
DECEMBER 15, 1978

W78-12101--W78-13000

Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the action of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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2A. General

THE APPLICATION OF A SURFACE CLIMATE SIMULATOR TO MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 2B.
W78-12217

STOCHASTIC MODELING OF WATERSHED SYSTEMS,
Illinois Univ. at Urbana-Champaign.
V. T. Chow.
In: Advances in Hydroscience, Vol. 11, 1978, p 1-93. 52 fig, 9 tab, 37 ref. B-060-ILL(9).

Descriptors: *Watersheds(Basins), Runoff, Water yield, Hydrologic systems, *Hydrologic models, *Stochastic hydrology, *Model studies, *Stochastic processes.

Discussion is presented of the approximation of hydrologic systems by modeling. The simulation of a watershed as a hydrologic system can be deterministic, quasi-stochastic, or stochastic. A quasi-stochastic system treats the input and output as stochastic while the system through which the throughput passes is deterministic. The theory and examples to model lumped quasi-stochastic and stochastic watershed systems are given.
W78-12264

EXTENSION OF THE HISARS SYSTEM,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W78-12276

SIMULATED HYDROLOGIC EFFECTS OF CANALS IN BARATARIA BASIN: A PRELIMINARY STUDY OF CUMULATIVE IMPACTS,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2L.
W78-12309

DEVELOPMENT OF DRAINAGE BASIN-ESTUARY NUMERICAL MODEL SYSTEM FOR PLANNING OF THE COASTAL ZONE,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-12316

MATHEMATICAL MODELS FOR SIMULATING MONTHLY WATER LEVELS AND SALINITIES IN SHALLOW LAKES,
University of the Witwatersrand, Johannesburg (South Africa).
For primary bibliographic entry see Field 2L.
W78-12411

AN ADAPTIVE ALGORITHM FOR ANALYZING SHORT-TERM STRUCTURAL AND PARAMETER CHANGES IN HYDROLOGIC PREDICTION MODELS,
Princeton Univ., NJ. Dept. of Civil Engineering.
E. F. Wood, and A. Szollosi-Nagy.
Water Resources Research, Vol. 14, No. 4, p 577-581. August 1978. 7 fig, 34 ref, 1 append.

Descriptors: *Rainfall-runoff relationships, *Simulation analysis, *Forecasting, *Input-output analysis, *Algorithms, *State space formulation, Environmental effects, Mathematical models, Behavior, Floods, Equations, Systems analysis, Random walk, Kalman filters, Ombone River basin(Italy), Noise covariances, Optimal operation.

An adaptive unbiased recursive prediction algorithm, based on the state space description of hydrologic systems, is discussed. Discrete linear systems with white Gaussian disturbances are considered. The algorithm allows for short-term structural and parameter changes due to random environmental effects. A prediction model is set up from a representation of the rainfall-runoff processes with the unknown parameters modeled by a random walk. The predictions are obtained by the use of linear Kalman filters where the unknown noise covariance matrices are also adaptively estimated. The behavior of the adaptive prediction algorithm is illustrated by a real-world example taken from rainfall-runoff flood forecasting. (Bell-Cornell)
W78-12551

EVALUATION OF DETENTION BASINS FOR CONTROLLING URBAN RUNOFF AND SEDIMENTATION,
Kentucky Water Resources Research Inst., Lexington.
C. T. Haan, and A. D. Ward.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 965, Price codes: A03 in paper copy, A01 in microfiche. Research Report No. 112, August 1978. 20 p, 4 fig, 11 ref. OWRT B-046-KY(3), 14-34-0001-6081.

Descriptors: *Detention basins, Urban hydrology, *Storm water, Management, *Sediment basins, Simulation analysis, *Urban runoff control, System analysis, Model studies, Sediment control.

The main project accomplishments were: (1) a demonstration of the desirability of considering systems of urban stormwater detention basins as opposed to individual basin design, (2) the development of a system analysis approach for least cost selection of a system of detention basins for meeting a preset hydrologic objective, (3) the development of a mathematical, computer-based simulation model of the performance of sediment retention basins, (4) partial verification of the sediment basin model and (5) the development of design recommendations for sediment basins based on simulations made with the sediment basin model. (Huffsey-Kentucky)
W78-12608

TRANSITION ZONES OF FORESTED INLAND WETLANDS IN NORTHEASTERN CONNECTICUT,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6G.
W78-12609

DIGITAL MODEL OF GROUND-WATER FLOW IN THE PICEANCE BASIN, RIO BLANCO AND GARFIELD COUNTIES, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-12731

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1976.
Australian Water Resources Council, Canberra Dept. of National Resources.
Australian Government Publishing Service, Canberra, 1976. 137 p, 1 append.

Descriptors: Water resources, *Research and development, *Projects, *Australia, Bibliographies, Census, Abstracts, Water sources, Groundwater, Surface waters, Water pollution, Water quality, Data collections, Data processing, Hydrology, Hydraulics, Meteorology.

The Inventory of Water Resources Research in Australia 1976 is issued on behalf of the Australian Water Resources Council. The Inventory covered research into water resources and directly related matters, and it included research projects in progress during the calendar year 1976. The information included in the Inventory was sought by means of a letter circulated to 265 research units in March 1976. For the purpose of the Inventory, a research project was defined as one which is designed to reveal new principles, techniques, or methods, to make comparative studies or to determine applicability in new situations. The basis of the Inventory was the collection of 'Project Details' which are in the form received from cooperating research units. The 'Subject Index' was based on the provision of up to 5 subject index terms for each project. The section 'Classification of Projects by Water Resources Research Categories' listed project titles in accordance with the 'Water Research Categories' (and sub-categories) of the USI Federal Council for Science and Technology. Details of categories were included in Appendix I. The 'Research Personnel Index' listed alphabetically all research personnel cited in the Inventory and the projects with which they are involved. (See also W76-02680) (Froehlich-ISWS)
W78-12833

THE FRESHWATER REGIME OF FAXAFLOI, SOUTHWEST ICELAND AND ITS RELATIONSHIP TO METEOROLOGICAL VARIABLES,
Iceland Univ., Reykjavik; and Marine Research Inst., Reykjavik (Iceland).
For primary bibliographic entry see Field 2L.
W78-12834

2B. Precipitation

MARKOV PROCESS FOR SIMULATING DAILY POINT RAINFALL,
Booker Associates, Inc., Lexington, KY.
D. I. Carey, and C. T. Haan.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR1, Proceedings Paper 13631, p 111-125, March 1978. 2 fig, 11 tab, 9 ref, 1 append. OWRT A-045-KY(3) and A-052-KY(5).

Descriptors: *Rainfall, *Model studies, *Markov processes, *Kentucky, Mathematical models, Simulation analysis, Rainfall simulators, Simulated rainfall, Rainfall intensity, Synthetic hydrology, Rain, Precipitation(Atmospheric), Runoff, Storage, Reservoirs, Estimating equations, Hydrology, Meteorology, Climatology.

A modified Markov Chain model was used to generate synthetic traces of daily rainfall amounts at a point. Mixed discrete-continuous distributions were used to model the state transition probabilities. The use of the modified model affords a considerable reduction in historical data requirements for parameter estimation. A two-parameter gamma distribution was used in the model with data from 7 weather stations in Kentucky and provided a good representation of the daily point rainfall process. (Sims-ISWS)
W78-12119

THE APPLICATION OF A SURFACE CLIMATE SIMULATOR TO MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
A. J. Brazel.
Journal of the Arizona Academy of Science, Vol 12, No 1, p 29-35, Feb 1977. 3 tab, 3 fig, 10 ref.

Descriptors: *Model studies, *Arizona, *Montezuma Well(Ariz), *Simulation analysis, Thermal water, *Microclimatology, Artesian wells, Air-earth interfaces.

This paper describes a microclimatic model developed for Montezuma Well, focusing on the interaction of the radiative properties of the landscape and the resulting diurnal amplitude and phase parameters of radiant temperatures of the air-ground interface. The model agrees with field data for amplitude and phase parameters at five sites investigated, but a more sophisticated model is required to obtain precise spatial estimates of surface temperatures each hour during a clear sky diurnal period. (Russell-Arizona)
W78-12217

PRECIPITATION CLIMATOLOGY FOR THE TEXAS HIGH PLAINS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 3B.
W78-12221

COMPUTER PROGRAM FOR CALCULATING ATMOSPHERIC PLANETARY WAVES,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W78-12254

EXTENSION OF THE HISARS SYSTEM,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W78-12276

CLIMATOLOGY, HYDROLOGY, AND HYDROGRAPHY OF THE VERMILION BASIN. SYNOPTIC WEATHER TYPES AND ENVIRONMENTAL RESPONSES. HYDROLOGIC AND HYDROGRAPHIC PROCESSES,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2L.
W78-12308

DENDROCLIMATOLOGY IN SOUTH AFRICA,
University of the Witwatersrand, Johannesburg (South Africa).
J. F. Gillooly.
South African Forestry Journal (Pretoria) Vol. 98, 1976. 1 fig, 5 ref. p 64-65.

Descriptors: *Dendroclimatology, *Climatic data, *Rainfall patterns, Hydrologic cycle, Weather forecasting, Future planning, *South Africa.

Climatic observations in South Africa extend for a relatively short period back in time, generally covering a period of no more than 60-70 years. For this reason any natural phenomenon, linked to climate may prove useful in elucidating past climatic states. On such phenomenon is the annual growth pattern in woody plants, the study of which when used for determining the variability in present and past climates is called dendroclimatology. The method used in the above study is to extract cores from several old trees in an area and measuring ring widths with a traveling microscope. If, by extending the climatic record back in time, the known oscillatory annual rainfall behaviour patterns can be shown to be persistent through time, future longterm weather predictions can be made with some degree of confidence. (So Afr Water Info Ctr)
W78-12409

GETTING WISE TO THE WEATHER.
Scientiae, Vol. 16, No. 6, p 10-17, 1975.

Descriptors: *Climatology, *Weather patterns, *Meteorology, Weather data, Forecasting, Rainfall modification, Droughts, Seasonal variations, Satellites, Topographic influences, Mathematical models, Humidity, Wind direction, Orographic influences, Thermocline, Atmospheric conditions, Agulhas current, Gough island, Bouvet island, Atlantic Ocean, *South Africa.

Average losses caused by the weather in Southern Africa are in the region of 23 per cent of annual production or approximately R285 000 000. A large proportion of these losses could be prevented if better use were made of the weather services available. The article describes the research dam in South Africa as trying to find out more about general weather patterns, to understand more about the weather and to be able to predict it more accurately. To enable them to get information from far beyond this country's borders, South African scientists are preparing to take part in the Global Atmospheric Research Program (GARP). With its extended facilities and South Africa's envisaged participation in the GARP programme, the country is on the brink of exciting developments in weather forecasting and there are numerous opportunities for new research projects and for the extension of present work on meteorology. (So Afr Water Info Ctr)
W78-12425

CORN YIELD - AN EARLY WARNING SYSTEM,
T. G. Dyer, and J. F. Gilloolu.
South African Journal of Science, Johannesburg, Vol 73, No 8, p 252-253, 1977. 9 refs, 1 graph.

Descriptors: *Crop yield, *Forecasting, Meteorological data, Agriculture, Rainfall, Temperature, Time, Linear regression, Statistical analysis, Data analysis, *Corn(Field), *Orange Free State, South Africa.

Reports on research aimed at forecasting a current year's maize crop using simple meteorological and other data. Compared with pedictive methods developed elsewhere, the approach appears to hold particular promise as an agricultural micro-scale studies, where daily values of various meteorological parameters are used as a basis for prediction. Unfortunately the results obtained often lack practical application on a large scale even though they may be useful in other respects, for example, in providing a better understanding of the optimum conditions for promoting plant growth. (So Afr Water Info Ctr)
W78-12471

STORAGE-GAGE PRECIPITATION DATA FOR WESTERN UNITED STATES 1974-1975. VOLUME 20.
National Climatic Center, Asheville, NC.
For primary bibliographic entry see Field 7C.
W78-12623

A CASE STUDY OF THE MEASUREMENT OF SNOWFALL BY RADAR: AN ASSESSMENT OF ACCURACY,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2C.
W78-12644

OBSERVATIONS OF PRECIPITATION-FORCED CIRCULATIONS IN WINTER OROGRAPHIC STORMS,
Utah Water Research Lab., Logan.
G. E. Hill.
Journal of the Atmospheric Sciences, Vol. 35, No. 8, p 1463-1472, August 1978. 11 fig, 1 tab, 18 ref.

Descriptors: *Air circulation, *Precipitation(Atmospheric), *Orography, *Storms, *Utah, Winter, Snow, Circulation, Mountains, Model studies, Mathematical models, On-site investigations, On-site data collections, Weather, Meteorology, Cloud physics, Precipitation-forced circulation.

Observational evidence was presented which identifies the occurrence of strong precipitation-forced circulations during winter orographic storms. It was shown by analysis of several case studies that precipitation in the mountains is greatly reduced following the development of such circulations. The development of a precipitation-forced circulation occurs first at low levels and expands upward to near mountain-top levels. Both the original updraft and the downdraft beneath are subsequently weakened; at that time there is a rapid reduction of precipitation. In most instances, a weak low-level updraft and a secondary maximum of precipitation redevelop. (Sims-ISWS)
W78-12648

DROUGHT IN CALIFORNIA--WATER-RESOURCES DATA FOR 1977,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12730

SUMMARY OF METROMEX, VOLUME 2: CAUSES OF PRECIPITATION ANOMALIES,
Illinois State Water Survey, Urbana.
B. Ackerman, S. A. Changnon, Jr., G. Dzurisin, D. L. Gatz, and R. C. Grosh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 288, Price codes: A18 in paper copy, A01 in microfiche. Bulletin 63, 1978. 399 p, 178 fig, 82 tab, 272 ref. DOE EY-76-02-1199, NSF ENV73-07796.

Descriptors: *Weather modification, *Weather patterns, *Climatology, *On-site investigations, *Illinois, *Missouri, Weather data, Meteorological data, Data collections, Winds, Air temperature, Humidity, Rainfall, Storms, Rainfall disposition, Data processing, Analytical techniques, Instrumentation, Networks, Distribution patterns, Hail, Cities, Water quality, Air pollution, Radar, Cloud physics, Meteorology, *METROMEX, *St. Louis(MO), Precipitation anomalies, Weather anomalies, Inadvertent weather modification.

This was the last of two volumes presenting the major findings from the 1971-1975 METROMEX field operations at St. Louis. It presented climatological analyses of surface weather conditions, but the report primarily concerned those factors helping to describe the causes of the anomalies. Volume 1 covered spatial and temporal distributions of surface precipitation and severe storms, and impacts of urban-produced precipitation anomalies. Volume 2 described relevant surface weather conditions including temperature, moisture, and winds, all influenced by the urban area. Urban influences extended well into the boundary layer affecting aerosol distributions, winds, and the thermodynamic structure, and often reached cloud base levels. Studies of modification of cloud and rain processes showed urban-industrial influences on (1) initiation, local distribution, and characteristics of summer cumulus clouds; and (2) development of precipitation in clouds and the resulting surface rain entities. (See also W78-06738) (Sims-ISWS)
W78-12830

AN ATTEMPT TO DETECT THE EFFECTS OF A STEELWORKS ON PRECIPITATION AMOUNTS IN CENTRAL HUNGARY,
Illinois Univ., Urbana-Champaign. Dept. of Ecology, Ethology, and Evolution; and Illinois Univ., Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5B.
W78-12860

RAINFALL FREQUENCIES FOR THE PERSIAN GULF COAST OF IRAN,
Dames and Moore, Denver, CO.
U. Kuppus, J. M. Bleek, and S. H. Blair.

Hydrological Sciences Bulletin, Vol. 23, No. 1, p 119-129, March, 1978. 4 tab, 2 fig, 19 ref.

Descriptors: *Rainfall disposition, *Probable maximum precipitation, Depth-area-duration analysis, Nuclear powerplants, *Iran, *Persian Gulf.

The purpose was to develop the design basis flood elevations for a proposed nuclear power plant at Haliheh, on the Persian Gulf. The probable maximum precipitation and 2-to 100-year return period rainfall events were estimated using graphical relationships. The need for very conservative design criteria motivated studies directed towards estimating the physical upper limits to storm rainfall in this region. While the climate is arid and subtropical, with a mean annual rainfall of 226 mm, sudden heavy rains could cause flooding that must be considered in designing the nuclear power plant. (Russell-Arizona)
W78-12945

2C. Snow, Ice, and Frost

PHYSICAL MEASUREMENTS OF RIVER ICE JAMS,
Army Terrestrial Sciences Center, Hanover, NH.
D. J. Calkins.
Water Resources Research, Vol. 14, No. 4, p 693-695, August 1978. 3 fig, 2 tab, 5 ref.

Descriptors: *Ice jams, *Measurement, *On-site investigations, Rivers, Ice, On-site data collections, Data processing, Cold regions, Freezing, *Ice thickness.

River ice jam measurements always have been relatively difficult to obtain because of the uncertain stability of the floating ice mass. But recently two ice jams resolidified for about 3 weeks, allowing the ice thickness to be measured at several cross sections along their longitudinal profiles. The size distribution of surface ice floes in one of the jams also was evaluated from low-level aerial photography. The ice jams were found to be thickest at the downstream end, of the order of 4-5 times the thickness of the ice cover before breakup, and decreased almost linearly in thickness upstream. The largest surface ice floes measured in one ice jam ranged from 0.27 to 0.05 of the river's average width (approximately 45 m). The largest floes were at the downstream end, and floe size decreased progressively with distance upstream. (Sims-ISWS)
W78-12148

THE DEPENDENCE OF THE RESIDUAL GRAVITY ON HYDRAULIC CONSTANTS IN GLACIAL DEPOSITS,
Rhode Island Univ., Kingston. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-12156

ENERGY EXCHANGE OVER YOUNG SEA ICE IN THE CENTRAL ARCTIC,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
G. A. Maykut.
Journal of Geophysical Research, Vol. 83, No. C7, p 3646-3658, July 20, 1978. 17 fig, 5 tab, 42 ref. ONR N00014-76-C-0324.

Descriptors: *Sea ice, *Energy transfer, *Heat transfer, *Model studies, *Arctic, Mathematical models, Cold regions, Ice, Snow, Radiation, Solar radiation, Atmosphere, Temperature, Air temperature, Water temperature, Variability, Seasonal, Ice thickness, Snow effects.

A simple model of heat transport through young sea ice was combined with climatological data on air temperatures and incoming radiation in the central Arctic to predict how each component of the surface heat balance is affected by changes in ice thickness. Results indicated that during the cold months the net heat input to the atmosphere from ice in the 0- to 0.4-m range in between 1 and 2 orders of magnitude larger than that from perennial ice. Once the ice exceeds a meter in thickness, there is little change in any of the heat fluxes as the ice thickens. Although both the amount of absorbed radiation and the emitted longwave radiation depend on ice thickness it is the turbulent fluxes which undergo the largest changes. The rate of heat exchange over thin ice was shown to be extremely sensitive to snow depth and assumed boundary layer temperatures. It was concluded that with the present ice thickness distribution in the central Arctic, total heat input to the atmospheric boundary layer from regions of young ice is equal to or greater than that from regions of open water or thick ice. (Sims-ISWS)
W78-12162

PECULIARITIES OF BIOLOGICAL PRODUCTIVITY OF WATERS NEAR BIRD'S BAZAARS IN THE NORTH OF NOVAYA ZEMIYA (SOBENNOSTI BIOLOGICHESKOI PRODUKTIVNOSTI VOD BLIZ PTICHIKA BAZAROV SEVERA NOVOI ZEMLI, LENINGRAD, 1972),
Sovetskii Natsionalnyi Komitet po Provedeniyu Mezhdunarodnoi Biologicheskoi Programmy, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W78-12184

BIBLIOGRAPHY OF CANADIAN GLACIOLOGY, 1975 - BIBLIOGRAPHY NO. 1, GLACIER INVENTORY NOTE NO. 10,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
C. S. L. Ommanney.
Report Series No. 59, 1978, in English and French, 117 p.

Descriptors: *Bibliographies, *Glaciology, *Census, *Snow, *Ice, *Glaciers, *Icebergs, Instrumentation, Methodology, Frost action, Meteorology, Climatology, Geographical regions, Arctic Ocean, *Canada, Atlantic Provinces, Maritime Provinces, Marine environments, British Columbia, Northwest Territories, Ontario, Prairie Provinces, Quebec, Yukon Territory, Author Index, Geographical Index.

The bibliography lists all snow and ice studies in Canada published or printed in 1975. References are given under the following major subject headings - general glaciology; glaciological instruments and methods; physics of ice; land ice, glaciers, ice shelves; icebergs, sea, river and lake ice; glacial geology; frost action on rocks and soil, frozen ground, permafrost; meteorological and climatological glaciology; snow. A geographical and an author index are also provided. (WATDOC)
W78-12252

WATER PRESSURE IN RIPE SNOWPACKS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Wankiewicz.
Water Resources Research, Vol. 14, No. 4, p 593-600, August 1978. 9 fig, 14 ref.

Descriptors: *Snowpacks, *Melting, *Water pressure, On-site investigations, On-site data collections, Tensiometers, Snow, Permeability, Darcys law, Equations, Melt water, Percolation, Steady flow, Unsteady flow, Diurnal.

The water pressure regime of a quasi steadily melting homogeneous and isotropic snowpack was derived from Darcy's equation and from an experimental determination of the permeability-pressure relation for snow. The derivation demonstrated that at a given melt rate, (1) significant water pressure gradients are confined to the base of the snowpack and (2) the snow water pressure at higher levels is independent of depth and equal to a characteristic value called the gravity flow pressure, which is a function of the melt rate and wetting history of the snow. Simple and inexpensive tensiometers were used to measure the water pressure variations in a deep snowpack. Diurnal pressure changes were found to be about 300 N/sq m in amplitude within the ripe snow. Layering resulted in a scattering of the water pressures along the vertical direction. Such simple tensiometer measurements can now be used with the above derivation to provide field measurements of the permeability of different types of snow. (Sims-ISWS)
W78-12627

CHEMISTRY OF SNOW MELTWATER: CHANGES IN CONCENTRATION DURING MELTING,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 2K.
W78-12630

DIFFERENCES IN RADAR RETURN FROM ICE-COVERED NORTH SLOPE LAKES,
Army Terrestrial Sciences Center, Hanover, NH.
W. F. Weeks, A. G. Fountain, M. L. Bryan, and C. Elachi.
Journal of Geophysical Research, Vol 83, No C8, p 4069-4073, August 20, 1978. 5 fig, 7 ref. NASA NA57-100.

Descriptors: *Lakes, *Ice cover, *Radar, *Cold regions, *Alaska, Remote sensing, Aircraft, Interfaces, Ice-water interfaces, Bubbles, Lake ice, Iced lakes, Salinity, Ice, Snow, On-site data collections, Radar backscatter.

Comparisons were made between L and X band synthetic aperture radar images of frozen lakes on the North Slope of Alaska and ground truth observations of the nature of their ice covers. It was shown that the differences in radar backscatter observed on different areas of a lake can be correlated with whether or not the lake is frozen completely to the bottom at the site in question. This explanation is reasonable inasmuch as the reflection coefficient associated with the high-dielectric contrast ice/water interface is significantly higher than that associated with a low-contrast ice/soil interface. However, the presence of the ice/water interface cannot be the only condition required for the higher backscatter because the ice/water interface per se would be specular at X and L band frequencies, causing the energy returned from the interface to be reflected away from the radar receiver. The other principal factor contributing to the return of energy from the ice/water interface to the receiver is believed to be the presence in the ice of numerous vertically elongated air bubbles which would act as scatters. (Sims-ISWS)
W78-12639

ICE GROWTH IN DULUTH-SUPERIOR HARBOR,
Minnesota Univ., Duluth. Dept. of Physics.
M. Sydor.
Journal of Geophysical Research, Vol. 83, No. C8, p 4074-4078, August 20, 1978. 9 fig, 7 ref. NOAA USDC-NOAA-04-5-022-13.

Descriptors: *Ice, *Harbors, *Heat budget, *Lake Superior, Weather, Temperature, Radiation, Solar radiation, Air temperature, Water temperature, Snow, Computers, Lakes, Heat transfer, On-site investigations, *Duluth(Minn), Ice thickness, LANDSAT, Ice growth.

The heat budget for ice in the Duluth-Superior Harbor was obtained from measurements, of temperatures and net radiation and from weather data. It was found that ice growth in the harbor is nearly uniform and depends mainly on the net radiation term. Some localized variations in ice thickness can be attributed to the spatial distribution in al-

bedo and the variation of the turbulent heat flux in water. For localized areas with high turbulence and thermal pollution where the heat transport in a water becomes significant, a 20-50% decrease in ice thickness is observed, depending on flow velocities and the proximity of the areas to the heated effluent sources. Outside of these localized areas there are smaller but persistent variations in ice thickness over broad regions of the harbor adjacent to the industralized sections of Duluth and Superior. These variations can be attributed to the relative changes in the albedo due to particulate fallout. Landsat data were used for determination of the relative distribution in albedo, while the turbulent heat flux in water was obtained from temperature distribution measurements and from flow rates which were calculated from a numerical model of the harbor. (Sims-ISWS)
W78-12640

SHOALING OF WAVES UNDER ICE,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
T. Green.
Journal of the Waterway, Port, Coastal and Ocean Division, Proceedings of the American Society of Civil Engineers, Technical Note, Vol. 104, No. WW4, p 327-330, August 1978. 4 fig, 3 ref, 1 append.

Descriptors: *Ice cover, *Shores, *Waves(Water), *Ice, Analytical techniques, Theoretical analysis, Coastal structures, Piles(Foundations), Ice breakup, Shoaling.

In winter, ice is often present along the shores of water bodies. The vertical motions of such ice can affect winter coastal dynamics and structures held up by offshore pilings. These motions are often due to waves generated offshore, in the ice-free area, and propagating shoreward. Then the shoaling of waves under a shorebound ice sheet is of some interest. The results also may provide insight to ice cracking and to variations in sediment motion and scouring under ice. Ice breaking is probably related to the maximum stress, and thus the maximum curvature of the ice sheet. In all cases calculated, the curvature increases monotonically with decreasing depth, more rapidly for thinner ice, so that the ice first reaches its ultimate strength at the shoreline. Presumably, the wave would completely reflect until this stress is reached. (Humphreys-ISWS)
W78-12641

A CASE STUDY OF THE MEASUREMENT OF SNOWFALL BY RADAR: AN ASSESSMENT OF ACCURACY,
British Meteorological Office, Bracknell (England).
C. G. Collier, and P. R. Larke.
Quarterly Journal of the Royal Meteorological Society, Vol. 104, No. 441, p 615-621, July 1978. 3 fig, 19 ref.

Descriptors: *Remote sensing, *Snowfall, *Radar, Evaluation, Precipitation(Atmospheric), Measurement, Watersheds(Basins), Snow, Snowpacks, Surveys, Water resources, Rain gages, Runoff, Melt water, Weather, Meteorology.

Radar measurements during a period of snowfall in a region of variable terrain were described. The accuracy of estimates of areal snow depth, using a calibrated radar, was shown to be similar to that achieved for areal rainfall using the same technique. This detailed case study supported similar conclusions made by other workers, who used more cases but fewer validating measurements. It also was shown that provided the variations in terrain height are not very large, compensation for the effects of melting over low terrain can be made in deriving the snow depth field by using two independent snow depth calibration measurements-one representative of upland areas, and the other of lowland areas. (Sims-ISWS)
W78-12644

OBSERVATIONS OF PRECIPITATION-FORCED CIRCULATIONS IN WINTER OROGRAPHIC STORMS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2B.
W78-12648

BEHAVIOR OF THE BOUCHARD NO. 65 OIL SPILL IN THE ICE-COVERED WATERS OF BUZZARDS BAY,
For primary bibliographic entry see Field 5G.
W78-12806

POLAR CONTINENTAL SHELF PROJECT. TITLES AND ABSTRACTS OF SCIENTIFIC PAPERS SUPPORTED BY PCSP.
Department of Energy, Mines and Resources, Ottawa (Ontario) Polar Continental Shelf Project.
For primary bibliographic entry see Field 5C.
W78-12819

TESTS OF THE ARCTIC BOAT CONFIGURATION OF THE LOCKHEED CLEAN SWEEP OIL RECOVERY SYSTEM IN A BROKEN ICE FIELD,
ARCTEC, Inc., Columbia, MD.
For primary bibliographic entry see Field 5G.
W78-12826

MULTISPECTRAL REMOTE OBSERVATIONS OF HYDROLOGIC FEATURES ON THE NORTH SLOPE OF ALASKA,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
D. K. Hall, and M. L. Bryan.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-27483, Price codes: A03 in paper copy, A01 in microfiche. Report NASA-TM-X-71351 (X-913-77-124), May 1977. 45 p, 18 fig, 6 tab, 43 ref.

Descriptors: *Remote sensing, *Lakes, *Surface waters, *Alaska, *Arctic, Snow, Ice, Rivers, Snow cover, Aircraft, Satellites(Artificial), Instrumentation, Equipment, Data processing, Cold regions, *North Slope(Alaska), LANDSAT.

Visible and near-infrared satellite data and active and passive microwave aircraft data were used to analyze some hydrologic features in Arctic Alaska. The following features were studied: the small thaw lakes on the Arctic Coastal Plain ('oriented lakes'), Chandalar Lake in the Brooks Range, several North Slope rivers, surface water on the tundra, and snowcover on the North Slope and in the Brooks Range. Passive microwave brightness temperatures (T sub B) as seen on Electrically Scanned Microwave Radiometer (ESMR) imagery were shown to increase with increasing ice thickness on all of the lakes studied. April Synthetic Aperture Radar (SAR) imagery of the oriented lakes revealed qualitative lake depth information. Lakes not frozen to the bottom (those more than 2 m in depth, because 2 m is the maximum ice thickness attained on these lakes) tend to give higher returns than lakes frozen to the bottom because of high reflections at the ice/water interface. Aufeis, an important hydrologic parameter in the Arctic, was observable in the Sagavanirktok River channel on April ESMR imagery. The low resolution (approximately 500 m) of the EMSR imagery does not permit any quantitative analyses. However, Landsat imagery with better (80 m) resolution was useful for measuring aufeis extent using band 5 imagery obtained just after snowmelt in June. It was shown that the extent of aufeis (as measured on Landsat imagery) varies with meteorological conditions and, therefore, may be a useful indicator of annual climate fluctuations on the North Slope. (Sims-ISWS)
W78-12832

SUSPENDED SEDIMENT DYNAMICS IN BLUE FJORD, WESTERN PRINCE WILLIAM SOUND, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W78-12835

THERMODYNAMIC EQUILIBRIUM BETWEEN ICE AND WATER IN POROUS MEDIA,
Norwegian Geotechnical Inst., Oslo (Norway).
J. P. G. Loch.
Soil Science, Vol 126, No 2, p 77-80, August 1978. 9 ref.

Descriptors: *Thermodynamics, *Ice, *Water properties, *Porous media, Model studies, Mathematical models, Equations, Equilibrium, Soils, Soil water, Freezing, Melting, Frozen soils, Soil science.

A derivation was given for the equation of thermodynamic equilibrium between ice and water in porous media. The equation accounts for a difference between the pressure of the ice phase and the total potential (in pressure units) of the water phase. Emphasis was laid on the distinction between the total potential and the hydrostatic pressure and osmotic pressure of the unfrozen soil solution. The difference between the hydrostatic pressure of the solution and the ice pressure was accounted for by the ice-water interfacial tension, as expressed by the generalized form of Laplace's equation. The resulting generalized form of the Clausius-Clapeyron equation is an equilibrium expression, whereas the Laplace equation only expresses a definition, valid under any circumstances. It was emphasized that all influences of the pore wall, which may or may not work via the diffuse double layer and which cause the liquid to have lower Gibbs free energy than the equilibrium liquid at the same temperature, were collected in the osmotic pressure term. (Sims-ISWS)
W78-12841

ICEBERGS MIGHT SUPPLY WATER TO ARID REGIONS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 3B.
W78-12936

2D. Evaporation and Transpiration

TRANSPIRATION OBSERVATIONS FROM A SPRUCE FOREST AND COMPARISONS WITH PREDICTIONS FROM AN EVAPORATION MODEL,
Institute of Hydrology, Oxon (England).
I. R. Calder.
Journal of Hydrology, Vol. 38, No. 1/2, p 33-47, July 1978. 6 fig, 13 ref.

Descriptors: *Transpiration, *Forests, *On-site investigations, *Model studies, Precipitation(Atmospheric), Rainfall, Rain gages, Lysimeters, Evaporation, Evapotranspiration, Soil moisture, Watersheds(Basins), Forest watersheds, Trees, Nuclear moisture meters, Soil water, Spruce forests.

Neutron-probe and lysimetric techniques were used to investigate the transpiration response of spruce forest to changing environmental variables and to test the operation of a previously proposed model of evaporation. Measurements obtained during the summer drought in 1976 enabled the influence of soil-moisture and vapor-pressure deficits to be determined over an exceptional range. The experimental results were consistent with model predictions. Model predictions also were shown to be consistent with independent 'tree cutting' experiments. (Sims-ISWS)
W78-12149

EVAPOTRANSPIRATION FROM WATER HYACINTH IN TEXAS RESERVOIRS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
A. R. Benton, Jr., W. P. James, and J. W. Rouse, Jr.
Water Resources Bulletin, Vol. 14, No. 4, p 919-930, August 1978. 3 fig, 3 tab, 21 ref. NASA NGL44-001-001.

Descriptors: *Evapotranspiration, *Water hyacinth, *Reservoirs, *Water loss, *Texas, Aquatic plants, Floating plants, Aquatic life, Aquatic weeds, Lakes, Water resources, Planning, Vegetation, Vegetation effects, *Texas Water Plan, Aquatic plant control.

Water hyacinth, an attractive, floating aquatic plant, poses a substantial threat of unanticipated water loss from Texas reservoirs. A mature plant will lose about three times as much water through evapotranspiration as is lost from evaporation of an equivalent area of open water. The reservoirs of east and southeast Texas, which comprise the bulk of the state's existing and planned water storage capacity, seem likely to suffer a 20% average surface infestation of water hyacinth. A coverage that great will result in a yearly net loss of over 2,000,000 acre-feet of impounded water, based on present water development plans for the state. This would amount to nearly 20% of the anticipated yield from the reservoirs affected. An effective aquatic plant control program could head off the threat of this significant water loss. (Sims-ISWS)
W78-12155

FEASIBILITY STUDY OF GENERAL CRUST MANAGEMENT AS A TECHNIQUE FOR INCREASING CAPACITY OF DREDGED MATERIAL CONTAINMENT AREAS,
Texas A and M Research Foundation, College Station.
For primary bibliographic entry see Field 8D.
W78-12622

ICE GROWTH IN DULUTH-SUPERIOR HARBOR,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2C.
W78-12640

ESTIMATING EVAPOTRANSPIRATION FROM POTENTIAL EVAPORATION: PRACTICALITY OF AN ICONOCLASTIC APPROACH,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
F. I. Morton.
Journal of Hydrology, Vol. 38, No. 1/2, p 1-32, July 1978. 10 fig, 1 tab, 22 ref.

Descriptors: *Evapotranspiration, *Evaporation, *Model studies, *Canada, *Africa, Mathematical models, Evaporation pans, Solar radiation, Temperature, Air temperature, Humidity, Albedo, Meteorological data, Climatology, Meteorology, *Ireland, *Kenya, Potential evaporation.

The concept of a complementary relationship between the evapotranspiration from an area and the potential evaporation at some point in the area is diametrically opposed to the conventional wisdom. However, pan and dish evaporation data from irrigated areas and adjoining deserts provide evidence that the above mentioned concept reflects reality. Furthermore, the mentioned concept provides the basis for a model that permits evapotranspiration to be estimated from the routine observations of temperature, humidity, and sunshine duration that are used in computing potential evaporation, thereby eliminating the need to represent the complexities of the soil-vegetation system by locally optimized fudge factors. This means that the model is verifiable so that errors in the associated assumptions and empirical relationships can be detected and corrected over an ever-widening range of environments. The current model represents the culmination of such a methodology. It was calibrated at climatological stations in desert areas-where the monthly precipitation approximates evapotranspiration-and applied over a wide range of environments without local optimization of coefficients. The practicality of this unorthodox approach was demonstrated by comparing model estimates of evapotranspiration with the corresponding water budget estimates for 122 river basins in Canada, Ireland, Kenya, and the southern U.S. (Sims-ISWS)
W78-12646

EVAPORATION CONTROL ON FARM-SIZE RESERVOIRS,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
For primary bibliographic entry see Field 3B.
W78-12649

REDUCING PHREATOPHYTE TRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 3B.
W78-12939

DIURNAL TRENDS IN WATER STATUS, TRANSPIRATION, AND PHOTOSYNTHESIS OF SALTCEDAR,
Idaho State Univ., Pocatello. Dept. of Biology.
For primary bibliographic entry see Field 3B.
W78-12940

CONSTANCY OF THE CORRELATION BETWEEN TRANSPIRATION RATES AND NEEDLE MASS IN THE SCOTCH PINE (IN RUSSIAN),
Vesesoyuznyi Nauchno-Issledovatelskii Inst. Vinodelyia i Vinogradarstva, Yalta (USSR).
V. E. Rudakov.
Fiziol Rast (Mosc) 24(4), p 854-855, 1977.

Descriptors: *Scotch pines, *Transpiration rates, *Literature review, Needle mass, *Moisture deficit, Age(Trees).

A literature review on the relationship between transpiration rates and needle mass curves in relation to age is presented. The relationship of moisture loss to needle mass established. The relationship between the transpiration rate over a vegetative period and the mass of pine needles was not age-related and thus remained constant between new stands of pine and older trees.--Copyright 1978, Biological Abstracts, Inc.
W78-12944

APPLICATION OF AN EVAPORATIVE LOSS MODEL TO ESTIMATE THE PERSISTENCE OF CONTAMINANTS IN LENTIC ENVIRONMENTS,
Purdue Univ., LaFayette, IN. Dept. of Forestry and Natural Resources.
For primary bibliographic entry see Field 5B.
W78-12982

2E. Streamflow and Runoff

KALMAN FILTER IN OPEN CHANNEL FLOW ESTIMATION,
Pittsburgh Univ., PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-12137

GENERATION OF SKEWED ANNUAL FLOWS USING FAST FRACTIONAL GAUSSIAN NOISE GENERATOR,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. Srikanthan, and T. A. McMahon.
Water Resources Research, Vol. 14, No. 4, p 665-671, August 1978. 2 fig, 4 tab, 12 ref, 1 append.

Descriptors: *Synthetic hydrology, *Streamflow, *Model studies, *Mathematical models, Flow, Markov processes, Mathematics, Streams, Rivers, Hydrology, *Australia, Gaussian noise generator.

The fast fractional Gaussian noise process was modified to generate skewed streamflows and those having negative lag 1 autocorrelation. The modified procedures were applied to two Australian streams, and the results were compared with the corresponding historical values. (Sims-ISWS)
W78-12146

SERIALLY LINKED RESERVOIR SYSTEM DESIGN USING STOCHASTIC PROGRAMING,
Magyar Tudomanyos Akademia, Budapest.
For primary bibliographic entry see Field 4A.
W78-12147

EXPECTED VALUE OF ASYMPTOTIC MAXIMUM DEFICIT FOR PERIODIC-STOCHASTIC INFLOWS OF FULL-FLOW REGULATION,
Engineering Consultants, Inc., Denver, CO.
For primary bibliographic entry see Field 4A.
W78-12150

GENERATING STREAMFLOW SEQUENCES WITH TREND AND CYCLICAL MOVEMENTS,
Florida Univ., Belle Glade. Dept. of Agricultural Engineering.
S-F. Shih.
Water Resources Bulletin, Vol. 14, No. 4, p 942-955, August 1978. 5 fig, 4 tab, 11 ref.

Descriptors: *Streamflow, *Model studies, *Synthetic hydrology, *Florida, Mathematical models, Computer models, Computer programs, Regression analysis, Analytical techniques, Hydrology, *Kissimmee River(Fla), Autoregressive models, Trend movement, Cyclical movement.

A first-order autoregressive model was modified with the trend and cyclical movements to generate the streamflow sequences. Three main portions were involved in this modified model, i.e., six-year cycle with trend changing; six-year cycle without trend changing; and both annual and six-year cycles with trend changing. The synthetic sequences of monthly streamflow sequences were compared with the historical records obtained from the Kissimmee River basin by using the Chi-Square test for goodness-of-fit. The results indicated that the newly proposed model has a better solution than the original model because the trend and cyclical movements involved in generating sequences are much closer to the historical records. (Sims-ISWS)
W78-12157

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO. 4 REGRESSION OF LOW FLOWS ON PHYSIOGRAPHIC PARAMETERS,
Department of the Environment, Vancouver (British Columbia). Inland waters Directorate (Pacific Region).
R. M. Leith.
Report Series No. 57, 1978, 26 p, 4 fig, 3 ref, 2 tab, 4 append.

Descriptors: *Streamflow, *Low flow, *Regional analysis, *Average, *Annual, Flow, Statistics, Precipitation(Atmospheric), Sampling, Hydrometry, Drainage area, Geomorphology,

Parametric hydrology, Calibration, Canada, *British Columbia, *Vancouver Island.

Mean annual seven-day low flows have been regressed on basin-averaged physiograhic parameters for 85 hydrometric stations in British Columbia. To examine the effect of number of stations used in the analysis several sets of random samples were selected from the 85 stations and equations developed for each sample. Finally, for the complete 85-station sample, the following equation was developed for unit mean low flow (UMLF), in cfs per square mile: UMLF equals 0.6689 plus 0.0130 NPOSI minus 0.0001170 ELEV plus 0.005350 SLP percent minus 0.0007083 DSN minus 0.0008782 DSNW plus 0.02073 RALKE minus 0.00009903 BHW plus 0.000008956 SENW plus 0.00001215 SEW minus 0.000003755 SESW. This equation explained 65 percent of the variance and had a standard error of estimate of 0.204 or 52 percent percent of the response mean. Examination of the residuals for the preceding equation provided evidence for the geographical division of the original sample into three regions. Equations were developed for each region. The regionalization procedure was tested by a split sample which indicated that better estimates were made with the regional equations than with the overall equation. (WATDOC)
W78-12257

STOCHASTIC MODELING OF WATERSHED SYSTEMS,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 2A.
W78-12264

RIVER RUNOFF AND THE YIELD OF DAMS IN RHODESIA,
For primary bibliographic entry see Field 4A.
W78-12475

RIVER MANAGEMENT,
R. M. Wild.
Rhodesia Science News, (Salisbury), Vol 11, No 6, p 127-132, 1977. 3 fig, 1 map.

Descriptors: *Water resources, *Management, Rivers, *Future planning, Water demand, Dam construction, Financing, Design standards, Droughts, Water costs, *Rhodesia, Africa.

The purpose of river management is to ensure the optimum development and use of our water resources. It presents the basic problem of industry, business and economics: how to make the best use of the scarce resources available, operating within constraints such as limitations of data, authority, the law, finance, staff and supply. It is the function of management to identify the constraints and where possible, to work for their removal but otherwise to work as efficiently as possible within them. (So Afr Water Info Ctr)
W78-12476

RELIABILITY OF FLOOD WARNING,
Illinois Univ. at Urbana-Champaign. Dept. of Civil and Ceramic Engineering.
For primary bibliographic entry see Field 6F.
W78-12528

APPLICATION OF STOCHASTIC MODELS TO RESERVOIRS NEAR THE ALPS,
Technische Univ., Munich (West Germany). Inst. for Hydraulics and Hydrology.
For primary bibliographic entry see Field 4A.
W78-12529

AN ADAPTIVE ALGORITHM FOR ANALYZING SHORT-TERM STRUCTURAL AND PARAMETER CHANGES IN HYDROLOGIC PREDICTION MODELS,
Princeton Univ., NJ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-12551

EVALUATION OF DETENTION BASINS FOR CONTROLLING URBAN RUNOFF AND SEDIMENTATION,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 2A.
W78-12608

APPROXIMATION OF A NORMAL DISTRIBUTION BY A THREE-PARAMETER LOG NORMAL DISTRIBUTION,
Washington Univ., Seattle. Dept. of Civil Engineering.
S. J. Burges, and K. Hoshi.
Water Resources Research, Vol 14, No 4, p 620-622, August 1978. 1 fig, 3 tab, 4 ref, 1 append.

Descriptors: *Analytical techniques, *Data processing, *Hydrology, *Streamflow, Equations, Formulation, Mathematical models, Mathematics, Normal distributions, Log normal distributions.

A procedure was given where mixed normal and log normal populations exist; the normal populations can be approximated with three-parameter log normal (3PLN) distributions to facilitate multivariate stochastic hydrologic disaggregation or generation approaches. Approximations can be made by assuming an arbitrary small value of skew G(0.05-0.01). For G less than or equal to 0.1, the appropriate parameters for a 3PLN distribution can be approximated as dimensionless location parameter. Equations for the parameters were given. (Sims-ISWS)
W78-12631

HOLOCENE STRATIGRAPHY IN FLOOD FREQUENCY ANALYSIS,
Denver Univ., CO. Dept. of Geography.
J. E. Costa.
Water Resources Research, Vol 14, No 4, p 626-632, August 1978. 6 fig, 37 ref. USGS 14-08-0001-G-517.

Descriptors: *Flood frequency, *Stratigraphy, *United States, *Radioactive dating, Erosion, Trees, Analytical techniques, Floods, Disasters, Frequency, Data processing, Geology, Organic matter, Soil properties, Floodplains, *Holocene stratigraphy.

The risk of rare catastrophic flood events is extremely difficult to evaluate by using conventional flood frequency analyses. The true return period may be so long compared to gaging station or historical records that the stratigraphic record of the Holocene (0-10,000 years B.P.) may be the best method for assessing the risk of outstanding floods. Several geologic methods applicable to flood frequency analysis are: (1) tree ring analysis of floodplain trees destroyed or scarred by floodwaters, (2) radiocarbon dating of organics in deposits (landforms) eroded by recent floods, (3) radiocarbon dating or organic materials in older flood deposits, (4) pollen analysis and radiocarbon data of organic materials in lenses of fine-grained alluvium buried by coarse flood deposits, (5) radiocarbon dating of soil horizons or organic material in slack-water deposits, (6) radiocarbon or archaeological dating of soils developed in older flood deposits, and (7) dating of landforms eroded or buried by floods based on changes in quantitative soil properties versus time. Using one or more of the above geologic techniques, return periods of some recent catastrophic floods in the United States are: 1976 Big Thompson River, Colorado, 5000 years; 1964 Klamath River, California, 100 years; 1972 Western Run, Maryland, 2100 years; and 1972 Elm Creek, Texas, 400 years. (Sims-ISWS)
W78-12632

FLOOD-FREQUENCY ANALYSES WITH PRERECORD INFORMATION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-12729

FRICTION COEFFICIENT VARIATION WITH FLOW IN AN URBAN STREAM,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 8B.
W78-12863

STATISTICAL MODELS AND METHODS FOR RIVERS IN THE SOUTHWEST,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
S. Yakowitz.
Hydrology and Water Resources in Arizona and the Southwest, Vol. 7, p 147-151, 1977. 1 fig, 15 ref.

Descriptors: *Statistical models, *Model studies, *Simulation analysis, Computer models, Hydrologic data, River flow, River forecasting, Streamflow forecasting, Southwest U.S.

Essential in decision making relating to irrigation planning, reservoir control, flood forecasting structural design for flood retention is the ability to create statistical models of riverflow. This author believes that presently used models are unsatisfactory principally because derived simulations bear little resemblance to southwestern river records. Presented in this paper is a general Markov model which assumes only that rivers have a finite memory. Procedures for calibration are illustrated and evidence is presented for the success of this method is simulating typical flows. (Tickes-Arizona)
W78-12925

2F. Groundwater

CARBON CONTENTS AND SOURCES IN GROUND WATERS OF THE CENTRAL PLATTE REGION IN NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 5A.
W78-12103

MAPPING OF EARTH FISSURES IN LAS VEGAS VALLEY, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
R. O. Patt, and G. B. Maxey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 969, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Center, Publication No. 41501, March 1978. 19 p, 8 fig, 11 ref. A-071-NEV(1).

Descriptors: Fissuring, Subsidence, Groundwater effects, *Nevada, *Mapping, *Las Vegas Valley(Nev).

In 1948 Maxey and Jameson theorized that certain scarp features in the Las Vegas Valley may be related to differential compaction of alluvium. Earth fissures have been observed for at least 20 years near some of these fault scarps, as well as associated with several high yield wells. Seven zones of fissuring in the vicinity of Las Vegas are outlined and discussed. Fissures in Las Vegas Valley can be correlated with the following features: (1) fault scarps (compaction or tectonic); (b) well fields; and (c) tectonic activity. Several features are noted which may be interrelated with subsidence and fissuring in Las Vegas Valley. Damage to streets and homes as a result of fissuring is discussed.
W78-12107

WISCONSIN GROUND WATER - AN ANNOTATED BIBLIOGRAPHY, 1973-1977.
Wisconsin Univ., Madison. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 520, Price codes: A05 in paper copy, A01 in microfiche. Bibliography, Report WIS-WRC 78-06, 86 p. Compiled by A. Zaporozec. OWRT A-081-WIS(2), 14-34-0001-7106.

Descriptors: *Groundwater, *Bibliographies, Information exchange, Publications, Abstracts, *Wisconsin.

First annotated supplement to the Bibliography of Wisconsin Groundwater 1834-1972, includes 254 citations to publications on various aspects of Wisconsin's groundwater resource which were published during the years 1973 through 1977. The number of entries is indicative of the continuing interest and concern in the field of groundwater in Wisconsin and documents the need for regular bibliographical control. The references were annotated from the following source materials: reports in professional and trade magazines and journals; reports, studies and unpublished material in federal, state and local files; books, documents, and conference proceedings; and student theses in the University of Wisconsin libraries. The references are arranged by author for each calendar year, and accompanied by author, county, general reference indexes. An abbreviation in the upper right corner of each entry indicates the library where the reference is located. (See also W78-12600)
W78-12135

A STUDY OF THE KALAMOS SPRINGS IN GREECE WITH ENVIRONMENTAL ISOTOPES,
International Atomic Energy Agency, Vienna (Austria).
B. R. Payne, J. Leontiadis, Ch. Dimitroulas, A. Dounas, and G. Kallergis.
Water Resources Research, Vol. 14, No. 4, p 653-658, August 1978. 4 fig, 1 tab, 4 ref.

Descriptors: *Springs, *Recharge, *Isotope studies, Geology, Groundwater, Stable isotopes, Sampling, Chemical analysis, Data processing, Mixing, Groundwater movement, Coasts, Water chemistry, *Greece.

Variations in the stable isotopic composition of water were used to define the area of recharge to the Kalamos springs, issuing brackish water near the coast. The two possible areas of recharge differed in elevation, so that their stable isotope indices were different owing to the altitude effect, whereby the stable isotopic composition of precipitation contains less deuterium and 180 with an increase of elevation. The results of the study showed that the area of recharge is located in the Parnis system at elevations greater than 570 m. (Sims-ISWS)
W78-12144

A STUDY OF UNCONFINED NON-DARCY SEEPAGE TO A WELL,
Indian Inst. of Tech., Kharagpur (India). Dept. of Civil Engineering.
B. S. Rama Rao, and R. N. Das.
Journal of Hydrology, Vol. 38, No. 1/2, p 161-178, July 1978. 5 fig, 5 tab, 20 ref.

Descriptors: *Seepage, *Wells, *Water wells, *Model studies, Mathematical models, Hydraulic conductivity, Free surfaces, Groundwater, Groundwater movement, Porous media, Darcys law, Water levels, Water table, Flow, Hydrology, Non-Darcy seepage.

A study was made, by the finite-element method, of a few specific cases of the problem of steady non-Darcy seepage to a fully penetrating well in an unconfined aquifer based on Forchheimer's non-linear seepage law. Two types of problems were considered: in one type the entire seepage domain around the well was assumed to experience non-Darcy flow; and in the other type, the seepage domain close to the well was assumed to have non-Darcy flow, with the rest of the domain having Darcy flow. A qualitative appraisal was made of the difference between Darcy and non-Darcy flow conditions in relation to the discharge into the well, the form of the free surface, the potential and the potential gradients in the flow domain. (Sims-ISWS)
W78-12151

NUMERICAL SOLUTION OF UNSTEADY FLOW PROBLEMS IN POROUS MEDIA BY SPLINE FUNCTIONS,
Technical Univ. of Istanbul (Turkey). Dept. of Petroleum Engineering.
A. H. Dogru, W. Alexander, and R. L. Panton.
Journal of Hydrology, Vol. 38, No. 1/2, p 179-195, July 1978. 6 fig, 2 tab, 19 ref.

Descriptors: *Unsteady flow, *Porous media, *Model studies, Mathematical models, Mathematics, Equations, Aquifers, Groundwater movement, Flow, Analytical techniques, Hydrology, *Spline functions.

Two dimensional spline functions were utilized in the solution of linear parabolic partial differential equations which describe the transient flow of water in porous aquifers with and without a sink within the domain. A collocation method of solution was used, and several types of spline representations were investigated. Results were compared with the finite-difference solutions and with the analytical solutions. B-splines with an extended region of definition were concluded to be superior. For problems with a sink, the B-splines alone were not accurate; however, supplementing the splines with a logarithm term produced very good results. (Sims-ISWS)
W78-12152

THE DEPENDENCE OF THE RESIDUAL GRAVITY ON HYDRAULIC CONSTANTS IN GLACIAL DEPOSITS,
Rhode Island Univ., Kingston. Dept. of Geology.
R. K. Frohlich.
Water Resources Bulletin, Vol. 14, No. 4, p 931-941, August 1978. 8 fig, 2 tab, 8 ref. NSF HE575-12253.

Descriptors: *Glacial aquifers, *Gravity studies, *Groundwater, *Rhode Island, On-site investigations, Glacial drift, Glacial sediments, Aquifers, Hydraulic conductivity, Profiles, Underground streams, Transmissivity, Bedrock, Wells, Water resources, Residual gravity.

Buried glacial stream channels contain large and easily accessible groundwater resources. Gravity surveys have been applied frequently for their location. A gravity survey in the geohydrologically explored Wood River Valley Area of southern Rhode Island showed extreme lows of -2 mgals over channel depths of maximal 300 feet. Three gravity profiles were observed in east-west direction across a north-south striking stream channel. The bedrock depth increases rapidly towards the south from 130 to 300 feet. The gravity lows observed across each profile are not related to the bedrock depth but rather to the saturated thickness of the main aquifer and its hydraulic transmissivity. Well logs indicated that the large change of bedrock depth is solely due to an increase of till of low permeability. The volume of the glacial outwash, which is the major groundwater resource, changed little underneath the three profiles. The gravity lows appear to be related directly to the density contrast between glacial outwash and till. The response to the hydraulically more pertinent units renews the interest in the gravity method as it may have a potential to estimate yields of hydrologically complex aquifers. (Sims-ISWS)
W78-12156

FRESNO, CALIF., SUBSURFACE DRAIN COLLECTOR-DEEP WELL RECHARGE SYSTEM,
Agricultural Research Service, Fresno, CA. Water Management Research.
For primary bibliographic entry see Field 4B.
W78-12158

COMPREHENSIVE ANALYSIS OF WATER-TABLE AQUIFER TEST DATA,
Upper Mississippi River Basin Commission, Twin Cities, MN. Minnesota.
For primary bibliographic entry see Field 4B.
W78-12165

ON THE STATE OF SATURATION OF GROUNDWATER WITH RESPECT TO DISSOLVED CARBONATES, EDWARDS ARTESIAN AQUIFER, SOUTH-CENTRAL TEXAS,
San Diego State Univ., CA. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2K.
W78-12216

EFFECT OF BALCONES FAULTS ON GROUNDWATER MOVEMENT, SOUTH CENTRAL TEXAS,
San Diego State Univ., CA. Dept. of Geological Sciences.
P. L. Abbott.
The Texas Journal of Science, Vol 29, Nos 1 and 2, p 5-14, Sept 1977. 3 fig, 13 ref.

Descriptors: *Groundwater movement, *Subsurface flow, Fractures(Geologic), *Texas, *Balcones fault(Tex), *Faults(Geologic).

According to evidence presented in this paper, the fault surfaces in the Balcones system are not the major sites of cavern development characteristic of south central Texas. Various fault-defined blocks have had different degrees of cavern formation. The larger faults in Comal County have acted as barriers diverting ground-water flow to the northeast. The location of most major fault systems was determined largely by the porosity and permeability, in addition to structural controls incident to Balcones faulting, created by groundwater flow patterns established millions of years ago. Modern cave locations are thus inherited and may demonstrate no easily discernible relationship to modern topography and stream courses. (Russell-Arizona)
W78-12219

COMPUTER ESTIMATES OF NATURAL RECHARGE THROUGH SOILS IN SOUTHERN ARIZONA, U.S.A.,
Geological Survey of Israel, Jerusalem; and Ben Gurion Univ. of the Negev, Beesheba (Israel). Inst. of Desert Research.
U. Kafri, and J. Ben Asher.
Journal of Hydrology, Vol 38, p 125-138, July, 1978. 6 fig, 2 tab, 8 ref.

Descriptors: *Natural recharge, *Soil water movement, *Hydrologic budget, Computer models, Mathematical models, Arizona.

Rainfall in the Sonoita and Cienega Basins in Arizona is characterized by intense thunderstorms of 30 to 60 minutes in the summer and rainy days (averaging 2) in the winter. This may explain why conventional water balance methods employing long-term average values of rainfall, runoff and evapotranspiration yield values of natural recharge which have little correlation with rainfall for these basins. A different approach for calculating recharge through soils is proposed, based on the basins' characteristics and rainfall regimes.

This model deals with individual rainfall events, considering moisture distribution, evapotranspiration and deep drainage as initial and boundary conditions. The results show that while winter rainfall is smaller than summer rainfall, its computed contribution to recharge through soils is considerably higher. Various factors affecting recharge are also discussed. (Russell-Arizona)
W78-12232

USE OF HYDROCHEMICAL TECHNIQUES IN GROUNDWATER EXPLORATION IN THE VENTERSTAD AREA, CAPE PROVINCE (IN AFRIKAANS),
P. J. Van der Linde, and F. D. I. Hodgson.
Water SA (Pretoria) Vol 3, No 3, p 166-171, 1977, 9 ref, 4 fig, 1 tab.

Descriptors: *Hydrochemistry, *Groundwater sources, Water resources evaluation, Chemical analysis, Groundwater recharge, Carbon radioisotopes, Tritium, Aquifers, Sulphate, Hydrogeochemistry, Groundwater flow, *Cape Province, *South Africa.

The object of this research is to demonstrate the extent to which hydrochemical techniques can be used in preliminary groundwater resource evaluations. A theoretical background of the techniques applied is presented and the validity of the method is tested against actual field data from the Venterstad area. From chemical analyses it is concluded that the groundwater can be grouped into two categories, namely recently recharged groundwater and old groundwater. These conclusions are verified by a comparison of the results with actual 14C and tritium age determinations on some of the samples. The old groundwater can undoubtedly be connected with a deapseated aquifer, which in turn could have been responsible for the flooding of the nearby Orange-Fish River Tunnel in 1969. A prominent feature of some of these old groundwaters, is a low concentration of sulfate, which can be ascribed to bacterial action. The consistency of the groundwater chemistry, with regard to time, is also demonstrated. It is suggested that future groundwater development projects in the Southern Orange Free State should be limited to the older, more consistent source. (So Afr Water Info Ctr)
W78-12465

RESTORATION OF THE DOLOMITE WATER BALANCE AT WESTERN AREAS GOLD MINING COMPANY LTD,
For primary bibliographic entry see Field 4B.
W78-12488

BIBLIOGRAPHY AND INDEX OF WISCONSIN GROUNDWATER, 1851-1972: ADDENDUM 1834-1972.
Wisconsin Univ.-Madison. Water Resources Center.
For primary bibliographic entry see Field 10C.
W78-12600

GROUND WATER IN THE CALIFORNIA WATER QUANDRY,
Environmental Defense Fund, Washington, DC.
For primary bibliographic entry see Field 4B.
W78-12615

SPATIAL AND TEMPORAL HYDROCHEMICAL VARIATIONS IN A SEMICONFINED BURIED CHANNEL AQUIFER: ESTERHAZY, SASKATCHEWAN, CANADA,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 2K.
W78-12637

ARTIFICIAL GROUND-WATER RECHARGE AS A WATER-MANAGEMENT TECHNIQUE ON THE SOUTHERN HIGH PLAINS OF TEXAS AND NEW MEXICO,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-12725

GROUND-WATER RESOURCES OF ADAMS AND BOWMAN COUNTIES, NORTH DAKOTA,
Geological Survey, Bismark, ND. Water Resources Div.
M. G. Croft.
North Dakota County Ground-Water Studies 22--Part III, and North Dakota Geological Survey Bulletin 65--Part III, 1978. 54 p, 18 fig, 4 plates, 7 tab, 51 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Groundwater availability, *Water quality, *Hydrogeology, Water yield, Water levels, Water utilization, Potential water supply, *North Dakota, Adams County, Bowman County.

The most important aquifer in Adams and Bowman Counties, N.Dak., is in the Fox Hills Formation and the basal part of the Hell Creek Formation. The aquifer system, which ranges in thickness from 340 to 520 feet, crops out in western Bowman County and is as much as 940 feet below land surface in Adams County. The beds consist of fine- to medium-grained sandstone interbedded with siltstone and claystone. The transmissivity ranges from 110 feet squared per day in western Bowman County to 540 feet squared per day in eastern Adams County. Bowman, Hettinger, Reeder, and Scranton pump about 570 acre-feet of water annually from the aquifer system. Water from the aquifer system is generally clear and lower in dissolved solids and sulfate than water in the overlying aquifer systems. Dissolved solids in water samples analyzed ranged from 504 to 1,680 milligrams per liter and averaged 1,050 milligrams per liter. (Woodard-USGS)
W78-12727

DIGITAL MODEL OF GROUND-WATER FLOW IN THE PICEANCE BASIN, RIO BLANCO AND GARFIELD COUNTIES, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
J. B. Weeks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 341, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 78-46, June 1978. 108 p, 6 fig, 2 tab, 12 ref.

Descriptors: *Groundwater movement, *Model studies, *Computer models, *Analytical techniques, *Aquifer characteristics, Oil shales, Hydrogeology, Equations, *Colorado, Rio Blanco County(Colo), Garfield County(Colo), *Piceance basin(Colo), Unita Formation, Green River Formation.

The digital model used to simulate ground-water flow in the aquifer system in the basin drained by Piceance and Yellow Creeks in northwestern Colorado is described in detail. The model is quasi three-dimensional in that it simulates groundwater flow in a multiaquifer system by assuming horizontal flow in the aquifers and vertical flow through the confining layers separating the aquifers. The model uses the iterative alternating-direction implicit procedure to solve the finite-difference flow equations. The digital model is documented by a program listing and flow charts. Data used in the model and sample output are presented to document the simulation of steady-state flow in the aquifer system. The variables used in the computer program and program options are discussed in detail. (Woodard-USGS)
W78-12731

HYDROLOGIC ANALYSIS OF THE U.S. BUREAU OF MINES' UNDERGROND OIL-SHALE RESEARCH-FACILITY SITE, PICEANCE CREEK BASIN, RIO BLANCO COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 8B.
W78-12732

METHOD OF ESTIMATING NATURAL RECHARGE TO THE EDWARDS AQUIFER IN THE SAN ANTONIO AREA, TEXAS,
Geologica Survey, Tuscaloosa, AL. Water Resources Div.
C. Puente.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 364, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 78-10, April 1978. 34 p, 11 fig, 1 tab, 23 ref.

Descriptors: *Groundwater recharge, *Estimating, *Methodology, *Surface-groundwater relationships, *Aquifer characteristics, Hydrogeology, Infiltration, *Texas, *Edwards aquifer(Tex), *San Antonio area(Tex).

The method described for estimating annual recharge to the Edwards aquifer in the San Antonio area, Texas is basically the same method used by various investigators who have made recharge estimates dating back to 1934. The estimated annual recharge to the Edwards aquifer is shown by basin from 1934 to 1975. Recharge estimates made since 1953 are considered to be more accurate because gaging stations were installed after 1953 in several areas that were previously ungaged. Occasionally, the water-balance equations used for computed recharge are complicated by the occurrence of the heavy rain-storms in the infiltration area and in areas between the lower edge of the infiltration area and the lower gaging stations. In some of the computations, the outflow at the lower gage may be greater than the inflow at the upper gage. Under these conditions, the recharge is assumed to be zero only during certain times in the Blanco River basin, where high aquifer-head conditions produce discharge from the aquifer. In all other basins, estimates of runoff are adjusted to reflect the heavy rainfall in the area between the upper and lower gages. The long-term average estimate of annual recharge is probably representative of the true average, because the averaging procedure of the many estimates tends to cancel out the major errors. Monthly estimates of recharge during periods of high runoff probably contain the major errors. (Woodard-USGS)
W78-12733

PLAN OF STUDY FOR THE HIGH PLAINS REGIONAL AQUIFER-SYSTEM ANALYSIS IN PARTS OF COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-12739

LAND SUBSIDENCE IN THE SANTA CLARA VALLEY,
Geological Survey, Sacramento, CA.
J. F. Poland.
Water Spectrum, Vol. 10, No. 2, Spring, 1978, p 11-16. 7 fig.

Descriptors: *Land subsidence, *Subsidence, *Artesian heads, *Pore pressure, *California, *Santa Clara Valley(Calif), Groundwater mining.

Land subsidence caused by the withdrawal of water is a particular problem of arid regions that depend heavily on groundwater to fill their water needs. Subsidence in the Santa Clara Valley of

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California caused a total of about $15-20 million of damages. It resulted from a decline in the artesian head and was stopped by raising the head to equal or exceed the maximum pore pressures in the Aquitards. If the artesian head is maintained at 1-20 feet above the 1971-73 levels, subsidence will not reoccur. (Russell-Arizona)
W78-12941

2G. Water In Soils

EFFECT OF RAINFALL AND SUBSEQUENT DRYING ON NITROGEN AND PHOSPHORUS CHANGES IN A DRYLAND FALLOW LOAM,
Department of Agriculture, Swift Current (Saskatchewan). Research Station.
For primary bibliographic entry see Field 5B.
W78-12109

NEW ASPECTS OF SOIL FRACTURING IN CLAY,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 8D.
W78-12161

COMPUTER ESTIMATES OF NATURAL RECHARGE THROUGH SOILS IN SOUTHERN ARIZONA, U.S.A.,
Geological Survey of Israel, Jerusalem; and Ben Gurion Univ. of the Negev, Beesheba (Israel). Inst. of Desert Research.
For primary bibliographic entry see Field 2F.
W78-12232

EVALUATION OF LYOPHILIZATION METHOD OF DISAGGREGATING SAND, SILT AND CLAY,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
E. F. Dolan, and M. A. Cashman.
Technical Bulletin, No. 108, 35 p, 16 fig, 4 ref. (1978).

Descriptors: *Sands, *Silts, *Clays, *Freeze drying, Beds, *Bottom sediments, Particle size, Degradation(Decomposition), Methodology, Analysis, Evaluation, *Labconco Freeze Dryer - 3, *Lyophilization method, *Over-drying method.

The Sediment Survey program includes the collection of 'bed material' samples that are analyzed for particle size distribution. The present method of oven-drying requires vigorous grinding with a mortar and pestle to disaggregate the particles. The adaptation of the freeze dryer reduces this grinding time considerably. This report evaluates the freeze dryer or lyophilization method of disaggregating sands, silts and clays for particle size analysis and compares it with the oven-dried method presently used in the Sediment Laboratories of the Water Survey of Canada. (WATDOC)
W78-12258

DISSOLUTION OF ARSENIC FROM WATER-LOGGED AND AERATED SOIL,
Missouri Univ.-Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-12267

FLOW OF KAOLINITE AND SEWAGE-SLUDGE SUSPENSIONS IN SAND-SILT POROUS MEDIA,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-12606

CLASSIFICATION AND ENGINEERING PROPERTIES OF DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 8G.
W78-12621

FEASIBILITY STUDY OF GENERAL CRUST MANAGEMENT AS A TECHNIQUE FOR INCREASING CAPACITY OF DREDGED MATERIAL CONTAINMENT AREAS,
Texas A and M Research Foundation, College Station.
For primary bibliographic entry see Field 8D.
W78-12622

ANALYSIS OF A CAPILLARY HYSTERESIS MODEL BASED ON A ONE-VARIABLE DISTRIBUTION FUNCTION,
Colorado State Univ., Fort Collins. Engineering Research Center.
Y. Mualem, and H. J. Morel-Seytoux.
Water Resources Research, Vol 14, No 4, p 605-610, August 1978. 11 fig, 12 ref. NSF ENG76-11542.

Descriptors: *Hysteresis, *Soil moisture, *Model studies, *Mathematical models, *Theoretical analysis, Wetting, Drying, Soils, Porous media, Soil water, Soil water movement, Laboratory tests, Pores, Soil physics, Soil science, Model calibrating, Drying curves.

Parlange's model corresponds to a special case of Mualem's similarity hypothesis f(psi sub w, psi sub d) = h(psi sub w)1(psi sub d) in which h(psi) is set at unity for all psi values. Interpreted in terms of the soil water domain theory, this assumption implies that the relative pore volume of the domains is distributed uniformly in respect to the wetting radius (or to psi sub w). In this paper the proper mathematical equation was derived for calibrating the model from the experimental main drying curve. The applicability of Parlange's model for the soil water hysteresis was analyzed theoretically and extensively tested for different types of porous media. Theoretical hysteretic curves derived by direct implementation of Parlange's model were compared with experiments. These comparisons showed that Parlange's model contradicts well-known properties of the soil moisture characteristics. The good results reported by Parlange were not obtained when actual measured curves of the hysteresis loop were used. Whether the main branch of hysteresis for wetting or for drying is used in calibration, badly distorted shapes of hysteresis curves are obtained. Parlange's suggestion for calibrating the model on the basis of the main drying curve plus one additional point from the main wetting curve is considered too arbitrary to be reliable. (Sims-ISWS)
W78-12628

SOIL WATER FLOW MODEL WITH TWO-DIMENSIONAL AUTOMATIC GAMMA RAY ATTENUATION SCANNER,
Science and Education Administration, Riverside, CA. Salinity Lab.
C. Dirksen, and M. J. Huber.
Water Resources Research, Vol 14, No 4, p 611-614, August 1978. 2 fig, 17 ref.

Descriptors: *Soil water movement, *Moisture content, *Laboratory tests, *Instrumentation, Model studies, Soil water, Gamma rays, Moisture meters, Soil moisture meters, Automation, Automatic control, Equipment.

Described is a physical laboratory model to study two-dimensional transient water and solute transport in unsaturated soil, including water uptake by roots. It features an automatic two-dimensional gamma ray attenuation scanner for measuring soil water content. Automation is obtained with a simple closed loop control circuit. After a gamma count is transmitted to the teletypewriter, a signal is sent to the hydraulically moved scanner to search for the next grid point. Upon arrival, the scanner sends a signal back to initiate another data acquisition sequence, and so on. In this way, synchronization between counter and scanner is assured independent of counting time, travel time, configuration of grid points, temporary slowdown, etc. It also eliminates dead time between grid points for any recording pattern. Grid points are established by an array of holes that trap the core of a solenoid actuator. The configuration of grid points can be changed easily by opening and closing the desired holes. This mechanical trapping was found to be simpler and more accurate than a potentiometric control. The soil water flow model is constructed in modules. It can be used as one unit of 3.15 by 1.07 by 0.178 m and inclined up to 30 degrees, or it can be subdivided into up to 8 compartments, each with its own drainage filter tubes. The front glass walls allow visual observations of soil packing, wetting fronts, root distribution, etc. The back aluminum walls allow installation of instruments, such as tensiometers, salinity sensors, and psychrometers. (Sims-ISWS)
W78-12629

A FIELD-MEASURING INSTRUMENT OF SATURATED PERMEABILITY KF IN UNDISTURBED SOIL SAMPLES BY THE CORE-SAMPLER METHOD,
Geologisches Landesamt Nordheinestfalen, Krefeld (West Germany).
W. Kley, and U. Krahmer.
Ground Water, Vol 16, No 5, p 354-356, September-October 1978. 4 fig, 10 ref.

Descriptors: *Permeability, *Sampling, *Equipment, *Cores, Soil water, Saturated flow, Saturated soils, Measurement, On-site data collections, Instrumentation, Soil physics, Soil science, Soil core samplers.

A field instrument to determine saturated permeability (kf) was presented. It is possible to take several samples and obtain measurements quickly. The instrument, adapted for a series of measurements, permits the identification of erroneous values and allows repeated measurements. Calculating permeability values through self-made tables or nomograms make field results immediately available for the description of the cross section. Transporting the samples to the laboratory is no longer required. The instrument is sturdy and requires little maintenance. (Sims-ISWS)
W78-12638

RELATIONSHIPS BETWEEN SOIL SALINITY AND THE SALINITY OF APPLIED WATER IN THE SUISUN MARSH OF CALIFORNIA,
California State Dept. of Fish and Game, Sacramento. Wildlife Management Branch.
G. L. Rollins.
California Fish and Game, Vol 59, No 1, p 5-35, January, 1973. 15 fig, 4 tab, 16 ref.

Descriptors: *Salinity, *Soil chemistry, *Water quality, *Waterfowl, *Leaching, *Marshes, Wetlands, Rooted aquatic plants, California, Soil chemical properties, Suisun Marsh(CA).

Part I of this investigation was conducted on four private duck clubs under water management practices typical of those used throughout the suisun marsh. Part II was conducted in a test pond where water management and surface water salinities were controlled. A significant correlation existed between the salinity of applied water and the salinity in the first and second feet of soil. The flooding of marsh soils with highly saline water, under present marsh management practices, would greatly increase existing soil salinities. The leaching of marsh soils by alternate flooding and draining with low salinity water was an effective means of reducing soil salinity. The type of water management practiced by the duck clubs produced extremely high soil salinities which inhibit the production of valuable waterfowl food plants. Leaching is recommended as a general practice in Suisun Marsh to enhance the production of the

more important waterfowl food plants. A water management schedule is provided as a guide to duck club owners and operators to maximize waterfowl food production. (Stihler-Mass)
W78-12692

SURFACE HYDROLOGY OF PEATLANDS,
Michigan Univ., Ann Arbor. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2H.
W78-12708

MINNESOTA'S PEAT RESOURCES: THEIR CHARACTERISTICS AND USE IN SEWAGE TREATMENT, AGRICULTURE AND ENERGY,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W78-12717

RESISTANCE TO WATER UPTAKE IN A DOUGLAS FIR FOREST,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 2I.
W78-12840

THERMODYNAMIC EQUILIBRIUM BETWEEN ICE AND WATER IN POROUS MEDIA,
Norwegian Geotechnical Inst., Oslo (Norway).
For primary bibliographic entry see Field 2C.
W78-12841

SOIL WATER RETENTION AS RELATED TO PARTICLE SIZE IN SELECTED SANDS AND LOAMY SANDS,
Bureau of Reclamation, Bismark, ND. Missouri-Souris Projects Office.
E. D. Rivers, and R. F. Shipp.
Soil Science, Vol 126, No 2, p 94-100, August 1978. 1 fig, 3 tab, 7 ref.

Descriptors: *Soil water, *Particle size, *Soil texture, *North Dakota, Soils, Sands, Loam, Laboratory tests, Soil tests, Retention, Soil types, Field capacity, Soil science, *Soil water retention, *Glacial Lake Souris basin(ND).

Sands and loamy sand within the Glacial lake Souris basin in North Dakota vary considerably from one area to another in their particle size distribution. The objective was to relate water retention of these sandy soil textural classes to particle size percentage. Water retention percentages, on an oven-dry basis, were determined for samples at field capacity under field conditions and also at 1/10-, 1/15-, and 1/20-bar soil water suction for air-dried, less than 2-mm samples in conventional porous ceramic plate-pressure pot equipment. No single soil water suction produced water retention values adequately representing field capacity for all textures. In most instances, the percentage of very fine sand alone and in combinations with the percentages of silt and clay were correlated significantly with soil water values. (Sims-ISWS)
W78-12842

FIELD CALIBRATION AND USE OF THE NEUTRON MOISTURE METER ON SOME NIGERIAN SOILS,
Ibadan Univ. (Nigeria). Dept. of Agronomy.
O. Babalola.
Soil Science, Vol 126, No 2, p 118-124, August 1978. 4 fig, 2 tab, 23 ref.

Descriptors: *Nuclear moisture meters, *Calibrations, *Instrumentation, *Moisture content, On-site investigations, Laboratory tests, Soils, Soil types, Soil texture, Moisture meters, Measurement, Equipment, Soil water, Curves, Soil properties, Soil science, *Nigeria.

This investigation was carried out because of a need to monitor soil moisture content periodically in the field. The neutron probe eqipment (Troxler, model 104 A) was calibrated in the field on 4 soil profiles of contrasting soil physical properties. The effects of gravel content and gravel mineralogical composition on the thermalization of neutrons also were investigated in the laboratory. An oil drum was filled with mixtures of gravel and a subsoil fine earth fraction. Gravel concentrations of 0, 50, and 75% were used. Quartz gravel and iron/manganese concretions were used separately. The correlation coefficient of the regression equation, Y = a + bx, where Y is the count ratio and x is the mositure content, which was obtained for the different soil layers in the field, ranged between 0.84 and 0.98. The lower correlation coefficient, obtained mostly in the gravelly layers, was attributed to both spatial variability of the soil physical properties and the inherent problem associated with gravimetric moisture determination in gravelly soils. Although it was possible to establish one single calibration curve for al soils and depths (r = 0.89), the use of the curve to infer absolute moisture content would lead to an appreciable error. Also, the factory calibration curve will find its best use only in interpreting relative changes in moisture content. (Sims-ISWS)
W78-12843

LONGITUDINAL AND TRANSVERSE DISPERSION COEFFICIENTS IN UNSATURATED PLAINFIELD SAND,
Wisconsin Univ.-Madison. Dept. of Soil Science.
D. F. Yule, and W. R. Gardner.
Water Resources Research, Vol. 14, No. 4, p 582-588, August 1978. 7 fig, 2 tab, 19 ref.

Descriptors: *Dispersion, *Soils, *Sands, *Laboratory tests, Equipment, Instrumentation, Data processing, Mathematical models, Inflow, Discharge(Water), Soil water, Pore water, Soil water movement, Velocity, Unsaturated flow, Diffusion, Soil physics, Soil science, Transverse dispersion, Longitudinal dispersion, Soil columns.

The relationship between the longitudinal and transverse dispersion coefficients (D sub L and D sub T) and the pore water velocity (v) and the effective diffusion coefficient (D sub e) was determined for v between 0.01 and 0.28 cm/min in a vertical unsaturated column (L = 23 cm) of C horizon Plainfield sand. The inflow and outflow control systems on the soil column consisted of rows of porous ceramic tubes with individual adjustable pressure controls. Uniform inflow and outflow were achieved across the column, and v was maintained constant during each experiment. An analysis of the transverse spread produced indicated that the effect of apparatus-induced dispersion was less than 10%. D sub L (sq cm/min) was linearly related to v(cm/min) (D sub L = 0.216v + 0.0032; sq r = 0.90). Slightly larger D sub L was found in experiments with H2O replacing Cl than in experiments with Cl replacing H2O. D sub L at the lowest v was 2 orders of magnitude greater than D sub e. D sub T(sq cm/min) was essentially independent of v(D sub T = 0.0035v + 0.0031; sq r = 0.15) and was about 2 orders of magnitude greater than D sub e at the lowest v studied. The spread of tracer at the outflow was inversely proportional to v, and transverse dispersion had reduced the concentration peak of the inflow by 84% at L = 23 cm and v = 0.01 cm/min. The ratio D sub L/D sub T was proportional to v and ranged from about 1(v = 0.01 cm/min) to about 20(v = 0.28 cm/min). (Sims-ISWS)
W78-12852

RAPID ESTIMATE OF UNSATURATED HYDRAULIC CONDUCTIVITY FUNCTION,
Agricultural Research Organization, Bet Dagan (Israel). Div. of Soil Physics.
E. Bresler, D. Russo, and R. D. Miller.
Soil Science Society of America Journal, Vol. 42, No. 1, p 170-172, January-February 1978. 4 fig, 10 ref.

Descriptors: *Hydraulic conductivity, *Unsaturated flow, *Infiltration, *Estimating equations, Laboratory tests, Soil physical properties, Pore pressure, Pore water, Horizontal infiltration, Wetting front, Nonsodic soils, Air entry value.

From results of Reichardt, Nielsen, and Biggar and of Russo and Bresler, it was inferred that a laboratory horizontal infiltration experiment with air-dry soil yields an estimate of the saturated-unsaturated hydraulic conductivity function given by K(h) = 0.27(m to the 4th power)(h sub e/h) to the 2.6 power or K(theta) = 0.27(m to the 4th power)(theta - theta sub d)/(theta sub w - theta sub d)) to the 7.2 power. Here m = dx/d(t to the 1/2 power); x is distance to the wetting front and t is infiltration time; theta sub d and theta sub w are water contents of air-dry and 'unsaturated' soil; h is pore water pressure head, and h sub e is the air entry value of h. These relationships can serve as a general approximation of K(theta) and K(h) in nonsodic stable soils. Field measurements of h sub e and saturated K can also be used to derive K(theta) and K(h). (Visocky-ISWS)
W78-12853

LEACHING CHARACTERISTICS OF A LAYERED FIELD SOIL,
Connecticut Agricultural Experiment Station, New Haven.
J. L. Starr, H. C. DeRoo, C. R. Frink, and J. Y. Parlange.
Soil Science Society of America Journal, Vol. 42, No. 3, p 386-391, May-June 1978. 8 fig, 18 ref.

Descriptors: *Groundwater movement, *Percolating water, *Soil physical properties, *Soil leaching, *Infiltration, Leaching, Percolation, Soil chemistry, Movement, Chemical properties, Solutes, Solubility, Soil water movement, Physical properties, Saturated flow, *Solute movement, *Ponded infiltration, *Leaching characteristics, *Percolating water movement, Fingering, Instability, Ponded-flow infiltration.

Two ponded flow experiments were conducted to study the leaching characteristics of a layered field soil, fine sandy loam over coarse sand, with a water table at a depth of 1.8 m. In the first experiment, a steel cylinder 1.8 m in diameter was driven into a soil to a depth of 3.6 m. Infiltrations of water and dye provided the means for direct observation of the effect of air entrapment upon the rates of infiltration as well as the primary pattern of water flow through the coarse subsoil. The rate of infiltration was observed to increase by nearly two-fold when the entrapped air between the saturated surface layer and the shallow groundwater table was vented directly to the atmosphere. Removal of the soil layers following infiltration of a dye solution showed that most of the infiltrating water moved through fingers ranging from 5 to 20 cm in diameter. In the second experiment, chloride distributions at six depths were measured following the application of a pulse of 0.3N CaCl2 solution to the soil surface. Chloride movement for the 20- to 60-cm soil depths averaged about 50% slower than that determined from the average pore-water velocity at the soil surface. In contrast to this relatively low rate of chloride movement, several salt pulses reached the 120- and 180-cm depths soon after or before reaching the 60-cm depth. This greatly increased flow rate corresponds to the observations in the first experiment where flow became unstable and the solute moved in fingers of flow below the 60-cm depth. (Henley-ISWS)
W78-12854

STRAW-MULCH RATE EFFECT ON SOIL WATER STORAGE AND SORGHUM YIELD,
Southwestern Great Plains Research Center, Bushland, TX.

r primary bibliographic entry see Field 3F.
78-12855

FFECT OF LYSIMETER MATERIALS ON IN-CES OF LYSIMETRIC WATER CHEMICAL OMPOSITION (IN RUSSIAN),
kademiya Nauk SSSR, Leningrad. Pochvennyi st.
F. Govorenkov.
ochvovedenie (6), p 41-49, 1977.

escriptors: *Lysimiters, *Chemical degradation, Acidity, *Soil water, Chemical reactions, Iron, cidic soils, Zinc.

he results of long-term field and laboratory ex-eriments showed that the lysimeters made of gal-anized Fe are not chemically resistant to an acid oil medium. When they interact with soil solution ney release Zn into solution, leading to considera-le changes in chemical composition of the latter, specially, with regard to its acidity. Lysimeters nade of viny-plast do not effect the composition f lysometric water.--Copyright 1978, Biological Abstracts, Inc.
W78-12942

A MODEL SYSTEM TO STUDY THE DESORP-TION AND BIOLOGICAL AVAILABILITY OF PCB IN HYDROSOILS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W78-12980

2H. Lakes

ANALYSIS FOR POLYCHLORINATED BIPHENYLS IN LAKE MACATAWA BOTTOM SEDIMENTS,
Hope Coll., Holland, MI. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-12105

A COMPARATIVE ECOLOGICAL STUDY OF THE CALIFORNIA CRAYFISH, PACIFASTACUS ZENIUSCULUS (DANA), FROM TWO SUBALPINE LAKES,
California Univ., Davis. Div. of Environmental Studies.
C. R. Goldman, and J. C. Rundquist.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 798, Price codes: A02 in paper copy, A01 in microfiche. Presented at Proc. 3rd International Symposium Freshwater Crayfish. Kuopio, Finland, Dec 1976. 22 p, 9 fig, 5 tab, 19 ref. (California Water Resources Center Project UCAL-WRC-W-475) OWRT A-056-CAL(1).

Descriptors: *Crayfish, *Lakes, Limnology, Ecology.

Crayfish growth and population density were determined and compared for Pacifastacus leniusculus (Dana) populations in two closely situated but limnologically distinct Sierra-Nevada lakes, Lake Tahoe (California-Nevada) and Donner Lake (California). Physical, chemical and biological parameters for the lakes were also compared to determine whether differences observed in the crayfish populations could be related to broad limnological characteristics of the lakes. The crayfish population in mesotrophic Donner Lake was considerable less dense than in ultraoligotrophic Lake Tahoe. The implication of this finding for crayfish production management is discussed. A brief discussion of possible genetic differences between the two crayfish populations, based on gel electrophoresis, is also presented. (Snyder-Calif, Davis)
W78-12112

DISTRIBUTION OF PHYTOPLANKTON IN VIRGINIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12122

DISTRIBUTION OF PHYTOPLANKTON IN TENNESSEE LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12123

RELATIONSHIPS OF PRODUCTIVITY AND PROBLEM CONDITIONS TO AMBIENT NUTRIENTS: NATIONAL EUTROPHICATION SURVEY FINDINGS FOR 418 LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-12124

DISTRIBUTION OF PHYTOPLANKTON IN OHIO LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12126

DISTRIBUTION OF PHYTOPLANKTON IN NEW JERSEY LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-12127

DISTRIBUTION OF PHYTOPLANKTON IN GEORGIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12128

DISTRIBUTION OF PHYTOPLANKTON IN KENTUCKY LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-12129

EVAPOTRANSPIRATION FROM WATER HYACINTH IN TEXAS RESERVOIRS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2D.
W78-12155

ESTABLISHING BASELINE DATA FOR MANAGEMENT OF HALIFAX, N.S., LAKE WATERSHEDS,
Nova Scotia Technical Coll., Halifax. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-12159

A COMPARISON OF THE ZOOPLANKTON OF LAKE KAINJI AND OF THE RIVERS NIGER AND SWASHI,
Reading Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-12201

AN INTRODUCTION TO THE LIMNOLOGY OF THE FRIESIAN LAKES,
Limnological Inst., Oosterzee (Netherlands). Tjeukemeer Field Station.
For primary bibliographic entry see Field 5A.
W78-12202

DIEL FEEDING AND RESPIRATION RHYTHMS IN ZOOPLANKTON,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12203

INTERACTIONS BETWEEN SEDIMENTS AND OVERLYING WATERS IN AN EXPERIMENTALLY EUTROPHIED PRECAMBRIAN SHIELD LAKE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W78-12204

AN ASSESSMENT OF PRINCIPAL COMPONENT ANALYSIS FOR DESCRIPTION OF PHYTOPLANKTON PERIODICITY IN LAKE WINGRA,
Wisconsin Univ.-Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W78-12209

SUMMARY ANALYSIS OF THE NORTH AMERICAN (U.S. PORTION) OECD EUTROPHICATION PROJECT: NUTRIENT LOADING--LAKE RESPONSE RELATIONSHIPS AND TROPHIC STATE INDICES,
Texas Univ., at Dallas, Richardson. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-12245

DISTRIBUTION AND IMPORTANCE OF PHYTOPLANKTON IN THE ATCHAFALAYA BASIN,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12246

DISTRIBUTION OF PHYTOPLANKTON IN DELAWARE LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-12248

IFYGL TEMPERATURE TRANSECTS, LAKE ONTARIO, 1972,
Canada Centre for Inland Waters, Burlington (Ontario); and Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
F. M. Boyce, and C. H. Mortimer.
Technical Bulletin No. 100, 1977, 315 p, 13 ref, 111 fig, 9 tab, 2 append.

Descriptors: *Lake Ontario, *Cross-sections, *Temperature distribution, *Thermocline, *Measurement, Depth, Isotherms, Data collections, On-site data collections, Surveys, Internal waves, Standing waves, Time series analysis, Instrumentation, Ships, Bathymetry, Bathythermographs, Canada, *International Field Year on the Great Lakes(IFYGL), Moored temperature profiles.

During the International Field Year on the Great Lakes (IFYGL) a sequence of experiments was carried out on Lake Ontario wherein it was attempted to measure the temperature structure across three vertical cross sections of the lake simultaneously and continuously for periods of at least four days. Experiments were carried out in July, August, and October of 1972 using up to three research vessels equipped with standard and towed temperature profiling devices. The data have been presented as sequences of cross sections of the lake showing the depths of selected isotherms as functions of horizontal distance and time. The data contain striking examples of both

large- and small-scale internal waves, standing and progressive. A very limited discussion of the data in terms of the dynamics of basin-wide internal standing waves is given, since it is intended that this publication be viewed primarily as a data report. Time series plots of isotherm depths from moored temperature profiles are included where they overlap the ship surveys. Data from the coastal chain surveys have been used to extend the measurements shorewards and to verify the ship-based measurements. The instrumentation used to obtain the profiles is described in some detail. A considerable effort has been expended to make the report as complete as possible to facilitate the interpretation of the data for future researchers. (WATDOC)
W78-12256

THE ESTIMATION OF SAMPLE SIZE REQUIRED IN CHEMICAL LIMNOLOGY AND AUTECOLOGY OF SHELLED INVERTEBRATES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 7B.
W78-12262

THE POLLUTION OF NATURAL RIVER BED SEDIMENTS BEHIND THE SAVA RIVER ARTIFICIAL DAM (IN SLOVENIAN),
For primary bibliographic entry see Field 5A.
W78-12271

EFFICIENT PRESSURE SOLUTION FOR CIRCULATION PREDICTION,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-12281

INVESTIGATION ON DRILLING CORES OF SEDIMENTS OF LAKE CONSTANCE: I. PROFILES OF THE POLYCYCLIC AROMATIC HYDROCARBONS (IN GERMAN),
Biochemisches Inst. Umweltcarcinogene, Ahrensburg (West Germany).
For primary bibliographic entry see Field 5A.
W78-12290

MAIN ASPECTS OF THE ANTHROPOGENIC TRANSFORMATION OF LAKE ECOSYSTEM OF THE NORTHWESTERN EUROPEAN USSR (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
I. I. Nikolaev.
Gidrobiol Zh 13(2), p 5-13, 1977.

Descriptors: Ecosystems, Environmental effects, Water level fluctuations, *Hydroelectric powerplants, *Lake ecosystems, Ponds, Discharge, Fish, *Ichthyosides, Invertebrates, *Thermal pollution, Water pollution control.

The main anthropogenic aftereffects on the lake ecosystems were analyzed on the basis of data from literature and results of actual studies. Examples are given of complete rearrangement of small lake ecosystems by applying ichthyocides with subsequent introduction of valuable ichthyofauna; in ponds this was done by fertilizer application. In large lakes the aftereffects of the transformation into hydroelectric plant reservoirs and variations in the level evoked by this transformation were considered; ecosystems of medium lakes were affected by lowering of the water level used for irrigation. The effect of thermal waters from the state regional power station on hydrobionths of the reservoir was analyzed. Examples of settling fish, invertebrates and water plants are given.--Copyright 1978, Biological Abstracts, Inc.
W78-12298

MACRO-NUTRIENTS IN THE LAKE GEORGE ECOSYSTEM,
Rennselaer Polytechnic Inst., Troy, NY.
For primary bibliographic entry see Field 5C.
W78-12304

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 3: MILWAUKEE COUNTY,
Wisconsin Geological and Natural Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 2J.
W78-12314

CHICAGO LAKEFRONT DEMONSTRATION PROJECT. ENVIRONMENTAL IMPACT HANDBOOK,
Chicago, IL, Dept. of Development and Planning.
P. C. Ryner.
Illinois Coastal Zone Management Program, 'Chicago Lakefront Demonstration Project'. (1978) 76 p, 2 fig, 3 tab, 3 append.

Descriptors: *Coasts, Environment, Management, Lakes, Environmental effects, *Chicago(Lakefront), Illinois, *Environmental impact, Handbook, *Lake Michigan, Coastal zone management.

This handbook has been designed to serve as a guide in assessing the environmental effects of project developed in accordance with 'The Lakefront Plan of Chicago (1972)'. This handbook assumes that lakefront development has been identified by the City as being a potentially desirable activity and that there is a fairly clear idea as to what public objectives such development would hope to meet. It presents a time-and cost-effective approach to environmental analysis that can improve the environmental soundness of the planning and design process; facilitate the granting of City and State permits; and lead to the submission of a clear, concise, and technically adequate Environmental Impact Assessment to the U.S. Army Corps of Engineers as part of their required permit application process. (NOAA)
W78-12315

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 2J.
W78-12336

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 1: KENOSHA COUNTY,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 2J.
W78-12337

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 8: MILWAUKEE COUNTY, SUMMARY OF ENGINEERING BORING LOGS,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 2J.
W78-12338

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 6: SOUTHERN AND CENTRAL MANITOWOC COUNTY,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 2J.
W78-12360

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 5: SHEBOYGAN COUNTY,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 2J.
W78-12367

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 4: OZAUKEE COUNTY,
Wisconsin Geological and Natural History Survey, Madison; Wisconsin Dept. of Natural Resources, Madison; and Wisconsin Office of State Planning and Energy, Madison.
For primary bibliographic entry see Field 2J.
W78-12392

THE TALE OF A LAKE,
Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
G. L. Lombard.
Environment RSA (Pretoria), Vol. 2, No. 5, p 2-3, 1975.

Descriptors: *Freshwater lakes, Aquatic insects, *Ecological studies, Acid mine drainage, Acidification, De-acidification, Lake limnology, Sulphur pollution, pH effect, Recreational water, Reclamation, Pyrite, Lime addition, Pollution sources, Ecology, Lake stages, Freshwater fish, Aquatic plants, Water birds, Arundo, *Germiston lake, *Chironomidae, South Africa.

The author describes the deterioration of Germiston lake, a small lake of 57ha in extent in the heart of the mining town of Germiston. This previously popular recreational lake was slowly polluted due to acid mine drainage from the nearby mine dumps, to a point where the water had a pH of 4,2. All plant, animal and insect life in the lake died off except for two kinds of gnats of the family Chironomidae, which found conditions ideal and in the absence of competitors a population explosion occurred which made life unbearable for persons living near the lake. The Transvaal department of nature conservation was called in to help and by addition of spent caustic soda and agricultura lime, the pH was pushed up to a more acceptable 6,0, at which point others forms of water insects and plants returned to the lake and natural conditions were again established after restocking the lake with fish. (So Afr Water Info Ctr)
W78-12413

NITROGEN AND PHOSPHORUS INPUT TO THE MIDMAR DAM, NATAL,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
For primary bibliographic entry see Field 5C.
W78-12491

THE DISTRIBUTION OF NUTRIENTS IN SWARTVLEI, A SOUTHERN CAPE COASTAL LAKE,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
For primary bibliographic entry see Field 5B.
W78-12493

STUDIES OF PHYTOPLANKTON BIOGENIC ELEMENT REQUIREMENTS IN DIFFERENT TYPES OF LAKES USING A METHOD OF PLANNED SUPPLEMENTS (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
For primary bibliographic entry see Field 5C.
W78-12514

CHEMICAL CHARACTERISTICS OF LAKE MARYUT, A POLLUTED LAKE SOUTH OF ALEXANDRIA, EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
For primary bibliographic entry see Field 5A.
W78-12520

SOME REGULARITIES IN THE CHANGES IN LAKE ECOSYSTEMS IN CONNECTION WITH ANTHROPOGENIC FACTORS (IN RUSSIAN),
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
Z. Kajak.
Gidrobiol Zh 13(2), p 14-22, 1977.

Descriptors: *Lakes, *Ecosystems, *Eutrophication, *Plankton, *Aquatic productivity, *Biological communities, Variability, Nutrient requirements, Benthos, Productivity, Trophic level, Heating, Thermal stress, Surface waters, Population, Carp, Water temperature, Self-purification, Carp, Dreissena, Heating, Lakes, Masurian, Poland, Pollution, Silver, Tubificids.

Recent studies demonstrated rapid eutrophication of the Masurian Lakes, Poland. Data were collected on nutrition of dominant species of plankton and benthos (Dreissena, tubificids) and their role in the ecosystem. The production and efficiency of production of different trophic levels in different bodies of water were determined, as well as energy dynamics in the lake ecosystem. Heating of the water had a positive effect on its self-purification but negatively affected a polluted river. Introduction of silver carp reduced the plankton population, and introduction of carp significantly affected the structure of the biocenosis. Under certain conditions, both fish may be used for purification of water from secondary pollution.--Copyright 1978, Biological Abstracts, Inc.
W78-12557

SEASONAL VARIABILITY IN THE BIOCHEMICAL COMPOSITION OF PLANKTON IN THE MINGECHAUR AND VARVARA RESERVOIRS (IN RUSSIAN),
Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Inst. Zoologii.
S. B. Gadzhieva.
Gidrobiol Zh 13(4), p 70-75, 1977.

Descriptors: *Plankton, Reservoirs, Seasonal, Mingechaur Reservoir(USSR), Varvara Reservoir(USSR), *Caloric content, *Carbohydrates, *Dry matter, *Fat, *Protein, USSR.

Seasonal changes between 1969 and 1970 were traced for plankton content of dry matter, fat, proteins, carbohydrates and caloric content. The content of dry matter apparently was maximum in spring and in winter (1970) in the Varvarian reservoir (USSR). Fat content and caloric content of plankton increased from spring to winter. The maximum values were in autumn, the minimum in summer (1970) only in the Varvarian reservoir. The protein content in 1969 increased from spring to autumn and in 1970 the maximum was observed in summer, the minimum in winter. Carbohydrate amount in plankton decreased from spring to winter.--Copyright 1978, Biological Abstracts, Inc.
W78-12560

REMOTE SENSING TO IDENTIFY, ASSESS, AND PREDICT ECOLOGICAL IMPACT ON LAKE CHAMPLAIN WETLANDS,
State Univ. of New York Coll. at Plattsburgh.
For primary bibliographic entry see Field 6G.
W78-12601

FLUCTUATION OF OXYGEN CONCENTRATION IN LAKE BLED DURING THE YEARS 1974-1976 (IN SLOVENIAN),
Ljubljana Univ. (Yugoslavia). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-12613

ENERGETICS OF A SALMON LAKE ECOSYSTEM (IN RUSSIAN),
Akademiya Nauk SSR, Moscow. Inst. Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W78-12614

SPECIES COMPOSITION OF PHYTOPLANKTON FROM DIFFERENT TYPES OF LAKES IN THE CENTRAL KARELIAN ISTHMUS (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
For primary bibliographic entry see Field 5C.
W78-12620

OPTIMIZATION OF LAKE HYDROGRAPHIC SURVEYS,
National Swedish Environment Protection Board, Uppsala (Sweden). Limnological Survey.
For primary bibliographic entry see Field 7C.
W78-12624

ATMOSPHERIC NITROGEN AND PHOSPHORUS LOADING TO HARP LAKE, ONTARIO, CANADA,
Ontario Ministry of the Environment, Rexdale (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5B.
W78-12626

CIRCULATION PATTERNS IN THE FOX CHAIN OF LAKES IN ILLINOIS,
Illinois State Water Survey, Urbana.
N. G. Bhowmik, and J. B. Stall.
Water Resources Research, Vol 14, No 4, p 633-642, August 1978. 10 fig, 1 tab, 20 ref.

Descriptors: *Water circulation, *Lakes, *Winds, *Illinois, On-site investigations, On-site data collections, Circulation, Shallow water, Water bodies, Inflow, Discharge(Water), Flow, Rivers, Laboratory tests, Model studies, Mathematical models, Data processing, Limnology, *Fox Chain of Lakes(Ill).

Extensive circulation data were collected at 7 locations on 5 different occassions during 1975 in the Fox Chain of Lakes in Illinois. In areas of negligible inflow, the circulation patterns in all of the lakes were governed by the wind. Even in areas of significant inflow, the wind dominated the movement of water as soon as diffusion of the inflow jets reduced the flow velocity. Generally, the surface water moved with the wind and there was some return flow below certain depths. Measured wind-generated current profiles in the lakes indicated that they generally follow a logarithmic distribution. The wind factor defined as the ratio of surface water velocity to wind velocity varied from 2 to 7%. Theoretical circulation patterns in Pistakee Bay for a few selected wind conditions were computed by a finite element method. Computer plots were developed, and the theoretical circulation patterns were compared with the measured circulation patterns. Correlation between the theoretical and measured circulation patterns was found to be good. (Sims-ISWS)
W78-12633

DIFFERENCES IN RADAR RETURN FROM ICE-COVERED NORTH SLOPE LAKES,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-12639

ICE GROWTH IN DULUTH-SUPERIOR HARBOR,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2C.
W78-12640

INTEGRAL EQUATION FAILURE IN WAVE CALCULATIONS,
New Orleans Univ., LA. Dept. of Physics.
For primary bibliographic entry see Field 2L.
W78-12642

DISSOLVED SILICA IN PORE WATERS OF LAKES ONTARIO, ERIE, AND SUPERIOR SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-12645

COMMUNITY STRUCTURE, DYNAMICS AND NUTRIENT CYCLING IN THE OKEFENOKEE CYPRESS SWAMP-FOREST,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I.
W78-12679

THE INFLUENCE OF FLOATING VASCULAR PLANTS ON THE DIURNAL FLUCTUATIONS OF TEMPERATURE NEAR THE WATER SURFACE IN EARLY SPRING,
Guelph Univ. (Ontario). Dept. of Botany and Genetics.
For primary bibliographic entry see Field 2I.
W78-12688

REMOTE SENSING FOR IDENTIFICATION AND CLASSIFICATION OF WETLAND VEGETATION,
Fisheries and Wildlife, Jamestown ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 2I.
W78-12689

WATERFOWL USE OF UINTA MOUNTAIN WETLANDS IN UTAH,
Utah Cooperative Wildlife Research Unit, Logan.
For primary bibliographic entry see Field 2I.
W78-12693

CHANGES IN SUBMERGED PLANTS AT THE SOUTH END OF CAYUGA LAKE FOLLOWING TROPHICAL STORM AGNES,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Natural Resources.
R. T. Oglesby, A. Vogel, J. H. Peverly, and R. Johnson.
Hydrobiologia, Vol 48, No 3, p 251-255, March 31, 1976. 1 fig, 2 tab, 8 ref.

Descriptors: *Storms, Effects, *Submerged vegetation stage, *Lakes, Aquatic plants, Rooted aquatic plants, Wetlands, Standing crops,

Biomass, Sediments, *New York, *Cayuga Lake(NY).

Tropical storm Agnes produced increased suspended sediments and decreased water transparency for a sustained period during the early summer of 1972. Biomass decreased drastically for the growing season in which the storm occurred but increased to near pre-storm levels the following year. Species composition of the plant community changed compared to 1970; in 1973 shifts in spatial distribution had occurred, and the community had further changed to one highly dominated by Myriophyllum sp. with the virtual exclusion of some previously abundant forms, especially Heteranthera dubia. (Stihler-Mass)
W78-12694

IMPACT OF FLUCTUATING WATER LEVELS ON FEEDING ECOLOGY OF BREEDING BLUE-WINGED TEAL,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
G. A. Swanson, and M. I. Meyer.
Journal of Wildlife Management, Vol 41, No 3, p 426-433, July, 1977. 1 fig, 2 tab, 47 ref.

Descriptors: *Blue-winged teal, *Food abundance, *Water levels, waterfowl, Ducks, Foods, Invertebrates, Midges, Aquatic insects, Snails, Ecology, Drawdown, Wetlands, Lakes, Broods.

As a result of low-water levels in 1973, seasonal wetlands dried early in the spring, and blue-winged teal used semi-permanent lakes that were entering a drawdown phase. When water levels fall on semi-permanent lakes, a short-term increase in invertebrate availability to waterfowl may result due to shallow water conditions and the concentration of invertebrates by a reduced water volume. Blue-winged teal shifted from a diet high in snails when seasonal wetlands were relatively abundant to one dominated by midge larvae when semi-permanent lakes were the main wetlands used. (Stihler-Mass)
W78-12695

FRESHWATER WETLANDS AND SEWAGE EFFLUENT DISPOSAL: PROCEEDINGS OF A NATIONAL SYMPOSIUM HELD AT THE UNIVERSITY OF MICHIGAN.
For primary bibliographic entry see Field 5E.
W78-12707

SURFACE HYDROLOGY OF PEATLANDS,
Michigan Univ., Ann Arbor. Dept. of Chemical Engineering.
R. H. Kadlec.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium Held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 3-24, 1976. 11 fig, 3 ref.

Descriptors: *Hydrology, *Michigan, Evapotranspiration, Wetlands, Waste water, Flow, Precipitation(Atmosphere), Streamflow, Hydrologic budget, *Peatlands, *Houghton Lake(Mich).

The hydrology of Porter Ranch at Houghton Lake, Michigan, an undisturbed peatland, is discussed. A correlation exists between precipitation and inflow with a drainage time on the order of 3 to 5 days; outflow is also responsive to rain on a short-time scale. For both inflow and outflow, magnitudes are 5 to 10 times less than either precipitation or evapotranspiration. The 15-cm litter-stem zone has a hydraulic conductivity of 92 cm/sec.; for all practical purposes, flow is zero below the peat surface. The peatland was irrigated with wastewater amounting to 8 inches on 10 acres in 8 weeks. No water level effects were observed; no increases in peatland outflow were observed. It is believed that a major portion of the added water evaporated from the test locale. (See also W78-12707) (Stihler-Mass)
W78-12708

DISSOLVED NUTRIENTS IN A PEATLAND NEAR HOUGHTON LAKE, MICHIGAN,
Utah State Univ., Logan. Dept. of Wildlife Science.
For primary bibliographic entry see Field 5C.
W78-12709

PRODUCTIVITY AND NUTRIENT CONTENT OF EMERGENT MACROPHYTES IN TWO WISCONSIN MARSHES,
Wisconsin Univ.-Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-12710

EFFECTS OF SEWAGE EFFLUENT ON ECOSYSTEM DYNAMICS IN CYPRESS DOMES,
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W78-12714

INSECTS AND WETLANDS,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 7B.
W78-12719

WISCONSIN LAKE LEVELS, THEIR UPS AND DOWNS,
Geological Survey, Madison, WI. Water Resources Div.
R. P. Novitzki, and R. W. Devaul.
Wisconsin University Geological and Natural History Survey, Madison, February 1978. 11 p, 5 fig, 1 tab, 7 ref.

Descriptors: *Wisconsin, *Lakes, *Water level fluctuations, *Lake stages, Inflow, Discharge(Water), Seasonal, Fluctuations, *Hydrologic lake classification, *Lake-aquifer relationships, *Lake hydrology.

Lakes in Wisconsin are grouped into three major lake types--ground-water flow through, ground-water discharge, and surface-water flow through. Lake type is inferred from lake characteristics: ground-water flow-through lakes are those with neither inlet nor outlet; ground-water discharge lakes are those with only outlet streams; surface-water flow-through lakes are those with substantial inlet and outlet streams. Water-level fluctuations are greatest in the ground-water flow-through lakes, where levels ranged from 2.5 feet to nearly 11 feet during the period of record. Fluctuations are smallest in the ground-water discharge lakes, where levels ranged from 1.4 to 3.5 feet. Surface-water flow-through lakes fluctuated from 3.4 to 7.3 feet. High lake levels are typical in spring or early summer; low levels in fall or winter. High lake levels occasionally occur in winter or fall in lakes that respond to ground-water recharge after the growing season and in lakes influenced by surface runoff. The fluctuation in ungaged lakes is estimated to be within the ranges for the lake types described. (Woodard-USGS)
W78-12728

THE HYDROLOGY OF LAKE ROUSSEAU, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12741

PHOSPHORUS SOURCE MANAGEMENT FOR EUTROPHIC LAKES. PHASE I: TRIBUTARY PHOSPHORUS LOADING,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Zoology; and Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
For primary bibliographic entry see Field 5B.
W78-12746

MULTISPECTRAL REMOTE OBSERVATIONS OF HYDROLOGIC FEATURES ON THE NORTH SLOPE OF ALASKA,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 2C.
W78-12832

WIND-DRIVEN, STEADY FLOWS IN LAKE SUPERIOR,
National Taiwan Univ., Taipei. Inst. of Oceanography.
S. L. Lien, and J. A. Hoopes.
Limnology and Oceanography, Vol. 23, No. 1, p 91-103, January 1978. 12 fig, 1 tab, 22 ref.

Descriptors: *Water circulation, *Lake Superior, *Winds, *Model studies, Mathematical models, Laboratory tests, Lakes, Circulation, Currents(Water), Velocity, Analytical techniques, Flow, Energy, Bathymetry, Limnology, Wind-driven circulation, Physical models.

The wind-induced, steady-state circulations in Lake Superior were investigated by use of both mathematical and physical models. The mathematical model was developed from the equations of motion, assuming a homogeneous lake, negligible nonlinear accelerations, constant Coriolis force, hydrostatic pressure distribution, negligible horizontal turbulent shear stresses, and constant vertical eddy viscosity. With these assumptions, the equations of motion were solved analytically to give expressions for the velocities in terms of position in lake, wind stress, water surface slopes, depth, vertical eddy viscosity, and bottom condition (i.e. no-slip or slip). Water surface slopes were obtained from a numerical solution to the vertically integrated equations of motion, expressed in terms of a mass transport stream function and subject to appropriate wind stress and inflow-outflow conditions. Two- and three-dimensional velocity fields were obtained for uniform and curl wind stress distributions, for constant (average) and actual (variable) depth conditions, and for slip and no-slip on bottom. Laboratory experiments on the wind-generated circulation were conducted in a rotating, vertically distorted model of Lake Superior. Surface current patterns were obtained for steady, westerly winds that were constant in magnitude (uniform) over the lake and that had a constant curl (speeds decreased linearly from south to north) over the lake. The laboratory circulation patterns were in reasonable agreement with results from the numerical model. (Sims-ISWS)
W78-12850

MONO LAKE: SILENT, SAILLESS, SHRINKING SEA,
For primary bibliographic entry see Field 4A.
W78-12851

CONCENTRATIONS OF HEAVY METALS IN SMALL NORWEGIAN LAKES,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5B.
W78-12861

EXPERIMENTAL AND FIELD STUDIES ON ECOLOGICAL ENERGETICS OF ASELLUS AQUATICUS L. (ISOPODA), III. POPULATION DYNAMICS ON THE BACKGROUND OF MACROBENTHOS OCCURRENCE IN THE LITTORAL ZONE OF POWSINSKIE LAKE,
Polish Academy of Sciences, Warsaw (Poland). Dept. of Ecological Bioenergetics.
For primary bibliographic entry see Field 5C.
W78-12865

GROWTH OF HETEROTROPHIC BACTERIA AND ALGAL EXTRACELLULAR PRODUCTS IN OLIGOTROPHIC WATERS,
Montana State Univ., Bozeman. Dept. of Microbiology.

For primary bibliographic entry see Field 5C.
W78-12886

COMPARISON OF LIGHT AND ELECTRON MICROSCOPIC DETERMINATIONS OF THE NUMBER OF BACTERIA AND ALGAE IN LAKE WATER,
Lund Univ., (Sweden). Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W78-12888

THE DISTRIBUTION OF NUTRIENTS IN SWARTVLEI, A SOUTHERN CAPE COASTAL LAKE,
Rhodes Univ., Grahamstown (South Africa). Inst. for Freshwater Studies.
For primary bibliographic entry see Field 5B.
W78-12889

VERTICAL MIGRATION IN ZOOPLANKTON AS A PREDATOR AVOIDANCE MECHANISM,
Washington Univ., Seattle. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-12891

NITROGEN AND PHOSPHORUS INPUT TO THE MIDMAR DAM, NATAL,
National Inst. for Water Research, Cogella, (South Africa).
For primary bibliographic entry see Field 5C.
W78-12893

NUMBERS AND BIOMASS OF THE LITTORAL FAUNA IN MIKOLAJSKIE LAKE AND IN OTHER MASURIAN LAKES,
Polish Academy of Science, Warsaw. Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W78-12894

NORTH AMERICAN PROJECT--A STUDY OF U.S. WATER BODIES.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W78-12895

ANALYSIS OF TROPHIC CONDITIONS AND EUTROPHICATION FACTORS IN LAKE WEIR, FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W78-12896

AN OVERVIEW OF LIMNOLOGICAL CHARACTERISTICS OF SHAGAWA LAKE, MINNESOTA,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W78-12897

LAKE SALLIE, MINNESOTA,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-12898

THREE OLIGOTROPHIC LAKES IN NORTHERN MINNESOTA,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W78-12899

PHYTOPLANKTON, PHOSPHORUS, AND SEWAGE EFFLUENTS IN LAKE MINNETONKA,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Ecology.
For primary bibliographic entry see Field 5C.
W78-12900

REPORT ON THE MINNEAPOLIS CITY LAKES,
Minnesota Univ., Minneapolis. Limnologica Research Center.
For primary bibliographic entry see Field 5C.
W78-12901

A DESCRIPTION OF THE TROPHIC STATUS AND NUTRIENT LOADING FOR LAKE GEORGE, NEW YORK,
Rensselaer Polytechnic Inst., Troy, NY. Fresh Water Inst.
For primary bibliographic entry see Field 5C.
W78-12902

THE LIMNOLOGY OF CAYUGA LAKE, NEW YORK--A SUMMARY,
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W78-12903

TROPHIC STATUS AND NUTRIENT BALANCE FOR CANADARAGO LAKE,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5C.
W78-12904

LIMNOLOGICAL AND GEOCHEMICAL CHARACTERISTICS OF THE TWIN LAKES WATERSHED, OHIO,
Kent State Univ., OH. Center for Urban Regionalism and Environmental Systems.
For primary bibliographic entry see Field 5C.
W78-12905

WALDO LAKE, OREGON,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W78-12906

LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-12907

NUTRIENT LOADING AND TROPHIC STATE OF LAKE SAMMAMISH, WASHINGTON,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-12908

LAKE MENDOTA - NUTRIENT LOADS AND BIOLOGICAL RESPONSE,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-12909

REPORT ON NUTRIENT LOAD - EUTROPHICATION RESPONSE OF LAKE WINGRA, WISCONSIN,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-12910

REPORT ON NUTRIENT LOAD - EUTROPHICATION RESPONSE OF SELECTED SOUTH-CENTRAL WISCONSIN IMPOUNDMENTS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-12911

THE JOHN H. KERR RESERVOIR, VIRGINIA - NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W78-12912

TROPHIC STATUS AND NUTRIENT LOADING FOR LAKE TAHOE, CALIFORNIA - NEVADA,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-12913

REPORT ON NUTRIENT LOAD - EUTROPHICATION RESPONSE FOR THE OPEN WATERS OF LAKE MICHIGAN,
Texas Univ. at Dallas, Richardson, Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-12914

TROPHIC STATUS AND NUTRIENT LOADING FOR LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W78-12915

2I. Water In Plants

WATER RESOURCES AND FRESHWATER FISHERIES IN SOUTHERN AFRICA,
Rhodes Univ., Grahamstown (South Africa).
P. B. N. Jackson.
In: Conference on resources of Southern Africa today and tomorrow, (Johannesburg), South Africa, p 196-207, September 22-26, 1975. 5 ref.

Descriptors: *Freshwater fish, *Fisheries, *Water resources, Fish farming, Eutrophication, Fish conservation, Legal aspects, Water pollution, Fishing, Fish management, Fish stocking, Fish types, Economic assessment, *Southern Africa, South Africa, Zambia, Malawi, Botswana.

Freshwater fisheries are described in Zambia, Malawi and Rhodesia and points out how inadequate planning has all but ruined some previously rich fishing grounds, due to overfishing and the use of smaller mesh nets. The potential richness of Kariba, the Okavango swamps and Cabora Bassa as producers of freshwater fish for a hungary population is discussed and thoughts are expressed as to the preservation and management of these valuable natural resources. The reasons why Commercial freshwater fishing in South Africa has never been practiced are discussed and criticised. The importation of exotic species for angling sport are mostly to blame as authorities fear that netting would exterminate the trout and bass that have been established at great cost. The emergence of fish farming in Transvaal and Natal is discussed and the possibility of using indigenous fish like Tilapia in aquaculture for the better management of eutrophic waters is suggested. Conclusions suggest the formation of a water bank, a campaign to promote the conservation of water by irrigation farmers, a revision of the Water Act to give equal consideration to fish and wildlife as well as human water needs, the multi purpose use of storage dams and the funding of research on the fish populations of our larger dams. (So Afr Water Info Ctr)
W78-12419

COMMUNITY STRUCTURE, DYNAMICS AND NUTRIENT CYCLING IN THE OKEFENOKEE CYPRESS SWAMP-FOREST,
California Univ., Santa Barbara. Dept. of Biological Sciences.
W. H. Schlesinger.
Ecological Monographs, Vol. 48, p 43-65, Winter, 1978. 3 fig, 13 tab, 120 ref.

Descriptors: *Communities, *Nutrients, *Cycling nutrients, Biomass, Productivity, Forests, Swamps, Bogs, *Cypress, Okefenokee Swamp, Biogeochemistry, Peat, Georgia.

Dominance of the tree stratum by cypress is probably due to recurrent understory fires which eliminate other swamp species. Density and total basal area of living stems greater than 4 cm diameter vary greatly, but mean values (1,465 stems/ha; 52 sq m/ha) are high compared to upland forests. Differences in density among stands are due to past differences in the frequency and intensity of forest fires during periodic droughts. Cypress trees compose 98% of the total forest above-water biomass of 307 tonnes/ha. Net primary productivity is low (692 g/sq m/yr); high biomass is the result of the old age (150 yr) of the stand and the high density of trees. Cypress net production is largely channeled into bole wood (41%) and current twigs with needles (41 %). Nutrient pools in the above water community are large (666 kg/ha Ca, 111 kg/ha Mg, 230 kg/ha K, 996 kg/ha N and 46 kg/ha P) and primarily contained in cypress boles. The nutrient uptake (54 kg/ha/yr, 11 each for Mg and K and 2.3 for P) is largely channeled to the small amount (231 g/sq m) of very efficient cypress foliage abscission and foliar leaching by rainfall return 73 to 91% of the annual nutrient uptakes. Except for K which is apparently resorbed from foliage before abscission, the cypress trees do not appear to conserve foliar nutrients. Nutrient conservation may be effected by minimizing the amount of foliage. Litterfall has resulted in a large accumulation of peat containing permanent nutrient losses from the community. (Maroncelli-Mass)
W78-12679

ELM-ASH-COTTONWOOD FOREST TYPE BIBLIOGRAPHY,
Purdue Univ., Lafayette, IN. Dept. of Forestry and Natural Resources.
S. R. Shifley, and K. M. Brown.
USDA Forest Service, North Central Forest Experiment Station, General Technical Report NC-42, 1978. 56 p, 2 ref.

Descriptors: *Bibliographies, *Ash trees, *Cottonwoods, Wetlands, Forests, Deciduous trees, Maple trees, Forest management, Ecology, Trees, Elm trees.

The 679 references on the biology, ecology, silviculture and mensuration of the elm-ash-cottonwood type, characteristic of many wooded wetlands of the southeastern United States, are arranged by author's names, species, and subject index is provided. (Stihler-Mass)
W78-12681

SEED VIABILITY IN SALT MARSH TAXA, GEORGETOWN COUNTY, SOUTH CAROLINA,
Saint John's Univ., Jamaica, NY. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W78-12683

SEED VIABILITY IN TWO ATLANTIC COAST POPULATIONS OF SPARTINA ALTERNIFLORA,
Saint John's Univ., Jamaica, NY. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W78-12684

ORIGIN OF BLANKET MIRES,
King's Coll., London (England). Dept. of Plant Sciences.
For primary bibliographic entry see Field 4C.
W78-12685

THE INFLUENCE OF FLOATING VASCULAR PLANTS ON THE DIURNAL FLUCTUATIONS OF TEMPERATURE NEAR THE WATER SURFACE IN EARLY SPRING,
Guelph Univ. (Ontario). Dept. of Botany and Genetics.
H. M. Dale, and T. Gillespie.
Hydrobiologia, Vol 49, No 3, p 245-256, June 30, 1976. 4 fig, 6 tab, 20 ref.

Descriptors: *Floating plants, *Water temperature, Effects, *Diurnal, Winds, Aquatic plants, Energy, Wetlands, Temperature, Air temperature, Heat transfer, Spring, Duckweed, Ponds.

On clear days a mat of duckwood or other floating aquatic plants increased the temperature at the water surface from 4.0 to 11.0 degrees C. above that of adjacent open water. The temperature of the environment 2 cm above or below the plant surface closely followed the surface temperature's quick response to changes in net radiation. The plant surface reflects more and transmits less energy than open water, therefore there is less fluctuation in temperature in the water 10 cm and more below the floating plant surface. This results in a diurnal thermal stratification below the mat. At the surface of the open water changes in temperature tended to be smaller and slower, and, with wind disturbance, the water profile maintained relatively homogeneous temperatures. (Stihler-Mass)
W78-12688

REMOTE SENSING FOR IDENTIFICATION AND CLASSIFICATION OF WETLAND VEGETATION,
Fisheries and Wildlife, Jamestown ND. Northern Prairie Wildlife Research Center.
L. M. Cowardin, and V. I. Myers.
Journal of Wildlife Management, Vol 38, No 2, p 308-314, April, 1974. 1 fig, 3 tab, 24 ref.

Descriptors: *Remote sensing, *Wetlands, *Vegetation, *Infrared radiation, Aquatic plants, Lakes, Swamps, *Minnesota, Wild rice, Floating plants, Aerial photography, Multispectral photography.

Multispectral photography and ground truth were obtained on an area of 12 miles (19.3 km) east of Bemidji, Minnesota, to identify and map wetlands less than 2 acres (0.8 hectare) in size, to map emergent vegetation in lakes, and to explore the feasibility of classifying vegetation from aerial photographs. Wetlands less than 2 acres in size were identified on photography taken in May 1971, and emergent vegetation was recorded on purposely overexposed infrared black and white photography from a flight in September 1971. Several vegetation types and species groups were recongizable with the aid of color, color infrared, and black and white infrared photography. Proper timing of flights, use of multispectral photography, and knowledge of the ecology of the area are considered essential for wetland mapping by remote sensing. (Stihler-Mass)
W78-12689

VARIABILITY OF WETLAND REFLECTANCE AND ITS EFFECT ON AUTOMATIC CATEGORIZATION OF SATELLITE IMAGERY,
Delaware Univ., Newark. Center for Remote Sensing.
For primary bibliographic entry see Field 7B.
W78-12690

SEDIMENTATION RATES, SHORELINE MODIFICATION, AND VEGETATION CHANGES ON TIDAL MARSHES ALONG THE COAST OF CONNECTICUT,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 2L.
W78-12691

WATERFOWL USE OF UINTA MOUNTAIN WETLANDS IN UTAH,
Utah Cooperative Wildlife Research Unit, Logan.
S. R. Peterson, and J. B. Low.
Journal of Wildlife Management, Vol 41, No 1, p 112-117, January, 1977. 2 fig, 3 tab, 8 ref.

Descriptors: *Wetlands, *Waterfowl, *Utah, *Elevation, Ducks, Mallard ducks, Rooted aquatic plants, Invertebrates, Reproduction, Broods, Ponds, Freezing.

Waterfowl use was recorded in 1965 and 1966 at different evaluations from spring thaw until fall freeze-up. Sixteen species were observed; mallard, greenwinged teal, pintail, and ring-necked duck were the most abundant species. Ninety-eight percent of the observed waterfowl were below 3,000 m. Adult waterfowl were seen most often on natural catchment basins and beaver ponds larger than 0.4 ha. Low-elevation wetlands (< 2,000 m) had high indices of aquatic invertebrates and contained aquatic plants with high seed-producing capabilities, whereas high-elevation wetlands (> 2,900 m) had little waterfowl food. Utilization of high mountain wetlands by spring migrants and breeders was dependent upon ice melt, whereas freeze-up did not seriously affect fall use. (Stihler-Mass)
W78-12693

CHANGES IN SUBMERGED PLANTS AT THE SOUTH END OF CAYUGA LAKE FOLLOWING TROPHICAL STORM AGNES,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Natural Resources.
For primary bibliographic entry see Field 2H.
W78-12694

IMPACT OF FLUCTUATING WATER LEVELS ON FEEDING ECOLOGY OF BREEDING BLUE-WINGED TEAL,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 2H.
W78-12695

1974 FINAL REPORT, RESEARCH ON SHORE AND UPLAND MIGRATORY BIRDS IN NEW JERSEY CLAPPER RAIL STUDIES,
New Jersey Dept. of Environmental Protection, Trenton. Div. of Fish, Game, and Shellfisheries.
R. E. Mangold.
1974. 17 p, 3 fig, 10 tab, 7 ref.

Descriptors: *Rails, *Distribution patterns, *Census, *New Jersey, Wetlands, Salt marshes, Birds, Wading birds, Marshes, Migratory birds, Spatial distribution, Temporal distribution, Nesting, Clapper rail, Call counts.

The principal goals of the project were an ecological study of the clapper rail, a common salt marsh bird, and to develop a technique to determine population status on a state-wide basis. The one technique usable on as large an area as a state was the use of call counts on the various marsh types. This system is a relatively inexpensive, yet fairly accurate index of annual changes in the abundance of the clapper rail. (Steiner-Mass)
W78-12696

THE MARSHES OF MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2L.
W78-12702

THE DISTRIBUTION OF CERTAIN SUBMERGED PLANTS IN MISSISSIPPI SOUND AND ADJACENT WATERS,
Gulf Coast Research Lab., Ocean Springs, MS.
L. N. Eleuterius.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi, p 191-197, 1973. 2 fig, 1 tab, 24 ref.

Descriptors: *Mississippi, *Estuarine environments, *Submerged plants, Estuaries, Distribution patterns, Rooted aquatic plants, Algae, Substrate, Salinity.

A systematic sampling program was set up to locate, record, and map the extent of seagrass beds, submerged spermatophytes, and attached algae of Mississippi Sound. A more diversified plant community was found in the eastern portion and unique stands of benthic algae were present in the western portion. Some obvious factors responsible for the presence of the attached submerged vegetation are substrate, water depth, salinity, and protection from erosion. No plant habitats were found off the beaches exposed to the open Gulf. A succession was noticed in the composition of the algal species present in pure stands and associated with the spermatophytes. Substratum is a limiting factor for plant growth and distribution in Mississippi waters. The diversity of marine species which now occurs is mainly because of minor alterations of the environment by man. (See also W78-12698) (Steiner-Mass)
W78-12703

ESTUARINE ZOOPLANKTON, MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2L.
W78-12704

ESTUARINE INVERTEBRATES, MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
J. Y. Christmas, and W. Langley.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, p 255-319, 1973. 2 fig, 32 tab, 96 ref.

Descriptors: *Mississippi, *Estuarine environment, *Invertebrates, Estuaries, Distribution patterns, Crustaceans, Aquatic animals, Mollusks, Shellfish, Shrimp.

The occurrence, relative abundance, seasonal and areal distribution of invertebrates within the temperature-salinity matrix in the Mississippi estuarine study area are reported. A total of 180 species in 124 families are listed. Sediment samples included 62 species in 43 families that were not collected in trawls and seines. Thirty species of crustaceans and molluscs comprised 97% of the total number of specimens taken by trawl and seine. Polychaetes and molluscs dominated the infauna. White and brown shrimp were the two most abundant species. Shrimp, crabs, and oysters provided all of the reported commercial landings of invertebrate species. Squid was the fourth most abundant species. (See also W78-12698) (Steiner-Mass)
W78-12705

ESTUARINE VERTEBRATES, MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2L.
W78-12706

INSECTS AND WETLANDS,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 7B.
W78-12719

RESISTANCE TO WATER UPTAKE IN A DOUGLAS FIR FOREST,
British Columbia Univ., Vancouver. Dept. of Soil Science.
J. U. Nnyamah, T. A. Black, and C. S. Tan.
Soil Science, Vol 126, No 2, p 63-76, August 1978. 10 fig, 2 tab, 36 ref.

Descriptors: *Douglas fir trees, *Moisture uptake, *Resistance, Soils, Forests, Soil water, Drying, Roots, Xylem, Evapotranspiration, Trees, Forestry, Forest soils, On-site investigations, Model studies, Mathematical models, Soil science, Water uptake.

Soil and root resistances were studied in two stands of a Douglas fir forest. Soil water potential was measured with a tensiometer-pressure transducer system in the 0 to -1-bar range, and with Wescor HR-33T dew point microvoltmeter and hygrometers at values less than -1 bar. Root xylem water potential was measured with hygrometers, and twig xylem pressure potential was measured by the pressure-chamber technique. Transpiration rates were calculated from energy balance and stomatal diffusion resistance measurements. Total bulk-soil-to-root xylem resistances were calculated from the water potential differences and transpiration fluxes. Root density was determined from intensive sampling. Root xylem water potential, like twig xylem pressure potential, showed a definite diurnal trend. Soil water potential approached the root water potential as the soil dried. Assuming the absence of contact resistance between roots and soil, the soil water potential of -11 bars. An analysis using a contact resistance model suggested that contact resistance could account for one-half the total bulk-soil-to-root-xylem resistance when the soil was moist (-0.3 bar) and almost three-quarters when dry (-11 bars). Analysis of midday data during the drying period showed that the rate of water uptake was linearly related to the difference between soil and root xylem water potentials, and that total soil-to-root-xylem resistance remained relatively constant with decreasing soil water potential. (Sims-ISWS)
W78-12840

PLUTONIUM UPTAKE BY PLANTS FROM SOIL CONTAINING PLUTONIUM-238 DIOXIDE PARTICLES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5B.
W78-12938

GROWTH OF RUSSIAN ELM AND EUROPEAN ASH SEEDLINGS DEPENDING ON DURATION OF FLOODING (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Inst. of Experimental Btotany.
M. D. Nyestsyarovich, and T. F. Dzyaruhina.
Vyestsi Akad Navuk Bssr Biyal Navuk 4, p 5-9, 1975.

Descriptors: *Ash, *Elm, European ash, *Flooding, Growth rates, Root, Seedlings, Shoots, Trunks, Russian elm, Trees.

The effect of flooding for 15,30,60,90, and 120 days on the growth of Russian elm and European ash seedlings was investigated. In the initial period flooding had no effect on plant development. Shoot growth began simultaneously in the control and flooded variants. Flooding for up to 60 days had little effect on the duration of shoot growth (82-88 days for elm and 67 days for ash). However, in this case there was a decrease in the average indices of the shoot length (78.8% for elm and 55.5% for ash in comparison with the control), plant height (by 21.1% for elm and 10.6% for ash), diameter of the trunks and root length. An increase of the flooding time to 90 and 120 days shortened the growth period of the shoots by 30-36 days for elm and 35 days for ash. Under these conditions the shoot length, trunk diameter, root length and plant height decreased even more in comparison with the control.
W78-12987

2J. Erosion and Sedimentation

ANALYSIS FOR POLYCHLORINATED BIPHENYLS IN LAKE MACATAWA BOTTOM SEDIMENTS,
Hope Coll., Holland, MI. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-12105

FLUID DYNAMIC LIFT ON A BED PARTICLE,
Canterbury Univ., Christchurch (New Zealand). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W78-12138

A SEDIMENT GRAPH MODEL BASED ON AN INSTANTANEOUS UNIT SEDIMENT GRAPH,
Agricultural Research Service, Temple, TX. Grassland Forage Research Center.
For primary bibliographic entry see Field 4D.
W78-12145

DEVELOPMENT OF A SIMPLE, RAPID FIELD TECHNIQUE FOR ESTIMATING OIL CONCENTRATIONS IN THE SEDIMENTS,
Mississippi State Univ., Mississippi State.
For primary bibliographic entry see Field 5A.
W78-12182

AN EXPERIMENTAL INVESTIGATION OF SOME COMBINED FLOW SEDIMENT TRANSPORT PHENOMENA,
North Carolina State Univ. at Raleigh. Center for Marine and Coastal Studies.
For primary bibliographic entry see Field 2L.
W78-12188

SEDIMENT DISPERSAL TRENDS OF THE CAMINADA-MOREAU BEACH-RIDGE SYSTEM,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W78-12193

EVALUATION OF LYOPHILIZATION METHOD OF DISAGGREGATING SAND, SILT AND CLAY,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2G.
W78-12258

PHOSPHORUS INTERACTIONS WITH STREAM-BED SEDIMENTS,
South Dakota School of Mines and Technology, Rapid City. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-12280

INVESTIGATION ON DRILLING CORES OF SEDIMENTS OF LAKE CONSTANCE: I. PROFILES OF THE POLYCYCLIC AROMATIC HYDROCARBONS (IN GERMAN),
Biochemisches Inst. Umweltcarcinogene, Ahrensburg (West Germany).
For primary bibliographic entry see Field 5A.
W78-12290

DECISIONS FOR DELAWARE: SEA GRANT LOOKS AT BEACH MANAGEMENT,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-12312

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 3: MILWAUKEE COUNTY,
Wisconsin Geological and Natural Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
D. M. Mickelson, R. Klauk, L. Acomb, T. Edil, and B. Haas.
Wisconsin Coastal Management Technical Report, 'Shore Erosion Study', Appendix 3, February 1977. 118 p.

Descriptors: *Lake Michigan, *Erosion, *Shores, Wisconsin, Geomorphology, Lakeshores, Coastal zone management.

Detailed information on shoreline conditions within much of Milwaukee County is presented. A text which describes the characteristics of shoreline conditions at the beginning of each reach section is accompanied by a map of the whole reach which shows the sections, public perception of erosion hazards, shore damage in 1952, short- and long-term recession rates, bluff height, shore protection structures, houses per mile, and boat ramps. Also on the map, locations of measured profiles are shown along the shoreline. A running description of bluff characteristics, materials making up the toe of the slope, and beach characteristics are also given. Engineering data such as safety factor, the confidence level on this safety factor, and the distance the slope must retreat to attain a stable slope angle is given. It should be noted that this distance assumes no wave cutting at the base of the bluff. Profiles from the water's edge to the bluff top are included with each section. These profiles show stratigraphy, slope angles, circles of failure, and calculated safety factors along the shoreline. (NOAA)
W78-12314

BEACH PROFILES OBTAINED WITH AN AMPHIBIOUS DUKW ON THE OREGON AND WASHINGTON COASTS,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W78-12317

THE ANNUAL CYCLE OF PROFILE CHANGES OF TWO OREGON BEACHES,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2L.
W78-12318

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
D. M. Micekelson, L. Acomb, N. Brouwer, T. Edil, and C. Fricke.
Wisconsin Coastal Management Technical Report, 'Shore Erosion Study', February 1977. 209 p, 94 fig, 4 tab, 22 ref.

Descriptors: *Wisconsin, *Lake Michigan, *Lake Superior, *Erosion, Shores, Geomorphology, Lakeshores, Coastal Zone Management.

Shoreline erosion is a critical problem along Wisconsin's Lake Michigan and Lake Superior Coasts. The Shore Erosion Study forms an integral part of the Coastal Management Development Program with a primary goal of developing alternative plans for the prevention and abatement of shore damage to private and public coastal property. The Shore Erosion Study is divided into three major elements: (1) the analysis of protective structural alternatives, (2) the analysis of non-structural alternatives, (3) the field survey of erosion problem areas. This report represents the field survey effort and is based directly on many of the preceding work elements of the study, and forms the essential basis for the analyses of structural and non-structural alternatives. (NOAA)
W78-12336

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 1: KENOSHA COUNTY,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
A. F. Schneider, T. Edil, and B. Haas.
Wisconsin Coastal Management Technical Report, 'Shore Erosion Study', Appendix 1, February 1977. 82 p.

Descriptors: *Lake Michigan, *Erosion, *Shores, Wisconsin, Geomorphology, Lakeshores, Coastal Zone Management.

Detailed information on shoreline conditions within much of Kenosha County is presented. A text which describes the characteristics of shoreline conditions at the beginning of each reach section is accompanied by a map of the whole reach which shows the sections, public perception of erosion hazards, shore damage in 1952, short- and long-term recession rates, bluff height, shore protection structures, houses per mile, and boat ramps. Also the map, locations of measured profiles are shown along the shoreline. A running description of bluff characteristics, materials making up the toe of the slope, and beach characteristics are also given. Engineering data such as safety factor, the confidence level on this safety factor, and the distance the slope must retreat to attain a stable slope angle is given. It should be noted that this distance assumes no wave cutting at the base of the bluff. These profiles from the water's edge to the bluff top are included with each section. These profiles show stratigraphy, slope angles, circles of failure, and calculated safety factors along the shoreline. (NOAA)
W78-12337

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 8: MILWAUKEE COUNTY, SUMMARY OF ENGINEERING BORING LOGS,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
R. Klauk.
Wisconsin Coastal Management Technical Report, 'Shore Erosion Study', Appendix 8, February 1977. 95 p.

Descriptors: *Lake Michigan, *Erosion, *Shores, Wisconsin, Geomorphology, Boring, Lakeshores, Coastal Zone Management.

A compilation of test boring information collected in Milwaukee County between June 1, 1976 and November 1, 1976 is presented. The purpose of this section is to aid in the evaluation of the stratigraphy of the lake bluffs, to include any information that will be of value in the geotechnical evaluation of bluff stability, and to compile information that has been located with various organizations within the county. This section is organized in such a way that the borings are in succession from north to south. Included with each boring is the name of the company that did the boring, the project the boring was taken for, a location map with respect to the county, and where possible, the boring locations on the site itself. (NOAA)
W78-12338

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 6: SOUTHERN AND CENTRAL MANITOWOC COUNTY,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
D. Hadley, C. Fricke, T. Edil, and B. Haas.
Wisconsin Coastal Management Technical Report, 'Shore Erosion Study', Appendix 6, April 1977. 98 p.

Descriptors: *Lake Michigan, *Erosion, *Shores, Wisconsin, Geomorphology, Lakeshores, Coastal zone management.

Detailed information on shoreline conditions within much of southern and central Manitowoc County is presented. A text which describes the characteristics of shoreline conditions at the beginning of each reach section is accompanied by a map of the while reach which shows the sections, public perception of erosion hazards, shore damage in 1952, short- and long-term recession rates, bluff height, shore protection structures, houses per mile, and boat ramps. Also on the map, locations of measured profiles are shown along the shoreline. A running description of bluff characteristics, materials making up the toe of the slope, and beach characteristics are also given. Engineering data such as safety factor, the confidence level on this safety factor, and the distance the slope must retreat to attain a stable slope angle is given. It should be noted that this distance assumes no wave cutting at the base of the bluff. Profiles from the water's edge to the bluff top are included with each section. These profiles show stratigraphy, slope angles, circles of failure, and calculated safety factors along the shoreline. (NOAA)
W78-12360

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 5: SHEBOYGAN COUNTY,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
D. Hadley, C. Fricke, T. Edil, and B. Haas.
Wisconsin Coastal Management Technical Report, 'Shore Erosion Study', Appendix 5, April 1977. 119 p.

Descriptors: *Lake Michigan, *Erosion, *Shores, Wisconsin, Geomorphology, Lakeshores, Coastal Zone Management.

Detailed information on shoreline conditions within much of Sheboygan County is presented. A text which describes the characteristics of shoreline conditions at the beginning of each reach section is accompanied by a map of the whole which shows the sections, public perception of erosion hazards, shore damage in 1952, short- and long-term recession rates, bluff height, shore protection structures, houses per mile, and boat ramps. Also on the map, locations of measured profiles are shown along the shoreline. A running description of bluff characteristics, materials making up the toe of the slope, and beach characteristics are also given. Engineering data such as safety factor, the confidence level on this safety factor, and the distance the slope must retreat to attain a stable slope angle is given. It should be noted that this distance assumes no wave cutting at the base of the bluff. Profiles from the water's edge to the bluff top are included with each section. These profiles show stratigraphy, slope angles, circles of failure, and calculated safety factors along the shoreline. (NOAA)
W78-12367

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 4: OZAUKEE COUNTY,
Wisconsin Geological and Natural History Survey, Madison; Wisconsin Dept. of Natural Resources, Madison; and Wisconsin Office of State Planning and Energy, Madison.
L. Acomb, R. Klauk, D. Michelson, T. Edil, and B. Haas.
Wisconsin Coastal Management Technical Report, 'Shore Erosion Study', Appendix 4, February 1977. 167 p.

Descriptors: *Lake Michigan, *Erosion, *Shores, Wisconsin, Geomorphology, Lakeshores, Coastal Zone Management.

Detailed information on shoreline conditions within much of Oazukee County is presented. A text which describes the characteristics of shoreline conditions at the beginning of each reach section is accompanied by a map of the whole reach which shows the sections, public perception of erosion hazards, shore damage in 1952, short- and long-term recession rates, bluff height, shore protection structures, houses per mile, and boat ramps. Also on the map, locations of measured profiles are shown along the shoreline. A running description of bluff characteristics, materials making up the toe of the slope, and beach characteristics are also given. Engineering data such as safety factor, the confidence level on this safety factor, and the distance the slope must retreat to attain a stable slope angle is given. It should be noted that this distance assumes no wave cutting at the base of the bluff. Profiles from the water's edge to the bluff top are included with each section. These profiles show stratigraphy, slope angles, circles of failure, and calculated safety factors along the shoreline. (NOAA)
W78-12392

SHORE EROSION STUDY TECHNICAL REPORT. SHORELINE EROSION AND BLUFF STABILITY ALONG LAKE MICHIGAN AND LAKE SUPERIOR SHORELINES OF WISCONSIN. APPENDIX 2: RACINE COUNTY,
Wisconsin Geological and Natural History Survey, Madison; and Wisconsin Dept. of Natural Resources, Madison.
A. F. Schneider, T. Edil, and B. Haas.
Wisconsin Coastal Management Technical Report, 'Shore Erosion Study', Appendix 2, February 1977. 72 p.

Descriptors: *Lake Michigan, *Erosion, *Shores, Wisconsin, Geomorphology, Lakeshores, Coastal Zone management.

Detailed information on shoreline conditions within much of Racine County is presented. A text which describes the characteristics of shoreline conditions at the beginning of each reach section is accompanied by a map of the whole reach which shows the sections, public perception of erosion hazards, shore damage in 1952, short- and long-term recession rates, bluff height, shore protection structures, houses per mile, and boat ramps. Also on the map, locations of measured profiles are shown along the shoreline. A running description of bluff characteristics, materials making up the toe of the slope, and beach charcteristics, materials making up the toe of the slope, and beach characteristics are also given. Engineering data such as safety factor, the confidence level on this safety factor, and the distance the slope must retreat to attain a stable slope angle is given. It should be noted that this distance assumes no wave cutting at the base of the bluff. Profiles from the water's edge to the bluff top are included with each section. These profiles show stratigraphy, slope angles, circles of failure, and calculated safety factors along the shoreline. (NOAA)
W78-12461

STUDIES ON FUNCTION OF WATER AND SOIL CONSERVATION BASED ON FOREST LAND: II. INFLUENCE OF DISTURBANCE IN GROUND FLOOR UPON WATER RUNOFF, INFILTRATION AND SOIL EROSION, AND THE CONSERVATION MANAGEMENT OF FOREST LAND (IN JAPANESE),
Government Forest Experiment Station, Tokyo (Japan).
For primary bibliographic entry see Field 4C.
W78-12463

THE DISTRIBUTION OF NUTRIENTS IN SWARTVLEI, A SOUTHERN CAPE COASTAL LAKE,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
For primary bibliographic entry see Field 5B.
W78-12493

EFFECT OF PH ON THE ADSORPTION OF TRACE RADIOACTIVE CESIUM BY SEDIMENTS,
King Faisal Univ., Dammam (Saudi Arabia). Dept. of Soils and Water, and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-12635

DISSOLVED SILICA IN PORE WATERS OF LAKES ONTARIO, ERIE, AND SUPERIOR SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. O. Nriagu.
Limnology and Oceanography, Vol. 23, No. 1, p 53-67, January 1978. 7 fig, 9 tab, 50 ref.

Descriptors: *Silica, *Silicates, *Sediments, *Great Lakes, *Lake Ontario, *Lake Erie, *Lake Superior, Dissolved solids, Chemicals, Sampling, Chemical analysis, Pore water, Clays, Iron, Aluminum, Water chemistry, Diatoms, Biodegradation, Limnology, Ferroaluminum silicates.

The distribution of dissolved silica in pore waters from Lakes Ontario, Erie, and Superior sediments is not directly related to the deposition of diatomites from the overlying water. It was proposed that silica concentrations in the pore waters are controlled by dissolution of ferroaluminum silicate. The cryptocrystalline complex is formed in the sediments by the reaction of biogenic silica with aluminum and ferric oxyhydroxides or by the hydrolysis of clay minerals. A massive episodic flux of biogenic silica to the sediments follows the crash of diatom blooms. However, most of the biogenic silica is dissolved in the water column or at the sediment-water interface; a small fraction is fixed permanently in the sediments as the cryptocrystalline complex. Budget calculations showed that regeneration of silica from Ontario and Erie sediments far exceeds annual input from external sources. (Sims-ISWS)
W78-12645

SEDIMENTATION RATES, SHORELINE MODIFICATION, AND VEGETATION CHANGES ON TIDAL MARSHES ALONG THE COAST OF CONNECTICUT,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 2L.
W78-12691

SEDIMENT TRANSPORT IN THE FEATHER RIVER, LAKE OROVILLE TO YUBA CITY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
G. Porterfield, R. D. Busch, and A. O. Waananen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 290, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 78-20, June 1978. 73 p, 27 fig, 14 tab, 30 ref.

Descriptors: *Sediment transport, *Sediment yield, *Particle size, *Reservoir releases, *Streamflow, Flow rates, Data collections, *California, *Feather River, *Lake Oroville(Calif), Yuba City(Calif).

Regulation of the Feather River by Oroville Dam and reservoir in northeast California (beginning in 1967) changed the streamflow and sediment discharge downstream from the dam. Changes in channel geometry to adjust to the new regimen were still in process in 1975. Streamflow and sediment concentration and discharge had decreased. Median streamflow at Feather River near Gridley and Feather River at Yuba City, 27 miles and 49 miles downstream from the dam, had not changed, although the frequency of flow rates less than median increased and the frequency of flow rates greater than median, and which transport most sediment, decreased. Sediment-transport data indicate an increase in sediment yield from the 1965-67 period to the 1968-75 period in the basin downstream from Gridley to Yuba City, although the quantity of sediment transported was reduced owing to removal of sediment by Oroville Dam and to reduced streamflow. The increase in yield, assuming no change in tributary inflow, may be attributed partly to channel erosion accelerated by the clear-water releases and to the change in frequency and magnitude of flow rates. (Woodard-USGS)
W78-12736

SUSPENDED SEDIMENT DYNAMICS IN BLUE FJORD, WESTERN PRINCE WILLIAM SOUND, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W78-12835

EVALUATION OF THE SIGNIFICANCE OF WATERWAY SEDIMENT-ASSOCIATED CONTAMINANTS ON WATER QUALITY AT THE DREDGED MATERIAL DISPOSAL SITE,
Texas Univ. at Dallas, Richardson.
For primary bibliographic entry see Field 5A.
W78-12981

2K. Chemical Processes

CARBON CONTENTS AND SOURCES IN GROUND WATERS OF THE CENTRAL PLATTE REGION IN NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 5A.
W78-12103

A STUDY OF THE KALAMOS SPRINGS IN GREECE WITH ENVIRONMENTAL ISOTOPES,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 2F.
W78-12144

SULFUR ISOTOPE DISTRIBUTION IN SULFATES FROM SURFACE WATERS FROM THE NORTHERN JORDAN VALLEY, ISRAEL,
Weizmann Inst. of Science, Rehovot (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5B.
W78-12167

NUCLEAR TECHNIQUES APPLICABLE TO STUDIES OF POLLUTANTS IN GROUND WATER,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5A.

W78-12168

GEOCHEMISTRY AND HYDROTHERMAL ALTERATION AT SELECTED UTAH HOT SPRINGS. VOLUME 3,
Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.
W. T. Parry, N. L. Benson, and C. D. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 415, Price codes: A08 in paper copy, A01 in microfiche. Report No NSF/RA-760370, July 1976. 137 p, 43 fig, 18 tab, 39 ref. GI-43741.

Descriptors: *Utah, *Geochemistry, *Heat transfer, *Hydrothermal studies, Hot springs, Rock mechanics, Flow, Properties, Geothermal studies, Physical properties, Chemical analysis, Trace elements, Water chemistry, Thermal properties, Reservoirs, Resources, Water analysis.

This report detailed the results of estimation of subsurface temperatures in Utah from published water analyses and new analyses of selected hot springs. Two hot spring areas in differing geological environments were selected for detailed rock alteration studies. The Monroe-Red Hill area is within an area of Tertiary volcanics and is underlain by a thick Jurassic salt bearing deposit. The Roosevelt area is in Tertiary and Precambrian crystalline rocks. Comparison of rock alteration and water chemistry in these two areas serves as a model for further exploration and resource characterization in Utah using geochemical techniques. Hydrothermal alteration, heavy metal distribution and water chemistry provide some characterization of the Roosevelt system. The hot spring deposits consist of laminated opal and siliceous sinter. Geology and alteration have been mapped in the Monroe KGRA. Alteration of the volcanic host rocks includes the following assemblages: kaolinite and jarosite, kaolinite and mixed layer clay, montmorillonite and mixed layer clay, montmorillonite and chlorite. Calcite and gypsum are also abundant. (Henley-ISWS)
W78-12171

DETERMINATION OF CADMIUM IN WATERS OF THE STATE OF PIAUI, BRAZIL (DETERMINACAO DE CADMIO EM AGUAS DO ESTADO DO PIAUI, BRASIL),
Ceara Univ., Fortaleza (Brazil). Centro de Ciencias.
J. Campos Accioly, and M. F. Santana Neves.
Ciencia Agronomica, Vol 6, No 1-2, p 1-2, December, 1976. 1 tab, 7 ref.

Descriptors: *Water analysis, *Chemical analysis, *Spectrophotometry, *Cadmium, *Brazil, Water wells, Pollutant identification, Analytical techniques, Arid lands.

Water from 37 wells in the state of Piaui, located in Brazil's arid Northeast, was tested for the presence of cadmium using atomic-absorption spectrophotometry. Concentrations varied from 1 to 5 micrograms per liter, with the exception of one sample which contained 23 micrograms per liter. After excluding that sample, the average value was 2.2 micrograms per liter - well below the maximum level for potable water (10 micrograms per liter) established by the World Health Organization. (Russell-Arizona)
W78-12213

DETERMINATION OF IRON, MANGANESE, COPPER AND ZINC IN WATERS OF THE STATE OF PIAUI, BRAZIL (DETERMINACAO DE FERRO, MANGANESE, COBRE E ZINCO EM AGUAS DO ESTADO DO PIAUI, BRASIL),
Ceara Univ., Fortaleza (Brazil). Centro de Ciencias.
J. Campos Accioly, and M. F. Santana Neves.
Ciencia Agronomica, Vol 6, No 1-2, p 7-9, December, 1976. 1 tab, 4 ref.

Descriptors: *Water analysis, *Chemical analysis, *Iron, *Manganese, *Copper, *Zinc, *Spectrophotometry, *Brazil, Pollutant identification, Analytical techniques, Water wells, Arid lands.

Water from 37 wells in the state of Piaui, located in Brazil's arid Northeast, was tested for iron, manganese, copper and zinc content using atomic-absorption spectrophotometry. These concentrations varied respectively from 0.016 to 0.516 mg per liter; 0.01 to 0.032 mg per liter; 0.03 to 0.275 mg per liter; and 0.017 to 2.133 mg per liter. The average values of these metals were 0.100 mg per liter (iron); 0.007 mg per liter (manganese); 0.031 mg per liter (copper) and 0.421 mg per liter (zinc). With the exception of 5.4% of the iron samples, the other elements were present in lower concentrations than the maximum levels established by the World Health Organization. (Russell-Arizona)
W78-12214

DETERMINATION OF BORON IN WATERS OF THE STATE OF PIAUI, BRAZIL (DETERMINACAO DE BORO EM AGUAS DO ESTADO DO PIAUI, BRAZIL),
Ceara Univ., Fortaleza (Brazil).
J. Campos Accioly, and M. F. Santana Neves.
Ciencia Agronomica, Vol 6, No 1-2, p 3-5, December, 1978. 1 tab, 5 ref.

Descriptors: *Water analysis, *Chemical analysis, *Boron, *Brazil, *Pollutant identification, Water wells, Arid lands, Analytical techniques.

Boron was found in water samples collected from 37 wells in the state of Piaui, located in Brazil's arid Northeast. The samples were tested using electrometric titrations. Concentrations varied from 0.06 mg per liter to 0.87 mg per liter, with an average of 0.23 mg per liter. Since the maximum tolerable level of boron in drinking and irrigation water is 1 mg per liter, there is no evidence for boron pollution in the waters of Piaui. As this area has a long history of droughts, it is important to ascertain the chemical content of the available water supply. (Russell-Arizona)
W78-12215

ON THE STATE OF SATURATION OF GROUNDWATER WITH RESPECT TO DISSOLVED CARBONATES, EDWARDS ARTESIAN AQUIFER, SOUTH-CENTRAL TEXAS,
San Diego State Univ., CA. Dept. of Geological Sciences.
P. L. Abbott.
The Texas Journal of Science, Vol 29, Nos 3-4, p 159-167, December, 1977. 1 tab, 1 fig, 12 ref.

Descriptors: Groundwater movement, *Subsurface flow, Calcite, Dolomite, *Caves, *Limestones, *Texas, *Edwards Aquifer(Tex), *Carbonates, Dissolved solids.

Long distances of groundwater flow through limestone would presumably result in water unable to dissolve host rock due to its saturation or supersaturation with respect to calcite and dolomite. However, groundwater flowing through the Edwards Limestone in the Balcones Fault Zone has created extensive caverns near the discharge-dominated end of the flow system even after travelling over 100 miles. The well-developed caverns result from the general undersaturation of the Edwards aquifer water. At least seasonal undersaturation is maintained by introduction of small amounts of flood recharge in Medina, Bexar and Comal counties to the groundwater body. (Russell-Arizona)
W78-12216

SAMPLING FREQUENCY FOR RIVER QUALITY MONITORING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-12239

INTERLABORATORY QUALITY CONTROL STUDY NO. 16, TOTAL MERCURY IN NATURAL WATERS,
Canada Centre for Inland Watersm burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-12259

ENRICHMENT OF ANIONS OF WEAK ACIDS BY DONNAN DIALYSIS,
Southern Illinois Univ. at Carbondale. Dept. of Chemistry and Biochemistry.
For primary bibliographic entry see Field 5A.
W78-12266

USE OF HYDROCHEMICAL TECHNIQUES IN GROUNDWATER EXPLORATION IN THE VENTERSTAD AREA, CAPE PROVINCE (IN AFRIKAANS),
For primary bibliographic entry see Field 2F.
W78-12465

CALCIUM CARBONATE PRECIPITATION KINETICS PART 2. EFFECTS OF MAGNESIUM,
L. Benjamin, R. E. Loewenthal, and G. R. Marais.
Water SA, (Pretoria), Vol 3, No 3, p 155-165, 1977, 19 ref, 7 fig, 1 tab.

Descriptors: *Calcium carbonate, *Chemical precipitation, *Reaction kinetics, Magnesium, Interfering substances, Water softening, Calcites, Solubility products, Rate constants, Supersaturation, Crystals, Hydrogen ion concentration, *South Africa.

The precipitation kinetics of CaCO3 in the presence of Mg(+2) can be formulated in terms of the hypothesis of Davies and Jones for calcite seeded solutions. The apparent solubility product, K(spa), is related to the solubility product for magnesium calcite, K(spm). Both the solubility product for magnesium calcite, K(spm), and the precipitation rate constant, K, vary with the ratio of magnesium to calcium in the aqueous solution. (So Afr Water Info Ctr)
W78-12469

THE USE OF A SLOTTED QUARTZ TUBE FOR THE ANALYSIS OF TRACE METALS IN FRESH WATER,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W78-12494

SAMPLING, PRESERVATION AND STORAGE OF WATER SAMPLES FOR ANALYSIS OF METALS,
Norsk Inst. for Vannforskning, Blindern.
A. Henriksen, and K. Balmer.
Vatten 33(1), p 33-38, 1977.

Descriptors: Cadmium, Copper, Iron, Lakes, Lead, Manganese, Norway, Zinc, *Metals, *Water analysis, *Sampling.

Concentrations of heavy metals in unpolluted surface waters are generally low, often below or near the detection limit of routine analytical methods. Reliable analysis thus is critically dependent on sample collection, preservation and analytical procedures that minimize contamination and chemical changes during storage. A method suitable for routine use was developed and tested. Water samples are collected in 25-ml glass vials with polyethylene snap-caps that were washed in succession with solutions of 1% Na-EDTA and 5% Deconex detergent, soaked in nitric acid and thoroughly rinsed with distilled water. After ar-

rival at the laboratory the samples are preserved with 0.25 ml 3.5 N nitric acid, and the concentrations of heavy metals (Zn, Pb, Cu, Cd, Mn and Fe) determined by flameless atomic-absorption spectrophotometry. Statistical evaluation of results from samples collected from 18 lakes in Norway indicates that neither the time of addition of nitric acid nor the length of time between sample preservation and analysis greatly affects the measured concentrations of Zn, Pb, Mn and Fe. Evaluation of Pb and Cd was precluded because the concentrations of these metals was at or below the analytical detection limit in most of the lakes sampled. This procedure was successfully used in the collection and analysis of water samples from 261 small lakes in all of Norway in 1974-75.--Copyright 1978, Biological Abstracts, Inc.
W78-12524

STUDIES OF TRACE METALS IN THE WATERS AND SEDIMENTS OF BADFISH CREEK AND LAKE WINGRA, NEAR MADISON, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-12603

INVESTIGATION OF THE CHEMICAL IDENTITY OF SOLUBLE ORGANOPHOSPHORUS COMPOUNDS FOUND IN NATURAL WATERS,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-12607

CHEMISTRY OF SNOW MELTWATER: CHANGES IN CONCENTRATION DURING MELTING,
Norsk Institutt for Vannforskning, Blindern.
M. Johannessen, and A. Henriksen.
Water Resources Research, Vol 14, No 4, p 615-619, August 1978. 7 fig, 4 tab, 12 ref.

Descriptors: *Snow, *Snowmelt, *Melt water, *Water chemistry, Laboratory tests, On-site investigations, Lysimeters, Snowpacks, Melting, Chemicals, Hydrogen ion concentration, Acids, Runoff, Streams, Fish, Water quality, *Norway.

Over much of Norway a large portion of the yearly precipitation falls as snow, and the pollutants contained in precipitation accumulate in the snowpack to be released during a short period in spring. Atmospheric fallout of sulfur compounds has been estimated to be about 30% of the total deposition in Norway, but fallout on the snow cover is probably considerably smaller. During winters with little or no snowmelt before spring, most of the pollutant load is retained in the snowpack. Laboratory and field lysimeter experiments indicated that 50-80% of the pollutant load is released with the first 30% of the meltwater. The average concentration of pollutants in this fraction is 2-2.5 times the concentration in the snowpack itself. The very first fractions may contain more than 5 times the snowpack concentrations. These high concentrations may be due to a freeze-concentration process during snow recrystallization and melting in which contaminants accumulate preferentially at the surfaces of ice particles. The resulting increase in the acid concentration of low-buffered water courses occassionally leads to s... physiological stress to fish and other aquatic organisms and even to massive fish kills. This process occurs at a time which is critical to the hatching stage of salmonid fish species. (Sims-ISWS)
W78-12630

SPATIAL AND TEMPORAL HYDROCHEMICAL VARIATIONS IN A SEMICONFINED BURIED CHANNEL AQUIFER: ESTERHAZY, SASKATCHEWAN, CANADA,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
C. C. Davison, and J. A. Vonhof.
Ground Water, Vol 16, No 5, p 341-351, September-October 1978. 8 fig, 3 tab, 30 ref.

Descriptors: *Aquifers, *Groundwater, *Water chemistry, *Canada, On-site data collections, On-site investigations, Surveys, Sampling, Chemicals, Chemical analysis, Hydrogen ion concentration, Oxidation-reduction potential, Iron, Calcite, Dolomite, Gypsum, Silicates, Carbonates, Hydrology, Chemistry, Groundwater chemistry, Hydrochemical variations.

Groundwater samples from a portion of a semiconfined, buried glacial channel aquifer in southeastern Saskatchewan, Canada, were collected and analyzed to determine the spatial and temporal variations of the major chemical constituents, pH, Eh and Fe. Dilute Ca-HCO3 type water characterized the shallow portion of the aquifer. There was a linear modified Piper Plot trend toward more concentrated Na-SO4 type water with increasing depth in the aquifer and with increased distance along the groundwater flow path. Groundwater flowing from a well penetrating the shallow portion of the aquifer responded chemically to an intense spring storm event. The groundwater chemistry of a flowing well completed in the deep portion of the aquifer did not respond to this intense spring storm, but showed a temporal chemical trend which paralleled a midsummer recharge event. The spatial and temporal hydrogeochemical variations indicated that two chemically distinct groundwater components, resulting from two different physicochemical groundwater flows origin, are probably recharging and mixing within this portion of the buried channel aquifer. (Sims-ISWS)
W78-12637

USE OF LABORATORY DATA TO PREDICT SULFATE SORPTION DURING ARTIFICIAL GROUND-WATER RECHARGE,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-12724

UNSTEADY SOLUTE-TRANSPORT SIMULATION IN STREAMFLOW USING A FINITE-DIFFERENCE MODEL,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-12726

STREAM QUALITY IN THE SAN LORENZO RIVER BASIN, SANTA CRUZ COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-12734

MECHANISMS OF HYDROGEN SULFIDE RELEASE FROM COASTAL MARINE SEDIMENTS TO THE ATMOSPHERE,
Aarhus Univ. (Denmark). Inst. of Ecology and Genetics.
For primary bibliographic entry see Field 2L.
W78-12848

2L. Estuaries

CIRCULATION IN AN OPEN BAY,
Bedford Inst. of Oceanography, Dartmouth (Novsa Scotia). Atlantic Oceanographic Lab.
B. Petrie, and K. Drinkwater.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 8, p 1116-1123, August 1978. 7 fig, 1 tab, 8 ref.

Descriptors: *Water circulation, *Bays, *Canada, *Tidal waters, On-site investigations, Data processing, Coasts, Circulation, Tides, Fish eggs, Fish, Temperature, Water temperature, Salinity, Winds, Currents(Water), Oceanography, *St. Georges Bay, *Nova Scotia.

The circulation of St. Georges Bay, Nova Scotia, under stratified conditions was presented. The mean surface circulation is characterized by a clockwise eddy with velocities of about 10 cm/s. Bottom (30 m) flow at the mouth was found to be less than 2 cm/s out of the bay. Depth-averaged currents still exhibit the clockwise eddy. Although energy was found to be equally partitioned among the mean ciruclation, the tides, and low-frequency events, the latter detemines the rate of exchange between the bay and the Gulf of St. Lawrence. Estimates of flushing time for tides and the mean circulation was of the order of a month, while low-frequency events could flush the bay on a time scale of days. Low correlation between current meters reveals that the vertical and horizontal length scales of the bay are less than 10 m and 5 km, respectively. The circulation and exchange rates can significantly affect the dispersal (or exchanges with populations existing outside the bay) for passive particles such as fish eggs or larvae. (Sims-ISWS)
W78-12163

COMPUTER-AIDED ANALYSIS OF LANDSAT DATA FOR SURVEYING TEXAS COASTAL ZONE ENVIRONMENTS,
Purdue Univ., Lafayette, IN. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7C.
W78-12178

CALIFORNIA COASTAL PROCESSES STUDY - LANDSAT II. FINAL REPORT: LANDSAT INVESTIGATION NO 22200,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5C.
W78-12179

SUBLETHAL EFFECTS OF SUSPENDED SEDIMENTS ON ESTUARINE FISH,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W78-12183

DIURNAL AND SEASONAL FLUCTUATIONS OF ORGANISMS IN A NORTH FLORIDA ESTUARY,
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 5C.
W78-12186

MODELING OF TIDE AND WIND INDUCED FLOW IN SOUTH BISCAYNE BAY AND CARD SOUND,
Miami Univ., FL.
E. A. Swakon, Jr., and J. D. Wang.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-272 815, Price codes: A08 in paper copy, A01 in microfiche. Technical Bulletin No. 37, June 1977. 159 p, 39 fig, 10 tab, 20 ref, 5 append. SG-04-5-158-14.

Descriptors: *Winds, *Tidal effects, *Models, *Florida, Baseline studies, Water quality, Resources development, Outer Continental Shelf, Biscayne Bay, Card Sound, Flushing, Convective transport, Environmental impact.

A recently developed model using the finite element technique to solve the vertically integrated equations of motion and continuity was applied to South Biscayne Bay and Card Sound to investigate the wind and tide induced flow. Wind data were obtained from the Miami International Airport and Homestead Air Force Base. A comparison of the records from the two stations for the month of November revealed no significant spatial variation and it was therefore assumed that the wind field over Biscayne Bay as a first approximation is uniform. Preliminary analysis of the tide data showed significant differences in both tidal ranges and phase lags from the average conditions as presented in the tide tables. The inclusion of these winds induced surface gradients into the model forcing was found to have an important effect on predicted residence times. Predicted velocity patterns and 'Lagrangian particle' drifts are presented for average spring and neap tide conditions with and without wind. Estimates of flushing times based on these results are also given. The convective transport in the Bay system was found to be strongly influenced by wind whereas normal tidal variations played a minor role. (Sinha-OEIS)
W78-12187

AN EXPERIMENTAL INVESTIGATION OF SOME COMBINED FLOW SEDIMENT TRANSPORT PHENOMENA,
North Carolina State Univ. at Raleigh. Center for Marine and Coastal Studies.
L. Bliven, N. E. Huang, and G. S. Janowitz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 672, Price codes: A08 in paper copy, A01 in microfiche. Report No. 77-3, and North Carolina University Sea Grant Program Report No. UNC-SG-77-04, February, 1977. 151 p, 59 fig, 8 tab, 79 ref.

Descriptors: *Sediment transport, *Bed load, *Flow characteristics, *Water quality, Continental shelf, Topography, Baseline studies, Outer Continental Shelf.

Sediment transport and the resulting topographic features generated by combined wave and steady flow conditions are studied by laboratory experiments. The investigation is limited to the conditions where bedload is the dominant transport mode. A dimensional analysis of the sediment and fluid variables is performed to identify the pertinent nondimensional parameters. Various characteristic measures of the sediment profiles are obtained using statistical methods. These topographic measures and the sediment transport are related to the non-dimensional parameters. A generalized expression is introduced to describe the ripple number spectra as a function of the sediment and flow characteristics for both local equilibrium and equilibrium states. The net sediment transport rate is linearly related to the stream power available at the top of the bottom boundary layer as proposed by Bagnold. The possibility of quantitatively measuring the net sediment transport rate by topographic features is proposed. (Sinha-OEIS)
W78-12188

FLOW-THROUGH MICROCOSMS FOR SIMULATION OF MARINE ECOSYSTEMS: DEVELOPMENT AND INTERCOMPARISON OF OPEN COAST AND BAY FACILITIES,
Naval Undersea Center, Kailua, HI. Div. of Chemistry and Environmental Sciences.
For primary bibliographic entry see Field 5G.
W78-12189

SIGNIFICANCE OF PHENOLIC COMPOUNDS IN THE DELAWARE ESTUARY,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W78-12190

EFFECT OF THERMAL SHOCK ON DEVELOPMENTAL STAGES OF ESTUARINE FISH,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 5C.
W78-12191

INTERIM ENVIRONMENTAL SYNTHESIS OF THE NORTHEAST GULF OF ALASKA.
Science Applications, Inc., Boulder, CO.
For primary bibliographic entry see Field 6G.
W78-12192

SEDIMENT DISPERSAL TRENDS OF THE CAMINADA-MOREAU BEACH-RIDGE SYSTEM,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
J. R. Harper.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A046 772, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 249, December 1977. Reprinted from: Transactions of Gulf Coast Association Geological Societies, Vol. 27, p 283-289, 1977. 7 fig, 2 tab, 13 ref. N00014-75-C-0192.

Descriptors: *Sediment transport, *Dispersion, *Deltas, *Gulf of Mexico, Water resources, Geomorphology, Baseline studies, Resources development, Outer Continental Shelf, Environmental impact.

The Caminada-Moreau chenier plain is located within an abandoned system of the Mississippi River, and its formation is closely related to shifts of the active delta. The most recent of these changes, the shift to the present bird-foot delta has placed a dynamic stress on the beach system by changing the effective wave climate and by cutting off the sediment source. The system response is a redistribution of sediments to reduce longshore power gradients. Despite the moderate wave climate found in the Gulf of Mexico, extremely high erosion rates have resulted in long-term shoreline retreat as high as 20 m/yr and a net volumetric loss over a 20-km shoreline section. The sediment movement is dominated by longshore transport, as evidenced by longshore gradients in erosion rates, which decrease from west to east, and occurs primarily during storms. Of the material transported downdrift, 41% is captured on the Grand Isle barrier. The sediment crosses Caminada Pass through lateral migration of inter-channel shoals. On a large scale, the Caminada-Moreau beach system displays several levels of form-process variability. The coastline is undergoing reorientation toward the dominant wave approach. On a smaller scale, sediment is being eroded, transported, and redeposited as sediment envelopes as opposed to a continuous sediment flow. The tidal inlet represents an important sediment redistribution point, where some of the sediment passes laterally across the inlet and the remainder is either lost offshore or incorporated into the tidal delta complex. (Sinha-OEIS)
W78-12193

THE ATTACHMENT OF ZYGOTES AND GERMLINGS OF HALIDRYS SILIQUOSA (L.) LYNGB. (PHAEPHYCEAE, FUCALES),
Newcastle-upon-Tyne Univ. (England). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-12199

PRODUCTION OF EPIBENTHIC SALT MARSH ALGAE: LIGHT AND NUTRIENT LIMITATION,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W78-12206

CONTRIBUTIONS TO THE ROTIFER OF WEST BENGAL. II. GENUS LEPADELLABORY DE ST. VINCENT, 1826,
Zoological Survey of India, Calcutta.
For primary bibliographic entry see Field 5C.
W78-12210

CULTURE STUDIES ON MARINE ALGAE FROM WEST GREENLAND, III. THE LIFE HISTORIES AND SYSTEMATIC POSITIONS OF POGOTRICHUM FILIFORME AND LEPTONEMATELLA FASCICULATA (PHAEOPHYCEAE),
Institute for Sporeplanter, Copenhagen (Denmark).
For primary bibliographic entry see Field 5C.
W78-12211

AN AIRLIFT SAMPLING DEVICE FOR IN SITU COLLECTING OF BIOTA FROM ROCKY SUBSTRATA,
National Marine Fisheries Service, Tiburon, CA. Southwest Fisheries Center.
For primary bibliographic entry see Field 7B.
W78-12242

EFFICIENT PRESSURE SOLUTION FOR CIRCULATION PREDICTION,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-12281

SPECIES COMPOSITION AND VERTICAL DISTRIBUTION OF PSAMMOPHILLIC INFUSORIANS IN ODESSA BAY, (IN RUSSIAN),
Odessa State Univ. (USSR).
M. M. Dzhurtubaev.
Gidrobiol Zh 13(2), p 73-77, 1977.

Descriptors: *Distribution, *Benthic fauna, Water temperature, Thermal stress, Infusorians, *Odessa Bay(USSR), Amphileptidae, Condilostomidae, Diversity, Euplotidae, Frontoniidae, Holophryidae, Loxodidae, Oxytrichidae, Spathidiidae, Species, Spirostomidae, Trachelocercidae, Ukrainian-SSR, USSR, Vorticellidae.

Analyses of psammophilic infusorians in Odessa Bay (Ukrainian SSR, USSR) revealed 36 spp. from 11 families: Holophryidae, Trachelocercidae, Amphileptidae, Loxodidae, Frontoniidae, Spathididae, Condilostomidae, Oxytrichidae, Euplotidae, Spirostomidae and Vorticellidae. The 0-1 cm layer of sand showed the greatest species variety (36) and average density of individuals (220/cm2). The number of species and individuals decreased as the depth of the sand layer increased. Sudden cooling of the water in mid-Aug. (drop from 24 to 12 degrees C) altered the vertical distribution of the infusorians. The greatest species diversity (16) was found in the 2-3 cm layer and the greatest density (202 individuals/cm.²) was noted in the 5-6 cm layer.--Copyright 1978, Biological Abstracts, Inc.
W78-12301

THE SHORE VEGETATION OF FRIER ESTUARY, TELEMARK, SE NORWAY (IN NORWEGIAN),
Bergen Univ. (Norway). Biological Station.
For primary bibliographic entry see Field 5C.
W78-12302

OCS DEVELOPMENT IN COASTAL LOUISIANA: A SOCIO-ECONOMIC IMPACT ASSESSMENT,
New Orleans Univ., LA. Urban Studies Inst.
For primary bibliographic entry see Field 6B.
W78-12307

CLIMATOLOGY, HYDROLOGY, AND HYDROGRAPHY OF THE VERMILION BASIN. SYNOPTIC WEATHER TYPES AND ENVIRONMENTAL RESPONSES. HYDROLOGIC AND HYDROGRAPHIC PROCESSES,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
C. L. Wax, R. A. Muller, and M. J. Borengasser.
Louisiana State University Center for Wetland Resources Final Report to Louisiana State Planning Office, June 30, 1977. 117 p, 30 fig, 14 tab, 23 ref.

Descriptors: *Louisiana, *Weather, *Water level, Wetlands, *Environmental effects, Resources development, Hydrography, Hydrology, Coasts, Climatology, Coastal Zone Management, Vermillion Basin(La).

The Vermilion Basin is located along the central Louisiana coast, about midway between New Orleans and Lake Charles. The Vermilion River is the primary drainage system of the basin, which is separated from the Mermentau Basin to the west by a system of locks on canals crossing the drainage divide. The first part of the report presents an analysis of relationships between climatic inputs and water level regimes in the Vermilion Basin estuaries to illustrate how elements of the environment respond to variations in weather as indexed by the synoptic weather type calendars. The second part of the report deals with the impact of man in the Vermilion Basin which was dictated by the need for freshwater supply to irrigate rice fields in the area. In meeting this requirement extensive systems of water control structures were installed. This resulted in interruption of the normal estuarine/marshland nutrient cycle through periodic blockage of water circulation between marsh habitats and Vermilion Bay. (NOAA)
W78-12308

SIMULATED HYDROLOGIC EFFECTS OF CANALS IN BARATARIA BASIN: A PRELIMINARY STUDY OF CUMULATIVE IMPACTS,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
J. H. Stone, and G. F. McHugh.
Louisiana State University Center for Wetland Resources Final Report to Louisiana State Planning Office, June 30, 1977. 43 p, 1 fig, 19 tab, 7 ref, append.

Descriptors: *Louisiana, *Canals, *Environmental effects, Hydrography, Dredging, *Simulation analysis, Computer simulations, Coastal Zone Management, Environmental impact, *Barataria Basin(La).

Computer simulation of the hydrography of Barataria Basin indicate significant hydrologic changes due to navigation and transportation canals. The simulations compared hydrologic parameters in the Basin before and after the construction of the Barataria and Intracoastal Waterways, and the canals associated with eight oil and gas fields. The waterways accounted for about 90% of the simulated changes; the remaining 10% was due to the canals of the eight oil and gas fields. The effects of oil and gas canals are individually small, but they are cumulative and, overall, probably are just as significant as those due to waterways, since there are approximately 90 fields in the Basin. Water heights increased on the average by about 2 inches, or more than 9% above normal conditions. Total water flow over a 25-hour tidal cycle increased between 7 and 16% in the intermediate marshes. Water flow at individual exchange points in the freshwater marshes was reduced between 20 and 70% of normal. Water flow through tidal passes was not changed. Systematic studies of these effects, how to mitigate them, and how they are related to biological production are badly needed. Large-scale development projects, which require waterways or canals, should be carefully evaluated and monitored to determine their full environmental effects. (NOAA)
W78-12309

OUTER CONTINENTAL SHELF IMPACTS, MORGAN CITY, LOUISIANA,
University of Southwestern Louisiana, Lafayette.
For primary bibliographic entry see Field 6G.
W78-12310

THE USE OF CARBON AND SULFUR ISOTOPIC RATIOS AND TOTAL SULFUR CONTENT FOR IDENTIFYING THE ORIGIN OF BEACH TARS IN SANTA MONICA BAY, CALIFORNIA,
University of Southern California, Los Angeles. Sea Grant Program.
For primary bibliographic entry see Field 5B.
W78-12311

DECISIONS FOR DELAWARE: SEA GRANT LOOKS AT BEACH MANAGEMENT,
Delaware Univ., Newark. Coll. of Marine Studies.
P. A. Jensen, R. A. Dalrymple, and B. W. Lee.
Delaware University College of Marine Studies Sea Grant Report No. DEL-SG-7-78, August 1978. 32 p, 18 ref.

Descriptors: *Delaware, *Beach erosion, *Shore protection, Management, Water resources, Littoral drift, Coastal zone management.

Along Delaware's coast, natural processes cause erosion at a rate of 3 to 9 feet each year in some places. Severe storms--for which Delaware is essentially unprepared--may cause considerable property damage and threaten the lives of many people. The situation has prompted demands for protective actions which in many cases have proven expensive and not very effective. Sea level continues to rise about 5 inches each century. And because of the orientation of Delaware's coast, waves produce a longshore current that scours sand from the beach and carries it northward. Nothing can be done to permanently halt the loss of land to the sea. However, some temporary measures can be taken to slow down the process or adapt to it. At least four paths to follow emerge from this discussion. One path is to attempt to hold the line by massive erosion-control structures. Another is to do little and let nature take its course. A third is to continue on as before. The fourth path involves some elements of the other three and would be largely a continuation of present policy--maintain dunes and continue small-scale beach nourishment where feasible, but with significant modifications in building regulations and increased research. (NOAA)
W78-12312

DEVELOPMENT OF DRAINAGE BASIN-ESTUARY NUMERICAL MODEL SYSTEM FOR PLANNING OF THE COASTAL ZONE,
Florida Univ., Gainesville. Dept. of Civil Engineering.
D. S. Graham, and B. A. Christensen.
Reprinted from: Coastal Zone '78, Proceedings of the Symposium on Technical, Environmental, Socioeconomic and Regulatory Aspects of Coastal Zone Management, ASCE, San Francisco, Calif. March 14-16, 1978. p 621-633, 3 fig, 1 tab, 41 ref. SG-04-7-158-44046.

Descriptors: *Estuaries, *Coasts, *Mathematical models, *Florida, Drainage area, Planning, Model studies, Coastal zone management.

Proper management of Florida's coastal zone requires the ability to predict the effects of basin activities on influents. Mathematical models now exist which have successfully simulated both basin and estuarine water quality and discharges. Selected proven and available models will be linked to simulate most of the hydrosystem and verification will be attempted on a relatively simple prototype for which a substantial data base exists. This will provide a solid basis for application to more complicated and stressed localities. (NOAA)
W78-12316

BEACH PROFILES OBTAINED WITH AN AMPHIBIOUS DUKW ON THE OREGON AND WASHINGTON COASTS,
Oregon State Univ., Corvallis. Dept. of Oceanography.
P. D. Komar.
Oregon State University Sea Grant Reprint No. ORESU-R-77-037, Reprinted from: The Ore Bin, Vol 39, No. 11, p 169-180, November 1977. 8 fig, 1 tab, 15 ref. SG-04-6-158-44004.

Descriptors: *Beach erosion, *Sand bars, *Oregon, *Washington, *Beach profiles, Longshore, Wave conditions, Beach morphology.

The beach profiles that were obtained with an amphibious DUKW during University of California investigations show one, two, or three offshore bars at various localities on Oregon and Washington beaches. All bars can migrate in the on-offshore direction under changing wave conditions and alter their depths in the process. There may be appreciable longshore variations in the nature of the beach profiles. The data include examples where one profile has a pronounced bar-and-trough system, and at the same time, some 1,000 to 2,000 feet in the longshore direction, the beach profile is flat. Such longshore changes in the profiles can be best explained as having been caused by a system of longshore currents feeding offshore-flowing rip currents. The beach profiles obtained by the study are particularly valuable in that they extend across the entire nearshore zone and include information on the outer bars and troughs. Beach profiles obtained with the conventional stadia rod and transit are confined to the inner surf zone, seldom reaching the middle bar and never the outer bar. Considering the intensity of the surf on Oregon and Washington beaches and the difficulties of measurement in this zone, it is doubtful whether additional profiles that span the entire nearshore will be obtained. (NOAA)
W78-12317

THE ANNUAL CYCLE OF PROFILE CHANGES OF TWO OREGON BEACHES,
Oregon State Univ., Corvallis. School of Oceanography.
N. A. Aquilar-Tunon, and P. D. Komar.
Oregon State University Sea Grant Reprint No. ORESU-R-77-038. Reprinted from: the Ore Bin, Vol 40, No 2, p 25-39, February 1978. 9 fig, 31 ref. SG-04-6-158-44004.

Descriptors: *Beach erosion, *Oregon, Seasonal, Beaches, *Beach profiles, Wave conditions, Annual cycles.

Two Oregon coast beaches with significant differences in grain size, and thus in beach profile morphology and response to wave conditions, were studied. The purpose of the investigation is to allow the prediction of the amount of beach erosion or deposition from a knowledge of the wave conditions. In general, for the Oregon beaches studied, the principal beach erosion occurred during storm conditions when wave breaker heights exceeded 5 to 6 m (16 to 20 ft). Deposition occurred when there was no major storm and breaking waves averaged 4 m (13 ft) or less. Wave steepness showed a poorer relationship to the erosion/deposition than did breaker heights, indicating that the wave period was not a significant factor in the on-shore-offshore shift of sand and the resulting changes in the beach profile type. (NOAA)
W78-12318

ON THE BEACH - INFRARED SPECTROSCOPY IN THE REAL WORLD,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-12322

'BASELINE MONITORING STUDIES, MISSISSIPPI, ALABAMA, FLORIDA, OUTER CONTINENTAL SHELF, 1975-1976' VOLUME III, RESULTS,
State Univ. System of Florida Inst. of Oceanography, St. Petersburg.
For primary bibliographic entry see Field 7C.
W78-12328

STATE OF NORTH CAROLINA COASTAL MANAGEMENT PROGRAM AND DRAFT ENVIRONMENTAL IMPACT STATEMENT. APPENDICES.
North Carolina Dept. of Natural Resources and Community Development, Raleigh.
For primary bibliographic entry see Field 6G.
W78-12334

STATE OF NORTH CAROLINA COASTAL MANAGEMENT PROGRAM AND DRAFT ENVIRONMENTAL IMPACT STATEMENT.
North Carolina Dept. of Natural Resources and Community Development. Raleigh.
For primary bibliographic entry see Field 6G.
W78-12335

EFFECTS OF KEPONE ON ESTUARINE ORGANISMS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-12378

SOUTH AFRICAN MARINE POLLUTION SURVEY REPORT 1974-1975,
Council for Scientific and Industrial Research, Johannesburg (South Africa).
For primary bibliographic entry see Field 5B.
W78-12400

BIBLIOGRAPHY ON MARINE POLLUTION IN SOUTH AFRICA,
Council for Scientific and Industrial Research, Johannesburg (South Africa).
For primary bibliographic entry see Field 5B.
W78-12404

MATHEMATICAL MODELS FOR SIMULATING MONTHLY WATER LEVELS AND SALINITIES IN SHALLOW LAKES,
University of the Witwatersrand, Johannesburg (South Africa).
I. P. G. Hutchison.
Hydrological Research Unit Report No. 6/75, 1975, 11 ref.

Descriptors: *Mathematical models, *Simulation analysis, *Water level fluctuations, *Sainity, Lakes, Physicochemical properties, Shallow water, Water circulation, Statistical analysis, *Estuaries, *Computer programs, *Lake St. Lucia estuary (So Afr), South Africa.

The flow of water in estuaries is studied with the aid of a mathematical cell-type model. Flows between cells are established employing head loss or continuity relationships. Salinity is studied using dispersion equations. The flows in the St. Lucia estuary in South Africa are simulated on a monthly basis using the derived computer programs. (So Afr Water Info Ctr)
W78-12411

TOXICITY STUDIES ON MARINE ANIMALS,
Cape Town Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-12424

OIL IN THE MARINE ENVIRONMENT,
Department of Planning and the Environment, Cape Town (South Africa).
For primary bibliographic entry see Field 5G.
W78-12447

A NEW SPECIES OF HALICYCLOPS (COPEPODA, CYCLOPOIDA) FROM ESTUARIES IN TRANSKEI, SOUTHERN AFRICA,
Port Elizabeth Univ. (South Africa).
T. Wooldridge.
Annals of the South African Museum (Cape Town), Vol 73, No 10, p 361-371, 1977. 20 ref, 1 tab, 3 fig.

Descriptors: *Halicyclops pondoensis, *Copepoda, *Cyclopoida, Estuaries, Marine animals, Species description, Species distribution, Geographical distribution, *South Africa.

A new species of the genus Halicyclops Norman, 1903, is described and illustrated from estuaries in Transkei, southern Africa. The species, Halicyclops pondoensis is closely allied to H. neglectus, H. rotundipes and H. higoensis. It is distinguished from these three forms particularly in regard to the fourth and fifth pair of legs. In H. pondoensis hair-like structures are present in the proximal part of the seta of the first endopodite segment of leg 4. These hair-like structures are absent in other species. Two spines and three setae are present on leg 5 of the male of H. pondoensis. In H. neglectus, H. rotundipes and H. higoensis the male 5th leg in both the male and female is elongated. A key to the species recorded from the African continent south of the Tropic of Cancer, and from the islands of Madagascar and Reunion, is given. (So Afr Water Info Ctr)
W78-12504

TRACE METAL STUDIES IN KNYSNA ESTUARY,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W78-12509

AGENCY CREATED TO FIGHT COASTAL SUBSIDENCE MENACE,
Harris-Galveston Coastal Subsidence District, Houston, TX.
For primary bibliographic entry see Field 6E.
W78-12566

SHOALING OF WAVES UNDER ICE,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2C.
W78-12641

INTEGRAL EQUATION FAILURE IN WAVE CALCULATIONS,
New Orleans Univ., LA. Dept. of Physics.
J. E. Murphy.
Journal of the Waterway, Port, Coastal and Ocean Division, Proceedings of the American Society of Civil Engineers, Technical Note, Vol. 104, No. WW4, p 330-334, August 1978. 5 ref, 1 append.

Descriptors: *Waves(Water), *Wavelengths, *Ocean waves, *Coastal structures, Theoretical analysis, Breakwaters, Mathematical studies, Equations, Mathematical models, Analytical techniques, Potential flow, Critical wavelengths, Vertical cylinders.

The purpose of the power was to show that there may be characteristic wavelengths for which the potential theory formulation breaks down, and the solution of the boundary value problem cannot be represented by a wave source integral formula. Failures of the potential theory formulation generally are expected to occur when the wavelength is less than the characteristic lineal dimension of the object. These considerations may be of interest in the analyses of wave interactions with large breakwaters or extremely large offshore structures, such as floating nuclear power plants and ocean thermal energy conversion plants. The existence of critical wave numbers for which a simple source representation for scattered waves fails was demonstrated. Although the calculations were performed for the case of scattering by vertical cylinders, such wave numbers probably exist for more complex geometries. Even though it is known that these critical wave numbers can be associated with solutions to a related boundary value problem, the physical nature of these singular values is still an open question. Generally, critical wave numbers are not expected to occur until the wavelength is on the order of or less than the characteristic lineal dimension of the submerged object. Consulting a table of roots of Bessel functions allows one to determine the critical wavelengths at which the simple source representation fails for the case of scattering by a vertical cylinder. (Humphreys-ISWS)
W78-12642

CIRCULATION, VARIABILITY, AND DYNAMICS OF THE SCOTIAN SHELF AND SLOPE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
P. C. Smith, B. Petrie, and C. R. Mann.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 8, p 1067-1083, August 1978. 14 fig, 5 tab, 40 ref.

Descriptors: *Water circulation, *Continental shelf, *Continental slope, *Model studies, *Canada, *On-site investigations, Measurement, Data processing, Tides, Tidal effects, Circulation, Waves(Water), Internal waves, Mixing, Oceans, Oceanography, *Scotian Shelf, *Nova Scotia, Reynolds stress, Wind-driven circulation.

A brief summary of historical data relating to the mean circulation on the Scotian Shelf and Slope revealed the distribution of various water masses and certain general characteristics of the current field, supported by geostrophic calculations and observations of surface drift. However, extreme variability resulting from wind and tidal forces was evident in all measurements made on the shelf and slope. Various measurements and models of the first-order variable flows, including wind-driven circulation, diurnal and semidiurnal tides, and inertial waves, also were reviewed. Results from a new model for inertial motions in a variable-depth mixed layer were found to reproduce closely the transient behavior of inertial energy at the 50-m depth on the shelf, but certain aspects of the model were inconsistent with the observations. With results from a mooring program on the shelf in September-December 1968, the dynamics of the mean circulation were examined in the context of a vertically integrated, two-dimensional model. Reynolds stresses associated with the first-order flows were found to be insignificant in the inshore zone (within 90 km of the coast) where the balances are between mean wind and bottom stresses, surface pressure gradients, and Coriolis forces. Over the outer shelf, however, the geostrophic onshore balance breaks down, and Reynolds stress divergences in the inertial and tidal bands become important. At the shelf break, generation of the baroclinic semidiurnal tide produces internal Reynolds stress forces comparable to the barotropic terms on the shelf. (Sims-ISWS)
W78-12643

BEACH TOPOGRAPHY AND BEACH CUSPS,
Maryland Univ., Baltimore. Dept. of Geography.
R. N. Dubois.
Geological Society of America Bulletin, Vol. 89, No. 8, p 1133-1139, August 1978. 10 fig, 20 ref.

Descriptors: *Beaches, *Topography, *Delaware, Tides, Oceanography, Hydraulics, Geology, Berms, Waves(Water), *Beach cusps, Tidal berm, Backshore, Swash salients, Incident waves, Edge waves, Beach topography.

The development of beach cusps was studied along the northern shore of Delaware from June 9 through June 30, and from July 28 through August 10 of 1976. At the study site, the formation of beach cusps was dependent upon the existence of a tidal berm in the developing stage and of a favorable backshore topography. Beach cusps developed as follows: after an erosional event on a sandy beach, a berm developed at low tide. The swash extended over the berm and ponded between the berm and the backshore. The stream flow from the ponded water to the sea cut closely spaced channels through the berm. As the tide rose, the berm and channels migrated landward. When the tide fell, the swash could no longer overtop the berm, and no water was ponded landward of the berm. Since no water was returning seaward through the channels, the channel form could not be maintained, and the swash flared the channels into bays. A series of beach cusps appeared on the beach as the tide continued to fall. The spacing between cusps was irregular and was attributed to the irregular size of swash salients. At high tide, the horizontal distance from the berm crest to the backshore (L) was less than 12 m. At high tide where L was greater than 12 m, no beach cusps formed. Although a tidal berm developed, there was no effective backwash to cut through the berm. As the new tidal berm developed and as the swash overtopped the berm crest, the swash continued landward, and during a short period of time flooded a portion of the backshore. No cusps were observed to develop after a tidal berm had been constructed; berms and cusps developed together. (Lee-ISWS)
W78-12647

TANKERS AND OIL TRANSFER OPERATIONS ON THE DELAWARE RIVER AND BAY.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-12656

FACTOR ANALYSIS OF THE BIOCENOSES OF AQUATIC COLEOPTERA OF THE MARSHES OF LOWER GUADALQUIVIR (SPAIN), (IN FRENCH),
Seville Univ. (Spain). Dept. of Zoology.
A. C. Soler Andres, C. Montes Del Olmo, and L. Ramirex Diaz.
Ann Limnol 12(1), p 89-103, 1976.

Descriptors: *Statistical methods, *Biological communities, *Aquatic insects, *Marshes, *Aquatic environment, Environment, Physical properties, Chemical properties, Water temperature, Hydrogen-ion concentration, Magnesium, Calcium, Sulfates, Chlorides, Temperature, Coleoptera, Water depth, Guadalquivir, Spain, *Factor analysis.

Principal component analysis was used to study the bioenotic relationships between aquatic Coleoptera and 8 physical-chemical factors of the environment. Because of the large range of spatial and temporal conditions considered in this work, a preliminary analysis of 58 samples and 31 spp. showed a multidimensional structure in which it was not possible to detect ecological, faunistic or geographical affinities. Two analyses of samples taken from more homogenous environments (19 samples and 25 spp. from the marsh; 15 samples and 23 spp. from the rice field) revealed groups of species with a similar distribution. The significant correlations between the components of these analyses and environmental factors (temperature, pH, Chloride, sulphate, Mg, Ca and water depth) determined the ecological groups which were indicators of certain levels of environmental conditions. Daily variations in the community were more important than seasonal changes.--Copyright 1978, Biological Abstracts, Inc.
W78-12661

OPTIONS FOR MONITORING LOCAL PERMITS IN THE NORTH CAROLINA COASTAL AREA.
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6E.
W78-12662

MICROBIAL ECOLOGY STUDIES OF METULA SPILL IN THE STRAITS OF MAGELLAN,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-12673

SEED VIABILITY IN SALT MARSH TAXA, GEORGETOWN COUNTY, SOUTH CAROLINA,
Saint John's Univ., Jamaica, NY. Dept. of Biology.
R. Stalter, and W. T. Batson.
Castanea, Vol 38, No 1, p 109-110, March, 1973. 1 tab.

Descriptors: *Salt marshes, *Marsh plants, *Viability, Wetlands, Marshes, Seeds, Germination, *South Carolina, Georgetown County(SC).

Seeds were tested for viability from five salt marsh species and two salt marsh fringe species. Less than 10% of the seeds of Spartina patens and Spartina alterniflora are viable. Iva frutescens produces a greater proportion of viable seeds than the former two species, but the values are less than 50%. Species demonstrating moderate seed viability are Panicum virgatum, Solidago sempervirens, and Sporobolus virginicus. Borrichia frutescens produces the greatest percentage of viable seeds, 97%. (Steiner-Mass)
W78-12683

SEED VIABILITY IN TWO ATLANTIC COAST POPULATIONS OF SPARTINA ALTERNIFLORA,
Saint John's Univ., Jamaica, NY. Dept. of Biology.
R. Stalter.
Castanea, Vol 38, No 1, p 110-113, March, 1973. 1 tab, 15 ref.

Descriptors: *Marsh plants, *Viability, *Salt marshes, Wetlands, Marshes, Seeds, Germination, Grasses, South Carolina, Connecticut, *Spartina alterniflora.

The seeds in two populations of Spartina alterniflora near Charlestown, South Carolina, and Stonington, Connecticut, were tested for viability with tetrazolium chloride. The percentage of viable seeds in both populations was low, 8% for the population near Charlestown and 12% for the Stonington population. (Steiner-Mass)
W78-12684

VARIABILITY OF WETLAND REFLECTANCE AND ITS EFFECT ON AUTOMATIC CATEGORIZATION OF SATELLITE IMAGERY,
Delaware Univ., Newark. Center for Remote Sensing.
For primary bibliographic entry see Field 7B.
W78-12690

SEDIMENTATION RATES, SHORELINE MODIFICATION, AND VEGETATION CHANGES ON TIDAL MARSHES ALONG THE COAST OF CONNECTICUT,
Cornell Univ., Ithaca, NY.
E. Z. Harrison.
Master's Thesis, June, 1975. 107 p.

Descriptors: *Tidal marshes, *Sedimentation, *Seashores, *Vegetation, *Connecticut, Salt marshes, Coastal marshes, Wetlands, Sea level, Sediments, Erosion.

High marsh sedimentation rates are correlated with mean tide range at the five marsh sites studies. Average rates varied from 2 to 6.7 mm/yr. Correlation with mean tide range is best explained by the greater quantity of sediment-laden water that flows over sites with higher tide ranges. Over the past 10 years, high marsh sedimentation rates nowhere equaled the rapid short-term rise of sea level in Connecticut of 1 cm/yr. All of the marshes were progresively drowned during this interval. Over the past 40 years, however, the average rate of sea level rise (2 mm/yr) has been equaled or exceeded on all five sites. Over nine years, progradation occurred rarely, and marsh-edge retreat varied from none to a total of 14 m. Erosion rates seem to be related to protection from the short-period waves of Long Island Sound and sediment type. Changes in the elevation of mean high water from 1964 to 1973 were not reflected in the movement of the Spartina alterniflora/S. patens boundary. 'Breathing' of the marsh surface amounts to 5 to 8 mm vertical displacement. (Stihler-Mass)
W78-12691

1974 FINAL REPORT, RESEARCH ON SHORE AND UPLAND MIGRATORY BIRDS IN NEW JERSEY CLAPPER RAIL STUDIES,
New Jersey Dept. of Environmental Protection, Trenton. Div. of Fish, Game, and Shellfisheries.
For primary bibliographic entry see Field 2I.
W78-12696

ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS -- VOLUME III, EFFECTS ON LIVING RESOURCES AND HABITATS,
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-12697

THE MARSHES OF MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
L. N. Eleuterius.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi, p 147-190, 1973. 40 fig, 6 tab, 118 ref.

Descriptors: *Mississippi, *Marshes, *Marsh plants, *Distribution patterns, *Productivity, Estuaries, Estuarine environment, Wetlands, Salt marshes, Freshwater marshes, Plant groupings, Salinity, Juncus roemerianus, Rushes, Marsh zonation.

Phytosociological techniques were used to determine the vascular composition of the marhses of Mississippi for three estuarine systems. Juncus roemerianus, a rush, dominates the marshes of Mississippi. Freshwater marshes exhibited a great diversity of species, whereas saline marshes were more homogeneous with few species. The diversity of species increased with lower salinity and resulted in a penetration of freshwater species into more saline areas and vice versa. Organic matter production was greater in the saline marsh than in the freshwater marsh. Marsh regions, based on species composition, were established and zonation of each region recorded. Ecological factors are discussed and maps denoting marsh types presented. Marsh acreage by marsh type and dominant species was determined. Total standing crop and annual production was estimated at 3 million tons. (See also W78-12698) (Steiner-Mass)

W78-12702

THE DISTRIBUTION OF CERTAIN SUBMERGED PLANTS IN MISSISSIPPI SOUND AND ADJACENT WATERS,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2I.
W78-12703

ESTUARINE ZOOPLANKTON, MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
H. M. Perry, and J. Y. Christmas.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi, p 198-254, 1973. 2 fig, 39 tab, 98 ref, 1 append.

Descriptors: *Mississippi, *Estuarine environment, *Plankton, Estuaries, Distribution patterns, Zooplankton, Aquatic microorganisms, Mississippi Sound, Biloxi Bay(Mississippi), Copepods.

Plankton investigations were carried out through the central portion of Mississippi Sound and the Biloxi Bay estuary. Concurrent with the plankton samples, temperature, dissolved oxygen, salinity, and water transparency were measured. Freshwater, estuarine, and marine species made up the faunal components of the study. The populations were for the most part localized. Copepods were the dominant zooplankton group. Acartia tonsa was the most abundant plankton species. The influence of the ctenophore Mnemiopsis mccradyi on plankton volume is discussed. These predators probably play a large role in regulating the distribution and abundance of local plankton populations. (See also W78-12698) (Steiner-Mass)
W78-12704

ESTUARINE INVERTEBRATES, MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2I.
W78-12705

ESTUARINE VERTEBRATES, MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
J. Y. Christmas, and R. S. Waller.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, p 320-434, 1973. 11 fig, 36 tab, 99 ref.

Descriptors: *Mississippi, *Estuarine environment, *Fish, Estuaries, Vertebrates, Commercial fish, Fish populations, Growth rate, Continental shelf.

The occurrence, relative abundance, seasonal and areal distribution, distribution in the salinity-temperature matrix, spawning and growth rate of fishes collected in the Mississippi estuarine study area are reported. A list of 294 fish species from Mississippi estuaries and continental shelf waters off Mississippi included 251 species observed in the study area. The bay anchovy, largescale menhaden, Atlantic croaker, spot, butterfish, and sand seatrout comprised 93% of the total number of fishes collected. The role of other vertebrates in the study area is discussed. (See also W78-12698) (Steiner-Mass)
W78-12706

SEWAGE SPRAY IRRIGATION IN A DELAWARE RIVER FRESHWATER TIDAL MARSH,
Rider Coll., Trenton, NJ. Dept. of Biology.
For primary bibliographic entry see Field 5E.
W78-12712

THE FREQUENCY, DISTRIBUTION, AND PATHOLOGY OF THREE DISEASES OF DEMERSAL FISHES IN THE BERING SEA,
National Marine Fisheries Service, Seattle, WA. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.

W78-12751

LEAD AND COPPER IN THE WATERS OF RARITAN AND LOWER NEW YORK BAYS,
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5B.
W78-12811

SERIOUS MERCURY CONTAMINATION OF SEDIMENTS IN A NORWEGIAN SEMI-ENCLOSED BAY,
Norwegian Inst. for Water Research, Oslo (Norway).
For primary bibliographic entry see Field 5B.
W78-12815

ACUTE TOXICITY OF ALKYL LEADS TO SOME MARINE ORGANISMS,
Istituto di Ricerca Sulla Acque, Milano (Italy).
For primary bibliographic entry see Field 5C.
W78-12816

THE FRESHWATER REGIME OF FAXAFLOI, SOUTHWEST ICELAND AND ITS RELATIONSHIP TO METEOROLOGICAL VARIABLES,
Iceland Univ., Reykjavik; and Marine Research Inst., Reykjavik (Iceland).
U. Stefansson, and G. Guomundsson.
Estuarine and Coastal Marine Science, Vol. 6, No. 6, p 535-551, June 1978. 6 fig, 3 tab, 9 ref.

Descriptors: *Freshwater, *Saline water-freshwater interfaces, *Bays, *Precipitation(Atmospheric), Rainfall, Snowfall, Runoff, Evaporation, Air-water interfaces, Winds, Coasts, Salinity, Water balance, Glaciers, Meltwater, Foreign research, Correlation analysis, Estuaries, *Iceland.

On the basis of 15 surveys of 23 hydrographic stations in Faxafloi, Southwest Iceland, and the adjacent shelf region in the period February 1966 to March 1967, the freshwater regime of the bay was studied in relation to meteorological and hydrological factors. The freshwater content inside the bay ranged between 19,500,000 and 53,500,000 cu m, with an average value of 31,640,000 cu m. Direct runoff into Faxafloi averaged 29,280,000 cu m per day. However, the freshwater distribution, presented by means of charts of equivalent freshwater thicknesses, suggested that the freshwater input is due not only to local runoff and surplus precipitation, but also to advection of low-salinity water by the coastal current from the nearshore area south of Iceland. Analysis of wind data indicated a close association between the rate of change of the freshwater volume inside the bay between observations and the mean southerly wind component for the same period. This relationship was explained as the result of (1) southerly winds enhancing the transport of freshwater into the bay from the region south of Reykjanes, and (2) wind-driven transport leading to accumulation of freshwater in the bay. Conversely, winds from the north are believed to favor the transport of fresh surface water out of the bay and to suppress the inflow of freshwater by the coastal current from the south. Statistical methods were applied to the quantitative analysis of factors effecting changes in the freshwater content of Faxafloi. The results strongly supported the view that winds in the N-S direction are a major factor in producing the observed variations in freshwater content. (Sims-ISWS)
W78-12834

SUSPENDED SEDIMENT DYNAMICS IN BLUE FJORD, WESTERN PRINCE WILLIAM SOUND, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
C. M. Hoskin, D. C. Burrell, and G. R. Freitag.
Estuarine and Coastal Marine Science, Vol. 7, No. 1, p 1-16, July 1978. 8 fig, 23 ref. NSF 40159X, ERDA AT(45-1)-2229.

Descriptors: *Alaska, *Suspended solids, *Fjords, *Data collections, Sediment transport, Water circulation, Sedimentation rates, Water temperature, Sampling, Water analysis, Salinity, On-site data collections, Glacial sediments, Sounds, Turbidity, Testing procedures, Water quality, Tidal effects, Glaciers, *Blue Fjord(Alaska), *Prince William Sound(Alaska), Sediment traps.

Glacier meltwater and suspended discharge in Blue Fjord occurs over a brief 5-month period in summer. Suspended sediment concentrations in the meltwater stream reach 300 mg/l, and this sediment forms a surface turbid plume at the fjord head. Suspended sediment concentrations in the surface plume range from 200 mg/l at the head to a few mg/l 5 km away at the mouth. Turbidity does not seem to be related to density structure of the water column. Suspended sediment sinks through the water column, with most sediment settling at slack low water. Sediment trap measurements showed an April sediment flux of 1.5 mg dry sediment per sq cm/day at the head and 0.75 mg per sq cm/day at the mouth (mostly diatom frustules). September trap measurements yielded a sediment flux of 53 mg per sq cm/day at the head and 2 mg per sq cm/day at the mouth (mostly detrital inorganic silicates in the mud size range). Bottom sediment in the fjord basin is mostly mud, with an admixture of sand at the fjord head. Grainsize modes decrease from an average of 46 micrometers at the head to 8 micrometers 2 km away; no trend is discernable for sediments in the outermost 4 km of the fjord basin. Mud accumulates in the fjord at the rate of about 100 mm/meltwater year at the head, 10 mm/year in mid-fjord, and 4 mm/yeark in the 190 m basin inside the sill at the fjord mouth. (Humphreys-ISWS)
W78-12835

ENERGY BALANCE AND WIND EFFECTS IN A SHALLOW SOUND,
Naval Oceanographic Office, NSTL, MS.
W. E. Hart, and S. P. Murray.
Journal of Geophysical Research, Vol 83, No C8, p 4097-4106, August 20, 1978. 12 fig, 2 tab, 22 ref.

Descriptors: *Energy budget, *Winds, *Shalows water, *Coasts, Water circulation, Tidal waters, Currents(Water), Model studies, Mathematical models, On-site investigations, On-site data collections, Energy, Energy transfer, Islands, Barrier islands, Effects, Oceanography, *Chandeleur-Breton Sound, Wind effects.

Tidal energetics and wind effects in an extensive (3000 sq km) shallow (about 3.5 m) sound with two widely separated entrances were studied numerically with a two-dimensional vertically averaged model. A comparison of current predictions with observations from 15 current meter stations under differing tida regimes proved the reliability of the model. Evaluation of the instantaneous energy balance equation showed the change in energy content to be nearly balanced by input energy flux, frictional energy dissipation being of secondary importance. In contrast to the equipartition of energy in classical long waves, there is on the average 8 times more potential energy than kinetic energy. Input energy flows shows preferential pathways; the wide northern entrance mainly shows energy gain to the Sound, the southern entrance shows equal amounts of gain and loss, while small cuts through the barrier island chain serve mainly as conduits for energy loss. When real tidal input is used, the energy balance time-averaged over a diurnal tidal cycle is not in a steady state, and frictional dissipation is the dominant term. Experiments showed that with winds in the 8- to 9-m/s range, extensive setup can occur (20 cm), strongly dependent on wind direction. Increased speeds through the passages can significantly reduce the residence time in the Sound.

Relaxation time of the wind perturbations is only about 3 hours. (Sims-ISWS)
W78-12845

MECHANISMS OF HYDROGEN SULFIDE RELEASE FROM COASTAL MARINE SEDIMENTS TO THE ATMOSPHERE,
Aarhus Univ. (Denmark). Inst. of Ecology and Genetics.
M. H. Hansen, K. Ingvorsen, and B. B. Jorgensen.
Limnology and Oceanography, Vol. 23, No. 1, p 68-76, January 1978. 5 fig, 1 tab, 25 ref.

Descriptors: *Hydrogen sulfide, *Sediments, *Coasts, *Atmosphere, Sampling, Measurement, Biology, Marine biology, Chemistry, Water chemistry, Marine microorganisms, Bacteria, Sulfur bacteria, Sulfates, Oceans, Oceanography, Hydrogen sulfide release.

In two shallow, coastal areas in Denmark the rates of hydrogen sulfide, H2S, release were measured directly by continuously collecting the gas over a known area. Peak emission rates of up to 0.30 and 6.7 mmol H2S per sq m pr h were found with a diurnal average of 0.063 and 1.58 mmol H2S sq m per h. The release mainly takes place at night since photosynthetic microorganisms efficiently oxidize the sulfide during the day. Only traces of H2S escape through a stagnant layer of oxic water 10 cm deep. The rate of H2S release was compared to the diurnal changes in light, temperature, Eh, pH, O2, and H2S at the sediment surface and with the rate of sulfate reduction within the sediment. (Sims-ISWS)
W78-12848

TURBULENT FREE CONVECTION IN FRESH AND SALT WATER: SOME CHARACTERISTICS REVEALED BY VISUALIZATION,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
K. B. Katsaros.
Journal of Physical Oceanography, Vol. 8, No. 4, p 613-626, July 1978. 11 fig, 39 ref. ONR N00014-67-A-0103-0014.

Descriptors: *Convection, *Water circulation, *Laboratory tests, Photography, Tracers, Hydraulic models, Model studies, Turbulence, Turbulent flow, Turbulent boundary layers, Boundary layers, Flow, Freshwater, Saline water, Circulation, Oceanography.

Tracers were used to reveal the motions within the boundary layer on water in turbulent free convection. The technique of obtaining a thin sheet of light with an inexpensive laser and a cylindrical lens was suggested as a convenient tool for classroom demonstrations and research. Some facts about high Rayleigh number free convection, often not revealed by quantitative point sensors, which were illustrated with the accompanying photographs, were as follows: (1) the 'whole' thermal boundary layer at the air-water interface participates in the convection through cyclic instabilities, (2) the form of the convection is predominantly vertical sheets originating from narrow lines in the interface (also observed with 'schlieren' by Spangenberg and Rowland), (3) whether the boundary is rigid or free does not affect the appearance of these lines appreciably, (4) the lines move about in a unpredictable fashion and interact with each other, (5) entrainment away from the boundary very quickly broadens the convection elements, (6) presence of salt strongly affects the horizntal scales of the convection in evaporating water. The latter point also was demonstrated with horizontal wavenumber spectra, and compared to theory. Discussions of similarities between convective systems in atmosphere and ocean and these laboratory observations were included. (Sims-ISWS)
W78-12856

WIND-DRIVEN CIRCULATION IN A FJORD,
Bergen Univ. (Norway). Geofysisk Inst.
H. Svendsen, and R. O. R. Y. Thompson.
Journal of Physical Oceanography, Vol. 8, No. 4, p 703-712, July 1978. 14 fig, 3 tab, 16 ref.

Descriptors: *Water circulation, *Fjords, *Winds, Tides, Currents(Water), Water temperature, Salinity, Runoff, Water levels, Stratification, Circulation, Estuaries, Tide waters, On-site investigations, Model studies, *Norway.

Currents, temperature, salinity, wind, runoff, and water level were observed for a month in the Josenfjord of southern Norway. Tide gages and currents show little semidiurnal tide. There is a strong diurnal signal in the upper 20 m, which a linear model showed to be caused by the wind. There is a week-long event in which the entire water-mass above the still is flushed out; this is interpreted to be caused by downwelling outside the fjord. The strong stratification near the surface of the fjord greatly modifies the diurnal response of the fjord, but any density-driven mean circulation is at least an order of magnitude smaller than the wind-driven currents. (Sims-ISWS)
W78-12857

THE WAVE HEIGHT VARIATION FOR REGULAR WAVES IN SHOALING WATER,
Technical Univ. of Denmark, Lyngby (Denmark). Inst. of Hydrodynamics and Hydraulic Engineering.
I. A. Svendsen, and J. B. Hansen.
Coastal Engineering, Vol. 1, p 261-284, 1977. 12 fig, 4 tab, 21 ref, 1 append.

Descriptors: *Waves(Water), *Shoals, *Beaches, Ocean waves, Model studies, Mathematical models, Variability, Shallow water, Coasts, Laboratory tests, Flumes, Fluid mechanics, Wave heights, Cnoidal waves.

The theory of cnoidal wave shoaling previously has been connected to data in deeper water (described by sinusoidal wave theory) by assuming continuity in energy flux E sub f at the matching point between the two theories resulting in a small shift in wave height H at the matching point. In this paper it was assumed directly continuity in wave height, and tables were given from which the wave height variation can be determined when the wave is specified at any water depth (including deep water). It also was shown that a deep water limit for cnoidal waves exists. The nature of this limit and the behavior of the waves close to it were analyzed. Experimental data for waves with no free second harmonic components were compared with a shoaling model based on linear theory for h/L sub o greater than 0.10 and cnoidal theory for h/L sub o less than 0.10. The agreement is very good for deep water wave steepnesses H sub o/L sub o up to 3-4%. For larger steepnesses, the linear theory fails to predict the variation for h/L sub o greater than 0.10. (Sims-ISWS)
W78-12864

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN IV. NUMERICAL TREATMENT IN SITE-SPECIES DATA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Mathematics and Statistics.
For primary bibliographic entry see Field 5A.
W78-12868

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN VIII. SEASONAL, DIURNAL, AND LATITUDINAL VARIATIONS IN ABUNDANCE OF EUTHECOSOMATA ALONG THE 110 DEGREE E. MERIDIAN,
Marine Products Export Development Authority, Calcutta (India).
For primary bibliographic entry see Field 5C.
W78-12869

CHLOROPLAST PIGMENTS OF A GREEN PHYTOPLANKTER FROM THE HUDSON ESTUARY, U.S.A.,
Dalhousie Univ., Halifax (Nova Scotia) Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-12884

DENITRIFICATION OF AMMONIA FORMATION IN ANAEROBIC COASTAL SEDIMENTS,
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W78-12885

THE DISTRIBUTION OF NUTRIENTS IN SWARTVLEI, A SOUTHERN CAPE COASTAL LAKE,
Rhodes Univ., Grahamstown (South Africa). Inst. for Freshwater Studies.
For primary bibliographic entry see Field 5B.
W78-12889

LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-12907

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

MOLECULAR BACKWASH FOR DECONTAMINATION OF MEMBRANES,
California Univ., Berkeley. Sea-Water Conversion Lab.
K. S. Spiegler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 720, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, August 1, 1978. 26 p, 7 fig. OWRT S-0091(7536)(1).

Descriptors: *Electroosmosis, *Membranes, *Molecular backwash, *Osmosis, Membrane processes.

In studies of osmotic and electroosmotic backwash to decontaminate hyperfiltration membranes, it was found that the direction and magnitude of electroosmotic flow in asymmetric cellulose-acetate membranes in sodium-chloride solutions depends on the concentration of the solutions contacting the membrane. Conclusions from electrochemical evidence indicate that if the solution concentrations are below 0.02 M NaCl, the membranes (cured at 91.5-94C) are cation selective and above 0.1 M NaCl the membranes are anion selective. It is shown that the friction model of mass transport across membranes can explain reversal of electroosmotic flow, and of membrane selectivity even in homogeneous membranes. (This is not to mean that theories based on the heterogeneity of asymmetric membranes which take account of the multilayer nature of these membranes are not applicable to such membranes). For 'loose' membranes (i.e. those expanded after curing at 92.5C), the magnitude of the electroosmotic flux, and its variation with the current density were less than for a 'tight' (unexpanded) membrane cured at the same temperature.
W78-12101

PORTABLE WATER DISTILLATION APPARATUS,
For primary bibliographic entry see Field 5F.
W78-12776

COMMON ION EFFECT TO ASSIST LM SEPARATION,
Exxon Research and Engineering Co., Linden, NJ. (Assignee).
For primary bibliographic entry see Field 5D.
W78-12781

END POINT QUALITY CONTROL LIGHT CIRCUIT,
Continental Water Conditioning Corp., El Paso, TX. (Assignee).
For primary bibliographic entry see Field 5G.
W78-12788

DESALINATION PROCESS SYSTEM AND BY-PRODUCT RECOVERY,
Stone and Webster Engineering Corp., Boston, MA. (Assignee).
F. E. Conger.
U.S. Patent No. 4,083,781, 8 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 969, No 2, p 635-636, April 11, 1978.

Descriptors: *Patents, *Desalination, *Water treatment, *Water purification, Desalination processes, Sea water, Reverse osmosis, Separation techniques, Potable water, Flash distillation, Byproducts.

Known desalination techniques are combined to afford efficient energy usage and to provide by-products which are useful. The system relies essentially on a multi-stage reverse osmosis installation in series with a conventional flash evaporation unit and optionally a brine concentrator. The water to be desalinated is delivered to the first reverse osmosis sub-system, which is a moderate pressure sub-system, by a pump driven by a steam turbine. After passage of the water through the first reverse osmosis sub-system (consisting of one or more stages), both usable product water and salt water of much higher salt content are provided. The reject salt water is then delivered under a higher pressure by a turbine-driven pump to a second reverse osmosis sub-system, which is a high-pressure sub-system (consisting of one or more stages). Again in the second reverse osmosis system, both usable product water and high-salt content water are produced. The high-salt content water is delivered to the evaporation unit for further treatment. Distilled water is recovered by flash evaporation and the high-salt content product remaining is delivered for further process to either concentration ponds (solar ponds) or to mechanical brine concentrators, or to both. Calcium sulfate and soldium chloride are recovered. The process may also produce hydrogen, chlorinde and sodium hydroxide.
W78-12799

WATER CONDITIONING PROCESS,
Rohm and Haas Co., Philadelphia, PA. (Assignee).
For primary bibliographic entry see Field 5F.
W78-12800

3B. Water Yield Improvement

PRECIPITATION CLIMATOLOGY FOR THE TEXAS HIGH PLAINS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
D. R. Haragan.
The Texas Journal of Science, Vol 30, No 2, p 107-123. 7 fig, 3 tab, 6 ref. (June 1978).

Descriptors: *Weather modification, Cloud seeding, *Climatology, *Precipitation(Atmospheric), *Texas, Data collections, Variability, *High Plains(Tex).

The problem of evaluating cloud-seeding projects has been exacerbated by a lack of adequate statistical data for a quantitative definition of the natural variability characteristics of the region in question. Quantitative assessment of the spatial and temporal variability of the average (1944-73) precipitation on the Texas high plains is provided to serve as a base for proper evaluation. (Russell-Arizona)
W78-12221

WATER RESOURCES IN THE ARID ZONE OF THE USSR AND PROSPECTS OF THEIR UTILIZATION (IN RUSSIAN),
L. V. Dunin-Barkovskii.
Probl Osvo Pustyn 2, p 12-21, 1977.

Descriptors: *Arid lands, *Water utilization, *Moisture availability, *Water yield improvement, Deserts, Agriculture, Water supply, *USSR, Agriculture, Asia(Central), *Deserts.

The desert zone in the USSR (Central Asia) can be exploited more effectively for agricultural development when a sufficient amount of water is available. Ways are presented for improving the water supply in the southern regions.--Copyright 1978, Biological Abstracts, Inc.
W78-12299

INTERACTIONS IN WATER RESOURCE DEVELOPMENT,
Department of Water Affairs, Pretoria (South Africa).
For primary bibliographic entry see Field 6D.
W78-12421

HAIL DAMAGE TO AGRICULTURE AND ITS PREVENTION,
A. E. Carte.
South African Journal of Science, Johannesburg, Vol 73, No 11, p 327-330, 1977. 14 ref, 7 fig, 3 tab.

Descriptors: *Hail damage control, Agricultural production, Climatic factors, *Cloud seeding, Silver iodide, Operations research, *Weather modification, South Africa.

Bad weather claims about one quarter of agricultural production in South Africa each year, and can be much greater. Drought is the most important single cause of crop losses, yet those due to hail can amount to some R50 million annually. Research directed towards gaining a better understanding of hailstorms is being carried out in a number of countries including South Africa, as are operations to prevent hail damage. The results of the latter are generally controversial and they emphasize the need for further knowledge of hailstorms. (So Afr Water Info Ctr)
W78-12506

EVAPORATION CONTROL ON FARM-SIZE RESERVOIRS,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
W. Nicholaichuk.
Journal of Soil and Water Conservation, Vol. 33, No. 4, p 185-188, July-August 1978. 7 fig, 1 tab, 12 ref.

Descriptors: *Evaporation control, *Monomolecular films, Water control, Water conservation, Water levels, Water management(Applied), Water shortage, Water yield improvement, Water, Wind velocity, *Evaporation losses, *Vapor transport, Vapor pressure gradient, Evaporation rate, Fatty alcohols, Floating cover, Wind action.

The use of monomolecular films reduced evaporation 18% in a field test of several methods of controlling evaporation from a free-water surface in southwestern Saskatchewan, Canada. Although a further evaporation reduction was achieved by combining this treatment with windbreaks and floating grids, the cost of water saved increased. Rafts proved to be a good alternative to monomolecular films. The most economical raft was made of lightweight concrete, which conserved water at a cost competitive with monomolecular films. Generally, the rafts reduced the depth of ice formation beneath them about 50% compared with areas not covered by rafting material. This was an added benefit apart from evaporation suppression. (Roberts-ISWS)
W78-12649

EFFECTS OF FILM ANTITRANSPIRANTS ON WOOD PLANTS (IN RUSSIAN),
Moscow Forestry Inst. (USSR).
V. P. Dadykin, and L. P. Samsonova.
Fiziol Rast (Mosc) 24(3), p 574-581, 1977.

Descriptors: *Antitranspirants, Forest management, Acer-negundo, Acer-platanoides, Betula-pendula, Growth rates, Inhibition, *Methacrylates, Photosynthesis, Populus-deltoides, Populus-piramidalis, Roots, Tilia-cordata, Trees, Organic compounds.

The period of spring foresting can be made longer by employing film antitranspirants prepared on the basis of latex DMMA-65-1-GP (synthetic rubber, butadiene-methyl methacrylate) produced in the USSR. The experiments were conducted with seedlings of birch, linden, maple and poplar (Betula pendula, Tilia cordata, Acer platanoides, A. negundo, Populus pyramidalis and P. deltoides.) The period of spring foresting can be prolonged by 2 wk by means of the antitranspirant. Films of the antitranspirant produced on leaves decrease the rate of transpiration by 30-70% during 8-12 days; during this time, photosynthesis is inhibited by 30-50%, and is then restored to the level of the control. Temporary inhibition of photosynthesis causes changes in the growth rate of plants during the 1st year. The antitranspirant stimulates growth of the root system in the plants.--Copyright 1978, Biological Abstracts, Inc.
W78-12668

SUMMARY OF METROMEX, VOLUME 2: CAUSES OF PRECIPITATION ANOMALIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-12830

ICEBERGS MIGHT SUPPLY WATER TO ARID REGIONS,
Iowa State Univ., Ames.
C. Herman.
Irrigation Age, Vol. 12, No. 3, p 42, Nov.-Dec. 1977.

Descriptors: *Icebergs, *Melt water, Climatology, Melting, Ice, Ice loads, Arid lands, Sea ice, Fresh water, Water yield.

Two hundred scientists met recently in Ames, Iowa to consider the possibility of using icebergs as a source of fresh wate for arid regions. The plan involves transporting the icebergs from Antarctica to water-short areas of the world, melting them once there and using the water for irrigation and drinking water. Icebergs, formed from snow fall 10,000 to 100,000 years ago, contain the purest water on earth and Antarctica, producing more than 10,000 icebergs a year, is considered by scientists to be the source of 90% of the world's fresh water supply. The critical problems discussed at the conference addressed means and methods of harvesting or selecting a proper iceberg, transportation, insulation, and controlled melting at its destination. Towing an iceberg would for instance take 6 months to a year and millions of dollars. Although legal problems are also expected to cause complications, the potential water value of icebergs warrants serious consideration. (Tickes-Arizona)
W78-12936

DUCING PHREATOPHYTE TRANSPIRA-ON,
lifornia Univ., Davis. Dept. of Land, Air and ater Resources.
C. Davenport, and R. M. Hagan.
drology and Water Resources in Arizona and e Southwest, Vol. 7, p141-146, 1977. 4 tab, 2 fig, ef.

escriptors: *Phreatophytes, *Transpiration, ntitranspirents, *Transpiration control, hemcontrol, Stomata, Water conservation, ater utilization, Consumptive use, Water yield provement, Balance of nature, Thin films, esert plants, Tamarisk, Cottonwoods, Arid nds, Diurnal, Nocturnal.

hreatophyte vegetation in the semiarid southwest ccounts for large water losses through transpira-on. Efforts to control this problem through eradi-tion have been shown to cause severe ecological balances. This paper examines control efforts ith antitranspirants, a technique that avoids moval of vegetation or damage to the environ-ent. In June 1974 cuttings of Saltcedar (Tamarix entandra) and cottonwood (Populus sp.) were ken from a single mother plant, rooted and trans-lanted outdoors in five gallon drums. Irrigation as applied to the soil surface and daily transpira-on measurements were recorded by periodic eighing. Two waxbased, food grade antitrans-irants were used in these trials: (1) mobileaf FG Mobil Chemical Co.) and (2) Folicote (Crystal oap and Chemical Co.). These were sprayed on he foliage as emulsions with water by a solo back-ack mist blower at various dilutions and applica-ion rates. The wax-based antitranspirants in-reased folier diffusive resistance and reduced ranspiration of saltcedar and cottonwood by 32-38% initially and by 10% after 3 weeks. Antitrans-pirant effectiveness increased with ratio of day:night hours and with lower soil-water stress. (Tickes-Arizona)
W78-12939

DIURNAL TRENDS IN WATER STATUS, TRANSPIRATION, AND PHOTOSYNTHESIS OF SALTCEDAR,
Idaho State Univ., Pocatello. Dept. of Biology.
M. E. Williams, and J. E. Anderson.
Hydrology and Water Resources in Arizona and the Southwest, Vol 7, p 119-124, 1977. 3 fig, 12 ref.

Descriptors: *Tamarisk, *Diurnal, *Consumptive use, *Water utilization, *Transpiration control, Moisture uptake, Moisture deficit, *Photosynthesis, Pores, Respiration, Water loss, Stomata, Lysimeters, Plant physiology.

Saltcedar (Tamarix chinensis) is of economic importance in the semiarid southwest not only because it covers 1.3 million acres along permanent and ephemeral waterways but also because of its very high consumptive water use, amounting to over 5 million acre feet per year. Relative water content, water potential, and gas exchange were measured for this shrub at the San Bernado, New Mexico, lysimeter site. Although relative water content and water potential were found to be closely related, water potential measurements using a pressure bomb technique were used more reliably and conveniently. Results obtained under typical summer conditions indicated significant depressions of transpiration and photosynthesis during afternoon hours. This study assessed the diurnal trends to see if these depressions occured in twigs and photosynthesis were correlated with water stress. Although results indicated that stomatal close-up may be affected by water stress, transpiration and photosynthesis thesis seemed to be unaffected by leaf water status. A diurnal rhythm to control gas exchange is suggested. (Tickes-Arizona)
W78-12940

3C. Use Of Water Of Impaired Quality

SULFUR ISOTOPE DISTRIBUTION IN SULFATES FROM SURFACE WATERS FROM THE NORTHERN JORDAN VALLEY, ISRAEL,
Weizmann Inst. of Science, Rehovot (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5B.
W78-12167

THE SALT BALANCE OF THE MEXICALI, B.C. IRRIGATION DISTRICT (EL BALANCE DE SALES DEL DISTRITO DE RIEGO DE MEXICALI, B.C.),
Escuela Nacional de Agricultra, Chapingo (Mexico). Dept. of Irrigation and Drainage.
O. Palacios Velez, M. Escamilla, and A. Reyes.
Natural Resources Journal, Vol 18, p 49-67, January, 1978. 3 ref, English summary.

Descriptors: *Salinity, *Saline waters, *Saline soils, *Irrigation water, International waters, Mexico, Colorado River, Sampling, Wells.

The fluctuation of salt levels in the Mexicali irrigation district has been under investigation since 1970 in cooperation with technicians from the Secretary of Water Resources. Samples have been taken from more than 50 points at which water enters or leaves the area through canals and drains, as well as from 40 pumping wells considered to be representative of over 700 such wells in the area. Data have been complied concerning the daily, monthly, and yearly fluctuations in the water's salt content. In addition, yearly soil sampling is carried out to permit evaluation of the impact of salinity fluctuations in incoming and outgoing waters. (Russell-Arizona)
W78-12226

INTERNATIONAL EXTERNAL DISECONOMIES: THE COLORADO RIVER SALINITY PROBLEM IN MEXICO,
Escuela Nacional de Agricultura, Chapingo (Mexico); and Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6E.
W78-12231

RESOURCES DEPLOYED IN WATER RE-USE,
Pretoria Univ. (South Africa).
F. A. Van Duuren.
In: Conference on resources of Southern Africa today and tomorrow, (Johannesburg) South Africa, p 242-250, September 22-26, 1975, 2 fig, 4 tab, 24 ref.

Descriptors: *Water resources, *Water reuse, *Water requirements, Domestic consumption, Agricultural use, Industrial use, Water quality, Water quality criteria classification, Recreational water, Water quality control technique, Water treatment, *South Africa.

Re-use protects the quality and usefulness of water and increases its availability. A brief review is given of water requirements and demands in South Africa and the consumptive use of water by various industires are tabulated. Then follows the quality of water resources and the quality of water required for various purposes, eg. domestic supply, recreation purposes and for industrial purposes. The measurement of water quality and the classification of water parameters are discussed as well as the methods of purification and treatment. It is concluded that the philosophy and science of systematic water re-use to conserve natural resources, developed and extensively applied in South Africa, may well serve as an example to the better-watered places of the world. (So Afr Water Info Ctr)
W78-12422

RELATIONSHIPS BETWEEN SOIL SALINITY AND THE SALINITY OF APPLIED WATER IN THE SUISUN MARSH OF CALIFORNIA,
California State Dept. of Fish and Game, Sacramento. Wildlife Management Branch.
For primary bibliographic entry see Field 2G.
W78-12692

EFFECT OF SALINITY ON AGRICULTURE IN IRAQ,
Mosul Univ. (Iraq). Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W78-12922

IRRIGATING ON THE DEAD LEVEL,
U.S. Water Conservation Lab., Phoenix.
L. J. Erie, and A. R. Dedrick.
Irrigation Age, Vol. 12, No. 3, p 14-15, Nov.-Dec. 1977. 4 photos.

Descriptors: *Grading, *Leveling, Saline waters, *Return flow, Slopes, Labor, Costs, *Flow control, Water distribution(Applied), Irrigation systems, Irrigation canals, Infiltration, Concrete-lined canals, Dead leveling, Drainage.

The increasing trend in the Southwest to level cropland to zero grade promises to raise crop production, improve irrigation efficiency, and simplify water distribution systems. 'Dead leveling' is one of the measures the ARS is currently pursuing in an effort to reduce return flows to rivers which carry additional salts to downstream water users. ARS researchers using two dead leveled fields of 65 acres each in Arizona have developed automated irrigation systems which when used on dead leveled fields significantly reduce labor costs. An automated jack gate system allows one man to turn large irrigation streams onto a flat field with little difficulty. A piston type air cylinder replaces the gate lifting mechanism and can be activated to open or shut by time clocks. Another system developed to handle large streams is the use of several tile outlets embedded along concrete-lined supply canals. This system utilizes two types of air pillows to close or open the outlets, one containing a valve stem and the other a bellows type similar to those found on the air shocks of large trucks. These systems used on dead leveled fields allow the farmer to get water over the field quickly for even distribution and infiltration at minimal labor cost. (Tickes-Arizona)
W78-12935

3D. Conservation In Domestic and Municipal Use

ESTIMATING RUNOFF POLLUTION FROM LARGE URBAN AREAS--THE DELAWARE ESTUARY,
Rutgers - The State Univ., New Brunswick, NJ.
For primary bibliographic entry see Field 5B.
W78-12111

A STATISTICAL ANALYSIS OF FACTORS AFFECTING WATER PRICES IN SMALL MUNICIPALITIES,
Mississippi Univ., University. School of Business Administration.
W. E. Boyet, and K. W. Hollman.
Current Municipal Problems, Vol. XVII, No. 1, p 16-28, Summer 1975. 2 tab.

Descriptors: *Statistical methods, *Pricing, *Water rates, Mississippi, Regression analysis, Economic efficiency, Planning, Water management(Applied), Equations, Systems analysis.

Water system management and planning present problems of pricing water in the most efficient manner. Mismanagement in water pricing may result in excessive water consumption or in such frugal usage of water that economic development

is stymied. Sound pricing practices that conform to economic ideals have not always been used in the past. It is important that the variables which influence water prices be isolated so that water system managers can determine water prices on a more scientific basis in the future. Described is a study to determine, using multiple regression analysis, the effect that various social, economic, operational, and other types of factors exert on water prices in small Mississippi municipal water systems. A regression equation using these various types of factors was derived to describe water prices. It is found that prices are largely determined on a hit-or-miss basis and that it is only accidental when a particular system establishes a price which conforms to the economic ideal. In conclusion, there is a need for a reevaluation of the pricing practices utilized by the Mississippi water systems which have been studied. (Bell-Cornell)
W78-12118

THE ECONOMIC DEVELOPMENT OF TIJUANA IN RELATION TO WATER SUPPLY AND ATMOSPHERIC, MARINE AND AQUATIC CONTAMINATION,
Sonora Univ., Hermosillo (Mexico). School of Law and Social Sciences.
For primary bibliographic entry see Field 6E.
W78-12227

CHARACTERIZATION OF URBAN RUNOFF,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W78-12279

SOLAR POWER EQUIPMENT FOR DOMESTIC USE.
For primary bibliographic entry see Field 3E.
W78-12431

EVALUATION OF DETENTION BASINS FOR CONTROLLING URBAN RUNOFF AND SEDIMENTATION,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 2A.
W78-12608

DISTRIBUTION PATTERNS OF LAWN SPRINKLERS,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
G. L. Kerr, L. O. Pochop, J. Borrelli, and D. A. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 316, Price codes: A02 in paper copy, A01 in microfiche. ASAE Technical Paper No. 78-2011. 1978. 20 p, 10 fig, 5 tab, 8 ref. Paper presented at 1978 Summer Meeting of American Society of Agricultural Engineers, Utah State U., Logan, Utah, June 27-30, 1978. OWRT B-035-WYO(2), 14-34-0001-7201.

Descriptors: *Lawns, *Distribution patterns, *Sprinkler irrigation, *Rates of application, *Water distribution(Applied), *Water conservation, Water utilization, Municipal water, Christiansen's Uniformity Coefficient(UCC), Overlapped sprinkler patterns, Municipal Water Demand, Lawn appearance.

Distribution patterns of six basic types of lawn sprinklers were determined by testing four sprinklers of each type at three pressure levels. Christiansen's Uniformity Coefficient (UCC) was calculated for the original and nine overlapped watering patterns for each sprinkler tested. The amount of overlap required to achieve minimum acceptable UCC values was then determined.
W78-12610

PHOSPHORUS SOURCE MANAGEMENT FOR EUTROPHIC LAKES. PHASE I: TRIBUTARY PHOSPHORUS LOADING,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Zoology; and Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
For primary bibliographic entry see Field 5B.
W78-12746

URBAN STORM-WATER DATA MANAGEMENT SYSTEM, BROWARD COUNTY, FLORIDA,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Miami, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12747

QUALITY AND QUANTITY OF STORM-WATER RUNOFF FROM THREE LAND-USE AREAS, BROWARD COUNTY, FLORIDA,
Geological Survey, Miami, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-12748

SUMMARY OF METROMEX, VOLUME 2: CAUSES OF PRECIPITATION ANOMALIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-12830

REVIEW OF CANADIAN MUNICIPAL URBAN DRAINAGE POLICIES AND PRACTICES.
Gore and Storrie Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5G.
W78-12949

3E. Conservation In Industry

A MODEL FOR SOLAR RADIATION CONVERSION TO ALGAE IN A SHALLOW POND,
Purdue Univ., Lafayette, IN. School of Mechanical Engineering.
F. P. Incropera, and J. F. Thomas.
Solar Energy, Vol. 20, No. 2, p 157-165, 1978. 14 fig, 2 tab, 30 ref. OWRT A-042-IND(3).

Descriptors: *Algae, *Energy conversion, *Solar radiation, *Photosynthetic oxygen, Photosynthesis, Chlorella pyrenoidosa, *Bioconversion, Insolation.

In recent years there has been considerable interest in solar energy utilization through bioconversion, and a promising application involves the mass culture of unicellular algae. The purpose of this study has been to develop systematic procedures for predicting the yield of such cultures as a function of geographic location and diurnal and seasonal conditions. The procedures allow for the use of available insolation data and account for both the spectral and directional characteristics of the incident radiation. Calculations for the maximum hourly production of algae and oxygen have been performed for the Indianapolis, Indiana region, and the results are in reasonable agreement with field data obtained at similar latitudes.
W78-12270

ORGANIZATION OF SANITARY PROTECTION OF THE ENVIRONMENT (AIR, WATER BODIES, WATER SUPPLY, SOIL) IN DONETSK (IN RUSSIAN),
Donetsk Municipal Sanitation Disinfection Station (USSR).
For primary bibliographic entry see Field 5D.
W78-12287

THE DESIGN AND OPERATION OF A DRY COOLING SYSTEM FOR A 200MW TURBOGENERATOR AT GROOTVLEI POWER STATION; SOUTH AFRICA,
N. T. van der Walt, L. A. West, T. J. Sheer, and D. Kuball.
South African Mechanical Engineer, Johannesburg, Vol. 26, No. 12, p 498-507, 1976. 2 ref, 8 fig.

Descriptors: *Dry cooling, *Power generation, *Cooling towers, *Design criteria, Water saving, Atmospheric conditions, Humidity, Wind velocity, Climatic factors, *Performance, Experimental results, Grootvlei Power Station, *South Africa.

A large dry-cooling system for a 200 MW turbogenerator was commissioned in South Africa in 1971. One of the aims in installing this system was to gain design and operating experience of dry cooling systems. The cooling system is of the indirect type, with a jet condenser. For economic reasons a natural-draught cooling tower was selected, within which the finned-tube cooling elements are mounted horizontally. The design heat rejection for the non-reheat turbine is 1 191GJ/h. The overall height of the cooling tower is 100m. The design ambient conditions include an average dry-bulb air temperature of 15,6 degrees C, an annual temperature variation from 5 degrees C, to 35 degrees C and an atmospheric pressure of 846 mb (station elevation being 1 700 m above MSL). The commissioning of this installation is described, as well as some aspects of the first two years of operation, including spray condenser performance, condensate treatment, investigations into corrosion and fouling of the cooler tubes, waterhammer problems, and operator experience. Performance testing has been carried out, and has included the continuous monitoring of condensate and air temperatures over 24h periods. These tests have revealed variations in the heat transfer capability of the tower, over and above the expected variations associated with change in ambient temperature. This additional variation in performance is due to the influence of the total atmospheric environment on the draught through the tower. Change in the wind velocity at the top of the tower and in wind and temperature gradients in the vicinity of the tower are factors to which the variations are attributed. The cooling system has functioned very successfully to date, with practically 100 per cent availability of the cooling tower. In the dry and substantially pollution-free conditions generally encountered inland in South Africa, there seems no reason to doubt that long and troublefree operating lives of dry-cooling towers can be achieved. (So Afr Water Info Ctr)
W78-12389

COST OF HOT WATER SUPPLY REDUCED BY SOLAR HEATING,
For primary bibliographic entry see Field 6C.
W78-12391

REUSE FOR SURVIVAL,
For primary bibliographic entry see Field 5E.
W78-12405

POWER STATION EFFLUENT CONTROL AND THE REUSE OF ASH WATER FOR COOLING WATER TREATMENT,
For primary bibliographic entry see Field 5F.
W78-12417

SOLAR POWER EQUIPMENT FOR DOMESTIC USE.
Development Magazine, Vol. 11, No. 10, p 67, 71-72, 1977.

Descriptors: *Domestic water, *Solar energy, Solar heating, Geysers, Water pressure, Temperature fluctuations, Economics, Equipment descrip-

tion, Solar radiation, *Rhodesia, *Southern Africa.

Discussion is presented of the production of domestic solar water heaters in Rhodesia and the installation of a number of large units at schools and hostels. One of the problems that appeared was the need to educate users. With solar heaters, there is no progressive cooling and taps tend to be left running. Consequently, storage which should be sufficient for three to four days is often run off in one day. Various types of collectors are discussed as well as a solar cooker which can reach temperatures in excess of 180 degrees centigrade. (So Afr Water Info Ctr)
W78-12431

ENVIRONMENTAL POLLUTION CONTROL ON MINES,
For primary bibliographic entry see Field 5G.
W78-12439

PLUGGING IN TO THE BIG DYNAMO,
Council for Scientific and Industrial Research Pretoria (South Africa).
W. N. Cawood.
Scientiae pretoria. Vol 18, No 1, p 2-11, 1977. 7 refs.

Descriptors: *Solar energy, Steam turbines, Pumped storage, Domestic water, Solar heating, Agriculture, Swimming pools, Solar stills, Research and development, *South Africa.

While the world worries about dwindling fossil fuel reserves a virtually limitless energy source blazes away in the sky. Discussion is presented of the harnessing of solar energy and mentions solar research, photothermal processes, photovoltaic processes, domestic water heating, space heating, agricultural applications, swimming pool heating, cooking, solar stills and commercial and industrial uses. (So Afr Water Info Ctr)
W78-12445

THE DESIGN AND OPERATION OF A DOUBLE-V COMPARTMENT VERTICAL FLOW SETTLER,
B. N. Souter.
Journal of the South African Institute of Mining and Metallurgy, Vol 77, No 8, p 163-174, 1977. 4 tab, 19 figs.

Descriptors: *Vertical flow tanks, *Settling basins, Underground treatment plants, Pumping stations, Mines, Mine water, Filtration, Grit removal, *South Africa.

The development is described of a vertical-flow settler for underground pumping installations in the mines of Gold fields of South Africa Ltd. The recommended settler employs the principle of'dynamic filtration': the solids that are in suspension in mine water are filtered through a stable horizontal bed of flocculated particles, a technique that was established in about 1958. (So Afr Water Info Ctr)
W78-12455

EVAPORATION: SOME PROBLEMS AND THEIR SOLUTIONS,
J. W. Cole.
Certificated engineer, Johannesburg, Vol 50, No 9, p 124-126, 1977. 3 fig.

Descriptors: *Evaporation, Fouling, Corrosion, Energy costs, Sensitivity, Falling film evaporation, Evaporators, Equipment, South Africa.

The author examines some of the problems inherent in the evaporation process, with particular attention to fouling, corrosion, energy-saving and the treatment of heat-sensitive products. He describes how modern technology can help to solve them. (So Afr Water Info Ctr)
W78-12458

SOME ASPECTS OF ENERGY AND THE ENVIRONMENT IN THE STEEL INDUSTRY,
For primary bibliographic entry see Field 5G.
W78-12460

THE FUTURE OF ENERGY IN SOUTHERN AFRICA,
R. K. Dutkiewicz.
Rhodesia Science News, Salisbury, Vol. 10, No. 3, p 73-77, 1976. 7 ref, 3 tab.

Descriptors: *Energy sources, Hydroelectric power, Coals, Oil shales, Crude oil, Gas, Oil industry, Solar energy, *Southern Africa, Sasol, Kariba, Cabora Bassa.

Over the last few years the energy scene has been drastically altered by two happenings - firstly, the Oil Producing and Exporting Countries (OPEC) unilaterally increased the price of oil by a factor of four - and secondly, the Club of Rome issued two reports, the first 'Limits of Growth' by Meadows in 1972, the second, that of Professors Mesarovic and Pestel published in 1974 and called 'Mankind at the Turning Point.' The oil price rise, coming as it has at a difficult time of the world's economy has placed a large burden on the economies of many countries, especially the developing countries where the secondary effect of the oil price increase, such as the effect on fertilizer prices, has affected the country's ability to support themselves. Southern Africa must increase its hydroelectric usage to the maximum both for economic and environmental reasons it will, however, remain very reliant on coal reserves and the bulk of the sub-continent's energy, mainly consumed in South Africa, will continue to be dominated by coal well into the next century . By that time there will be an increasing reliance on nuclear power, again in South Africa, the other countries continuing to rely heavily on hydropower. South Africa, the other countries continuing to rely heavily on hydropower. On the far horizon, there is the possibility of fusion power, leading to almost limitless energy resources and possibly an increasing reliance on solar power. (So Afr Water Info Ctr)
W78-12499

GROUND-WATER USE FOR NUCLEAR POWER PLANTS,
Bechtel, Inc., Gaithersburg, MD.
E. M. Smith.
Ground Water, Vol 16, No 5, p 352-354, September-October 1978. 1 fig, 2 tab, 3 ref.

Descriptors: *Groundwater, *Water resources, *Nuclear powerplants, Water supply, Water sources, Water demand, Surveys, Cooling water, Construction, Powerplants, Electrical Powerplants.

The uses of water for nuclear power plants consist of the following: service water, emergency cooling water, domestic (potable, sanitary), construction, and fire fighting. The quantity of water for these various uses may range from 10 gpm (0.63 l/s) for domestic supplies to greater than 100,000 gpm (6309 l/s) for service water and emergency cooling water supplies. Historically, the source of a water for nuclear power plant use has been surface water bodies, such as rivers, lakes, oceans, and manmade canals. Groundwater sources have supplied relatively small quantities of water for plant use, mainly domestic and construction supplies. A survey of 123 nuclear power plant sites which are either built, under construction, or planned, revealed that about 3% of all plant water supplies is derived from groundwater sources. Presently, 4 nuclear power plants intend to use groundwater in relatively large quantities (as service water and emergency cooling water). Two of these plants will use groundwater via induced infiltration from radial collector wells, and the other two plants intend to withdraw groundwater from deep wells (1,000 feet) from a confined aquifer. Another plant, under construction, intends to use sewage effluent which ir originally derived from a combination of surface and groundwater. (Sims-ISWS)
W78-12844

DEWATERING ALTERNATIVES FOR POTATO WASTES, A PRELIMINARY STUDY,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W78-12951

3F. Conservation In Agriculture

TRICKLE IRRIGATION IN MICHIGAN FRUIT PLANTINGS,
Michigan State Univ., East Lansing. Dept. of Horticulture.
A. L. Kenworthy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 892, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, submitted to the Institute of Water Research, Michigan State University, East Lansing, June, 1978. 13 p, 6 fig, 1 tab, 16 ref. OWRT B-029-MICH(1), 14-31-0001-3899.

Descriptors: Irrigation, *Trickle irrigation, Water application, *Orchards, *Michigan, Fruit crops, Crop production, Traverse County(Mich), Leelanau County(Mich), Ottawa County(Mich).

Research plots were established on apple, peach, plum, and sour cherry plantings in Grant Traverse County; on sour cherry, sweet cherry and plum in Leelanau County; and on blueberry in Ottawa County. Water application rates were 0, 0.5, 1.0, and 2.0 gallons of water per hour per tree in 1973 and 1974. In 1975 and 1976 the rate was 0, 1.0, 2.0 and 4.0 gph per tree. Duration of irrigation varied with tree size. In 1975, all plots (except blueberry) were subdivided for different rates of nitrogen application through the trickle system. Nitrogen was applied to equal 100%, 50% and 25% of grower applications. Applications through the trickle system were in four equal amounts at weekly intervals in June. Yield responses indicated that a rate of 2.0 gph was best for all apple cultivars except R. I. Greening, which showed the best response at 4.0 gph. Increase in yield with increased amounts of water was not significant for sour cherry, significant for peach, while plum, sweet cherry and blueberry showed no increase. Nitrogen applications test results indicated that the amount of nitrogen could be reduced 50% if applied through the trickle system in June.
W78-12106

MAXIMUM NONEROSIVE FURROW IRRIGATION STREAM SIZE,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 4D.
W78-12143

ISLAMIC WATER LAW WITH SPECIAL REFERENCE TO OASIS SETTLEMENT,
Oxford Univ. (England). School of Geography.
For primary bibliographic entry see Field 6E.
W78-12212

ESTIMATION OF WATER PRODUCTION FUNCTIONS FOR EVALUATION OF IRRIGATION METHODS: A CASE STUDY IN CHILE,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
L. L. Parks.
Interciencia, Vol 3, No 2, p 79-86, March-April, 1978. 4 tab, 2 fig, 8 ref.

Descriptors: *Chile, *Economic efficiency, *Evaluation, Irrigation practices, *Irrigation efficiency.

Water scarcity and lack of funds to invest in large-scale irrigation projects will force some Latin American countries to use existing water resources more efficiently to increase crop production. Water use efficiency is determined here as the 'water production function', which expresses crop yield as a function of water quantity. The objectives of this study were to estimate (1) the shapes of water production functions for selected crops, (2) the magnitudes of differences in crop yields and water application between experimental farms and actual farms, and (3) the economic value of adopting improved irrigation technology. The general conclusions were that water production functions are useful in analyzing the efficiency of water use and that adoption of improved irrigation technology in the study area would increase economic gains significantly. (Russell-Arizona)
W78-12220

EVALUATION OF DRAINAGE - WATER TABLE CONTROL SYSTEMS USING A WATER MANAGEMENT MODEL,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-12274

A REPORT ON THE TRANSKEIS FIFTY MILLION RAND IRRIGATION SCHEME.
Civil Engineering contractor (Johannesburg) Vol. 10, No. 6, p 15-18, 1976.

Descriptors: *Canal linings, *Irrigation canals, Canal design, *Transkei.

A sophisticated R50m scheme is underway in the Transkei to help the Xhosa nation to an economic viability when it gains its independence. Mention is made of the construction and lining of the canals which will transport the water needed to irrigate 200 Ha of the Ncora flats in North Western Transkei. (So Afr Water Info Ctr)
W78-12416

WATER USE BY SUGARCANE, REVIEW NO 8 PART ONE,
South African Sugar Association Experimental Station, Mount Edgecombe.
G. D. Thompson.
South African Sugar Journal, Vol. 60, No. 11, p 593-600, 1976. 7 fig, 4 tab.

Descriptors: *Water requirements, *Crop production, Irrigation, Evapotranspiration, Soil moisture, *Crop yield, Capillary water, Water loss, Evaporation, Transpiration, Lysimeter, *Sugarcane, South Africa.

A discussion is presented of the consumptive use of water by sugarcane and touches on the potential evapotranspiration, the dynamic relationships between soil moisture and root distribution and the relationship between water use and crop yield in sugarcane production. A 'soil moisture profit and loss account' is presented over five successive stages in the life of the sugercane crop and a tabulation is given of the daily amounts of evapotranspiration measured in various lysimeter experiments from 1958 to 1973. Calculated mean total amounts of water per annum are given for Natal, Pongola, Mauritius and Australia. (So Afr Water Info Ctr)
W78-12426

PIPE DREAM COMES TRUE,
S. Fiske.
Farmer's Weekly, December 22, p 30-31. 1976.

Descriptors: Microjets, Fertigation, Herbigation, Irrigation, Crop production, Agricultural water, Weedicides, Herbicides, Costs, Nelspruit, South Africa.

The microjet system of irrigation has its main appeal in the advantages to be gained from economies in the use of water and of labour. The cost of installation is usually cited as the major disadvantage. The article points out that the high capital cost can be partially recouped if fertilizers and herbicides can be pumped through the same nozzles. The CSFRI at Nelspruit have been experimenting with various chemical weedicides on fruit-trees which are watered by microjet. The spraying pattern of the microjets ensures that very little of the spray actually comes into contact with the trees. (So Afr Water Info Ctr)
W78-12434

DEVASTATING FLOODS HIT ZULULAND AND CAUSE MILLIONS OF RAND IN DAMAGE.
South African Sugar Journal, Durban Vol 61, No 2, p 53, 55, 1977.

Descriptors: *Flood plains, *Flood damage, *Sugarcane, Crop production, Rainfall, *Zululand, Umflozi flats, Nkwaleni River, Umhlatuzi valley, South Africa.

The January 1977 floods are described, in Zululand in which cane growers lost approximately R7000 000 in overall damage. The flood damage in the Nkwaleni Valley, the Umfolozi flats and the Umhlatuzi Valley was serious and the Nkwaleni River and tributaries rose to levels unprecedented in living memory. (So Afr Water Info Center).
W78-12440

IRRIGATION OF SUGAR CANE, PART TWO,
G. D. Thompson.
South African Sugar Journal, Durban, Vol 61, No 4, p 161-174, 1977. 74 refs, 5 tabs.

Descriptors: *Irrigation, *Sugarcane, *Drip irrigation, *Crop irrigation, Applications, Soil types, Soil water plant relationships, Surface irrigation, Spray irrigation, Impervious soils, Frequency distribution, Soil moisture meters, *South Africa.

Part two compares in depth the various methods of irrigation of sugarcane namely surface, sprinkler and drip irrigation techniques. Other considerations which are mentioned include Burning versus trashing; supplementary irrigation in summer only and frequency of irrigation. The author next discusses irrigation and crop characteristics which includes Harvestable stalk populations; mean weight per stalk; harvested stalk length; stalk diameters; lodging; and flowering. Attention is also paid to irrigation control and the drying off period. (So Afr Water Info Ctr)
W78-12453

CORN YIELD - AN EARLY WARNING SYSTEM,
For primary bibliographic entry see Field 2B.
W78-12471

DIMETHOATE APPLIED BY MICROJET AND DRIP IRRIGATION FOR CONTROL OF CITRUS PSYLLA, TRIOZA ERYTREAE TRIOZA ERYTREAE, THE VECTOR OF GREENING DISEASE,
D. L. Milne, and G. A. de Villiers.
Citrus and Subtropical Fruit Journal, No 525, p 15-17, 1977. 7 ref, 4 tab, 1 fig.

Descriptors: *Dimethoate, *Microjets, *Drip irrigation, Citrus Psylla, Trioza Erytreae, Pest control, Plant pests, Crop production, pesticide residues, Insects, Toxoptera, Aonidiella, *South Africa.

Soil systemic pesticides have recently been used to obtain control of trips on citrus. In the present trial, use was made of microjet and drip irrigation systems for the application of dimethoate (Perfekthion 40% EC) to control citrus psylla on 7-year old trees. Effective control was obtained for more than seven weeks with a single application. Two applications gave seasonlong protection and residues were well below the accepted maximum permissible levels. Suppression of the black citrus aphid, Toxoptera citricidus, and red scale, Aonidiella Aurantii, were also obtained. (So Afr Water Info Ctr)
W78-12473

HAIL DAMAGE TO AGRICULTURE AND ITS PREVENTION,
For primary bibliographic entry see Field 3B.
W78-12506

DISTRIBUTION PATTERNS OF LAWN SPRINKLERS,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3D.
W78-12610

POLICIES, ISSUES AND CONCERNS OF WATER AND RELATED LAND RESOURCES INTEREST GROUPS,
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 6E.
W78-12619

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, TEXAS. VOL. 4, APPENDIX VI: IRRIGATION: APPENDIX VII: DRAINAGE AND FLOOD PREVENTION ON FLATLANDS.
For primary bibliographic entry see Field 6B.
W78-12763

BIG BLACK RIVER, MISSISSIPPI: COMPREHENSIVE BASIN STUDY. VOLUME II, ANNEX A: AGRICULTURAL REQUIREMENTS AND UPSTREAM WATERSHED DEVELOPMENT.
For primary bibliographic entry see Field 6B.
W78-12769

CONTROL VALVE AND SPEED ADJUSTMENT FOR WATER DRIVE IRRIGATION SYSTEM,
Heinzman Engineering, Inc., Grand Island, NE. (Assignee).
J. C. Groelz.
U.S. Patent No. 4,080,991, 10 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 968, No. 4, p 1336, March 28, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Flow control, Remote control, Application equipment, Valves.

A control valve for use in conjunction with the control system of water powered field irrigation equipment has a valve housing provided with an inlet opening, and outlet opening, and a flow passage connecting them. The flow path is selectively blocked and unblocked by a valve element actuated by a pilot valve controlled remotely by an operator of the equipment in order to determine the direction of rotation of a drive motor which propels a portion of the equipment about a pivot axis as a function of the position of other portions of the equipment. A fluid actuated motor provided with an eccentrically mounted output cam permits control of the time the end unit of the equipment, which unit controls the operation of other units placed between the end unit and the pivot axis is on and off in order to obtain a continuous speed control of the equipment. (Sinha-OEIS)
W78-12774

WATER DRIVE SYSTEM FOR A MOBILE AGRICULTURAL IRRIGATION UNIT,
Lindsay Mfg. Co., Lindsay, NE. (Assignee).
R. H. Stearns.
U.S. Patent No. 4,083,378, 6 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 969, No 2, p 501, April 11, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Water conveyance, Conveyance structures, Water utilization.

A water-driven unit for a center pivot irrigation system is described in which the pressure of the water in the pipe extending out from the center pivot is used as the motive force for moving the towers about the center pivot. (Sinha-OEIS)
W78-12797

STRAW-MULCH RATE EFFECT ON SOIL WATER STORAGE AND SORGHUM YIELD,
Southwestern Great Plains Research Center, Bushland, TX.
P. W. Unger.
Soil Science Society of America Journal, Vol. 42, No. 3, p 486-491, May-June 1978. 4 fig, 3 tab, 12 ref.

Descriptors: *Mulching, *Soil water, *Water storage, *On-site investigations, *Great Plains, Precipitation(Atmospheric), Infiltration, Moisture content, Runoff, Crops, Grain sorghum, Water conservation, Arid lands, Semiarid climates, Fallowing, Dry farming, Crop response, Agriculture, Straw mulch, Precipitation storage, Soil water content.

A field study was conducted to determine the effects of straw mulch rates on soil water storage during fallow and on subsequent grain sorghum production. Wheat straw at rates of 0 (check), 1, 2, 4, 8, or 12 metric tons/ha was placed on field plots in July 1973, 1974, and 1975. A different area, previously cropped to dryland wheat, was used each year. Atrazine was applied for volunteer wheat and weed control before mulch placement. Soil water content was measured periodically from July until the following May, when grain sorghum was planted, and during the sorghum growing season. Available soil water at planting averaged 12.3 and 21.4 cm for the 0- and 12-metric tons/ha mulch treatments, respectively. The additional water, along with greater infiltration and lower evaporation during the growing season, increased grain yields, which averaged 1,780 and 3,990 kg/ha for the respective treatments. Water-use efficiency increased from 55.6 kg/ha-cm for no mulch to 115.0 kg/ha-cm for 12 metric tons mulch/ha. (Sims-ISWS)
W78-12855

VARIABILITY OF ANNUAL NUTRIENT AND SEDIMENT DISCHARGES IN RUNOFF FROM OKLAHOMA CROPLAND AND RANGELAND,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 5G.
W78-12858

WATER TREATMENTS IN TRICKLE IRRIGATION SYSTEMS,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 5G.
W78-12920

PROTECTING THE GREAT PLAINS FROM WIND AND DROUGHT,
Soil Conservation Service, Lincoln, NE. Midwest Technical Service, Center.
B. L. Maus.
Soil Conservation, Vol. 42, No. 11, p 5-7, June, 1977. 5 photos.

Descriptors: *Water conservation, *Soil conservation, *Erosion control, Land management, Pasture management, Range management, Wind erosion, Windbreaks, Droughts, Moisture stress, Great Plains, Water yield improvement, Irrigation water, Soil Conservation Service.

The history and development of the 21 year old Great Plains Conservation Program (GPCP) are reviewed. Designed in the early 1950s with the purpose of solving problems resulting from drought and cultivation of land unsuited for sustained crop production, this program became law in 1956. The program is administered by the Soil Conservation Service through local districts and gives aid to ranchers and farmers to make needed adjustments in land use and to install conservation measures. Benefits of the programs have included reduced wind and water erosion, increased water for livestock, savings in irrigation water, and improved range and cropland. (Tickes-Arizona)
W78-12923

TEXAS RANCHER PROSPERS DESPITE DROUGHT,
Soil Conservation Service, Washington, DC. Information Div.
S. F. Fields.
Soil Conservation, Vol. 42, No. 11, p 8-9, June 1977. 2 photos.

Descriptors: *Droughts, *Grazing, *Range management, Browse utilization, Brush control, Carrying capacity, Range grasses, Soil conservation, Water conservation, Texas.

A Texas rancher has been fighting drought successfully since 1975 by following a ranch conservation plan under the Great Plains Conservation Program (GPCP). Proper grazing management has made it possible to water and feed his 750 head of cattle on 5,500 acres near Canadian, Texas, despite the drought that has besieged this area. Critical factors affecting the flexible grazing system used are time and amount of rainfall, forage growth, brush spraying, and sparseness or proliferation of brush. Aid from the GPCP and the Salt Fork Soil and Water Conservation District has made it possible to dig water wells and establish water storage facilities to supplement a regular program of brush spraying and grass seeding. (Tickes-Arizona)
W78-12930

THE GREENING OF THE DESERT: WHAT COST TO FARMERS.,
B. E. Worthington.
Civil Engineering, August, 1978, Vol. 48, No. 8, p 60-63. 3 fig.

Descriptors: Dams, *Irrigation programs, *Environmental effects, *Social impact, Irrigation systems, Land reclamation, Social adjustment, Social values, Social participation, Water resources planning, Project planning, Estimated benefits, Project post-evaluation, Public health, Epidemics, Environmental sanitation, Human disease, Egypt, Sudan, Iran, Developing countries.

Irrigation projects planned and built on large scale can contribute much to the agricultural and economic output of developing arid countries. Often however social and health problems are created by these projects that outweigh the positive benefits. While engineers understand the technical aspects of such projects, planners must consider the whole spectrum of influences these projects create. Three case studies are used here to illustrate this point. High Dam in Egypt was completed in 1970 and has created a million acres of new irrigated land, however, also created is the spread of the serious disease Schistosomiasis (Billariasis) to epidemic proportions along the canals and the need to feed large number of domestic animals required to lift and transport the water. In Sudan, the Khesham-el-Girba dam scheme has caused the traumatic resettlement of two different ethnic groups into the same area. Both nomads and dry land farmers in this country depend upon observation and prediction of nature in making critical decisions. The resulting social as well as disease-related problems caused by the new dam have driven many from the area. In Iran the DEZ Irrigation Project has shown that increased agricultural production is often at odds with socio-economic development in this traditional country. (Tickes-Arizona)
W78-12932

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS, 1975, FIFTH ANNUAL ISSUE,
Colorado State Univ., Fort Collikns. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W78-12933

RESPONSE TO DROUGHT,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W78-12943

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

ESTIMATING RUNOFF POLLUTION FROM LARGE URBAN AREAS--THE DELAWARE ESTUARY,
Rutgers - The State Univ., New Brunswick, NJ.
For primary bibliographic entry see Field 5B.
W78-12111

LOCATING DRAINAGE SYSTEMS BY MAGNETOMETER SURVEYS,
Toledo Univ., OH. Dept. of Geology.
For primary bibliographic entry see Field 8G.
W78-12142

GENERATION OF SKEWED ANNUAL FLOWS USING FAST FRACTIONAL GAUSSIAN NOISE GENERATOR,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-12146

SERIALLY LINKED RESERVOIR SYSTEM DESIGN USING STOCHASTIC PROGRAMING,
Magyar Tudomanyos Akademia, Budapest.
A. Prekopa, T. Rapcsak, and I. Zsuffa.
Water Resources Research, Vol. 14, No. 4, p 672-678, August 1978. 5 fig, 1 tab, 10 ref, 1 append.

Descriptors: *Reservoirs, *Rivers, *Model studies, *Mathematical models, Flow, Storage, Inflow, Discharge(Water), Overflow, Mathematics, Stochastic processes, Hydrology, *Hungary.

A stochastic programing model formulated for a serially linked reservoir system design was presented, and a numerical solution method was proposed. The model already has been formulated in a concise form. Here a more detailed explanation was given, the sequential unconstrained minimization technique for the solution of the optimization problem was applied, and a numerical example was presented. The example was taken from a large model which arose in the first implementation of this reservoir system design method in practice. (Sims-ISWS)
W78-12147

EXPECTED VALUE OF ASYMPTOTIC MAXIMUM DEFICIT FOR PERIODIC-STOCHASTIC INFLOWS OF FULL-FLOW REGULATION,
Engineering Consultants, Inc., Denver, CO.
K. N. Mutreja, and V. Yevjevich.
Journal of Hydrology, Vol. 38, No. 1/2, p 113-123, July 1978. 4 fig, 3 tab, 4 ref. NSF ENG74-17396.

Descriptors: *Reservoir storage, *Storage capacity, *Model studies, Mathematical models, Reservoirs, Regulated flow, Inflow, Discharge(Water), Storage, Stochastic processes, Analytical techniques, Hydrology.

An analytically derived expression is not available for the exact expected maximum deficit of periodic-stochastic net inflows in the case of full-flow regulation because of the complexities involved. Maximum deficit was defined as the storage capacity needed to supply water for a constant outflow (equal to or smaller than the total output mean) for a given sample size. Its properties were developed by using the method of generation of new samples. It was found that the expected asymptotic maximum deficit of periodic-stochastic net inflow (inflow minus outflow) for the full-flow regulation can be obtained by adding the storage required by the periodicity in the input and output means to the storage required by the stochastic component multiplied by the periodic standard deviation. The storage required by the periodicity in the means was approximated by a constant. (Sims-ISWS)
W78-12150

GENERATING STREAMFLOW SEQUENCES WITH TREND AND CYCLICAL MOVEMENTS,
Florida Univ., Belle Glade. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W78-12157

INSTITUTIONS FOR THE SOLUTION OF SURFACE WATER PROBLEMS BETWEEN MEXICO AND THE UNITED STATES (INSTITUCIONES PARA LA SOLUCION DE PROBLEMAS DE AGUAS DE SUPERFICIE ENTRE MEXICO Y LOS ESTADOS UNIDOS),
Instituto Mexicano de Estudios Diplomatico.
For primary bibliographic entry see Field 6E.
W78-12234

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO. 4 REGRESSION OF LOW FLOWS ON PHYSIOGRAPHIC PARAMETERS,
Department of the Environment, Vancouver (British Columbia). Inland waters Directorate (Pacific Region).
For primary bibliographic entry see Field 2E.
W78-12257

EVALUATION OF DRAINAGE - WATER TABLE CONTROL SYSTEMS USING A WATER MANAGEMENT MODEL,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs.
Paper No. 77-2030, presented at Annual Meeting of ASAE, St. Joseph, Missouri, June 1977, 8 p, 10 fig, 2 tab, 29 ref. OWRT A-083-NC(3), 14-34-0001-7070.

Descriptors: *Drainage control, Water movement, Surface waters, Irrigation waters, Model studies, Management, *Coastal plain soils, *North Carolina.

A water management model was used to continuously simulate the soil water regime over a 20-year period for alternative designs of drainage and water table control systems for two soils. Water management systems consisting of surface and subsurface drainage, controlled drainage and subirrigation were considered in the analysis. The systems were evaluated in terms of their effect on trafficable conditions for seedbed preparation in the spring, adequate drainage for crop growth during the growing season and number of dry days during the growing season. The results are presented on the basis of a five-year recurrence interval. It was found that a 43 m drain spacing will satisfy conventional drainage requirements for the Wagram soil. Closer spacings are not desirable as they will increase soil water deficiences during dry years unless water table control practices are used. Drain spacings required for the Bladen soil varied from 12 to 20 m depending on the quality of surface drainage. Subirrigation can be used to good advantage on the Wagram soil with a 30 m drain spacing and good surface drainage but was found to be infeasible for the tight Bladen soil. (Kiger-NC State)
W78-12274

SOLVING THE PIPE NETWORK ANALYSIS PROBLEM USING OPTIMIZATION TECHNIQUES,
Southern Methodist Univ., Dallas, TX.
For primary bibliographic entry see Field 8B.
W78-12285

MICROBIOLOGICAL STATE OF THE KIEV RESERVOIR IN THE SIXTH-SEVENTH YEARS OF ITS EXISTENCE (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5B.
W78-12297

WATER RESOURCES IN THE ARID ZONE OF THE USSR AND PROSPECTS OF THEIR UTILIZATION (IN RUSSIAN),
For primary bibliographic entry see Field 3B.
W78-12299

ANALYTICAL FRAMEWORK FOR THE DESIGN OF DATA COLLECTION SYSTEMS THAT ARE RESPONSIVE TO THE NEEDS OF PLANNING AND MANAGEMENT OF WATER RESOURCES AND RELATED LAND SYSTEMS,
Case Western Reserve Univ., Cleveland, OH. Systems Engineering Div.
For primary bibliographic entry see Field 6A.
W78-12388

A COMPARISON BETWEEN A MONTHLY SIMULATION AND AN ANNUAL MORAN MODEL OF VAAL DAM,
Natal Univ., Durban.
C. G. Pergram.
Civil Engineer in South Africa, (Johannesburg), Vol. 18, No. 6, p 131-133, 1976. 10 ref, 2 fig.

Descriptors: *Mathematical models, *Moran model, Reservoirs, *Model studies, Simulation analysis, Evaporation, Parameters, Hydrology, Vaal Dam, South Africa.

Among methods used to analyse reservoir performance, probably the most popular is that of simulation where an artificial inflow sequence, modelled on the historic flow records, is used as imput to a mathematical model of the reservoir. Another method which is not widely used is a probabilistic model on discrete Markov chains which was first proposed by Moran and extended to the case of serially correlated inflows by Lloyd. The purpose of this paper is to compare the two methods of analysis and to highlight advantages and disadvantages of each relative to the other when applied to a practical storage analysis. The reservoir used in the study is Vaal Dam. The author concludes with the remark that it had not been his intention to suggest that the Moran Model should replace simulation; but rather, that it is an independent, fast and accurate approach which can with advantage be used as an adjunct to simulation to solve problems concerning the reliability of single reservoirs. (So Afr Water Info Ctr)
W78-12393

WATER RESOURCES - THE SOUTHERN AFRICAN PICTURE,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
D. C. Midgley.
In: Conference on resources of Southern Africa today and tomorrow, (Johannesburg) South Africa, p 251-258, September 22-26, 1975, 1 fig.

Descriptors: *Water resources, Hydroelectric power, Industrial use, Water resources development, Interbasin transfers, International cooperation, *South Africa, Zambia, Mozambique, Rhodesia, Lesotho, Swaziland, Botswana, Transkei, Tugela Vaal Government Water Project.

Discussed are the attractive mutual benefits throughout Southern Africa to be gained from collaboration between water-rich areas of the North and the mineral-rich areas of the South. Water and power links across international borders could be the means by which prosperity generated in the core region of South Africa, can spread throughout the subcontinent. Reticence by neighbouring states to avail themselves of the opportunity to benefit from South Africa's spiralling demands for electricity and water could precipitate a premature switch to maritime development, leaving the interior to plod with primary activities. In such circumstances the need for water links and a sub-continental electricity grid would be deminished with the result that economic advancement of South Africa's neighbour states could be retarded by several decades. (So Afr Water Info Ctr)
W78-12423

MYRIOPHYLLUM, A POWERFUL THREAT TO OUR WATER SUPPLIES,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
For primary bibliographic entry see Field 5G.
W78-12427

IS THE WATER HYACINTH A CURSE OR BLESSING.,
For primary bibliographic entry see Field 5G.
W78-12433

WEED HARVESTER - THE AQUA-TRIO WEED HARVESTING SYSTEM IN USE AT SANDVLEI.
Municipal Engineer, Vol. 7, No. 3, p 21, 1976.

Descriptors: *Aquatic weed control, *Harvesting, Sandvlei, Nutrient removal, Equipment description, *Potamogeton, *South Africa.

A short article describing the Aqua-Trio weed harvesting system in use at Sandvlei in the Cape. The Aqua-Trio System consists of three parts: the Harvester, the Transport and the Shore conveyor, and it is estimated that it will clear 0,74ha of water infested with Potamogeton pectinatus weed, per day. (So Afr Water Info Ctr)
W78-12436

35 KM TUNNEL SYSTEM FOR CAPE WATER SCHEME,
Department of Water Affairs, Pretoria (South Africa).
J. M. Matchett.
South African Tunnelling, Vol 1, No 6, p 4-11, 1977.

Descriptors: *Tunnel construction, Water resources, Inter basin transfers, Watersheds, Dams, Reservoirs, Water supply development, *Cape water scheme, Theewaterskoof dam, As-

segaaibos Dam, Berg River Tunnel, Dasbos tunnel, Jonkershoek tunnel, Stellenboschberg tunnel, Western Cape, South Africa.

Presently under construction in the Western Cape is the Riviersonderend Berg river Government Water Scheme. The project, which comprises an interconnected system of dams and tunnels, will enable the winter surplus run-off of the upper reaches of the Sonderend, Berg, Dwars and Eerste Rivers to be colected, stored and subsequently used for agricultural, industrial and domestic purposes. The geological formation along the 35km tunnel route is very good granite to jointed sandstone, decomposed shales and granitic clay. (So Afr Water Info Ctr)
W78-12444

MADEN DAM RESERVOIR, KINGWILLIAMSTOWN,
G. C. Smith.
Civil Engineer in South Africa, Johannesburg, Vol 19, No 8, p 192-194, 1977. 3 illustr.

Descriptors: *Reservoirs, Water supply, *Impounding dams, Sand filters, History, *Maden dam, South Africa.

A historical review of the water supply to Kingwilliamstown since 1861 when water supply was by furrow. In 1880 a pipeline replaced the furrow and in 1903 the Maddan Dam Reservoir was completed on the Buffalo River, known as the Pirie Water Scheme, which still supplies 70% of the town's water. (So Afr Water Info Ctr)
W78-12472

RIVER RUNOFF AND THE YIELD OF DAMS IN RHODESIA,
T. B. Mitchell.
Rhodesia Science News (Salisbury) Vol 11, No 6, p 124-126, 1977. 3 fig, 1 tab.

Descriptors: *River flow, Water storage, Dams, *Average runoff, Groundwater recharge, Water yield, Evaporation loss, Southern Africa, *Rhodesia.

In common with other countries, Rhodesia is concerned at the demands being made on its natural resources. Water is a natural resource and although it is renewable, there is a limit to the amount that is available for exploitation. The initial demand for water in Rhodesia's development was easily met from river flow in the high-rainfall areas, but with the accelerating water demand for urban development, industry, mining and irrigation, the inexpensive water in the form of natural stream flow has, in most areas, been taken up and further storage works because there will not be enough water available to fill them often enough. Thus, while it is still economical to build a costly large dam that will fill, say, once in every three years, it is uneconomical to build a costly large dam that will only fill once in every twenty-five years. The article further describes mean annual runoff from hydrological zones in Rhodesia, the zone description, the variation of annual runoff, the yield of dams and a summary of water statistics for Rhodesia. (So Afr Water Info Ctr)
W78-12475

RIVER MANAGEMENT,
For primary bibliographic entry see Field 2E.
W78-12476

INTEGRATED RIVER BASIN DEVELOPMENT AND AQUATIC ECOLOGY,
For primary bibliographic entry see Field 6G.
W78-12500

CABORA BASSA IN ITS FIRST YEAR: SOME ECOLOGICAL ASPECTS AND COMPARISONS,
For primary bibliographic entry see Field 6G.
W78-12501

RELIABILITY OF FLOOD WARNING,
Illinois Univ. at Urbana-Champaign. Dept. of Civil and Ceramic Engineering.
For primary bibliographic entry see Field 6F.
W78-12528

APPLICATION OF STOCHASTIC MODELS TO RESERVOIRS NEAR THE ALPS,
Technische Univ., Munich (West Germany). Inst. for Hydraulics and Hydrology.
P. G. Franke, and Th. Leipold.
In: Stochastic Processes in Water Resources Engineering, Proceedings. 2nd Intern. IAHR Symposium on Stochastic Hydraulics, Lund Institue of Technology, Sweden, August 1976. Lars Gottschalk, et al. (Eds.), Water Resources Publications, Fort Collins, Colorado, 1977, p 417-434 (Chapter 19). 5 fig, 6 tab, 11 ref.

Descriptors: *Reservoir operation, *Stochastic processes, *Model studies, *Simulation analysis, Optimization, *Long-term planning, Inflow, Discharge(Water), Reservoir storage, Release rule, Hydrologic aspects, Monte Carlo method, Time series, Alps, Linear regression, Queuing theory, Equations, Systems analysis.

The basis for the lon-term optimization of operating reservoirs is the use of models which describe this long-range process. As future natural flow in a river cannot be determined from that in the past by deterministic models, the inflow to a reservoir is assumed to be random. Therefore, the change of the discharge caused by a reservoir is a process which is deterministically regulated, but its course depends on the random inflow. To fulfill the requirements in theory and application, different types of stochastic models for reservoirs have been developed during the last twenty years. Herein, their applicability is investigated with respect to two existing reservoirs near the Alps. (Bell-Cornell)
W78-12529

A STOCHASTIC OPTIMIZATION MODEL OF THE LECH RIVER SYSTEM,
Technische Univ., Munich (West Germany). Inst. for Hydraulics and Hydrology.
R. Harboe.
In: Stochastic Processes in Water Resources Engineering, Proceedings, 2nd Intern. IAHR Symp. on Stochastic Hydraulics, Lund Institute of Technology, Sweden, August 1976. Lars Gottschalk, et al. (Eds.), Water Resources Publications, Fort Collins, Colorado, 1977, p 435-451 (Chapter 20). 8 fig, 2 tab, 5 ref.

Descriptors: *Multiple-purpose reservoirs, *Reservoir operation, *Stochastic processes, *Dynamic programming, *Computer programs, *Benefit maximization, *Lech River System(Austria), *Hydroelectric plants, Optimization, Mathematical models, Hydrologic aspects, Monthly, Flow, Algorithms, Reservoir releases, Constraints, Planning, Probability, Decision making, Recursive equations, Serial correlation, Sensitivity analysis, Operating policies.

A mathematical model is developed for optimizing the operation of a multiple-purpose reservoir and a series of hydroelectric power stations along the Lech River in Austria. The model includes the stochastic nature of hydrologic inputs, in particular its serial correlation among monthly flows. The objective function is the maximization of expected returns obtained from hydroelectric energy production, subject to a series of tehnical constraints. Computer programs to solve the optimization problem are based on dynamic programming algorithms. The optimal policies obtained show reservoir releases as a function of reservoir contents and inflow in the previous month, due to the serial correlation effect. Several sensitivity analyses are performed in order to test the stability of the results. (Bell-Cornell)
W78-12530

MULTIPURPOSE RESERVIOR OPERATION USING STOCHASTIC TRADE-OFF ANALYSES,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, and K. N. R. Rao.
In: Stochastic Processes in Water Resources Engineering, Proceedings, 2nd Intern. IAHR Symp. on Stochastic Hydraulics, Lund Institute of Technology, Sweden, August 1976. Lars Gottschalk, et al. (Eds.), Water Resources Publications, Fort Collins, Colorado, 1977, p 483-513 (Chapter 24). 13 fig, 32 tab, 23 ref.

Descriptors: *Multiple-purpose reservoirs, *Reservoir operation, *Stochastic processes, *Risk, *Flood control, *Recreation, *Optimization, *Trade-off analysis, Methodology, Measurement, Decision making, Constraints, Flood damage, Probability, Hydrology, Hydraulics, Equations, Mathematical models, Systems analysis, Multiobjective, Benefit maximization.

Non-commensurate, human factor multiobjectives are considered that are subjectively discerned and evaluated. Objectives are related in terms of real trade-off (noneconomic) benefits, and the need for a priori estimates of objective worth is eliminated. This 'trade-off' methodology systematicaly displays beneficial and adverse effects with regard to all operation objectives, so that different levels of achievement of each objective can readily be discerned and compared, indicating relevant trade-offs for optimum operations. The risk or confidence associated with each trade-off level synthetic input realizations. Decisions on reservoir operation can then be made which recognize both subjective trade-off choices and their reliabilities. A present conflict exists on the Coralville Reservoir near Iowa City between recreation opportunities and consequent higher pool levels; the latter maintain that the reservoir was originally designed for flood control and that any deviation from current operation plans will impair flood control benefits. The present study is evolving operation plans that provide more recreation opportunities with minimum disturbance of the flood control benefits. (Bell-Cornell)
W78-12531

A SIMPLE MATHEMATICAL MODEL OF QUANTITATIVE AND QUALITATIVE PROCESSES OCCURRING IN THE STREAM CHANNEL FOR WATER DISTRIBUTION CONTROL,
Institute of Meteorology and Water Management, Krakow, Poland. Krakow Div.
For primary bibliographic entry see Field 5G.
W78-12538

COMPUTER PREDICTION OF THE CHANGES IN RIVER QUALITY REGIMES FOLLOWING LARGE SCALE INTER BASIN TRANSFERS,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 5B.
W78-12539

AN ADAPTIVE ALGORITHM FOR ANALYZING SHORT-TERM STRUCTURAL AND PARAMETER CHANGES IN HYDROLOGIC PREDICTION MODELS,
Princeton Univ., NJ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-12551

CHOICE OF DISTRIBUTION FUNCTIONS FOR HYDROLOGIC DESIGN,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 8B.

W78-12552

ALLOCATION OF WATER STORED FOR FLOOD CONTROL AND NAVIGATION PURPOSES (PROPOSED RULE).
Corps of Engineers, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-12561

THE WORLD REMOTE SENSING BIBLIOGRAPHIC INDEX,
Tensor Industries, Inc., Falls Church, VA.
For primary bibliographic entry see Field 7B.
W78-12618

APPROXIMATION OF A NORMAL DISTRIBUTION BY A THREE-PARAMETER LOG NORMAL DISTRIBUTION,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-12631

HOLOCENE STRATIGRAPHY IN FLOOD FREQUENCY ANALYSIS,
Denver Univ., CO. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W78-12632

CIRCULATION PATTERNS IN THE FOX CHAIN OF LAKES IN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2H.
W78-12633

FLOOD PLAIN INFORMATION: CORRALITOS CREEK, SANTA CRUZ COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, CA.
Prepared for Santa Cruz County, CA, June 1976, 18 p, 10 fig, 17 plates, 6 tab.

Descriptors: *California, *Streamflow forecasting, *Flood forecasting, *Flood profiles, *Flood data, Floods, Flood flow, Historic floods, Flood frequency, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Control structures, Levees, *Corralitos Creek(CA), Santa Cruz County(CA), 100-year flood.

The study area involves the portion of Santa Cruz County that is subject to flood from Corralitos Creek. Land use in the flood plain is primarily agricultural, with some residential and commercial establishments. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. The main flood season occurs from December through March and results from heavy rainfall. The worst flood recorded at the U.S. Geological Survey gage at Freedom occurred on December 22, 1955, cresting at 105.0 feet mean sea level (msl), and discharging 3,620 cubic feet per second (cfs). This flood caused the Creek slightly to exceed bankfull stage at several points. At the same location, the 100-year flood would crest at 107.5 feet msl and would discharge 6,600 cfs, while the Standard Project Flood (SPF) would crest at 108.4 feet msl and would discharge 8,500 cfs. Two bridges would be affected by the 100-year flood and three would be affected by the SPF. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-12650

FLOOD PLAIN INFORMATION: LEVISA FORK AND TRIBUTARIES, BUCHANAN COUNTY, VIRGINIA, GRUNDY TO OAKWOOD.
Army Engineer District, Huntington, WV.
Prepared for Virginia Department of Conservation and Economic Development, January 1971, 39 p, 12 fig, 15 plates, 9 tab.

Descriptors: *Virginia, *Flood forecasting, *Flood profiles, *Flood data, *Non-structural alternatives, Floods, Historic floods, Flood recurrence interval, Flood stages, Peak discharge, Flood plains, Standard Project Flood, Flood protection, Land use, Planning, Buchanan County(VA), *Levisa Fork(VA), Big Sandy River(VA), Intermediate Regional Flood.

The study area involves a 14.7 mile segment of Levisa Fork of Big Sandy river and lower reaches of principal tributaries in Buchanan County, Virginia. Most public, commercial, and residential structures in the study area are located on the bottom lands subject to frequent flooding. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs in late winter and early spring with all of the larger floods resulting from heavy general rainfall. On the small tributary streams, intense local thunderstorms may cause summer floods. The worst flood recorded at the U.S. Geological Survey gage near Grundy occurred on January 29, 1957, discharging 33,200 cubic feet per second (cfs) and cresting at 1010.4 feet mean sea level (msl). At the same location, the Intermediate Regional Flood (IRF) would discharge 40,500 cfs and would crest at 1012.7 feet msl, while the Standard Project Flood (SPF) would discharge 131,000 cfs and would crest at 1029.7 feet msl. Twenty eight of the 35 bridges in the study area would obstruct the IRF flow. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-12651

SOCIAL IMPACT ASSESSMENT, 10.
For primary bibliographic entry see Field 6B.
W78-12652

OPTIONS FOR MONITORING LOCAL PERMITS IN THE NORTH CAROLINA COASTAL AREA.
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6E.
W78-12662

PLAN OF ACTION: THE TRINITY RIVER PUBLIC INVOLVEMENT PROGRAM,
Texas A and M Univ., College Station. Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 6B.
W78-12664

WATER RESOURCES PLANNING, MANAGEMENT, AND DEVELOPMENT: WHAT ARE THE NATION'S WATER SUPPLY PROBLEMS AND ISSUES.
General Accounting Office, Washington, DC.
For primary bibliographic entry see Field 6D.
W78-12665

FLOOD EMERGENCY BUILDING INSPECTOR PROGRAM FOR THE CITY OF WILKES-BARRE.
Wilkes-Barre Dept. of Planning and Development, PA. Bureau of Flood Recovery.
For primary bibliographic entry see Field 6F.
W78-12667

EFFECTS OF FILM ANTITRANSPIRANTS ON WOOD PLANTS (IN RUSSIAN),
Moscow Forestry Inst. (USSR).
For primary bibliographic entry see Field 3B.
W78-12668

FLOOD-FREQUENCY ANALYSES WITH PRERECORD INFORMATION,
Geological Survey, Reston, VA. Water Resources Div.
G. D. Tasker, and W. O. Thomas, Jr.
Journal of the Hydraulics Division, ASCE Proceedings, Vol. 104, No. HY2, Paper 13558, p 249-259, February 1978. 5 tab, 5 ref, 2 append.

Descriptors: *Floods, *Flood frequency, *Frequency analysis, *Monte Carlo method, *Historic floods, Simulation analysis, Peak discharge, Evaluation.

Monte Carlo expriments were performed on each of several procedures for treating historic flood information in flood-frequency analyses. The procedures differ in the sequence in which sample skew is weighted with a generalized skew and adjustment for information is made. The procedures also may differ in the weight given the generalized skew coefficient. The performance of each method was judged by how well the 100-year peak discharges determined by each method approximate the true value of the 100-year peak discharge of the Pearson Type III distribution underlying the generated data. Results indicate that when sample skew is adjusted for historic information before weighting with a generalized skew coefficient, it is better to use historic record length than systematic record length in computation of the weighting factor. Also, adjusting for historic information after weighting sample skew and generalized skew coefficients was the optimal method tested when overdesign losses are small compared to underdesign losses. (Woodard-USGS)
W78-12729

DROUGHT IN CALIFORNIA--WATER-RESOURCES DATA FOR 1977,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12730

DIGITAL MODEL OF GROUND-WATER FLOW IN THE PICEANCE BASIN, RIO BLANCO AND GARFIELD COUNTIES, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-12731

SEDIMENT TRANSPORT IN THE FEATHER RIVER, LAKE OROVILLE TO YUBA CITY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-12736

INTERIM REPORT ON STREAMFLOW, SEDIMENT DISCHARGE, AND WATER QUALITY IN THE CALABAZAS CREEK BASIN, SANTA CLARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-12738

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1977--VOLUME 1. ATLANTIC SLOPE BASINS, HUDSON RIVER TO CAPE MAY.
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12742

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1977--VOLUME 2.

DELAWARE RIVER BASIN AND TRIBUTARIES TO DELAWARE BAY.
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12743

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1977.
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12744

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1977.
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12745

DESCRIPTION OF THE ECOREGIONS OF THE UNITED STATES.
Forest Service (USDA), Ogden, UT.
For primary bibliographic entry see Field 6G.
W78-12749

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, VOLUME 1: SUMMARY REPORT.
For primary bibliographic entry see Field 6B.
W78-12760

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, VOL. 2, APP. I: ECONOMICS: APP. II: CLIMATE AND METEOROLOGY: APP. III: HYDROLOGY, SURFACE GROUND WATER AND GEOLOGY: APP. IV: FLOOD CONTROL AND MAJOR DRAINAGE.
For primary bibliographic entry see Field 6B.
W78-12761

COMPREHENSIVE BASIN STUDY. RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, TEXAS. VOLUME 3, APPENDIX V: UPSTREAM WATERSHED PROTECTION, USE, MANAGEMENT, AND DEVELOPMENT.
For primary bibliographic entry see Field 6B.
W78-12762

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, TEXAS. VOL. 4, APPENDIX VI: IRRIGATION: APPENDIX VII: DRAINAGE AND FLOOD PREVENTION ON FLATLANDS.
For primary bibliographic entry see Field 6B.
W78-12763

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, APP. XI: WATER SUPPLY & WATER QUALITY CONTROL: APP. XII: OUTDOOR RECREATION: APP. XIII: FISH & WILDLIFE.
For primary bibliographic entry see Field 6B.
W78-12765

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS. VOLUME 8, APPENDIX XV: PLAN FORMULATION.
For primary bibliographic entry see Field 6B.
W78-12766

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, AND TEXAS. VOLUME 7, APPENDIX XIV: STATE WATER LAWS, POLICIES AND PROGRAMS.
For primary bibliographic entry see Field 6B.
W78-12767

BIG BLACK RIVER, MISSISSIPPI--COMPREHENSIVE BASIN STUDY, VOLUME I: INTERAGENCY SUMMARY REPORT.
For primary bibliographic entry see Field 6B.
W78-12768

BIG BLACK RIVER, MISSISSIPPI: COMPREHENSIVE BASIN STUDY. VOLUME III, ANNEX B: ENGINEERING STUDIES OF WATER DEVELOPMENT PROJECTS.
For primary bibliographic entry see Field 6B.
W78-12770

WATER LEVEL ALARM APPARATUS,
J. Eagle.
U.S. Patent No. 4,080,985, 4 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 968, No. 4, p 1333, March 28, 1978.

Descriptors: *Patents, *Water levels, *Remote control, Floats, Valves, Overflow, Equipment.

A control mechanism terminates the flow of incoming water used to fill a container when a predetermined height is reached and also sounds an audible alarm. A float upon reaching an upper position, closes a set of stationary contacts, which in turn, completes a series of electrical circuit including an alarm bell and battery. Simultaneously with the closing of the contacts, an electrically operated solenoid valve, placed in series with a pipe connected to a water source closes, shutting down the incoming flow of water. Altering the length of the float or varying the positioning of the contacts, adjusts the maximum level of water within the container. (Sinha-OEIS)
W78-12773

WATER MANAGEMENT DISTRICTS.
N.D. Cen. Code Ann. secs 61-16-01 thru -45 (1960) as amended (Suppl 1977); secs 61-16-46 thru -50 (Supp. 1977).

Descriptors: *North Dakota, *Water districts, *Water management(Applied), *Legislation, Water conservation, Flood conservation, Flood control districts, Water control, Federal government, State government, Culverts, Dam construction, Regulation.

The North Dakota statutes chapter dealing with water conservation and flood control districts was amended in 1977. The procedure relating to petitions, bonds and hearings for the establishment of the districts was repealed. The area to be included within water management district was enlarged to encompass all land in North Dakota. The section exempting federal agencies from this chapter's provisions was also repealed. Also repealed were the sections dealing with the construction of bridges and culverts, and the procedure for dissolving a district or altering its boundaries. The procedure to be followed in ordering the creation of a water management district was set forth along with the appointment of a board of commissioners. In addition to its previous powers, the board was given the powers to do all things reasonably necessary and proper to preserve benefits to be derived from the conservation, control and regulation of water resources in the state. Joint exercise or power by two or more boards was provided. The financing method for the districts was provided for by special tax assessment. Many other operational procedures of the districts were also set forth in detail. (Quarles-Florida)
W78-12780

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1976.
Australian Water Resources Council, Canberra Dept. of National Resources.
For primary bibliographic entry see Field 2A.
W78-12833

MONO LAKE: SILENT, SAILLESS, SHRINKING SEA,
G. Rowell.
Audobon, Vol. 80, No. 2, p 102-106, March, 1978.

Descriptors: *California, *Lakes, *Diversion losses, Reservoirs, Streams, Water levels, Potential water supply, Diversion, Limnology, Alkalinity, Gulls.

California's Mono Lake has lost eight square miles of its previous 70 square mile surface since 1970, due to the diversion of two of its three tributary streams. Those two streams now empty into the Los Angeles Aqueduct, supplying 20 percent of that city's water needs. In this period of drought, there is not much interest in saving Mono Lake. Its alkaline waters are not suitable for sportfishing, boating or waterskiing. Its lunar-like landscape lacks traditional recreational value. But the lowering of the lake has created many legal problems. Shoreline property owners claim the newly exposed lands, as do state and federal governments by conflicting statutes. Basin residents and federal agencies complain about the blowing alkaline dust. Presently, the most vocal opponents of the lake's seemingly irreversible destruction are scientists--limnologists interested in its 700,000-year-old history and its unique chemistry, and biologists studying the state's largest single nesting colony of the California Gull. This article recounts the story of how the Los Angeles Department of Water and Power gained control of the Basin area and the present political situation. (Stump-Florida)
W78-12851

REHABILITATION OF DEGRADED ARID LANDS,
United Nations, New York. Environment Programme; and Secretariat for International Ecology (Sweden).
For primary bibliographic entry see Field 6E.
W78-12916

THE ARIZONA WATER COMMISSION'S CENTRA ARIZONA PROJECT WATER ALLOCATION MODEL SYSTEM,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6E.
W78-12924

STATISTICAL MODELS AND METHODS FOR RIVERS IN THE SOUTHWEST,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2E.
W78-12925

RESPONSE TO DROUGHT,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W78-12943

4B. Groundwater Management

NUMERICAL MODELLING OF LIQUID WASTE INJECTION INTO POROUS MEDIA SATURATED WITH DENSITY-STRATIFIED FLUID: A PROGRESS REPORT,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-12102

CARBON CONTENTS AND SOURCES IN GROUND WATERS OF THE CENTRAL PLATTE REGION IN NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 5A.
W78-12103

MAPPING OF EARTH FISSURES IN LAS VEGAS VALLEY, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 2F.
W78-12107

WISCONSIN GROUND WATER - AN ANNOTATED BIBLIOGRAPHY, 1973-1977.
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 2F.
W78-12135

EFFECT OF VEGETATION ON LANDFILL STABILIZATION,
Auburn Univ., AL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-12136

A STUDY OF THE KALAMOS SPRINGS IN GREECE WITH ENVIRONMENTAL ISOTOPES,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 2F.
W78-12144

A STUDY OF UNCONFINED NON-DARCY SEEPAGE TO A WELL,
Indian Inst. of Tech., Kharagpur (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-12151

THE DEPENDENCE OF THE RESIDUAL GRAVITY ON HYDRAULIC CONSTANTS IN GLACIAL DEPOSITS,
Rhode Island Univ., Kingston. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-12156

FRESNO, CALIF., SUBSURFACE DRAIN COLLECTOR-DEEP WELL RECHARGE SYSTEM,
Agricultural Research Service, Fresno, CA. Water Management Research.
W. C. Bianchi, J. J. Nightingale, and R. L. McCormick.
Journal of the American Water Works Association, Vol. 70, No. 8, p 427-435, August 1978. 12 fig, 9 tab, 32 ref.

Descriptors: *Groundwater recharge, *California, *Artificial recharge, *Recharge wells, *On-site investigations, Groundwater, Injection wells, On-site tests, Water quality, Flooding, Drainage, Subsurface drainage, Tile drainage, Water wells, Infiltration, Perched water, Aquifers, Costs, Turbidity, Specific capacity, Discharge(Water).

A system was described that greatly expands the geological profiles that can be used as recharge areas. Water was filtered through sand soil, collected in an agricultural drain placed in the shallow-perched water table, and gravity-fed into a specially designed recharge well. Recharge volume was increased by 75%. The collected water was low in dissolved gases and sufficiently low in suspended solids to allow gravity well recharge. The recharge well was designed to allow controlled mining of clogged aquifer sands. A system employing this technology could greatly expand the soil profiles that can be used as recharge areas by providing a way to bypass low-permeability subsurface horizons limiting vertical water movement into the groundwater table. The successful performance of the Fresno drain collector-recharge well system, as indicated by 600 acre-ft of recharge water, results from preconditioning surface canal water by soil filtration before injection. (Humphreys-ISWS)
W78-12158

COMPREHENSIVE ANALYSIS OF WATER-TABLE AQUIFER TEST DATA,
Upper Mississippi River Basin Commission, Twin Cities, MN. Minnesota.
W. C. Walton.
Ground Water, Vol. 16, No. 5, p 311-317, September-October 1978. 6 fig, 4 tab, 11 ref.

Descriptors: *Analytical techniques, *Water table aquifers, *Aquifer testing, *Graphical analysis, Curves, Graphical methods, Groundwate, Wells, Anisotropy, Permeability, Saturated flow, Penetration, Storage, Storage coefficient, *Type curves, *Partial penetration, *Casing storage, Vertical permeability.

Flow to wells in water table aquifers is related to anisotropy, vertical components of flow, well storage capacity, degree of wlll penetration, and changes in aquifer saturated thickness. The manner and extent to which these factors affect water levels may be evaluated with aquifer test data. Families of type curves describe the typical S-shaped curves of log drawdown versus log time observed around wells in water table aquifers. Comprehensive analysis of water table aquifer test data is possible with the array of equations derived largely in the late 1950's to 1970's. Erroneous data analysis will result unless complicating factors are fully recognized and taken into account. This paper reviewed existing methods which were accepted and recommended for groundwater investigator use. (Visocky-ISWS)
W78-12165

NUCLEAR TECHNIQUES APPLICABLE TO STUDIES OF POLLUTANTS IN GROUND WATER,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5A.
W78-12168

GEOCHEMISTRY AND HYDROTHERMAL ALTERATION AT SELECTED UTAH HOT SPRINGS. VOLUME 3,
Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2K.
W78-12171

DETERMINATION OF CADMIUM IN WATERS OF THE STATE OF PIAUI, BRAZIL (DETERMINACAO DE CADMIO EM AGUAS DO ESTADO DO PIAUI, BRASIL),
Ceara Univ., Fortaleza (Brazil). Centro de Ciencias.
For primary bibliographic entry see Field 2K.
W78-12213

DETERMINATION OF IRON, MANGANESE, COPPER AND ZINC IN WATERS OF THE STATE OF PIAUI, BRAZIL (DETERMINACAO DE FERRO, MANGANESE, COBRE E ZINCO EM AGUAS DO ESTADO DO PIAUI, BRASIL),
Ceara Univ., Fortaleza (Brazil). Centro de Ciencias.
For primary bibliographic entry see Field 2K.
W78-12214

DETERMINATION OF BORON IN WATERS OF THE STATE OF PIAUI, BRAZIL (DETERMINACAO DE BORO EM AGUAS DO ESTADO DO PIAUI, BRAZIL),
Ceara Univ., Fortaleza (Brazil).
For primary bibliographic entry see Field 2K.
W78-12215

ON THE STATE OF SATURATION OF GROUNDWATER WITH RESPECT TO DISSOLVED CARBONATES, EDWARDS ARTESIAN AQUIFER, SOUTH-CENTRAL TEXAS,
San Diego State Univ., CA. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2K.
W78-12216

THE APPLICATION OF A SURFACE CLIMATE SIMULATOR TO MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 2B.
W78-12217

THE LEGALIZATION OF GROUNDWATER STORAGE,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 6E.
W78-12218

EFFECT OF BALCONES FAULTS ON GROUNDWATER MOVEMENT, SOUTH CENTRAL TEXAS,
San Diego State Univ., CA. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2F.
W78-12219

INTERRELATIONSHIP OF GROUND AND SURFACE WATER QUALITY IN THE EL PASO-JUAREZ AND MESILLA VALLEYS,
New Mexico State Univ., University Park. Coll. of Engineering.
For primary bibliographic entry see Field 5B.
W78-12225

THE UPPER RIO GRANDE,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W78-12229

INSTITUTIONAL ALTERNATIVES FOR MEXICO-U.S. GROUNDWATER MANAGEMENT,
City Univ. of New York.
For primary bibliographic entry see Field 6E.
W78-12230

GROUNDWATER OCCURRENCE AND UTILIZATION IN THE ARIZONA-SONORA BORDER REGION,
Arizona Univ., Tucson. Dept. of Hydrology; and Arizona Univ., Tucson. Dept. of Geosciences.
M. D. Bradley, and K. J. DeCook.
Natural Resources Journal, Vol 18, p 29-47, January, 1978. 2 fig, 26 ref, Spanish summary.

Descriptors: *Water management(Applied), Groundwater resources, International waters, Mexico, Colorado River, Drawdown, Pumping, Long-term planning.

Population growth and expansion of agricultural production along the border have increased pressure on both surface and ground waters. The lack of international agreements governing groundwater use has resulted in a modern parallel to the conflict between Mexico and the United States over the allocation of Colorado River water. As Mexican pumping causes a drawdown of groundwater from the U.S. side of the border, proposals

have been made to institute a protective and regulatory pumping scheme near Yuma, Arizona. Rather than short-term solutions of this nature, accelerated water use requires a long-range strategy of water management and resource planning based on the notion of the international water resource system, which encompasses all surface and groundwaters shared by more than one nation. (Russell-Arizona)
W78-12233

PROTRACTED RECHARGE OF TREATED SEWAGE INTO SAND: PART II - TRACING THE FLOW OF CONTAINATED GROUND WATER WITH A RESISTIVITY SURVEY,
Rensselaer Polytechnic Inst., Troy, NY.
For primary bibliographic entry see Field 5D.
W78-12305

PROTRACTED RECHARGE OF TREATED SEWAGE INTO SAND: PART I - QUALITY CHANGES IN VERTICAL TRANSPORT THROUGH THE SAND,
Rensselaer Polytechnic Inst., Troy, NY.
For primary bibliographic entry see Field 5D.
W78-12306

USE OF HYDROCHEMICAL TECHNIQUES IN GROUNDWATER EXPLORATION IN THE VENTERSTAD AREA, CAPE PROVINCE (IN AFRIKAANS),
For primary bibliographic entry see Field 2F.
W78-12465

RESTORATION OF THE DOLOMITE WATER BALANCE AT WESTERN AREAS GOLD MINING COMPANY LTD,
A. Vogelzang.
Journal of the South African Institute of Mining and Metallurgy (Johannesburg), Vol 78, No 3, p 73-78, 1977. 4 fig.

Descriptors: Restoration, *Water level, *Groundwater recharge, *Mines, Dolomite, Pumping geological structure, Sinkholes, Boreholes, Pipelines, Dams, Overflow, South Africa.

A description is presented of how the level of the water-table was reduced as a result of increased pumping of water from the mine. Because such a condition in an area where there is compactable material above solid dolomite results in surface movement, steps were taken to restore the water-table to its former level. These included the return of water underground via a sinkhole and boreholes, and the piping of water from another mine. (So Afr Water Info Ctr)
W78-12488

AGENCY CREATED TO FIGHT COASTAL SUBSIDENCE MENACE,
Harris-Galveston Coastal Subsidence District, Houston, TX.
For primary bibliographic entry see Field 6E.
W78-12566

RULES AND REGULATIONS GOVERNING WATER WELLS IN FLORIDA.
Florida State Dept. of Environmental Regulation, Tallahassee. Div. of Environmental Permitting.
For primary bibliographic entry see Field 6E.
W78-12569

GROUND WATER AND WELLS.
For primary bibliographic entry see Field 6E.
W78-12590

BIBLIOGRAPHY AND INDEX OF WISCONSIN GROUNDWATER, 1851-1972: ADDENDUM 1834-1972.
Wisconsin Univ.-Madison. Water Resources Center.
For primary bibliographic entry see Field 10C.
W78-12600

GROUND WATER IN THE CALIFORNIA WATER QUANDRY,
Environmental Defense Fund, Washington, DC.
W. R. S. Willey.
In: Proceedings of the Eleventh Biennial Conference on Groundwater, September 15-16, 1977, Fresno, California, California Water Resources Cente, University of Caifornia, Davis, Report No. 41, November 1977, p 18-26.

Descriptors: *California, *Economic impact, *Groundwater resources, *Overdraft, Diversion, Energy loss, Groundwater, Groundwater availability, Groundwater recharge, Land subsidence, Water resources, Aquifer management.

California's groundwater resources present an important option in any attempt to alleviate the states' growing water crises. The most commonly mentioned concern with California's groundwater resource is overdraft. Overdraft is generally defined as the amount of water extracted which exceeds recharge from both natural and imported souces. One impact of overdraft is in the lowering of groundwater levels and concomitant increased pumping lifts required. Land subsidences and reduced aquifer storage capacity sometimes result from overdraft. The present status of actual controls on groundwater use in California is limited and ineffectual. This arises not only from the lack of precise management objectives for California's water resources in general, but also from a virtually complete absence of economic incentives or water quaity standards as necessary parts of a management plan. The objective of groundwater management in California ought to be as ti presently exists in state law--beneficial and reasonable use plus development and protection of aquifer resources. Standards, economic incentives, and water rights are the basis upon which groundwater use rules need to be formulated in California. (See also W78-06039) (Jordan-Florida)
W78-12615

THE ROLE OF 208 IN PLANNING GROUNDWATER USE,
Southern California Association of Governments, Los Angeles.
For primary bibliographic entry see Field 5G.
W78-12616

THE INFLUENCE OF THE SAN FERNANDO CASE ON THE WORK OF THE GOVERNOR'S WATER RIGHTS COMMISSION,
A. J. Schneider.
In: Proceedings of the Eleventh Biennial Conference on Groundwater, September 15-16, 1977, Frenso, California, California Water Resources Center, University of California, Daivs, Report No. 41, November, 1977, p 34-46.

Descriptors: *Beneficial use, *California, *Groundwater, *Judicial decisions, Economics, Groundwater resources, Management, Prior appropriation, Pueblo water rights, Pumping, Competing uses, Water rights.

The California Supreme Court decision in City of Los Angeles v. city of San Fernando has had a tremendous impact on the legal position of groundwater pumpers and on groundwater management programs. The case has become the focal point of groundwater law in California. The Courts' guidance to the trial court on remand was direct and specific: the basis of any new judgement must be 'the constitutional duty to protect the parties' rights in a manner that would minimize waste and maximize beneficial use of the water in controversy. Three points are very important: (1) San Fernando's costs indicate that reliance on the courts may be too expensive to be an option; (2) groundwater pumpers now face a great deal of uncertainty as to how to protect their interests; and (3) groundwater management entities may have to address problems they cannot work out on a local basis. In al, it has taken more than 40 years to adjudicate the rights of relatively few parties to an average groundwater supply of 100,000 acre-feet per year. (See also W78-06039) (Jordan-Florida)
W78-12617

A MULTILEVEL DEVICE FOR GROUNDWATER SAMPLING AND PIEZOMETRIC MONITORING,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 7B.
W78-12636

SPATIAL AND TEMPORAL HYDROCHEMICAL VARIATIONS IN A SEMICONFINED BURIED CHANNEL AQUIFER: ESTERHAZY, SASKATCHEWAN, CANADA,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 2K.
W78-12637

USE OF LABORATORY DATA TO PREDICT SULFATE SORPTION DURING ARTIFICIAL GROUND-WATER RECHARGE,
Geological Survey, Reston, VA. Water Resources Div.
W. W. Wood.
Ground Water, Vol. 16, No. 1, p 22-31, January-February 1978. 15 fig, 1 tab, 21 ref.

Descriptors: *Groundwater movement, *Artificial recharge, *Forecasting, *Sulfates, *Sorption, Model studies, Water quality, Methodology, Unsaturated flow, Porous media, Aquifers, Adsorption, Groundwater recharge, Texas, *Lubbock area.

Sulfate sorption data determined from laboratory investigations were used to predict movement of sulfate during a field experiment of artificial ground-water recharge in a basin near Lubbock, Texas. Laboratory studies confirmed that sulfate sorption is controlled in the system by surface area, content of iron oxides and hydroxides, and pH. Predicted sulfate distribution in the unsaturated zone was made by assuming constant one-dimensional flow. Where these assumptions were net, predictions were generally good at shallow depths and for short times. At greater depths and longer times, these assumptions combined with other factors, such as changes in effective porosity, variable mineralogy, changing hydrodynamic dispersion coefficients, and variable infiltration rates contributed to the failure of the predicted values to match the observed data. It appears that sulfate distribution in the unsaturated zone during artificial recharge can be predicted by using laboratory data if the flow conditions in the field can be described adequately. (Woodard-USGS)
W78-12724

ARTIFICIAL GROUND-WATER RECHARGE AS A WATER-MANAGEMENT TECHNIQUE ON THE SOUTHERN HIGH PLAINS OF TEXAS AND NEW MEXICO,
Geological Survey, Austin, TX. Water Resources Div.
R. F. Brown, D. C. Signor, and W. W. Wood.
Texas Department of Water Resources, Austin, Report 220, August 1978. 32 p, 13 fig, 1 tab.

Descriptors: *Artificial recharge, *Aquifer management, *Injection wells, *Water spreading, *Playas, Irrigation, Water treatment, Methodolo-

gy, Water management(Applied), Texas, New Mexico, *Southern High Plains, *Ogallala Formation.

Artificial ground-water recharge of the Ogallala Formation of late Tertiary age is a water-management technique that may be of significant value on the Southern High Plains of Texas and New Mexico. Under specific conditions artificial recharge by use of either water-spreading basins or injection wells is a proved method of storing water that is available from the playa lakes on the Southern High Plains of Texas and New Mexico. Spreading basins are the most economical method of recharge in most areas of the Southern High Plains; however, in many areas where the surficial materials have low vertical permeability, and where the spreading-basin method cannot be used successfully, water can be recharged through injection wells. Artificial recharge of playa-lake water is more likely to be successful if the water is collected from near the surface of the playa lakes, treated and clarified in a settling basin, and recharged through a system that minimizes the clogging effect of suspended sediment. Reduction of the infiltration rate is minimized if the recharged water contains little or no suspended sediment. Case histories of recent recharge experiments on the Southern High Plains, the results of laboratory studies of sediment flocculation of playa-lake water, and a cost analysis of recharge systems are presented. (Woodard-USGS)
W78-12725

GROUND-WATER RESOURCES OF ADAMS AND BOWMAN COUNTIES, NORTH DAKOTA,
Geological Survey, Bismark, ND. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-12727

HYDROLOGIC ANALYSIS OF THE U.S. BUREAU OF MINES' UNDERGROND OIL-SHALE RESEARCH-FACILITY SITE, PICEANCE CREEK BASIN, RIO BLANCO COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 8B.
W78-12732

METHOD OF ESTIMATING NATURAL RECHARGE TO THE EDWARDS AQUIFER IN THE SAN ANTONIO AREA, TEXAS,
Geologica Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-12733

AN EVALUATION OF PROBLEMS ARISING FROM ACID MINE DRAINAGE IN THE VICINITY OF SHASTA LAKE, SHASTA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-12735

PLAN OF STUDY FOR THE HIGH PLAINS REGIONAL AQUIFER-SYSTEM ANALYSIS IN PARTS OF COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING,
Geological Survey, Lakewood, CO. Water Resources Div.
J. B. Weeks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 668, Price codes: A03 in paper copy, A01 in microfiche.
Geological Survey Water-Resources Investigations 78-70, June 1978. 28 p, 2 fig.

Descriptors: *Aquifer management, *Groundwater resources, *Project planning, *Scheduling, *Computer models, Hydrogeology, Aquifer characteristics, Regional analysis, Groundwater availability, Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, Wyoming, *High Plains, *Ogallala Formation, *Great Plains.

The Ogallala Formation and associated Tertiary and Quarternary deposits from the principal aquifers supporting irrigation in the High Plains of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. The volume of water in storage within the aquifers is declining in most of the High Plains because water is being withdrawn in excess of the rate of replenishment. The U.S. Geological Survey has initiated a 5-year study of the High Plains aquifer system to develop the geohydrologic data base and computer models of the ground-water flow system needed to evaluate the response of the aquifer system to ground-water management alternatives. This report describes the objectives, plan, and organization of the study and outlines the work to be accomplished in each State in the study area. (Woodard-USGS)
W78-12739

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1977--VOLUME 1. ATLANTIC SLOPE BASINS, HUDSON RIVER TO CAPE MAY.
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12742

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1977--VOLUME 2. DELAWARE RIVER BASIN AND TRIBUTARIES TO DELAWARE BAY.
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12743

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1977.
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12744

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1977.
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12745

PERMITTING OF ARTIFICIAL RECHARGE SYSTEMS.
Florida Dept. of Natural Resources. Suwannee River Water Management District, White Springs, FL.
For primary bibliographic entry see Field 6E.
W78-12839

LAND SUBSIDENCE IN THE SANTA CLARA VALLEY,
Geological Survey, Sacramento, CA.
For primary bibliographic entry see Field 2F.
W78-12941

ASSESSMENT OF THE TOXICITY OF LANDFILL LEACHATES BY THE RESIDUAL OXYGEN BIOASSAY,
EVS Consultants Ltd., New Westminister (British Columbia).
For primary bibliographic entry see Field 5A.
W78-12960

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF SKI AREA DEVELOPMENT AND USE ON STREAM WATER QUALITY OF THE SANTA FE BASIN, NEW MEXICO,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-12277

STUDIES ON FUNCTION OF WATER AND SOIL CONSERVATION BASED ON FOREST LAND: II. INFLUENCE OF DISTURBANCE IN GROUND FLOOR UPON WATER RUNOFF, INFILTRATION AND SOIL EROSION, AND THE CONSERVATION MANAGEMENT OF FOREST LAND (IN JAPANESE),
Government Forest Experiment Station, Tokyo (Japan).
H. Mural, and Y. Iwasaki.
Bull Gov For Exp Stn (Tokyo) 286, p 1-52, 1976.

Descriptors: *Water conservation, *Soil conservation, *Clear-cutting, Burning, Runoff, Infiltration, *Soil erosion, *Forest management, Fire, Forests, Infiltrometer, Japan, Slopes, Tohoku.

The influence of disturbances to the ground floor such as cutting and logging of the forest, forest fire or forest grazing upon the water and conservation functions of the forest land was evaluated. Analysis of factors such as surface runoff, infiltration or soil erosion on several examples of disturbance or on the specially privided model working areas, through comparing the disturbed with the undisturbed land, was presented. Measurements were made using the slope infiltrometer and soil erosion gauge. The investigation area centered in the mountainous drainage basin in the Tohoku district, Japan. The length of the study was 10 yr, 1965-1975.--Copyright 1978, Biological Abstracts, Inc.
W78-12463

REMOTE SENSING TO IDENTIFY, ASSESS, AND PREDICT ECOLOGICAL IMPACT ON LAKE CHAMPLAIN WETLANDS,
State Univ. of New York Coll. at Plattsburgh.
For primary bibliographic entry see Field 6G.
W78-12601

A HISTORICAL SURVEY OF WATER UTILIZATION IN THE COOK INLET-SUSITNA BASIN, ALASKA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 6B.
W78-12605

ORIGIN OF BLANKET MIRES,
King's Coll., London (England). Dept. of Plant Sciences.
P. D. Moore.
Nature, Vol 256, No 5515, p 267-269, July 24, 1975. 2 tab, 59 ref.

Descriptors: *Clear-cutting, *Bogs, *Britain, *Blanket mores, *Prehistoric man, Wetlands, Hydrology, Forests, Transpiration, Lumbering, Human population.

Prehistoric man was theoretically capable of influencing catchment hydrology in ways which would create effects of magnitude similar to those produced by major climatic changes. By clearing forests (usually associated with herbivore production) Mesolithic and Neolithic populations could increase local groundwater supply by reducing transpiration demands and interception by the crown. Such changes in hydrology could initiate peat formation. Pollen analyses indicate that peat

initiation often occurred at about the time of elm decline; elm decline is usually accompanied by indications of human activity and forest clearance. (Stihler-Mass)
W78-12685

PLAN AND CONCEPTS FOR MULTI-USE MANAGEMENT OF THE ATCHAFALAYA BASIN,
Coastal Environments, Inc., Baton Rouge, LA.
For primary bibliographic entry see Field 6G.
W78-12686

AN ATTEMPT TO DETECT THE EFFECTS OF A STEELWORKS ON PRECIPITATION AMOUNTS IN CENTRAL HUNGARY,
Illinois Univ., Urbana-Champaign. Dept. of Ecology, Ethology, and Evolution; and Illinois Univ., Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5B.
W78-12860

REHABILITATION OF DEGRADED ARID LANDS,
United Nations, New York. Environment Programme; and Secretariat for International Ecology (Sweden).
For primary bibliographic entry see Field 6E.
W78-12916

DESERTIFICATION PROCESSES AND THE SEARCH FOR SOLUTIONS,
Ben Gurion Univ. of the Negev, Beersheba (Israel). Research and Development Authority.
J. Schechter.
Interdisciplinary Science Reviews, Vol. 2, No. 1, p 36-54, March 1977. 4 fig, 2 tab, 136 ref.

Descriptors: *Deserts, *Land use, Management, *Social aspects, Non-structural alternatives, *Desertification, Overgrazing, Air pollution, Conservation, Technology.

The dominant cause of desertification is the influence of man through (1) population pressures leading to overstocking and overgrazing, (2) destructive irrigation and cultivation practices, (3) atmospheric pollution contributing to climatic change, and (4) other social, political and cultural factors. The process can be contained and even reversed by sound management and conservation of land and water resources. The major focus of research leading to a solution to desertification should be on man himself, including social organization, nomadism and sedentarization, technology transfers, population control, education, and other problems. (Russell-Arizona)
W78-12921

CAN DESERTIZATION BE STOPPED. SUMMARY AND RECOMMENDATIONS,
United Nations, New York. Environment Programme; andSecretariat for International Ecology (Sweden).
For primary bibliographic entry see Field 6E.
W78-12937

4D. Watershed Protection

MAXIMUM NONEROSIVE FURROW IRRIGATION STREAM SIZE,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
S. N. Hamad, and G. E. Stringham.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR3, Proceedings Paper 14021, p 275-281, Sept. 1978. 3 fig, 1 tab, 13 ref, 2 append.

Descriptors: *Furrow irrigation, *Erosion, *Irrigation ditches, Size, Slopes, Slope stability, Channels, Channel erosion, Channel flow, Irrigation, Surface irrigation, Soils, Water pollution, Sediments.

A technique was presented to predict maximum nonerosive irrigation stream size for furrows as a function of soil type and bed slope. Data for different soils and field conditions were analyzed to estimate the coefficients of a prediction equation. A table giving the estimated coefficients for each soil type was given. (Sims-ISWS)
W78-12143

A SEDIMENT GRAPH MODEL BASED ON AN INSTANTANEOUS UNIT SEDIMENT GRAPH,
Agricultural Research Service, Temple, TX. Grassland Forage Research Center.
J. R. Williams.
Water Resources Research, Vol. 14, No. 4, p 659-664, August 1978. 2 fig, 3 tab, 10 ref.

Descriptors: *Sedimentation rates, *Erosion, *Texas, *Storm runoff, *Model studies, Mathematical models, Sediments, Rainfall, Watersheds(Basins), Land use, Agriculture, Storms, Precipitation(Atmospheric), Sediment yield, Sedimentology.

A model was developed for predicting sediment graphs from agricultural watersheds. Storm sediment graphs were predicted by convolving source runoff with an instantaneous unit sediment graph (IUSG). The IUSG is the distribution of sediment from an instantaneous burst of rainfall producing one unit of runoff. The IUSG is the product of an instantaneous unit hydrograph and the sediment concentration distribution. Initial sediment concentration of the IUSG was assumed to vary linearly with source runoff volume. A sediment-routing function, based on travel time and sediment particle size, was used to predict the sediment concentration distribution. Tests with 50 storms from 5 watersheds showed that the model is applicable to agricultural watersheds in the Texas blacklands. It should be useful in designing reservoirs or in water quality-modeling problems. (Sims-ISWS)
W78-12145

WATER RESOURCES AND THE LAND-WATER INTERFACE,
Illinois Univ. Urbana-Champaign. Dept. of Ecology, Ethology, and Evolution.
For primary bibliographic entry see Field 5B.
W78-12164

STOCHASTIC MODELING OF WATERSHED SYSTEMS,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 2A.
W78-12264

MACROINVERTEBRATE AND WATER QUALITY-QUANTITY SURVEY OF OTTER CREEK, PIUTE COUNTY, UTAH,
Brigham Young Univ., Provo, UT. Center for Health and Envrionmental Studies.
R. N. Winget, and R. W. Baumann.
Funded by Bureau of Land Management, Final Report, November 1977. 11 p, 4 tab, 1 fig. UT-910-PH7-821.

Descriptors: *Watershed management, *Macrobenthos, *Stream improvement, *Water quality, Land management, Grazing, *Utah, *Otter Creek(Utah), Surveys, Environmental effects, Environmental Impact Evaluation, National Resource Lands, Critical Aquatic Habitat, Grazing Impacts, BLM administered streams.

Otter Creek, Piute County, Utah was surveyed for: (1) general water quality; (2) macroinvertebrate community condition; and (3) general hydrology relating to a possible underground aquifer. The US Bureau of Land Management had installed four rock-basket gabions in the stream in a fisheries habitat improvement attempt. Water users had charged that the gabions were causing a water loss by ground water recharge through the stream banks behind each gabion. Results of the survey indicated an extensive underground aquifer with continual loss of surface waters to the aquifer and stream recharge via springs. The gabions did not affect downstream flows. Water quality and macroinvertebrate community indicated a high potential for a successful fisheries in Otter Creek. (BLM)
W78-12303

CONTROL OF WATER CATCHMENTS BY THE DEPARTMENT OF FORESTRY,
D. P. Ackerman.
South African Forestry Journal (Pretoria), Vol. 98, p 24-27, 1976.

Descriptors: *Catchment areas, Wildlife conservation, Forestry, *Forest watersheds, Water resources conservation, Recreation facilities, Legal aspects, *Watershed management, *South Africa.

A short historical review explains how the Department of Forestry controls water catchment areas in South Africa. In 1970 the government decided that the department of forestry should take over the responsibility for the conservation of all mountain catchment areas, whether in public or in private ownership and to this end, the Mountain Catchment Areas Act - 1970, was passed by parliament. The provisions of this act are briefly summarised. The multiple use of forest land is discussed, which includes plantations, indigenous forests, conservation of water and wilderness areas. (So Afr Water Info Ctr)
W78-12410

STUDIES ON FUNCTION OF WATER AND SOIL CONSERVATION BASED ON FOREST LAND: II. INFLUENCE OF DISTURBANCE IN GROUND FLOOR UPON WATER RUNOFF, INFILTRATION AND SOIL EROSION, AND THE CONSERVATION MANAGEMENT OF FOREST LAND (IN JAPANESE),
Government Forest Experiment Station, Tokyo (Japan).
For primary bibliographic entry see Field 4C.
W78-12463

EVALUATION OF DETENTION BASINS FOR CONTROLLING URBAN RUNOFF AND SEDIMENTATION,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 2A.
W78-12608

TRANSITION ZONES OF FORESTED INLAND WETLANDS IN NORTHEASTERN CONNECTICUT,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6G.
W78-12609

INTERIM REPORT ON STREAMFLOW, SEDIMENT DISCHARGE, AND WATER QUALITY IN THE CALABAZAS CREEK BASIN, SANTA CLARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. M. Knott, G. L. Pederson, and R. F. Middelburg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 291, Price codes: A03 in paper copy, A01 in microfiche.

Water-Resources Investigations 78-2, April 1978. 41 p, 12 fig, 8 tab, 13 ref.

Descriptors: *Sediment transport, *Baseline studies, *Rainfall-runoff relationships, *Water quality, *California, Urbanization, Streamflow, Flow rates, Sediment discharge, Heavy metals, Pesticides, Santa Clara County(Calif), *Calabazas Creek basin(Calif).

Streamflow, sediment-discharge, and water-quality data are being collected in the Calabazas Creek basin, Santa Clara County, Calif., to determine annual water and sediment discharge at base-line conditions that are representative of a basin prior to urbanization. Results of the first 3 years of the study (1973-75) are given in this report. Climatic conditions during this period were representative of a very wet year (1973) and 2 years of above-average rainfall (1974 and 1975). Daily water and sediment discharge were monitored at three primary stations, and periodic measurements were made at five secondary stations during selected storms. Most of the total annual sediment discharge at each station was transported during a few days each year. Maximum daily sediment discharge in a given year ranged from 23 to 62 percent of the annual total. Daily water discharge at the gaging station Calabazas Creek at Rainbow Drive, near Cupertino, ranged from no flow to 3.31 cubic meters per second. Streamflow at this location was significantly augmented during low flow by diversion of water from the South Bay Aqueduct. Annual sediment discharge at Calabazas Creek at Rainbow Drive was 4,900 t in 1974 and 9,570 t in 1975. A large quantity of sediment was trapped in a debris basin at Comer Drive upstream from this station during both years. If this sediment had not been trapped, sediment discharge at the station would have been about 35 percent greater in 1974 and 30 percent greater in 1975. Most of the trapped sediment consists of sand and gravel that would probably have been deposited in the Calabazas Creek channel downstream from the station. (Woodard-USGS)
W78-12738

COMPREHENSIVE BASIN STUDY. RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, TEXAS. VOLUME 3, APPENDIX V: UPSTREAM WATERSHED PROTECTION, USE, MANAGEMENT, AND DEVELOPMENT.
For primary bibliographic entry see Field 6B.
W78-12762

BIG BLACK RIVER, MISSISSIPPI: COMPREHENSIVE BASIN STUDY. VOLUME II, ANNEX A: AGRICULTURAL REQUIREMENTS AND UPSTREAM WATERSHED DEVELOPMENT.
For primary bibliographic entry see Field 6B.
W78-12769

BIG BLACK RIVER, MS: COMPREHENSIVE BASIN STUDY: VOL. IV, AN. C--RECREATION ASPECTS: AN. D--FISH & WILDLIFE RESOURCES: AN. E--MUNICIPAL & INDUSTRIAL WATER SUPPLY & WATER QUALITY CONTROL: AN. F--GEOLOGY & WATER RESOURCES: AN. G--ARCHEOLOGICAL, HISTORIC, & NATURAL RESOURCES.
For primary bibliographic entry see Field 6B.
W78-12771

GROUND-WATER USE FOR NUCLEAR POWER PLANTS,
Bechtel, Inc., Gaithersburg, MD.
For primary bibliographic entry see Field 3E.
W78-12844

CONTROLLING DUST IN THE MOHAVE VALLEY,
Arizona Agricultural Experiment Station, Tucson.
A. D. Halderman.
Agricultural Engineering, Vol. 59, No. 2, p 25-26, Feb. 1978. 2 photos.

Descriptors: *Soil management, *Dust, *Air pollution, *Wind erosion, Indian reservations, Soil erosion, Land reclamation, Grading, Soil conservation, Water conservation, *Arizona, *Colorado River, *Mohave Valley(Ariz).

Land grading to adapt Indian lands for irrigated farming along the Colorado River in Mohave County, Arizona, has created dust problems severe enough to close schools and alarm health authorities. Between the removal of vegetation and the establishment of a crop, the land is particularly vulnerable to blowing. Members of the University of Arizona Department of Soils, Water and Engineering have offered several recommendations to alleviate the problem: Limiting the amount of land graded at any one time, coordinating clearing operations with prevailing winds to avoid blowing toward urban and commercial centers, digging wells to wet the land after brush removal and before grading, and the establishment of crops as soon as possible after grading. These recommendations can be adapted to local conditions and are presently being implemented. (Tickes-Arizona)
W78-12934

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

CARBON CONTENTS AND SOURCES IN GROUND WATERS OF THE CENTRAL PLATTE REGION IN NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
R. F. Spalding, J. R. Gormly, and K. G. Nash.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 723, Price codes: A02 in paper copy, A01 in microfiche. Journal of Environmental Quality, Vol. 7, No. 3, p 428-434, July-Sept 1978. 2 fig, 3 tab, 23 ref. OWRT A-047-NEB(2).

Descriptors: *Groundwater, *Dissolved oxygen, *Dissolved organic carbon, *Carbon, *Nebraska, Central Platte River region(Neb), Sampling, Water analysis, Pollutant identification, *Platte River(Neb), *Alkalinity, Water chemistry, Water wells, Land use.

Fifty-one ground water samples collected in a losing reach of the Platte River were analyzed for alkalinity, dissolved oxygen (DO), and dissolved organic carbon (DOC). Ranges in concentrations were 24.8 to 109 mg/liter, .0 to 5.5 mg/liter, and 0.5 to 4.8 mg/liter for organic carbon, DO, DOC, respectively. The concentrations of these constituents are primarily associated with land use and well depth. Carbon isotope fractionation can be useful in determining sources of organic carbon to the ground water.
W78-12103

ANALYSIS FOR POLYCHLORINATED BIPHENYLS IN LAKE MACATAWA BOTTOM SEDIMENTS,
Hope Coll., Holland, MI. Dept. of Chemistry.
I. J. Brink.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 699, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, submitted to the Institute of Water Research, Michigan State University, East Lansing, (June, 1978). 13 p, 1 fig, 2 tab, 5 ref.

Descriptors: *Polychlorinated biphenyls, Distribution, *Lake sediments, *Sediments, Sediment depth, Sediment location, Water pollution sources, Pollutant identification, Sediment analysis, *Lake Macatawa(Mich), Holland(Mich).

Forty-one sediment samples from four regions of Lake Macatawa, three of which contain the major spawning and feeding grounds for fish, were analyzed for PCBs by means of gas-liquid chromatography. Attempts to correlate PCB concentrations with sediment location and composition were partially successful. A linear relationship between PCB concentration and percent organic content was found for one sample region. Apparently the most important variable that determines the degree of PCB contamination is the proximity of the sample to point sources. Several possible PCB point sources were identified. The two sample regions located furthest from the most likely point sources had relatively low levels of contamination. Deep water sediments in these two regions had higher PCB concentrations than samples from shallow water. The region of the lake located closest to the major industrial and commercial activity in the greater Holland area had the highest levels of PCB contamination. The results appear to be consistent with the hypothesis that there is slow seepage of PCBs from an old abandoned land-fill site and a disposal site for dredgings. Results of these investigations are compared with those of a somewhat similar study made by the Michigan Department of Natural Resources.
W78-12105

PROCEDURES FOR MEASURING COUGH (GILL PURGE) RATES OF FISH,
Environmental Research Lab.-Duluth, MN.
R. A. Drummond, and R. W. Carlson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 091, Price codes: A04 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-133, December 1977. 47 p, 1 tab, 5 fig, 77 ref, 3 append.

Descriptors: Freshwater fish, *Bioassay, *Toxicity, *Methodology, Laboratory tests, Laboratory animals, Fish physiology, Fish behaviors, Water pollution effects, *Testing procedures, Brook trout, Sunfish, Metals, DDT, Cadmium, Chromium, Lead, Zinc, Copper, Chlorides, Diazinon, Malathion, Lindane, MATC, Maximum acceptable, Toxicant concentration.

The cough (gill purge) is an interruption in the normal ventilatory cycle of fish that serves to clean the gills of accumulated particulate matter. A review of the literature shows that the cough occurs in a variety of freshwater and marine fish; that both mechanical and chemical stimulation apparently can cause fish to increase their cough rates; and that an increase in coughing is a rapid and sensitive endpoint for studying chemicals and effluents. In reviewing the test methods and apparatus for measuring cough rates of fish, we conclude the electrode chamber method offers more potential as a bioassay tool for assessing the respiratory responses of fish due to toxicant exposure. Recommended test procedures, based on our experience, for using the electrode chamber method are given. (EIS-Katz)
W78-12131

BIOASSAY PROCEDURES FOR THE OCEAN DISPOSAL PERMIT PROGRAM.
Environmental Research Lab., Gulf Breeze, FL.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 631, Price codes: A08 in paper copy, A01 in microfiche. Report EPA 600/9-78-010, March 1978, 121 p. 25 tab, 16 fig, 131 ref.

Descriptors: *Methodology, *Bioassay, *Laboratory tests, Oysters, Crustaceans, *Marine fish, Algae, Laboratory equipment, Phytoplankton, Marine animals, Marine fish, Shrimp,

Zooplankton, Shrimp, Benthos, Juvenile fish, *Acetylcholinesterase inhibition assay.

The bioassay procedures given in this manual were developed to provide tests for conducting toxicity evaluations of waste materials considered for ocean disposal under EPA's Ocean Disposal Permit Program. The procedures specify the use of various organisms representing several trophic levels. Both flow-through and static tests are included. Methods given vary in their utility and complexity of performance. The procedures are not intended to be considered 'standard methods,' but, depending on the judgement of the EPA Regional Administrator responsible for the managing of the permit program, are to be used as reference methods or official methods. This manual is a revision of EPA 600/9-76-010 published May 1976. (See W77-00041) (EIS-Katz)
W78-12132

BENZO(A)PYRENE METABOLISM IN THE AMERICAN OYSTER CRASSOSTREA VIRGINICA,
Sloan-Kettering Inst. for Cancer Research, Rye, NY. Donald S. Walker Lab.
For primary bibliographic entry see Field 5C.
W78-12133

BIOLOGICAL EFFECTS OF PESTICIDES ON THE DUNGENESS CRAB,
Oregon State Univ., Newport. Marine Science Center.
For primary bibliographic entry see Field 5C.
W78-12134

DESIGN CONSIDERATIONS FOR AMBIENT STREAM QUALITY MONITORING,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. P. Lettenmaier.
Water Resources Bulletin, Vol. 14, No. 4, p 884-902, August 1978. 3 fig, 5 tab, 21 ref. NSF DEB74-20744 A02.

Descriptors: *Monitoring, *Water quality, *Network design, *Mathematical models, Networks, Sampling, Streams, Pollutants, Statistics, Statistical models, Statistical methods, Water sampling, Water pollution, Sample size, Sampling frequency.

Existing ambient water quality monitoring programs have resulted in data which are often unsuitable for assessment of water quality trends. A primary concern in designing a stream quality monitoring network is the selection of a temporal sampling strategy. It is extremely important that data for trend assessment be collected uniformly in time. Greatly superior trend detection power results for such a strategy as compared to stratified sampling strategies. In general, it is desirable that sampling frequencies be at least monthly but not greater than biweekly; higher sampling frequencies usually result in little additional information. An upper limit on trend detectability exists such that for both 5 and 10 year base periods it is often impossible to detect trends in time series where the ratio of the trend magnitude to time series standard deviation is less than about 0.5. For the same record lengths, trends in records with trend to standard deviation ratios greater than about one usually can be detected with very high power when a uniform sampling strategy is followed. (Sims-ISWS)
W78-12154

ESTABLISHING BASELINE DATA FOR MANAGEMENT OF HALIFAX, N.S., LAKE WATERSHEDS,
Nova Scotia Technical Coll., Halifax. Dept. of Civil Engineering.
D. Thirumurthi, and K. H. Tan.
Journal of the American Water Works Association, Vol. 70, No. 8, p 436-445, August 1978. 14 fig, 10 tab, 24 ref. NRCC A4358.

Descriptors: *Baseline studies, *Water quality, *Lakes, *On-site data collections, *Water supply, Basic data collections, Data collections, Watersheds(Basins), Turbidity, Water analysis, Precipitation(Atmospheric), Sodium, Nitrates, Nitrites, Potassium, Chlorides, Coliforms, Magnesium, Sulfates, Iron, Phosphates, Dissolved oxygen, Manganese, Water temperature, Stratification, Foreign countries, *Nova Scotia, *Halifax(Nova Scotia), Total organic carbon.

As pressure increased to open protected municipal watersheds for public access and recreational development, a more complete understanding of the effects of watershed use on water quality becomes imperative. The data presented detailed the impact of limited watershed activities on four once-protected water supply lakes near Halifax, Nova Scotia. A comparison of extensive analyses of water samples obtained in 1975 and 1976 with earlier data suggested that relaxation in control of watershed management could lead to deterioration in water quality of the 4 lakes. During a 5-year period of limited watershed activities, chloride, sodium, and conductivity increased steadily; in one lake, nutrient levels became critical enough to cause algal blooms in summer and to initiate a change from oligotrophic to mesotrophic level. The data were suggested as a baseline for assessing the impact of further release of the watersheds following on a switch to another source of water supply. (Humphreys-ISWS)
W78-12159

NUCLEAR TECHNIQUES APPLICABLE TO STUDIES OF POLLUTANTS IN GROUND WATER,
Battelle Pacific Northwest Labs., Richland, WA.
N. A. Wogman.
Preprint Paper for a Conference held at Krakow (Poland), December 6-10, 1976. 36 p, 12 fig, 9 tab, 26 ref.

Descriptors: *Pollutants, *Groundwater, *Analytical techniques, *Pollutant identification, Equipment, Instrumentation, X-ray fluorescence, Neutron activation analysis, Radioisotopes, Tracers, Spectrometers, Mass spectrometry, Gamma rays, Laboratory tests, On-site investigations, Water pollution, *Nuclear techniques.

This paper summarized the current nuclear methods which can be used for the analysis of inorganic pollutants or tracers, including radioactive species in sediments and in their associated atmospheric and aqueous media. Nuclear techniques allow many trace elements to be analyzed in the ppm to ppb range in both field and laboratory experiments. For direct in situ field measurements, techniques of X-ray fluorescence and neutron activation analysis were discussed. Direct instrumental techniques, as well as chemical procedures enhancing their effectiveness, were discussed as they are applied in laboratory analysis. Radioactive pollutants or tracers can be measured through radiative emissions under laboratory and field conditions. In the laboratory, a few disintegrations per minute can be measured in thousand-gallon water volumes through the use of preanalysis concentration methods. Laboratory instrumentation discussed included X-ray fluorescence analyzers, total absorption gamma ray spectrometry, multidimensional coincidence gamma ray spectrometry, multidimensional gamma ray spectrometry with beta coincidence, dual Ge(Li) anticoincidence shielded systems, as well as single Ge(Li) and NaI(T1)-Ge(Li) coincidence gamma ray spectrometers. Detection sensitivities for radioisotopes from fallout and those produced by neutron activation analysis methods were presented. (Sims-ISWS)
W78-12168

IDENTIFICATION OF OIL SLICKS BY INFRARED SPECTROSCOPY,
Rhode Island Univ., Kingston. Dept. of Chemistry.
C. W. Brown, P. F. Lynch, and M. Ahmadjian.
Report to Coast Guard Office of Research and Development Final Report No CG-D-19-77, August 1976. 299 p, 52 fig, 25 tab, 28 ref, 4 append. DOT-CG-81-74-1099.

Descriptors: *Pollutant identification, *Oil spills, Water pollution sources, Methodology, Rhode Island, *Spectroscopy, *Analytical techniques, Outer Continental Shelf, *Infrared spectroscopy.

An investigation was undertaken by the University of Rhode Island to evaluate the applicability of infrared spectroscopy to identify sources of oil spills, using computer methods for matching spectra. Eighty-five different oils of all types were weathered for two weeks in at least two of four weathering grids. Two of the grids were located on Narragansett Bay and two at the Kinston laboratory. Spectral data on approximately 900 weathered oil samples were digitized and stored in computer data files to form a library of weathered oils. These were then compared to some 300 spectra of their unweathered sources by a computer ratio method. The investigation showed that infrared spectroscopy coupled with computer analysis is a useful technique for identifying the source of spilled oil. By using artificial weathering techniques, the correct source of a spill can be identified by infrared with a high probability when samples are collected within one week of the original spill. (Sinha-OEIS)
W78-12172

INFRARED ANALYSIS TECHNIQUES FOR OIL IDENTIFICATION,
Department of Energy, Bartlesville, OK. Bartlesville Energy Research Center.
P. L. Grizzle, and H. J. Coleman.
Available from the National Technical Information Service, Springfield, VA 22161 as BERC-RI-77-4, Price codes: A02 in paper copy, A01 in microfiche. Report No BERC/RI-77-4, April 1977. 22 p, 1 fig, 9 tab, 39 ref.

Descriptors: *Pollutant identification, *Oil spills, *Water pollution, Oil pollution, Baseline studies, Methodology, Outer Continental Shelf, *Infrared analysis, Crude oil, Resources management.

Infrared (IR) absorbance data at 14 selected frequencies were obtained for 52 crude oils and 52 corresponding topped (distilled through 275C) crude oil samples. Statistical analysis of the absorbance data justifies the use of 12 of these frequencies for the identification of weathered (topped) crude oils as well as unweathered crude oil samples. Detailed comparison of the IR absorbances at each frequency for 46 pairs of crude oils and corresponding topped crude oil samples indicates that, on the average, the magnitude of these bands will change by approximately 9% upon weathering and that changes as large as 21% can and, in general, will occur. Comparative absorbance data analysis of a group of artificially weathered and unweathered crude oil samples from a common geographical location indicates that spectrally similar unweathered crude oils can be differentiated by IR analysis. Results also suggest that unweathered reference crude oil samples should be artificially weathered by a consistently reliable weathering procedure before comparative analysis to a weathered spilled sample. (Sinha-OEIS)
W78-12177

OIL SPILL IDENTIFICATION SYSTEM.
Coast Guard Research and Development Center, Groton, CT.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 750, Price codes: A10 in paper copy, A01 in

microfiche. Report No. CG-D-52-77, June 1977. 205 p.

Descriptors: *Pollutant identification, *Water pollution, *Oil spills, *Methodology, Gas chromatography, Fluorescence, Spectrophotometry, Baseline studies, Environmental effects, Outer Continental Shelf.

A report titled 'Oil Spill Identification System' was issued in October 1974 detailing all aspects of spill identification as conducted by the Coast Guard R&DC Chemistry Branch. Six of 'first generation' methods have been revised to incorporate the latest techniques developed by the R&DC. These include sampling, sampling handling and transmittal, gas chromatography, fluorescence and infrared spectrophotometry, and thin-layer chromatography. These methods are detailed as they will be used by the Coast Guard operational laboratory. In addition, back-up techniques of low temperature luminescence and high pressure liquid chromatography are included. An infrared field manual and an infrared field classification manual are included, along with a technique for simulated weathering of oils and a section on safety precautions. (Sinha-OEIS)
W78-12181

DEVELOPMENT OF A SIMPLE, RAPID FIELD TECHNIQUE FOR ESTIMATING OIL CONCENTRATIONS IN THE SEDIMENTS,
Mississippi State Univ., Mississippi State.
L. R. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A042 976, Price codes: A03 in paper copy, A01 in microfiche. Report to Coast Guard Office of Research and Development Report No. CG-D-27-77, April 1977. 29 p, 2 fig, 3 tab, 2 ref, append. DOT-CG-81-76-1476.

Descriptors: *Pollutant identification, *Oil pollution, Water pollution effects, *Oil spills, *Sediments, *Chromatography, Gulf of Mexico, Environmental effects, Resources development, Outer Continental Shelf, Argo Merchant.

A rapid method for estimating the relative concentration of oil in sediments was developed and may effectively be employed in the field by non-technical personnel. The method employs a TLC (thin-layer chromatographic) technique to concentrate, rather than separate, the fluorescent compounds in oil in one area of the chromatogram. The limit of detection on the chromatogram is 2 micrograms of Empire Mix or Saudi Arabian crude oil. It is a rapid, inexpensive field method for locating areas where the sediments contain oil and for estimating the relative amount of oil in comparison to adjacent areas. (Sinha-OEIS)
W78-12182

FLOW-THROUGH MICROCOSMS FOR SIMULATION OF MARINE ECOSYSTEMS: DEVELOPMENT AND INTERCOMPARISON OF OPEN COAST AND BAY FACILITIES,
Naval Undersea Center, Kailua, HI. Div. of Chemistry and Environmental Sciences.
For primary bibliographic entry see Field 5G.
W78-12189

AN INTRODUCTION TO THE LIMNOLOGY OF THE FRIESIAN LAKES,
Limnological Inst., Oosterzee (Netherlands). Tjeukemeer Field Station.
D. M. Beattie, H. L. Golterman, and J. Vijverberg.
Hydrobiologia, Vol. 58, No. 1, p 49-64, 1978. 9 fig, 7 tab, 47 ref.

Descriptors: *Friesian Lake District(Netherlands), *Lakes, *Limnology, *Eutrophication, *Zooplankton, *Chlorophyll, Benthic fauna, Water chemistry, Hydrology, Lake morphology, Color, Seasonal, Species composition, Netherlands, Leijen(Netherlands), Bergumermeer(Netherlands), Princenhof(Netherlands), Pikmeer(Netherlands), Sneekermeer(Netherlands), Langweerder Wielen(Netherlands), Koevordermeer(Netherlands), Heegermmer(Netherlands), Fluessen(Netherlands), Morra(Netherlands), Slotermeer(Netherlands), Brandemeer(Netherlands), Grote Brekken(Netherlands), Tjeukemeer(Netherlands).

Fourteen lakes in the Friesian Lake District, the Netherlands, were sampled November 1970-November 1972 to determine chemical composition, chlorophyll-a content, and zooplankton and benthic faunal species composition and population densities. Analysis of results in relation to the hydrology of the overall system of lakes and to the morphometry of the individual lakes showed them to be so similar as to be regarded as one large lake. Chlorophyll-a concentrations indicated eutrophic conditions in all lakes, though lakes in the south had higher concentrations than those in the northeast (except Leijen). Lakes studied were Leijen, Bergumermeer, Princenhof, Pikmeer, Sneekermeer (north and south), Langweerder Wielen, Koevordermeer, Heegermeer, Fluessen (north and south), Morra, Slotermeer, Brandemeer, Grote Brekken, and Tjeukemeer. The lakes, which act as water reservoirs for surrounding polders, are interconnected by canals. Brown color measurements gave a slightly better indication of water movements than chloride. Cladoceran zooplankton densities correlated strongly with chlorophyll-a, except in the Fluessen complex. Density of Chironomus plumosus larvae was used as the basis for a classification of the lakes, as variations in density were ascribed to combined effects of wind and lake morphometry. Chemical analyses included phosphate, chloride, silicon, iron, chlorophyll-a, and brown color intensity. (Lynch-Wisconsin)
W78-12202

COMPARATIVE FINE-STRUCTURAL STUDIES ON FIVE MARINE SPECIES OF PYRAMIMONAS (CHLOROPHYTA, PRASINOPHYCEAE),
Washington Univ., Friday Harbor. Friday Harbor Labs.
For primary bibliographic entry see Field 5C.
W78-12207

AN ASSESSMENT OF PRINCIPAL COMPONENT ANALYSIS FOR DESCRIPTION OF PHYTOPLANKTON PERIODICITY IN LAKE WINGRA,
Wisconsin Univ.-Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C.
W78-12209

DETERMINATION OF CADMIUM IN WATERS OF THE STATE OF PIAUI, BRAZIL (DETERMINACAO DE CADMIO EM AGUAS DO ESTADO DO PIAUI, BRASIL),
Ceara Univ., Fortaleza (Brazil). Centro de Ciencias.
For primary bibliographic entry see Field 2K.
W78-12213

DETERMINATION OF IRON, MANGANESE, COPPER AND ZINC IN WATERS OF THE STATE OF PIAUI, BRAZIL (DETERMINACAO DE FERRO, MANGANESE, COBRE E ZINCO EM AGUAS DO ESTADO DO PIAUI, BRASIL),
Ceara Univ., Fortaleza (Brazil). Centro de Ciencias.
For primary bibliographic entry see Field 2K.
W78-12214

DETERMINATION OF BORON IN WATERS OF THE STATE OF PIAUI, BRAZIL (DETERMINACAO DE BORO EM AGUAS DO ESTADO DO PIAUI, BRAZIL),
Ceara Univ., Fortaleza (Brazil).
For primary bibliographic entry see Field 2K.
W78-12215

SAMPLING FREQUENCY FOR RIVER QUALITY MONITORING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
T. G. Sanders, and D. D. Adrian.
Water Resources Research, Vol 14, No 4, p 569-576, 1978. 5 fig, 3 tab, 25 ref.

Descriptors: *Sampling, *Monitoring, *Water quality, Water quality, Control, Water analysis, Statistical methods, Chemical analysis, River basins, River flow, Mathematical models, On-site data collections, *Connecticut River.

Sampling frequency for a water quality monitoring network is presented, and for illustrative purposes the criterion is applied to the Massachusetts portion of the Connecticut River basin. The proposed frequency criterion is based upon the assumption that the primary objectives of future river quality monitoring networks are the determination of ambient water quality conditions and an assessment of yearly trends rather than detection of stream or effluent standards violations. The sampling frequency criterion is derived as a function of the random variability of the river flow. The criterion is specifically related to the magnitude of the expected half width of the confidence interval of the mean of the randon component of the annual statistic--mean log river flow. The approriate sampling intervals (at each sampling station within the river basin) are determined by specifying equality of this confidence interval half width, which insures a uniform reliability of the annual statistic. (EIS-Deal)
W78-12239

THE USE OF FISH AS A BIOLOGICAL SENSOR FOR TOXIC COMPOUNDS IN POTABLE WATER,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
W. S. G. Morgan.
Progress in Water Technology, Vol. 10, No. 1-2, p 395-398, 1978. 1 tab, 7 ref.

Descriptors: *Bioindicators, *Monitoring, *Automatic control, *Potable water, Water quality, Fish behavior, Water quality control, Public health, Water analysis, Physiochemical properties, Automation, Pollutant identification, Toxicity, Methodology, *Opercular rhythms.

Rapid, continuous, biological monitoring systems, intended to complement physical-chemical surveillance, have been developed to utilize increases in fish opercular rhythms and activity. Any increase above the rates to be expected under normal conditions is monitored electronically. Built-in, visual alarm systems provide advance warning of imminent conditions that may be deleterious to public health. (EIS-Deal)
W78-12241

PHYTOPLANKTON SAMPLING IN QUANTITATIVE BASELINE AND MONITORING PROGRAMS,
Virginia Inst. of Marine Science, Gloucester Point.
P. E. Stofan, and G. C. Grant.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 644, Price codes: A05 in paper copy, A01 in microfiche. Publication No. EPA-600/3-78-025, February 1978. 83 p, 166 ref. R804147010.

Descriptors: *Phytoplankton, *Methodology, *Monitoring, *Sampling, *Baseline studies, *Basic data collections, Algae, Bibliographies, Ecology,

Carbon radioisotopes, Chlorophyll, Estuaries, Oceans, Eutrophication, Research equipment.

An overview of methods for phytoplankton sampling, sample treatment, and sample analysis is presented, along with an extensive bibliography. The complexity of dynamic oceanic and estuarine ecosystems precludes prescription of a detailed and concise guideline for baseline or monitoring surveys. However, various general recommendations include: (1) Divide the investigative area into hydrographic subareas, and overlay them with a grid to provide a statistically valid sampling basis. (2) Sample at weekly to monthly intervals in estuarine systems, and biweekly to bimonthly in ocean environments. (3) Intensify sampling following ecosystem disturbances. (4) Subsurface bottle sampling is most efficient in eutrophic waters with high phytoplankton densities, a net or pump sampler may be preferable for oligotrophic ocean areas, while screens well-suited for surface sampling. (5) The Utermohl enumeration method is the most widely used because it provides a wide range of adaptability at medium cost; conventional live analysis should also be performed on sample aliquots. (6) Phytoplankton analysis in a general baseline survey should be accompanied by a wide array of ancillary data, including delineation of zooplankton, ichthyoplankton, and benthic communities. (7) Carbon-14 is the usual productivity estimate. (8) Chlorophyll-a is a good measure of standing stock. Several data storage banks were searched for this study to determine the current status of phytoplankton surveys. (Lynch-Wisconsin)
W78-12247

GUIDELINES FOR ZOOPLANKTON SAMPLING IN QUANTITATIVE BASELINE AND MONITORING PROGRAMS,
Virginia Inst. of Marine Science, Gloucester Point.
F. Jacobs, and G. C. Grant.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 151, Price codes: A04 in paper copy, A01 in microfiche. Publication No. EPA-600/3-78-026, February 1978. 51 p. R804147010.

Descriptors: Pollutant identification, *Zooplankton, *Methodology, *Baseline studies, *Monitoring, *Sampling, *Basic data collections, Bibliographies, Statistical methods, Research equipment, Nets, Pumps, Transects, Preservation, Data processing.

Methods of zooplankton sampling and analysis for quantitative baseline and monitoring surveys are described and evaluated. Zooplankton exhibit wide spatial, diurnal, and seasonal variations which, along with gear bias and capture avoidance, complicate data collecting and subsequent assessment of relationships. This study concludes: (1) Baseline studies require more frequent sampling and closely spaced stations than do monitoring studies. (2) Sampling locations can be further apart in homogeneous waters, while in heterogenous coastal or estuarine water sites should be more closely spaced and sampling conducted more frequently. (3) Sampling sites can be selected by means of a grid overlaid on the study area, though transects may be used with study areas which cover great distances and when ship time is limited. (4) In pollution studies a series of transect lines radiating from a single source may be advisable. (5) Pumping systems are an expensive but efficient means of capturing microzooplankton; a rate exceeding 150 liters/min is necessary to minimize avoidance. (6) Nets with mouth openings of 50-100 cm diameter are recommended for most groups of mesozooplankton. (7) In areas of high plankton density, a 333-micrometer mesh is peferable. (8) Specimens are generally best preserved in 4% buffered formaldehyde. (9) The Folsom and Burrell splitters are suggested. Statistical methods of analysis are discussed, and a bibliography is provided. (Lynch-Wisconsin)
W78-12249

WATER QUALITY DATA, MANITOBA, 1961-1976.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
1978, in English and French.

Descriptors: *Water quality, *Data collections, Water temperature, Flow, Discharge(Water), Gaging stations, Statistics, Pollutant identification, Canada, *Manitoba, *National Water Quality Data Bank(NAQUADAT), Hydrometric dara, 1961 to 1976.

This report presents, in table form, Water Quality Data for the province of Manitoba for the years 1961 to 1973. These data have been determined in Water Quality Branch laboratories as part of the National Water Quality Monitoring Program. This summary of Water Quality Data contains informations on water temperature, water flow and discharge for various specific locations within Manitoba. A guide to the use of the tables is included in the report. (WATDOC)
W78-12255

INTERLABORATORY QUALITY CONTROL STUDY NO. 16, TOTAL MERCURY IN NATURAL WATERS,
Canada Centre for Inland Watersm burlington (Ontario).
K. I. Aspila, and J. M. Carron.
Report Series No. 53, 1978, 19 p, 11 fig, 4 tab, 2 append.

Descriptors: *Laboratory tests, *Mercury, *Quality control, *Water sampling, Water properties, Data collections, *Analytical techniques, *Pollutant identification.

This study was designed to obtain information on the compatibility of mercury data generated by 25 laboratories using a variety of different methods. It was conducted from April to July of 1976. Test samples were provided as dilute solutions ready for analysis. The samples included one distilled water blank, one unspiked natural water and five fortified natural waters. Youden and standard addition plots were employed to describe the results. A comparison of in-laboratory and between-laboratory precision is given. (WATDOC)
W78-12259

THE ESTIMATION OF SAMPLE SIZE REQUIRED IN CHEMICAL LIMNOLOGY AND AUTECOLOGY OF SHELLED INVERTEBRATES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 7B.
W78-12262

ENRICHMENT OF ANIONS OF WEAK ACIDS BY DONNAN DIALYSIS,
Southern Illinois Univ. at Carbondale. Dept. of Chemistry and Biochemistry.
J. A. Cox, and K. H. Cheng.
Analytical Chemistry, Vol 50, Apr 1978, p 601-602, 3 tab, 6 ref. OWRT A-087-ILL(3).

Descriptors: *Ion exchange, *Chemical analysis, Membrane processes, *Anion exchanges, *Dialysis, *Acids, Weak acids, *Donnan Dialysis, Electrolyes.

The rate of Donnan Dialysis enrichment of weak acids was found to be influenced by the pH of the sample and of the receiver electrolyte; however, when the receiver pH is much less than the pK of the most acidic species, the transfer rate is independent of sample pH over a wide range. Under optimum conditions, the enrichment rate of several anions is identical. These results suggest that diffusion of the sample anion is not the rate-determining step in these enrichments and, further, that the rate of transfer across the membrane/receiver interface is especially important.
W78-12266

DISSOLUTION OF ARSENIC FROM WATER-LOGGED AND AERATED SOIL,
Missouri Univ.-Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-12267

THE POLLUTION OF NATURAL RIVER BED SEDIMENTS BEHIND THE SAVA RIVER ARTIFICIAL DAM (IN SLOVENIAN),
M. Aznik, F. Megusar, and J. Stern.
Zb Bioteh Fak Univ Ljublj Kmetijstvo 26, p 165-178, 1978.

Descriptors: *Lake sediments, Water pollution, Impoundments, Iron, Zinc, Lead, Manganese, *Metals, Aquatic fauna, *Bacteria, Microbes, Pseudomonas-fluorescens, Yugoslavia.

The mechanical composition, general chemical properties, Fe, Mn, Zn and Pb content, exchange state and capacity of colloidal particles, population density of bacterial saprophytes and the state of microbial cells together with some biochemical activities of the river bed sediments deposited over a period of 10 years behind the artificial dam of the river Sava (Yugoslavia) are presented and discussed. The non-polluted sediments from the nearby artificial water accumulation are utilized as a blank. A bioassay with Pseudomonas fluorescens as a test organism is utilized to estimate the possible toxic effect of water extractable fraction of the sediments. The possible utilization of the sediments as substrate for growing plants and probable causes for fatal effect on water fauna during the downstream transportation of material to clean the river bottom are also discussed.--Copyright 1978, Biological Abstracts, Inc.
W78-12271

SALMONELLA SEROTYPES ISOLATED FROM THE AQUATIC ENVIRONMENT (WABASH RIVER, INDIANA, 1973-1976),
Purdue Univ., Lafayette, IN. Dept. of Veterinary Microbiology, Pathology and Public Health.
For primary bibliographic entry see Field 5C.
W78-12272

EXPERIMENTAL SALMONELLA INFECTIONS IN CRASSIUS AURATUS (GOLDFISH),
Purdue Univ., Lafayette, IN. Dept. of Veterinary Microbiology, Pathology, and Public Health.
For primary bibliographic entry see Field 5C.
W78-12273

COLUMN CHROMATOGRAPHY FOR FIELD PRE-CONCENTRATION OF TRACE METALS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
M. S. Shuman, and J. H. Dempsey.
Journal Water Pollution Control Federation, Sept. 1977, p 2001-2006. 3 fig, 2 tab, 10 ref. OWRT A-073-NC(4), 14-31-0001-5033.

Descriptors: *Chromatography, *Trace elements, Metals, *Heavy metals, Ion exchange, Adsorption, Analytical technique, Cadmium, Chromium, Copper, Mercury, Zinc, *Pollutant identification, *Trace metals, Dissolved trace metals, Ion exchange column, Resins, Haw River(NC), *North Carolina, Cape Fear River(NC).

Column Chromatography was investigated for adaptation as a field technique for concentrating dissolved trace metals from natural waters. Manganese oxide impregnated acrylic fibers, a chelating resin (Chelex 100), a cation exchange resin (AG-50W) and an anion exchange resin (AG-1) were employed in preliminary work. Ion exchange resins were found to be the most satisfactory and the final design for field use consisted of a cation and an anion exchange column in series. Natural

water spiked with CR51 as a tracer indicated that soluble Cr (III) and Cr (IV) could be separated by the technique. A portable field unit was constructed and used to carry out a one-year survey of Cd, Cr, Cu, Pb, and Zn in the Haw-Cape Fear Rivers of North Carolina. Elevated concentrations of Cr, Cu, and Cd were observed in the upper industralized areas while Zn and Pb appeared to have sources throughout the basin. Concentration ranges in ug/l were <0.10-1.22 Cd, <0.1-26.8 Cr, 0.9-9.1 Cu, 1.1-74.0 Pb, and 2.9-74.0 Zn. (Kiger-NC State)
W78-12275

CHARACTERISTICS OF PREDICTING SANITARY CONDITIONS OF WATER USE BY THE POPULATION IN NEW ECONOMIC AREAS IN THE EXAMPLE OF THE CENTRAL REGION OF THE BAIKAL-AMUR RAILWAY (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny, Moscow.
For primary bibliographic entry see Field 5C.
W78-12284

INVESTIGATION ON DRILLING CORES OF SEDIMENTS OF LAKE CONSTANCE: I. PROFILES OF THE POLYCYCLIC AROMATIC HYDROCARBONS (IN GERMAN),
Biochemisches Inst. Umweltcarcinogene, Ahrensburg (West Germany).
G. Grimmer, and H. Boehnke.
Z Naturforsch Sect C Biosci 32(9/10), p 703-711, 1977.

Descriptors: West Germany, *Lake sediments, *Lake Constance(W Germany), *Drilling cores, *Aromatic hydrocarbons(Polycyclic), Organic compounds, *Pollutant identification.

The content of polycyclic aromatic hydrocarbons (PAH) from sediment layers of Bodensee (West Germany) areas differently exposed to environmental burden were determined; 32 PAH and 10 N containing PAH were identified by comparison with authentic samples. A method of quantitative enrichment and gas chromatographic determination to PAH containing 4-7 rings is described. In a comparative profile analysis only the 20 most abundant PAH were regarded. Low burdened areas (center of the lake, 250 m deep; Guettingen) show only 10-20% of the PAH content of high-burdened areas (mouth of Argen and Schussen). The qualitative and quantitative composition of the PAH fraction (PAH-profile) from different layers of a sediment drilling core are very similar, whereas profiles from different regions can be distinguished. The concentration of PAH increased from the surface to a layer with maximum burden (1965-1970) and then decreased to a remaining concentration (1900). From the typical PAH profile and some characteristic compounds, e.g., benzo(b)-naphtho(2,1-d)thiophan, benz(a/c)acridines, benzo(a/b/c)-carbazoles, dibenzacridines and dibenzcarbazoles some potential sources such as car traffic, petroleum, fuel oil and used lubricating oil can be excluded. Coal combustion smoke gas is probably the main source of emission.--Copyright 1978, Biological Abstracts, Inc.
W78-12290

TOXIC EFFECT OF COPPER STUDIED BY ELECTRO-CARDIOGRAM IN CARP (CYPRINUS CARPIO) (IN FRENCH),
Ecole National Superieure Agronomique de Toulouse (France). Lab. de Ichtyologie Appliquee.
For primary bibliographic entry see Field 5C.
W78-12293

QUANTITATIVE DETERMINATION OF THE TOXICITY OF DIFFERENT AGENTS USING CHLORELLA AS A TEST OBJECT (IN RUSSIAN),
Mosc. Sewage Res. Proj. Inst., Moscow, USSR.
G. K. Barashkov, and N. M. Kiristaeva.
Gidrobiol Zh 13(2), p 104-108, 1977.

Descriptors: *Chlorella-Pyrenoidosa, Sewage, Water pollution, *Toxicity tests, *Pollutant identification, Methodology, Algae.

A simple method for determining the toxicity of substances in sewage or natural waters using a mesophilic Chlorella pyrenoidosa culture is described. The sensitivity of the determination was increased by transferring the algae from 1 type of medium to another, and the use of ultrasound treatment increased accuracy. An internal standard of toxicity based on copper sulfate can be used for relative toxicity studies. The method is recommended for water quality studies.--Copyright 1978, Biological Abstracts, Inc.
W78-12294

HYGIENIC ASSESSMENT OF AN ANTICORROSION HERMETIC AH-4 USED IN A HOT WATER SUPPLY SYSTEM (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny, Moscow.
Yu. V. Novikov, and K. O. Lastochkina.
Gig Sanit (11), p 26-32, 1976.

Descriptors: *Potable water, *Water supply, *Water quality standards, Toxicity, Public health, Corrosion control, Water treatment, *Pollutant identification.

A complex of sanitary-chemical and toxicologic investigations were carried out on the quality and the biological properties of water, that was in contact with hermetic AH-4. After contact the properties of water (smell, taste, transparency, color and pH) corresponded to the requirements of the state standard for drinking water. No presence of adjuvants could be traced in the water. In experimental investigations no biological action of the water, which was in contact with hermetic AH-4, could be detected under conditions of a chronic test in rats by biochemical, physiological and pathological investigation methods. Based on complex investigation, hermetic AH-4 may be recommended for field use in the hot water supply system.--Copyright 1978, Biological Abstracts, Inc.
W78-12295

THE USE OF CARBON AND SULFUR ISOTOPIC RATIOS AND TOTAL SULFUR CONTENT FOR IDENTIFYING THE ORIGIN OF BEACH TARS IN SANTA MONICA BAY, CALIFORNIA,
University of Southern California, Los Angeles. Sea Grant Program.
For primary bibliographic entry see Field 5B.
W78-12311

ON THE BEACH - INFRARED SPECTROSCOPY IN THE REAL WORLD,
Rhode Island Univ., Kingston. Dept. of Chemistry.
C. W. Brown, W. P. Lee, P. F. Lynch, and M. Ahmadjian.
Rhode Island University Marine Reprint No. 104, Reprinted from: Environmental Analysis, p 79-91, 1977. Academic Press, New York. 7 fig, 5 ref. SG-04-6-148-44002.

Descriptors: *Pollutant identification, Water pollution, Sediments, Sand, Clams, Spectroscopy, Sea water, Analytical techniques, *Infrared spectroscopy, Hydrocarbons.

Organic extracts of sea water, beach sands, clams and ocean sediments have been analyzed by infrared spectroscopy during a three year study. Over 300 water samples, 37 sand and sediment samples and 12 clam samples were analyzed. Infrared spectra of the extracts were measured after removing the solvent. Furthermore, the spectra were re-measured after separation by TLC, and some were re-measured after saponifying the extracts. The spectra, obtained after removing the solvent, have suggested novel uses of infrared spectroscopy in marine pollution studies, e.g., various fractions of petroleum and phthalic acid esters can be monitored. Moreover, infrared spectroscopy can be used very effectively to 'screen' samples in order to determine further analysis requirements. (NOAA)
W78-12322

'BASELINE MONITORING STUDIES, MISSISSIPPI, ALABAMA, FLORIDA, OUTER CONTINENTAL SHELF, 1975-1976' VOLUME III, RESULTS,
State Univ. System of Florida Inst. of Oceanography, St. Petersburg.
For primary bibliographic entry see Field 7C.
W78-12328

DETERMINATION OF INDUSTRIAL DYES IN WATER BY LASER EXCITED RESONANCE RAMAN SPECTROMETRY,
Rhode Island Univ., Kingston. Dept. of Chemistry.
L. Van Haverbeke, P. F. Lynch, and C. W. Brown.
Rhode Island University Marine Reprint No. 103, Reprinted from: Analytical Chemistry, Vol 50, No 2, p 315-317, February 1978. 3 fig, 2 tab, 7 ref. SG-04-6-158-44002.

Descriptors: Water pollution, *Pollutant identification, *Dye concentrations, Chemical analysis, Spectrophotometry, Analytical techniques, Raman spectrometry, Industrial dyes.

Industrial fabric dyes were detected in distilled water at concentrations below 100 ppb and identified at concentrations below 200 ppb using resonance Raman spectrometry. The method was tested on doped samples of river and seawater. In both cases dyes could be detected and identified at the 200-ppb level. Detection and identification limits were higher in the natural samples because of an increase in the spectral background; however, the results show that the method is practical for 'real world' samples. (NOAA)
W78-12330

DISCHARGE OF ALKANES DURING OFFSHORE OIL PRODUCTION IN THE BUCCANEER OILFIELD,
Houston Univ., TX. Dept. of Biophysical Sciences.
For primary bibliographic entry see Field 5B.
W78-12355

DEVELOPMENT OF A RAPID FISH TOXICITY TEST UTILIZING A FREEZE CONCENTRATION TECHNIQUE FOR ROUTINE PETROLEUM REFINERY WASTEWATER MONITORING,
Imperial Oil Ltd., Toronto (Canada).
E. C. Birchard.
Progress in Water Technology, Vol. 9, p 749-759, 1977. 4 tab, 2 app, 13 ref.

Descriptors: *Bioassay, *Testing procedures, Analytical techniques, Toxicity, Laboratory tests, Chemical analysis, Chemical properties, Mortality, Rainbow trout, *Oil, *Oil pollution, Industrial wastes, Membrane processes, Metals, Methodology, *Toxicity testing.

Freeze concentration appears to be a viable technique for increasing toxicity of a refinery effluent and thus shortening the time required to elicit an end-point response in a test organism. Concentrating an effluent 5 to 1 by volume reduced equivalent mortality response time from 24 to 5 hours for the standard static bioassay, and from 96 to 13 hours for the standard flow-through bioassay. Further development of the freeze concentration technique may further reduce the response time and mortality may be able to be replaced by sublethal changes to the test organisms. (EIS-Deal)
W78-12369

FORMS OF IRON IN RIVER WATERS,
Hokkaido Univ., Hakodate (Japan). Lab. of Marine Chemistry.
For primary bibliographic entry see Field 5B.
W78-12371

RECENT ADVANCES IN FISH TOXICOLOGY -- A SYMPOSIUM.
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-12376

RELATIONSHIP BETWEEN PH AND ACUTE TOXICITY OF FREE CYANIDE AND DISSOLVED SULFIDE FORMS TO THE FATHEAD MINNOW,
Minnesota Univ., St. Paul. Dept. of Enterology, Fisheries, and Wildlife.
For primary bibliographic entry see Field 5C.
W78-12382

THE ACUTE TOXICITY OF NITRITE TO FISHES,
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
For primary bibliographic entry see Field 5C.
W78-12383

COPPER TOXICITY: A QUESTION OF FORM,
Corvallis Environmental Research Lab., OR. Western Fish Toxicology Station.
For primary bibliographic entry see Field 5C.
W78-12384

SOLID WASTES RESEARCH IN SOUTH AFRICA,
Council for Scientific and Industrial Research, Johannesburg (South Africa).
R. G. Noble.
South African National Scientific Programmes Unit, Report No 4, 1975. 17 ref, 3 tab.

Descriptors: *Solid wastes, Agricultural wastes, Domestic solid wastes, Landfills, Waste disposal, Waster paper, Plastics wastes, Guidelines, *Wastes(Research), *South Africa.

The National Programme for Environmental Sciences aims at identifying, evaluating and working towards solutions for environmental problems through cooperative studies drawing together interested scientists from various sectors. Apart from solid wastes, the National Programme also includes research relating to ecosystems, their structure, functioning and exploitation and disturbance by man. It includes research relating to environmental problems in inland waters, terrestrial ecosystems, the sea and lower atmosphere. This report reflects the preliminary thoughts of the Committee and identifies areas in need of further attention. Through the concerted attention of cooperating agencies, it is hoped that pollution effects arising from the disposal of solid wastes will be minimized and that it will contribute to the conservation of natural resources. (So Afr Water Info Ctr)
W78-12398

TOXICITY STUDIES ON MARINE ANIMALS,
Cape Town Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-12424

SUSPECTED KILLER UNDER THE MICROSCOPE.
Council for Scientific and Industrial Research, Pretoria (South Africa).
Scientiae, Pretoria, Vol 18, No 1, p 27-28, 1977.

Descriptors: *Eutrophication, Lentic environment, *Microcystis Aeruginosa, Water quality, Toxicity, Algae toxins, Seasonal variations, Electron microscopy, Structural analysis, Environmental aspects, Viruses, *South Africa.

The cell structure of Microcystis aeruginosa, the blue-green alga which has been linked with sporadic cattle deaths at the Hartebeespoort Dam, has been described for the first time. Samples of this controversial alga have been examined under the electron microscope by a researcher at the CSIR's National Institute for Water Research (NIWR), but even on such close scrutiny the cause of its recurrent toxicity remains elusive. The priority for researchers is, however to pinpoint the environmental conditions which cause Maeruginosa to produce a toxic molecule. Once these are known, preventive measures can be developed. Further study of a basic nature is already in progress. (So Afr Water Info Ctr)
W78-12446

THE USE OF A SLOTTED QUARTZ TUBE FOR THE ANALYSIS OF TRACE METALS IN FRESH WATER,
Council for Scientific and Industrial Research, Pretoria (South Africa).
R. J. Watling.
Water South Africa, Vol. 3, No. 4, p 219-220, 1977. 3 ref, 2 tab, 1 fig.

Descriptors: *Trace metals, Freshwater, *Water analysis, *Slotted quartz tube, Equipment evaluation, Flame atomic absorption spectroscopy, Sensitivity, Precision, Multielement determination, Rapid techniques, Interference, *Pollutant identification, South Africa.

With the growing awareness of the gradual build-up of trace metals in the marine and freshwater environments it has become increasingly necessary to monitor metal levels in water on a regular basis. Accordingly, fast and accurate analytical techniques are necessary. This paper describes the use of a slotted quartz tube (SQT) accessory to a conventional flame atomic absorption burner whereby significant increases in sensitivity and precision have been obtained to enable fourteen elements to be determined directly in a fresh water matrix. (So Afr Water Info Ctr)
W78-12494

TRACE METAL STUDIES IN KNYSNA ESTUARY,
Council for Scientific and Industrial Research, Pretoria (South Africa).
R. J. Watling, and H. R. Watling.
Environment, Republic of South Africa, (Pretoria) Vol 2, No 10, p 5-8, 1975, 6 ref, 1 fig, 2 tab.

Descriptors: *Biominitoring, *Trace elements, Mollusca, *Estuarine pollution, Estuarine environment, Estuarine sediments, Pollutant identification, South Africa, Knysna, Crassosterea margaritacea, Ostrea Esulis, Crassostrea gigas.

Knysna estuary is the most biologically productive estuary in South Africa, as such, is listed as an area of primary importance in the national marine monitoring programme. If the estuary should become polluted the coastal fishery may be adversely affected. For these reasons it is necessary to make a through study of the current tracemetal levels which occur in the estuary, to provide baseline data against which the effects of any future developments can be measured. Data obtained from the continued monitoring of trace-metal levels in sediments and biological species can be used to evaluate the effects of all future development in the Knysna estuary, so that when necessary, immediate steps may be taken to contol any pollution. (So Afr Water Info Ctr)
W78-12509

MODEL EXPERIMENTS ON POLIOMYELITIS SURVEILLANCE IN AN URBAN POPULATION OF THE RUHR VALLEY (ESSEN) BY INVESTIGATIONS OF THE SEWAGE WATER (IN GERMAN),
Essen Univ. (Gesamthochschule) West Germany). Abt. fuer Medizinische Virologie und Immunologie.
O. Thraenhart, E. Kuwert, and W. Worringen.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Betriebshyg Praev Med 164(4), p 328-339. 1977.

Descriptors: *Ruhr Valley(W Germany), *Viruses, *Sewage, Domestic wastes, Public health, Cities, Water pollution, *Pollutant identification, Kinetics, Picornavirus, *Poliovirus, Vaccine.

Correlation between viral infections in a population and circulation of the corresponding viruses in sewage waters is frequently observed. This investigation was directed towards 2 major goals: to minimize the time required for virus isolation and subsequent characterization of the isolates and to control more efficiently the poliovirus circulation in sewers of a metropolitan area under field conditions. On the laboratory level overlap procedures of isolation, identification and differentiation reduced the time lag between sampling and eventual characterization of poliovirus isolates from sewage waters to at least 14 days. In a field of poliomyelitis surveillance about 40% of sewage waters of a large urban community (Essen, West Germany, 290,000 population) were controlled by drawing samples at 9 different points in the sewers at weekly intervals over 5 mo. of an overall observation period of 2 yr. During this time no wild poliovirus could be isolated and no case of poliomyelitis was observed.--Copyright 1978, Biological Abstracts, Inc.
W78-12511

CHEMICAL CHARACTERISTICS OF LAKE MARYUT, A POLLUTED LAKE SOUTH OF ALEXANDRIA, EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
S. D. Wahby, S. M. Kinaway, T. I. El-Tabbach, and A. Abdel.
Estuarine and Coastal Marine Science, Vol 7, p 17-28, 1978. 7 fig, 2 tab, 29 ref.

Descriptors: *Water analysis, *Oxygen, *Industrial wastes, *Sewage effluents, Chemical analysis, Ammonia, Seasonal coasts, Oxygen demand, Organic compounds, *Hydrogen sulphide, Water pollution sources, Water pollution effects, *Oxygen consumption, *Lake Maryut, *Egypt.

Lake Maryut waters were analysed for chlorosity variations, pH, alkalinity, oxygen content, and the rate of oxygen consumption, in addition to ammonia, hydrogen sulphide and organic matter content. The object of the study was to assess the degree of water pollution as a probable cause of the decrease in fish production. Oxygen content showed complete depletion in many months and a high rate of oxygen consumption. Organic matter, hydrogen sulphide, and ammonia were high as compared to unpolluted waters. (EIS-Deal)
W78-12520

SAMPLING, PRESERVATION AND STORAGE OF WATER SAMPLES FOR ANALYSIS OF METALS,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 2K.
W78-12524

TECHNIQUE FOR REMOVAL OF DISSOLVED AND DISPERSED HYDROCARBONS FROM BIOASSAY EFFLUENTS,
South Carolina Univ., Columbia. Dept. of Geology.

W. S. Moore, J. L. Hyland, B. D. Melyan, W. Galloway, and P. Rogerson.
Environmental Science and Technology, Vol 12, No 5, p 595-596, 1978. 1 fig, 1 tab, 4 ref.

Descriptors: *Oil, *Oil pollution, *Bioassay, Organic compounds, Fuels, Analytical techniques, Laboratory tests, Equipment, Filters, *Filtration, Chemical analysis, Water analysis, Water quality, Methodology, *Pollutant identification.

A method for the efficient removal of petroleum-derived hydrocarbons from the oil-contaminated effluent of a continuous flow-through oil bioassay system is described. The concentration of No. 2 fuel oil in the effluent, discharged at rates from 17 to 26 L/min, is reduced from an average of 17 approximately 1 ppm by passing the water through acrylic fibers. (EIS-Deal)
W78-12525

AERIAL SURVEILLANCE TO MONITOR WATER QUALITY IN CATFISH PONDS,
Mississippi State Univ., Mississippi State. Dept. of Wildlife and Fisheries.
H. R. Robinette, D. Finnie, F. D. Whisler, J. Young, and W. F. Miller.
In: Proceedings of the Twenty-ninth Annual Conference, Southeastern Association of Game and Fish Commissioners, October 12-15, 1975, St. Louis, Missouri, p 287-293, (1975). 2 tab, 5 fig, 7 ref.

Descriptors: *Water quality, *Aquiculture, Ponds, *Fish management, *Fish farming, *Monitoring, *Aerial photography, *Remote sensing, *Catfish, *Farm ponds, Photography, Oxygen, Commercial fish, Suspended solids, *Infrared photography, *Munsell color system.

Remotely sensed data and ground truth data were collected simultaneously from 16 experimental ponds during 6 days in June and July, 1974. Color infrared images were taken with hand-held 35 mm cameras from single engine aircraft. Numerical color values for pond color were obtained by visually matching the pond color with a Munsell color system chip which had a standardized numerical value assigned to it. Ground truth data involved the determination of 14 chemical, physical and biological parameters. Regression analysis indicated a significant correlation existed only between total and inorganic solids and the Munsell Color System. There was evidence to suggest that the color-inorganic solid relationship was masked by the organic solids present.
W78-12526

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME I: SUBSYSTEM DESCRIPTION DEFINITION OF SYSTEM REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-12548

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME II: EXHIBITS, DEFINITION OF SYSTEMS REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-12549

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME III: DATA ELEMENT DICTIONARY DEFINITION OF SYSTEM REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-12550

MICROBIOLOGICAL CONDITIONS OF THE WATERS AROUND THE AUGUSTA ROAD-STEAD (IN ITALIAN),
Messina (Italy). 1st. di Idrobiologia.
For primary bibliographic entry see Field 5C.
W78-12556

STUDIES OF TRACE METALS IN THE WATERS AND SEDIMENTS OF BADFISH CREEK AND LAKE WINGRA, NEAR MADISON, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
J. J. Delfino, M. A. Degelow, and T. E. Imbrigiotta.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 966, Price codes: A04 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 78-07, 1978. 44 p, 18 fig, 6 tab, 24 ref. OWRT A-071-WIS(2), 14-34-0001-7105, 14-34-0001-7106.

Descriptors: *Iron, *Manganese, *Zinc, *Lead, *Sewage treatment, *Sewage effluents, Water pollution, *Sediment particle size, Lake sediments, Wisconsin, Trace elements, Metals, *Pollutant identification, Waste water treatment, *Badfish Creek(Wisc), Lake Wingra(Wisc).

The objectives were: to evaluate analytical techniques for measuring selected trace metals in natural waters and, in particular, to develop a mechanisms for metals discharged from a sewage treatment plant to a receiving stream; and to determine metal associations in stream and lake sediments, particularly related to distributions among various particle size fractions. Experiments with the Mn(II)-TTA complex indicated that 2-thenoyltrifluoroacetone (TTA) was not a satisfactory method for directly measuring Mn(II) at the microg/L level in natural waters. Field studies performed in Badfish Creek, south of Madison, WI indicated that the majority of the Creek sediments consisted of sand sized particles. However, as expected, on a per gram basis, the silt and clay fraction contained the highest trace metal concentrations. The concentrations of Pb, Zn, Fe, Mn, Cr and Cu in Badfish Creek sediments generally decreased with distance downstream from a metropolitan sewage treatment plant. In Lake Wingra, adjacent to Madison, WI, storm sewers and tributary creeks are the principal conduits for non-point sources of Pb, Zn, Fe and Mn deposited in the sediments. Lead and Zn are carried as suspended particulates in the silt fractions. The Pb and Zn also appeared to be affected by the presence of Fe and Mn oxides in the sediments, perhaps due to a controlling influence of the former. Organic matter may be affecting trace metal behavior but not clear mechanism was obvious.
W78-12603

INVESTIGATION OF THE CHEMICAL IDENTITY OF SOLUBLE ORGANOPHOSPHORUS COMPOUNDS FOUND IN NATURAL WATERS,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
R. A. Minear.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 967, Price codes: A07 in paper copy, A01 in microfiche. Tennessee Water Resources Research Center, Knoxville, Research Report No. 64, April 1978. 140 p. OWRT A-035-TENN(3), 14-34-0001-7090.

Descriptors: *Phosphorus compounds, Algal cultures, Soluble organics, Natural waters, Chlorella, *Organophosphorus compounds, *Phosphates, Anacystis, *Pollutant identification, Analytical techniques, *Dissolved organic phosphorus, Chlamydomonas, *Sephadex gel filtration, *Chromatography(Thin-layer), Inositol phosphates, Radiophosphorus, Autoradiography.

Four algal species (Chlamydomonas reinhardtii, Chlorella pyrenoidosa, Anacystis nidulans, and Anabaena flos-aquae) were grown in batch culture on 32P labelled media to yield dissolved organic phosphorus (DOP) compounds containing a radioactive tag. The DOP compounds of filtered culture solutions were characterized by Sephadex gel filtration and thin layer chromatography (TLC) as a function of culture age. Additional TLC of individual Sephadex fractions was conducted. Time, culture and known compounds (inositol mono and hexaphosphate) comparisons were made. High performance liquid chromatography was used to separate inositol mono-and hexaphosphates and to compare the DOP of one algal species (C. reinhardtii) with inositol phosphates. Combinations of alkaline bromination and Sephadex pretreatment were examined.
W78-12607

CHEMISTRY OF SNOW MELTWATER: CHANGES IN CONCENTRATION DURING MELTING,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 2K.
W78-12630

UTILIZATION OF FISH AS INDICATORS OF WATER QUALITY: AND COMPARISON WITH THE BIOTIC INDEX METHOD: APPLICATIONS TO THE LAXIA RIVER IN THE FRENCH BASQUE REGION AND THE GABAS RIVER IN THE LANDES DEPARTMENT, (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France). Lab. de Methodologie des Inventaires.
M. Laurent, and F. Calvet.
Ann Hydrobiol 8(1), p 67-88, 1977.

Descriptors: Invertebrates, *Bioindicators, Fish, *France, *Laxia River(Fr), *Gabas River(Fr), Rivers, *Methodology, *Water quality indicators.

Study of 2 rivers (physico-chemistry, invertebrates and fish for 1 river, and only fish for the other) showed that the diversity index and the mean condition factor applied to the fish stock give results comparable with those obtained by the physico-chemical study and by the biotic index method to show up the alteration of an aquatic environment. The diversity index method applied to fish for pollution characterization would present 2 advantages to confirm other methods and to be workable by a less highly specialized staff.--Copyright 1978, Biological Abstracts, Inc.
W78-12634

A MULTILEVEL DEVICE FOR GROUNDWATER SAMPLING AND PIEZOMETRIC MONITORING,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 7B.
W78-12636

DISSOLVED SILICA IN PORE WATERS OF LAKES ONTARIO, ERIE, AND SUPERIOR SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-12645

TRACE METALS IN SEA SCALLOPS, PLACOPECTEN MAGELLANICUS, FROM EASTERN UNITED STATES,
National Marine Fisheries Service, Milford, CT. Milford Lab.
R. A. Greig, D. R. Wenzloff, C. L. MacKenzie, Jr., A. S. Merrill, and U. S. Zdanowicz.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 3, p 326-334, 1978. 1 fig, 4 tab, 9 ref.

Descriptors: *Mollusks, *Heavy metals, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc, *Trace elements, Animal metabolism, *Animal physiology, *Benthic fauna, Path of pollutants, Metals, Northeast United States, Atlantic Ocean, Tissue analysis, Bioaccumulation, *Scallop.

Sea scallops were collected from 42 sampling locations off the Northeastern United States coast. Tissue was analyzed for 8 trace metals concentrations. Most metals, except zinc, were below detectable levels in muscle tissue. In contrast to muscle, silver, cadmium, copper and zinc were present in detectable concentrations in gonadal tissue. Concentrations of these metals were generally greater in females. When total visceral mass metal concentration was determined, only mercury and lead were below detection limits. (EIS-Deal)
W78-12672

STREAM QUALITY IN THE SAN LORENZO RIVER BASIN, SANTA CRUZ COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-12734

THE HYDROLOGY OF LAKE ROUSSEAU, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12741

CHEMICAL POLLUTANTS IN RELATION TO DISEASES IN FISH,
Chicago Medical School, IL. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-12754

VARIATION IN TOXICITY TESTS OF BIVALVE MOLLUSC LARVAE AS A FUNCTION OF TERMINATION TECHNIQUE,
Washington State Dept. of Fisheries, Brinnon. Shellfish Lab.-Point Whitney.
R. D. Cardwell, C. E. Woelke, M. I. Carr, and E. Sanborn.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 128-134, 1978. 1 fig, 1 tab, 9 ref.

Descriptors: *Toxicity, *Analytical techniques, *Mortality, *Testing procedures, Embryonic growth stage, Larval growth stage, Larvae, Growth stages, Sampling, Laboratory tests, Testing, Oysters, Clams, Water chemistry, Water analysis, Chemical analysis, Bioassays, Methodology.

This paper addresses two aspects of the bivalve embryo acute toxicity test procedure, namely the potential errors associated with subsampling the veliger-stage larvae at the end of the test and the relative sensitivity and precision of the mortality criterion. It is recommended that the filtration step be eliminated and that toxicant effects on mortality be reported along with those for abnormality. Control responses and their precision of measurement should also be reported along with a notation as to whether treatment responses were corrected for those of the controls. This information, which is not always reported explicitly, is considered essential for assessing the quality of the data. (EIS-Deal)
W78-12756

AUTOMATED POLLUTION MONITORING WITH MICROCOSMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., K. L. Dickson, J. P. Slocomb, S. P. Almeida, and J. K. T. Eu.
International Journal of Environmental Studies, Vol. 10, p 43-49, 1976. 5 fig, 15 ref.

Descriptors: *Ecosystems, *Monitoring, *Diatoms, Aquatic environment, Mathematical models, Water analysis, Water quality, Water quality control, Filters, Optical properties, Microorganisms, Chemical analysis, Data collections, Automation, Automatic control, Methodology, Microcosms.

Control measures applied to aquatic ecosystems, in the absence of information on the condition of the system, are apt to be inappropriate and thus may overprotect the receiving system at times and underprotect it at others since the ability of ecosystems to receive wastes is not constant through time or from one ecosystem to another. A major determinant of the effectiveness and efficiency of ecological quality control is the lag time in the feedback of biological information. This microcosm monitoring system is based on the use of a coherent optical spatial filtering system to identify diatoms rapidly. (EIS-Deal)
W78-12758

COMPARISON OF SEMI-CONTINUOUS AND CONTINUOUS FLOW BIOASSAYS,
Utah Water Research Lab., Logan.
J. H. Reynolds, E. J. Middlebrooks, D. B. Porcella, and N. Greeney.
Progress in Water Technology, Vol. 9, p 897-909, 1977. 7 fig, 2 tab, 13 ref.

Descriptors: *Bioassay, *Testing procedures, Toxicity, Analytical techniques, Cytological studies, Aquatic algae, Phenols, Water pollution effects, Growth rates, Growth stages, Inhibition, Methodology, *Selenastrum.

Semi-continuous flow cultures are characterized by varying organism specific growth rate, substrate concentration, and cell concentration. Continuous flow cultures establish a steady state at which organism specific growth rate, substrate concentration, and cell concentration are theoretically constant. A comparison of data obtained from a specific phenol toxicity experiment conducted with both semi-continuous and continuous flow cultures does not appear to be in agreement. Competitive inhibition constants obtained from semi-continuous flow cultures indicate less phenol toxicity to the alga Selenastrum capricornutum than inhibitor constants obtained from continuous flow cultures. This difference may be due to the variation in organism specific growth rate typically observed in semi-continuous cultures which may mask certain toxic effects. (EIS-Deal)
W78-12759

APPARATUS TO DETECT TOXIC IONS IN THE ATMOSPHERE OR DISSOLVED IN WATER,
Ministere des Armees, Paris (France). Delegation Ministerielle pour l'Armement.
F. Landon, M. Bonnemay, J. Laverge, P. Malaterre, and J. Royon.
U.S. Patent No. 4,083,766, 11 p, 8 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 969, No 2, p 630, April 11, 1978.

Descriptors: *Patents, *Water pollution, *Air pollution, Ions, Toxicity, Electrolysis, Electrodes, Electrolytes, Electrochemistry, Monitoring, *Pollutant identification.

A process detects toxic ions in the atmosphere or dissolved in water with an electrochemical cell which comprises an active electrode, a reference electrode and a counter electrode, connected by an electrolyte and to which a voltage is applied. The voltage alternates on each side of the thermodynamic potential. The cell, which is adapted to detect toxic gases in air, comprises a condensation chamber connected to a venturi for the admission of air and electrolyte, and to a measurement chamber. The electrolyte carrying the dissolved toxic gas is condensed in this chamber prior to passing through the measurement chamber. The invention is applicable in particular to check the atmosphere of workshops, and to check the pollution of bodies of water with an independent portable unit. (Sinha-OEIS)
W78-12798

STUDY OF DETECTION, IDENTIFICATION, AND QUANTIFICATION TECHNIQUES FOR SPILLS OF HAZARDOUS CHEMICALS,
Battelle Pacific Northwest Labs., Richland, WA.
G. A. Sandness, J. F. Washburn, and S. B. Ailes.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 216, Price codes: A09 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Report No. CG-D-114-76, October 1976. 197 p, 34 fig, 21 tab, 59 ref. DOT-CG-54323-A.

Descriptors: *Pollutant identification, *Water pollution, Chemicals, Oil pollution, Anaytical techniques, Remote sensing, Prototypes, Hazardous materials, Aerial scanner system.

Some of the initial technical data needed by the Coast Guard and the EPA for monitoring water pollution in inland and coastal waters is provided. In the first part of this report twelve generalized remote and insitu water pollution sensing techniques are identified and discussed. The relative potential and current detectability, identifiability, and quantifiability of each of the first 400 chemicals in the Coast Guard's CHRIS list are estimated with respect to each of these techniques. The results are presented as numerical matrices or charts. Needs for further research and development of pollution sensing instrumentation are discussed. The second part of the report describes the design and testing of a prototype, active, aerial scanner system being developed by Battelle-Northwest for nighttime pollution detection. The feasibility of the design concept was demonstrated by laboratory and flight tests of the scanner together with laboratory measurements of the fluorescence spectra of fourteen oils and five other chemicals. (Sinha-OEIS)
W78-12821

MECHANISMS OF HYDROGEN SULFIDE RELEASE FROM COASTAL MARINE SEDIMENTS TO THE ATMOSPHERE,
Aarhus Univ. (Denmark). Inst. of Ecology and Genetics.
For primary bibliographic entry see Field 2L.
W78-12848

CONCENTRATIONS OF HEAVY METALS IN SMALL NORWEGIAN LAKES,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5B.
W78-12861

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN IV. NUMERICAL TREATMENT IN SITE-SPECIES DATA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Mathematics and Statistics.
S. M. Carpenter.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 5, p 585-591, 1977. 1 tab, 11 ref.

Descriptors: *Species composition, *Analytical techniques, *Numerical analysis, *Plankton, *Indian Ocean, *Classification, Ecosystems, Sites, Methodology, Equations, Computer programs, Bioindicators, Species diversity, Similarity.

Various data analysis techniques used in a series of papers on plankton ecosystems of the eastern Indian Ocean are described, together with common terminology and notation. As standard statistical methods were unsatisfactory because of unequal time intervals, missing observations, and heterogeneous data, the methods adopted were based on classification analysis, largely following Lance and Williams (1968). Application of these techniques to marine biology is relatively new. Two methods of numerical classification are discussed, based on presence-absence data and on numerical data. Natural groupings of stations (latitude x time) and of species are thought to exist, and the goal is to: (1) obtain groupings, and (2) explain discontinuities in biotic or abiotic terms. All classifications chosen were hierarchical, and were either divisive or agglomerative. In a monothetic classification, a group divides into subgroups in which one possesses a particular attribute, the others do not. In a polythetic classification two groups are combined on the basis of similarity. Qualitative as well as quantitative data can be used with most methods, but use of presence-absence data will give rare attributes an effect out of proportion to their occurrence. These techniques are described: (1) information analysis, (2) similarity analysis, (3) normal and inverse analyses, (4) two-way matrices, and (5) diagnostic methods. (See also W78-12869) (Lynch-Wisconsin)
W78-12868

COMPARISON OF LIGHT AND ELECTRON MICROSCOPIC DETERMINATIONS OF THE NUMBER OF BACTERIA AND ALGAE IN LAKE WATER,
Lund Univ., (Sweden). Dept. of Microbiology.
K. Larsson, C. Weibull, and G. Cronberg.
Applied and Environmental Microbiology, Vol. 35, No. 2, p 397-404, February 1978. 3 fig, 2 tab, 27 ref.

Descriptors: *Microscopy, *Electron microscopy, *Bacteria, *Algae, *Lakes, *Instrumentation, *Laboratory tests, *Analytical techniques, Methodology, Microorganisms, Acridine stains, Research equipment, Lake Bysjon(Sweden), Sweden, Abundance, Measurement, Monitoring.

Comparison of counts of bacteria and algae in lake water made by bright-field light microscope and by electron microscope showed good agreement between the methods, though preparations for the latter from some samples contained small vibrio-like bodies and ill-defined structures which made precise comparison more difficult. Bacteria and small cyanophytic and chlorophytic algae could not always be differentiated with the light microscope, but was easily accomplished with electron microscopy. Results show that transmission electron microscopy can be used for checking light microscopic microorganism counts in lake water. Use of acridine orange or some other acridine-based stain is best for light microscopic counts. Pure cultures of bacteria and algae included Proteus mirabilis, Pseudomonas fluorescens, and Pandorina morum. Lake water samples were obtained from Lake Bysjon, east of Malmo, Sweden, and from a pond at Lomma, north of Malmo. Light microscope determinations were performed using conventional counting chambers. Tests with the fluorescence microscope were carried out through staining the organisms with acridine orange and filtering them onto Nuclepore filters. For transmission electron microscopy water samples were concentrated by centrifugation; the pellet was then solidified in agar, fixed, dehydrated, embedded in Epon, and thin-sectioned. (Lynch-Wisconsin)
W78-12888

PROCEEDINGS OF THE 3RD AQUATIC TOXICITY WORKSHOP HELD IN HALIFAX, NOVA SCOTIA, NOVEMBER 2-3, 1976.
Environmental Protection Service, Halifax (Nova Scotia).
Environment Canada, Atlantic Region Surveillance Report EPS-5-AR-77-1, 1977. 176 p. Parker, W.R., et al., eds.

Descriptors: *Pollutant identification, *Bioassays, *Toxicity, Mortality, *Methodology, Laboratory tests, Laboratory equipment, Environmental control, *Reviews, Laboratory animals, Environment, *Canada, Halifax, Nova Scotia, Conference.

A workshop was held in Halifax, Nova Scotia, November 2-3, 1976 to exchange technical information on methods and applications of aquatic bioassays. The papers included presentations on both the technical and philosophical aspects of standardization of bioassays. (See also W78-12953 thru W78-12965) (EIS-Katz)
W78-12952

STANDARDIZATION AND PROTOCOLS OF BIOASSAYS - THEIR ROLE AND SIGNIFICANCE FOR MONITORING, RESEARCH AND REGULATORY USAGE,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
J. C. Davis.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, Nov. 2-3, 1976, Environment Canada, Tech. Report No. EPS-5-AR-77-1-, Halifax, Canada, 1977, p 1-14. 2 tab, 2 fig, 22 ref.

Descriptors: *Bioassay, *Methodology, Laboratory equipment, *Laboratory tests, Toxicity, Mortality, Canada, Environment, Water pollution effects, Pulp wastes, Pulp and paper industry, Fish physiology.

This paper reviews the subject of bioassay procedures, their standardization and the use of protocols in bioassay methodology. Test types are discussed and test selection techniques described. It is stressed that the original objective in doing the test be carefully defined and the most practical test to suit the objective selected. The nature of standardization, techniques for standardization, and the dangers of over-standardization are summarized. Over-standardization can result in inflexibility, stifle innovation and lead to impractical conditions making the tests, in some cases, irrelevant. Priorities for future work are discussed with emphasis on the need for receiving water tests and relevance of test procedures. (See also W78-12952) (EIS-Katz)
W78-12953

STATISTICAL CONSIDERATIONS IN PLANNING AQUATIC BIOASSAYS,
Canada Centre for Inland Waters, Burlington (Ontario).
P. V. Hodson, C. W. Ross, A. J. Niimi, and D. J. Spry.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, Nov. 2-3, 1976, Environment Canada, Tech. Report No. EPS-5-AR-77-1, Halifax, Canada, 1977, p 15-31. 9 fig, 7 ref.

Descriptors: *Methodology, Bioassay, Laboratory tests, *Statistical methods, *Statistical modes, Mathematical studies, Computers, Toxicity, Probit analysis, Computer analysis, Experimental design.

Detailed understanding of the assumptions and statistical calculations of probit analysis are limited to a few statisticians. For the practitioner, probit analysis using computer programs is a 'black box' method, i.e., the derivation of the results may not be subjected to question. This paper examines the results of contrived and real toxicity data using a probit analysis program to illustrate how experimental design (e.g. number of concentrations, fish per tank, and replicates) affects fiducial limits, chi-square, slope, and variance of slope. Recommendations are also made for experimental approaches that would provide a more rational bioassay data base to support legal and environmental requirements. (See also W78-12952) (EIS-Katz)
W78-12954

BEHAVIORAL ASSAYS - PRINCIPLES, RESULTS AND PROBLEMS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
E. Scherer.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, Nov. 2-3, 1976, Environment Canada, Tech. Report No. EPS-5-AR-77-1, Halifax, Canada, 1977, p 33-40. 1 fig, 33 ref.

Descriptors: *Bioassays, Water pollution effects, *Methodology, *Fish physiology, Toxicity, Fish behavior, Biochemistry, Pathology, Laboratory tests, *Behavioral assays, Sublethal impairment, Locomotor reactions, Preference, Avoidance, Locomotor activity.

Behavior is based on integration of underlying physiological functions (e.g. sensory processes, metabolism, hormonal conditions). Sublethal impairment at any of these physiological sites is likely to show up in the behavioral output. Some behavioral effects, particularly inter- and intraspecific responses, are difficult to demonstrate and quantify under standardized conditions. Certain locomotor reactions controlled by abiotic factors appear more suitable for routine testing. A fish or invertebrate may, in a quantifiable way, respond to a pollutant by approach or withdrawal (preference/avoidance tests), or by change of a given locomotor pattern (e.g. locomotor activity). The present state of using such responses in bioassays is reviewed, considering technical aspects and questions of interpretation. Options and conditions for standardization are presented and discussed. (See also W78-12952) (EIS-Katz)
W78-12955

CHEMISTRY IN THE DETERMINATION OF TOXICITY OF CHEMICALS TO AQUATIC FAUNA,
Fisheries and Marine Service, St. Andrews (New Brunswick).
V. Zitko.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, Nov. 2-3, 1976, Environment Canada, Tech. Report No. EPS-5-AR-77-1, Halifax, Canada, 1977, p 41-48. 1 fig, 14 ref.

Descriptors: Methodology, *Water chemistry, Water quality, *Bioassay, *Toxicity, Monitoring, Water pollution effects, Metabolism, Chemistry, Chemical reactions, Aquatic animals.

The chemical characterization of water and tested compounds, monitoring of the concentration of tested compounds in water and animals during the tests, identification of breakdown products and metabolites, and structure-activity relationships are discussed. The importance of close cooperation between biology and chemistry is emphasized. (See also W78-12952) (EIS-Katz)
W78-12956

THE USE OF AVOIDANCE-PREFERENCE BIOASSAYS WITH AQUATIC INVERTEBRATES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
H. D. Maciorowski, R. M. Clarke, and E. Scherer.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, No. 2-3, 1976, Environment Canada, Technical Report No. EPS-5-AR-77-1, Halifax, Canada, 1977, p 49-58. 2 tab, 4 fig, 28 ref.

Descriptors: *Toxicity, Bioassay, *Laboratory tests, Methodology, Invertebrates, Laboratory animals, Laboratory equipment, *Behavior, Metals, Oil, Chlorinated hydrocarbon pesticides, Animal physiology, *Copper, Avoidance, Preference.

The potential exposure of aquatic organisms to lethal and sublethal concentrations of toxicants can be assessed by their behavior in avoidance-preference bioassays. Several avoidance-preference systems have been tested or modified for use with invertebrates. Invertebrate avoidance-preference responses have been monitored for various heavy metals, pesticides, and oil. Not all invertebrates are equally suitable for these avoidance-preference tests. Test conditions should be chosen to fit the general biology of the species. The behavioral response may vary with the physiological state of organism. Although avoidance or preference responses can be detected in avoidance-preference bioassays, the physiological and biochemical mechanisms causing these responses usually are unknown. In agreement with results reported for fish, the direct behavioral response of invertebrates to toxicants is no indication of toxicity. This is illustrated by the avoidance by Gammarus lacustris of 0.15 and 0.46 mg/l Cu++ and its attraction to 12.3 and 30.0 mg/l Cu++. The experimental design of avoidance-preference bioassays may be modified to measure the effects of toxicants on other behavioral patterns such as reactions to food stimuli. (See also W78-12952) (EIS-Katz)
W78-12957

A DISCUSSION ON THE USE OF BEHAVIOR BY GAMMARUS PSEUDOLIMNAEUS BOUSFIELD IN EVALUATING ENVIRONMENTAL STRESS,
Fisheries and Marine Service, Halifax (Nova Scotia).
R. R. Wallace.
In: Proceedings of the 3 rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, No 2-3, 1976, Environment Canada, Technical Report No. EPS-5-AR-77-1, Halifax, Canada, 1977, p 59-67. 1 tab, 8 fig, 8 ref.

Descriptors: *Stress, *Methodology, *Toxicity, *Bioassays, Laboratory tests, Laboratory animals, Invertebrates, *Amphipoda, Animal physiology, Animal behavior, Environment, Light intensity, Water temperature, Seasonal, Ultraviolet radiation.

An apparatus was constructed to automatically monitor the activity of G. pseudolimnaeus in the laboratory. Variables such as current speed, light, food and pollutants were introduced into carefully controlled situations and the change of behavioral activity was noted. Although G. pseudolimnaeus has been studied extensively in the field, our results indicate that a considerable amount of new data may be acquired by an experimental, laboratory aproach to behavioral studies of aquatic invertebrates. (See also W78-12952) (EIS-Katz)
W78-12958

A FIELD TECHNIQUE FOR STUDYING THE AVOIDANCE OF FISH TO POLLUTANTS,
Fisheries and Marine Service, Vancouver (British Columbia). Habitat Protection Directorate.
I. K. Birtwell.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, Nov. 2-3, 1976, Environment Canada, Tech. Report No. EPS-5-AR-77-1, Halifax, Canada, 1977, p 69-86. 4 tab, 5 fig, 34 ref.

Descriptors: *Toxicity, Bioassay, Mortality, Marine fish, Juvenile fish, *Chinook salmon, Herrings, On-site investigations, Mortality, *Pulp wastes, Pulp and paper industry, Behavior, Water, *Pollution effects, Estuarine environment, Water quality, Industrial wastes, Chum salmon, Clupea, *Avoidance reactions.

An experimental field technique is described which may be used to study the behavior of fish and shallow, stratified waters. The technique is particularly suited to determining the avoidance or preference, by fish, of water quality changes in both polluted and unpolluted situations. The technique was used to determine the effects of pulpmill effluents on the vertical distribution of juvenile salmon (Oncorhynchus keta and O. tshawytscha) and juvenile herring (Clupea harengus pallasii) in a brackish water environment. Although there was a differential response, all species of fish reacted to changes in the receiving water quality which were associated with the discharge of pulpmill effluent. Avoidance effects increased with proximity to the outfalls from the pulpmill. (See also W78-12952) (EIS-Katz)
W78-12959

ASSESSMENT OF THE TOXICITY OF LANDFILL LEACHATES BY THE RESIDUAL OXYGEN BIOASSAY,
EVS Consultants Ltd., New Westminister (British Columbia).
G. A. Vigers, and B. M. Ellis.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, Nov. 2-3, 1976, Environment Canada, Halifax, Canada, Technical Report No. EPS-5-AR-77-1, 1977, p 87-106. 8 tab, 5 fig, 16 ref.

Descriptors: On-site investigations, *Mortality, *Bioassay, *Toxicity, Rainbow trout, Dissolved oxygen, *Landfills, Statistical methods, Statistics, Water temperature, Hydrogen ion concentration, Laboratory equipment, Residual oxygen bioassay, LC50, Threshold values, *Landfill leachates.

The Residual Oxygen Bioassay is a rapid bioassay procedure which for rainbow trout (Salmo gairdneri) is sensitive to toxic materials at concentrations in the 96-h LC50 range. A simple method of graphing Residual Oxygen Bioassay results is described to determine threshold values. The procedure was evaluated using sodium pentachlorophenate and landfill leachates. The threshold values obtained from the rapid procedure were directly comparable to static 96-hr LC50 bioassays obtained by standard methods. Regression analysis of Residual Oxygen Bioassay data obtained in the field demonstrated a correlation with duplicate samples subjected to static 96-h LC50 bioassays in the laboratory. Further, there was no significant difference in the response of residual oxygen bioassays controls conducted in the lab and in the field. The mobile support facility used for the field studies is also described. (See also W78-12952) (EIS-Katz)
W78-12960

WATCH THE Y IN BIOASSAY,
Guelph Univ. (Ontario). Dept. of Zoology.
J. B. Sprague, and A. Fogels.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, Nov. 2-3, 1976, Environment Canada, Halifax, Canada, Tech. Report No. EPS-5-AR-77-1, 1977. p 107-118.

Descriptors: *Methodology, *Laboratory tests, Laboratory equipment, *Statistical methods, Statistical analysis, Laboratory animals, Analysis, Water pollution effects, Mortality, Standards, Rainbow trout, Standard tests, Fiducial tests, Canadian bioassays.

We need to pay more attention to why we are following certain practices in interpreting bioassays. First of all we should ask ourselves why we are doing a bioassay, and then match the procedure to the purpose. This leads to a multiplicity of methods, not to one standard test. A recent tabulation of purposes has been made by an FAO committee and is reviewed. Secondly we should ask why we usually calculate and state fiducial limits of LC50's. They are meant to be used but seldom are. A technique is suggested for telling whether one response is significantly different from another. Thirdly, we should ask why we are standardizing on rainbow trout. Reasons are given for using a small tropical fish for Canadian bioassays. (See also W78-12952) (EIS-Katz)
W78-12961

AN EVALUATION OF DEATH BY HYPOXIA IN A MARINE FISH AS AN INDICATOR OF OIL DEPRESANT TOXICITY,
Fisheries and Marine Service, St. John's (Newfoundland).
J. W. Kiceniuk, and J. F. Payne.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Nov. 2-3, 1976, Halifax, Nova Scotia, Environment Canada, Tech. Report no. EPS-5-AR-77-1, Halifax, Canada, p 119-122. 1 fig, 7 ref.

Descriptors: Methodology, *Toxicity, *Bioassay, Mortality, Marine fish, Oil, Oil spills, Oxygen, Water pollution effects, Fish physiology, Laboratory tests, Laboratory equipment, Dissolved oxygen, *Detergents, *Hypoxia, *Commercial oil spills, Dispersants.

There may be a correlation between the toxicity of a substance and oxygen tension after death by hypoxia. We have investigated this hypothesis using a series of commercial oil spill dispersants. Most dispersants even at concentrations of 2000-2500 ppm did not change the oxygen tension at death of a pelagic marine fish, Mallotus villosus. There appeared to be a trend towards higher residual oxygen tensions with alkylphenol polyethoxylate type detergents (known to be highly toxic). This trend is evident at much higher concentrations (-30 times) than the bradycardia threshold for this species. Oxygen tension after death by hypoxia may not be reliable sensitive indicator for general use in toxicity studies. Possible sites of action of nonionic detergents are discussed. (See also W78-12952) (EIS-Katz)
W78-12962

CHANGES IN STEROID HORMONE METABOLISM AS A SENSITIVE METHOD OF MONITORING POLLUTANTS AND CONTAMINANTS,
Fisheries and Marine Service, Halifax (Nova Scotia). Halifax Lab.
H. C. Freeman, and G. Sangalang.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, Nov. 2-3, 1976, Environment Canada, Halifax, Canada, Tech. Report No. EPS-5-AR-77-1, 1977, p 123-132. 5 fig, 13 ref.

Descriptors: *Methodology, *Bioassay, *Fish physiology, Animal pathology, *Animal physiology, Brook trout, Mammals, Laboratory tests, Laboratory equipment, Water pollution effects, Path of pollutants, Cadmium, Metals, Arochoric, Polychlorinated biphenyls, Sublethal effects, *Steroidogenesis, X-ray audioradiogram, Methylmercury, Gray seal, Selenium, Steroid hormone metabolism.

Fish, known to be sensitive to sublethal levels of pollutants, are used as sensitive indicators to determine the presence of these compounds in water. Method are given to determine the effects of trace quantities of contaminants or pollutants on steroidogenesis. Examples and data are given of altered steroid hormones metabolism in brook trout and also a marine animal, the seal. (See also W78-12952) (EIS-Katz)
W78-12963

APPLICATION OF TISSUE CULTURE SYSTEMS TO EVALUATE AQUATIC TOXICANTS,
Fisheries and Marine Service, Halifax (Nova Scotia). Halifax Lab.
M. F. Li, and S. Clyburne.

In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, No. 2-3, 1976, Environment Canada, Halifax, Canada, Tech. Report No. EPS-5-AR-77-1, 1977, p 133-140. 6 fig, 19 ref.

Descriptors: *Metals, *Cadmium, *Methodology, Water pollution effects, Bioassay, Laboratory tests, Animal physiology, Animal biochemistry, Enzymes, Growth, Path of pollutants, Animal pathology, *Tissue culture, Cells, Cellular multiplication, Mitosis, DNA, Metabolism, Nucleoprotein synthesis.

Tissue Culture cells can be readily propagated under standardized conditions without elaborate facilities and provide a bioassay system, completely avoiding the individual variation inherent in intact animals because of age, sex, reproductive condition, previous environment, and other effects that occur through the life cycle of the individual animal. Various parameters of cultivated cells, such as cellular multiplication, respiration, and morphology are discussed. Cadmium chloride at a concentration of 0.5 mg/l significantly affected the cellular multiplication. Morphological studies of the experimental cells revealed that CdCl2 severely affected normal mitosis. The abnormality of DNA metabolism could affect the nucleoprotein synthesis and consequently result in a poor stainability of the CdCl2 treated cells by May Grunwald stain. (See also W78-12951) (EIS-Katz)
W78-12964

COMPARISON OF RAPID BIOASSAY PROCEDURES FOR MEASURING TOXIC EFFECTS OF BLEACHED KRAFT MILL EFFLUENT TO FISH,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
D. J. McLeay, and T. E. Howard.
In: Proceedings of the 3rd Aquatic Toxicity Workshop, Halifax, Nova Scotia, Nov. 2-3, 1976, Environment Canada, Halifax, Canada, Tech. Report No. EPS-5-AR-77-1, 1977, p 141-155. 1 tab, 7 fig, 15 ref.

Descriptors: Methodology, *Bioassay, Mortality, Laboratory tests, Laboratory equipment, Salmon, Water pollution effects, Path of pollutants, *Pulp wastes, *Pulp and paper industry, Fish physiology, Animal biochemistry, Animal pathology, *Bleached kraft pulpmill effluent, *Coho salmon, British Columbia.

Comparisons were made between seven sublethal bioassay procedures that have been developed in part as alternatives to the conventional 96-h LC50 bioassay for measuring the acute toxicity of bleached kraft pulpmill effluent (BKME). The fish tested were juvenile coho salmon (Oncorhynchus kisutch); weight 0.82 + or - 0.15 g, length 4.25 + or - 0.21 cm. The study was carried out within seven days using a single 3400-l sample of BKME collected from a British Columbia coastal mill during normal operations. The initial 96-h LC50 value of 15.0% v/v for the neutralized filtered effluent remained essentially unchanged at 15.8% v/v by the end of the study. Concentration of BKME used in the sublethal bioassays were expressed as proportions of the initial 96-h LC50 value. (See also W78-12952) (EIS-Katz)
W78-12965

THE IMPORTANCE OF SEQUENTIAL ASSESSMENT IN TEST PROGRAMS FOR ESTIMATING HAZARD TO AQUATIC LIFE,
Proctor and Gamble Co., Cincinnati, OH. Ivorydale Technical Center.
J. R. Duthie.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, Eds., American Society for Testing and Materials, p 17-35, 1977. 3 fig, 2 tab, 17 ref.

Descriptors: *Toxicity, *Chemical properties, *Testing procedures, Water pollution effects, Testing, Analytical techniques, Aquatic life, Chemical analysis, Environmental effects, Ecology, Life history studies, Bioassay, Path of pollutants, Hazards, *Toxicity testing.

The qualification process for a new chemical should include not only appropriate toxicity testing but supportive evaluations which allow an assessment of potential risk to aquatic life. Since materials differ not only in toxicological effect but also in other properties that can affect their ecological impact, each material should be considered individually, and any tendency to apply a rigid standard test program to all should be resisted. Guidelines are provided to develop testing programs which will provide a sound basis for hazard assessment without squandering limited scientific resources. Review and assessment of data on a sequential basis are necessary to focus effort on the most appropriate kinds of tests. Based on expected usage and disposal patterns, it is important to estimate the maximum concentrations that are likely to occur in the environment and their critical locations. When chemical or biological tests have indicated that a material will not be persistent, the use of shorter term toxicity tests on sensitive life stages may be substituted for total life-cycle tests. Similarly, consideration of chemical and physical properties may provide guidance on the need or priority for bioconcentration testing. (See also W78-06608) (EIS-Deal)
W78-12966

PRESENT APPROACHES TO TOXICITY TESTING - A PERSPECTIVE,
Environmental Research Lab.-Duluth, MN.
D. I. Mount.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, Eds., American Society for Testing and Materials, p 5-14, 1977. 13 fig.

Descriptors: *Pollutant identification, *Bioassay, *Toxicity, *Testing procedures, Analytical techniques, Testing, Monitoring, Laboratory tests, Sampling, Measurement, Aquatic environment, Chemical anaysis, Life history studies, *Toxicity testing.

This article serves as an introduction to a series of papers concerning aquatic toxicity. Current trends in the field are reviewed and the use of chronic tests over short-term toxicity tests is advocated. (See also W78-06608) (EIS-Deal)
W78-12967

AN INDUSTRIAL APPROACH TO EVALUATING ENVIRONMENTAL SAFETY OF NEW PRODUCTS,
Monsanto Industrial Chemicals Co., St. Louis, MO.
R. A. Kimerle, G. J. Levinskas, J. S. Metcalf, and L. G. Sharpf.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, Eds., American Society for Testing and Materials, p 36-43, 1977. 3 fig.

A systematic approach is presented for evaluating the safety of new products to employees, customers, and consumers, and the environment. Upon initiation of a project to commercialize a new product, a safety assessment schedule is prepared which considers physical and chemical properties, use patterns, environmental persistence, physical and biological accumulation potential, interaction with environmental components, and toxicity. Safety data are obtained in a logical scheme from simple screening to confirmative studies, thus enabling hazard evaluations to be made continuously during product development. Application and utility of this concept to assess aquatic safety is demonstrated using results from a current detergent builder program. (See also W78-06608) (EIS-Deal)
W78-12968

A NEW CAPACITOR FLUID - A CASE STUDY IN PRODUCT STEWARDSHIP,
Dow Chemical Co., Midland, MI.
D. R. Branson.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, Eds., American Society for Testing and Materials, p 44-61, 1977. 2 fig, 8 tab, 31 ref.

Descriptors: *Toxicity, *Testing procedures, *Chemical properties, *Capacitors, Hazards, Testing, Laboratory tests, Persistence, Analytical techniques, Monitoring, Polychlorinated biphenyls, Biodegradation, Chemical analysis, Water pollution effects, Environmental effects, Path of pollutants, Aquatic environment, Chemical industry, *Toxicity testing.

Product stewardship is a commitment to exercising responsible care during the manufacturing, use, and ultimate disposal of chemical products. An important part of product stewardship is the generation of an adequate data base to assess the potential hazards of a new product. A new capacitor fluid is a working example of product stewardship. Electrically, the fluid has been found to perform as well as or better than capacitor-grade polychlorinated biphenyl (PCB) in capacitors. Assessment of its health and environmental acceptablility was based on the composite interpretation of movement, stability, bioconcentration, and toxicity data. The use pattern, sediment binding, and recommended disposal suggest that only small amounts of the new capacitor fluid will enter the aquatic environment. The routes for leaving the aquatic environment-biodegradation and volatilizaton- allow only very low concentrations of the capacitor fluid to remain in water. The bioconcentration potential of the fluid is low enough so that residue levels in fish are not critical to the health of the fish or animal consumers, and its toxicity to aquatic organisms is similar to that of a large group of commodity chemicals and less than PCB's. (See also W78-06608) (EIS-Deal)
W78-12969

METHODS FOR CALCULATING AN LC50,
Environmental Research Lab.-Duluth, MN.
C. E. Stephan.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, Eds., American Society for Testing and Materials, p 65-84, 1977. 4 tab, 49 ref.

Descriptors: *Mortality, *Toxicity, *Bioassay, *Testing procedures, Testing, Analytical techniques, Monitoring, Statistical methods, Laboratory tests, Environmental effects, Water pollution effects, Water analysis, Aquatic environment, *Toxicity testing, *LC50.

A variety of graphical and computational methods can be used to derive a median lethal concentration (LC50) from concentration-mortality data produced by an acute mortality test. In the selection of a method, practical considerations should receive as much attention as the usual theoretical and statistical considerations. No method should be used that does not calculate both LC50 and its 95 percent confidence limits. Unfortunately, several computational methods will not calculate an LC50 from some concentration-mortality data that are practically and statistically useful to aquatic toxicologists. Useful, statistically sound information about the LC50 and its 95 percent confidence limits can be calculated from the data produced by any acute mortality test that meets published criteria of acceptability, by using an internally consistent scheme based on the moving average method and the binomial test. (See also W78-06608) (EIS-Deal)
W78-12970

MECHANICAL TOXICANT INJECTOR FOR LOW-THROUGH TOXICITY TESTS,
akehead Univ., Thunder Bay (Ontario). Dept. of iology.
. W. Ozburn, and A. D. Smith.
: Aquatic Toxicology and Hazard Evaluation, STM STP 634, F.L. Mayer and J.L. Hamelink, ds., American Society for Testing and Materials, 85-89, 1977. 2 fig, 1 ref.

escriptors: *Equipment, *Toxicity, *Testing rocedures, Laboratory equipment, Bioassay, esting, Analytical techniques, Water analysis, hemical analysis, Laboratory tests, Aquatic en-ironment.

n injector is described for delivering a series of onstant concentrations of toxicant in a flow-rough toxicity test. The apparatus can be em-loyed either as a single channel unit for use with a roportional diluter or as a multichannel injector or use with an equal-volume water delivery ystem. The multichannel approach is emphasized or pesticide addition because the test concentra-ons are independent of each other. This allows he establishment of an unlimited range of toxicant oncentrations. Although the system is suitable for oxicity tests employing freshwater diluent, the etal components of the injector may be suscepti-le to corrosion under saltwater conditions. (See lso W78-06608) (EIS-Deal)
W78-12971

A FLOW-THROUGH SYSTEM FOR STUDYING NTERACTION OF TWO TOXICANTS ON AQUATIC ORGANISMS,
Georgia Univ., Athens. School of Forest Resources.
A. G. Auwarter.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, eds., American Society for Testing and Materials, p 90-98, 1977. 2 fig, 2 tab, 8 ref.

Descriptors: *Testing procedures, *Laboratory equipment, *Toxicity, Bioassay, Testing, Equipment, Analytical techniques, Water analysis, Chemical analysis, Chemical reactions, Chemical properties, Aquatic life, Methodology, *Toxicity testing.

An intermittent-flow, proportional diluter system has been designed for the study of synergistic and antagonistic effects of two toxicants on aquatic organisms. The system consists of two diluters mounted side by side, each of which produces three toxicant concentrations plus a solvent control. Below the diluters are two additional mixing, sample-splitting levels. The first divides each concentration of each toxicant into four volumes. The second consists of 16 compartments, each of which receives a measured volume from 1 of the 4 concentrations of each toxicant. This produces a 4 by 4 matrix of all 16 possible combinations. This final level also serves as a series of sample-replicating chambers from which the toxicant mixtures flow to 32 test aquaria. (See also W78-06608) (EIS-Deal)
W78-12972

METHOD FOR ASSESSING ADDITIVE TOXICITY OF CHEMICAL MIXTURES,
Fish and Wildlife Service, LaCrosse, WI. Fish Control Lab.
L. L. Marking.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, eds., American Society for Testing and Materials, p 99-108, 1977. 1 fig, 3 tab, 35 ref.

Descriptors: *Testing procedures, *Chemical reactions, *Toxicity, Rainbow trout, Pesticides, Pesticides, Water analysis, Chemical properties, Chemical analysis, Testing, Analytical techniques, Statistical methods, *Copper, *Zinc, *Nickel, Piscicides, Insecticides, *Toxicity testing, *Malathion, Additive toxicology.

Mixtures of chemicals or pesticides may produce unexpected effects; some are hazardous and some are beneficial. A method was divided in which individual toxic contributions of chemicals are summed, and the additive toxicity is defined by an index for two or more chemicals in combination. This linear index expresses the toxicity quantitatively: zero indicates simple additive toxicity, negative values indicate less than additive toxicity, and positive values indicate greater than additive toxicity. The significance of index values near zero is assessed by substituting values from the 95 percent confidence intervals into the formula to determine whether the range for the additive indices overlaps zero (simple additive toxicity). The range is derived by selecting values of the 95 percent confidence interval yielding the greatest deviation from the additive index. (See also W78-06608) (EIS-Deal)
W78-12973

MYSIDOPSIS BAHIA: AN ESTUARINE SPECIES SUITABLE FOR LIFE-CYCLE TOXICITY TESTS TO DETERMINE THE EFFECTS OF A POLLUTANT,
Environmental Research Lab., Gulf Breeze, FL.
D. R. Nimmo.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer, and J.L. Hamelink, eds., American Society for Testing and Materials, p 109-116, 1977. 3 tab, 18 ref.

Descriptors: *Toxicity, *Cadmium, *Chemical analysis, Water analysis, Chemical properties, Life history studies, Bioassay, Path of pollutants, Water pollution effects, Environmental effects, Metals, Pesticides, Reproduction, Fecundity, Growth rates, Growth stages, *Toxicity testing, *Mysid, *Mysidopsis.

This study documents the successful use of a mysid for life-cycle toxicity tests. These tests were conducted to determine acute and chronic toxicities of metal (cadmium) and pesticide (Kepone). Delay in the formation of mysid brood pouches and release of young were noted in low concentrations, less than 6.4 microg cadmium/liter. Fewer young produced per female and decreased growth were other indicators of effects of Kepone. (See also W78-06608) (EIS-Deal)
W78-12974

SUITABILITY OF SHEEPHEAD MINNOWS (CYPRINODON VARIEGATUS) FOR LIFE-CYCLE TOXICITY TESTS,
Environmental Research Lab., Gulf Breeze, FL.
D. J. Hansen, and P. R. Parrish.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer, and J.L. Hamelink, eds., American Society of Testing and Materials, p 117-126, 1977. 7 tab, 19 ref.

Descriptors: *Life history studies, *Toxicity, *Minnows, Bioassay, Fish physiology, Testing procedures, Testing, Estuarine environment, Endrin, pesticides, Heptachlor, Pesticide toxicity, Chemical analysis, Chemical properties, *Toxicity tests, *Malathion, *Carbofuran, *Methoxychlor.

Entire life-cycle toxicity tests are practical with sheepshead minnows. This is the only estuarine fish that has been utilized successfully in life-cycle toxicity tests, using methods formulated only since 1973. Salinity, temperature, and spawning requirements were determined, and initial life-cycle toxicity tests with endrin were conducted at the U.S. Environmental Agency Gulf Breeze (Florida) Laboratory. Subsequent tests with heptachlor, carbofuran, methoxychlor, and malathion were conducted. All studies confirmed the feasibility of using this estuarine fish for determining maximum acceptable toxicant concentrations and application factors. Results of our tests also corroborate data on application factors obtained in studies completed elsewhere with freshwater fishes and the same pesticides. (See also W78-06608) (EIS-Deal)
W78-12975

BIOASSAYS WITH A NATURAL ASSEMBLAGE OF BENTHIC MACROINVERTEBRATES,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
S. L. Burks, and J. L. Wilhm.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J. L. Hamelink, eds., American Society for Testing and Materials, p 127-136, 1977. 4 tab, 10 ref.

Descriptors: *Bioassay, *Benthic fauna, *Toxicity, Biological communities, Industrial wastes, Waste water(Pollution), Water pollution effects, Environmental effects, Aquatic environment, Sampling, Oil, Oil pollution, Organic compounds, *Toxicity testing, *Diversity.

A new bioassay method for determining the effects of environmental contaminants on populations of benthic macroinvertebrates is described. Colonized Hester-Dandy samplers were transported from a natural stream to artificial streams and exposed to industrial wastewater. Species diversity, number of taxa, and density of the aquatic organisms were measured before and after time intervals of exposure. A 30 and a 32-day continuous-flow exposure test with the benthic macroinvertebrates showed that activated sludge treated petroleum refinery wastewater caused a greater decrease in species diversity than the sequential activated sludge-dual media-activated carbon treated effluent. The effect upon number of taxa and mean density of individuals was even greater. (See also W78-06608) (EIS-Deal)
W78-12976

UTILITY OF TOXICITY TESTS WITH EMBRYOS AND FRY OF FISH IN EVALUATING HAZARDS ASSOCIATED WITH THE CHRONIC TOXICITY OF CHEMICALS TO FISHES,
EG and G, Bionomics, Wareham, MA.
K. J. Macek, and B. H. Sleight, III.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, eds., American Society for Testing and Materials, p 137-146, 1977. 4 tab, 28 ref.

Descriptors: *Toxicity, *Testing procedures, Embryonic growth stage, Fry, Growth stages, Life cycles, Life history studies, Fish physiology, Chemical properties, Chemical analysis, Hazards, Bioassay, Water pollution effects, Metals, Pesticides, Linear alkylate sulfonates, Methodology, *Toxicity testing.

The hypothesis that concentrations of toxicants safe to fish over their entire life cycle can be estimated from the results of continuous exposure of embryos and newly hatched fry has been examined critically in the light of recent data. The assumptions underlying the proposed hypothesis appear to be: (1) the chemical does not exhibit significant cumulative toxicity; (2) there is a single mode of action through which the effect of the chemical is manifested in a relatively short time frame; and (3) the effect is most severe on the critical life stages (that is, embryos and newly hatched fry), where parameters such as hatchability, survival, and growth can be measured, readily. The majority of available data indicate that the hypothesis is valid. In most cases, estimates of specific application factors derived from exposure of critical life stages reasonably approximate specific application factors empirically derived from chronic toxicity studies with much less cost, effort, time required. (See also W78-06608) (EIS-Deal)
W78-12977

CURRENT BIOCONCENTRATION TEST METHODS AND THEORY,
Lilly Research Labs., Greenfield, IN.
J. L. Hamelink.

In: Aquatic Toxicology and Hazard Evaluation, F.L. Mayer, J.L. Hamelink, , ASTM STP 634, American Society for Testing and Materials, p 149-161, 1977. 2 fig, 30 ref.

Descriptors: *Toxicity, *Testing procedure, Bioassay, Chemical properties, Analytical techniques, Laboratory tests, Testing, Chemical analysis, Hazards, Fish physiology, Growth rates, Animal growth, Kinetics, Mathematical models, Aquatic animals, Absorption, *Toxicity testing, *Bioconcentration, *Bioaccumulation, *Depuration.

Practical and theoretical solutions to the quantitation of chemical accumulation by aquatic animals are evaluated. Laboratory studies presently rely on continuous exposure for extended periods of time to simulate field conditions. Applicaton of the principles of pharmacokinetics permit laboratory results to be compared and indicate that mathematical models can be derived to predict contaminant accumulation under natural conditions adequately. Additional laboratory studies with large-sized and growing fish are identified as future research needs. (See also W78-06608) (EIS-Deal)
W78-12978

UPTAKE, CLEARANCE, AND BIOCONCENTRATION OF 14C-SEC-BUTYL-4-CHLORODIPHENYL OXIDE IN RAINBOW TROUT,
Dow Chemical Co., Midland, MI.
F. A. Blanchard, I. T. Takahashi, H. C. Alexander, and H. E. Bartlett.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, eds., American Society for Testing and Materials, p 162-177, 1977. 4 fig, 4 tab.

Descriptors: *Absorption, *Fish physiology, *Rainbow trout, Organic compounds, Animal metabolism, Radioisotopes, Radioactivity techniques, Toxicity, Water analysis, Chemical analysis, Chemical properties, Capacitors, Kinetics, *Bioconcentration, *Tissue analysis, *Depuration.

Steady state bioconcentration factors for sec-butyl-4-chlorodiphenyl oxide in rainbow trout muscle were calculated using a simple two-compartment model for radioassay data of concentrations of 14C in fish and water during an uptake and clearance (depuration) experiment. There was a relatively rapid removal with one half of the material cleared in 30 to 40 h. A partition coefficient (octanol/water) for sec-butyl-4-chlorodiphenyl oxide of 16000 + or - 4900 was measured. The regression equation relating the partition coefficient to bioconcentration factor in trout muscle predicts a bioconcentration factor of 100 to 500, in agreement with the calculated values of 292 and 336. (See also W78-06608) (EIS-Deal)
W78-12979

A MODEL SYSTEM TO STUDY THE DESORPTION AND BIOLOGICAL AVAILABILITY OF PCB IN HYDROSOILS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W78-12980

EVALUATION OF THE SIGNIFICANCE OF WATERWAY SEDIMENT-ASSOCIATED CONTAMINANTS ON WATER QUALITY AT THE DREDGED MATERIAL DISPOSAL SITE,
Texas Univ. at Dallas, Richardson.
G. F. Lee, and G. M. Mariani.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F. L. Mayer, and J. L. /Hamelink, eds., American Society for Testing and Materials, p 196-213, 1977. 4 tab, 14 ref.

Descriptors: *Dredging, *Sediments, *Manganese, *Ammonia, Polychlorinated biphenyls, Heavy metals, Chlorinated hydrocarbon pesticides, Nutrients, Bioassays, Toxicity, Aquatic life, Water pollution effects, Water analysis, Chemical properties, Path of pollutants, Water quality.

During the past few years, considerable interest has developed concerning the significance of chemical contaminants associated with dredged sediments. Research has been done on the factors influencing the release of contaminants from waterway sediments and the toxicity of these sediments to various forms of aquatic life. This study has shown that the only two compounds which are released in potentially significant amounts to affect water quality at the disposal site are manganese and ammonia. The other compounds studied including heavy metals, chlorinated hydrocarbon pesticides, polychlorinated biphenyls (PCBs), and aquatic plant nutrients are either not released, released in insignificant amounts, or taken up as a result of mixing the sediments with the overlying waters under conditions which simulate typical dredging and dredged material disposal. Bioassays conducted of the elutriates of the sediments with the sediments present show that, in general, large concentrations of contaminants can be present in dredged sediments which would have little or no effect on water quality at an in-water disposal site. (See also W78-06608) (EIS-Deal)
W78-12981

APPLICATION OF AN EVAPORATIVE LOSS MODEL TO ESTIMATE THE PERSISTENCE OF CONTAMINANTS IN LENTIC ENVIRONMENTS,
Purdue Univ., LaFayette, IN. Dept. of Forestry and Natural Resources.
For primary bibliographic entry see Field 5B.
W78-12982

AN EVALUATION OF FENITROTHION TOXICITY IN FOUR LIFE STAGES OF RAINBOW TROUT, SALMO GAIRDNERI,
Fisheries and Marine Service, Winnipeg (Manitoba).
For primary bibliographic entry see Field 5C.
W78-12983

ACUTE TOXICITY TO AND BIOCONCENTRATION OF ENDOSULFAN BY ESTUARINE ANIMALS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-12984

THE EFFECT OF SUBACUTE PARATHION EXPOSURE ON THE LOCOMOTOR BEHAVIOR OF THE BLUEGILL SUNFISH AND LARGEMOUTH BASS,
Raytheon Co., Portsmouth, RI. Oceanographic and Environmental Dept.
For primary bibliographic entry see Field 5C.
W78-12985

DIET QUALITY IN FISH TOXICOLOGY: EFFECTS ON ACUTE AND CHRONIC TOXICITY,
Fish and Wildlife Service, Columbia, MO. Fish-Pesticide Research Lab.
For primary bibliographic entry see Field 5C.
W78-12986

SPONTANEOUS SKELETAL DEFORMITIES IN THE ZEBRA DANIO (BRACHYDANIC RERIO) BRED FOR FISH TOXICITY TESTS,
Unilever Research Colworth/Welwyn Lab., Bedford (England). Environmental Safety Div.
R. D. Piron.
Journal of Fish Biology, Vol. 13, p 79-83, 1978. 1 tab, 1 plate, 12 ref.

Descriptors: *Fish reproduction, *Fish genetics, *Breeding, Bioassay, Testing, Testing procedures, Laboratory tests, Fish diseases, Animal pathology, Aquaria, Genetics, Toxicity, Laboratory animals, Methodology, *Zebra danio, *Toxicity testing.

Zebra Danio tropical fish are easily maintained and bred under laboratory conditions; procedures for maintenance and breeding are described. Intensive inbreeding of the fish gave rise to a high incidence of spontaneous skeletal deformities which appear to reflect a genetic defect rather than an environmental stimulus. This finding casts doubt on the suitability of the Zebra Danio for fish toxicity testing. (EIS-Deal)
W78-12993

BREEDING THE CONVICT CICHLID (CICHLASOMA NIGROFASCIATUM) FOR USE IN LABORATORY FISH TOXICITY TESTS,
Unilever Research Colworth/Welwyn Lab., Bedford (England). Environmental Safety Div.
R. D. Piron.
Journal of Fish Biology, Vol. 13, p 119-122, 1978. 1 tab, 1 plate, 4 ref.

Descriptors: *Fish reproduction, *Cichlids, *Fish genetics, *Breeding, Bioassay, Testing procedures, Laboratory tests, Freshwater fish, Fish behavior, Aquaria, Animal pathology, Fish diseases, Laboratory animals, *Toxicity testing.

A procedure is described for breeding Convict Cichlid tropical fish under laboratory conditions. Three generations of Convict Cichlids were bred successfully using this procedure and there was no significant incidence of deformities from inbreeding to the F3, which contrasts with a high incidence of skeletal deformities observed when Zebra Danio tropical fish were inbred to the F3 generation. The Convict Cichlid is a suitable species for laboratory toxicity testing, particularly studies to assess effects on breeding performance. (EIS-Deal)
W78-12994

TRACE METAL CONTENT OF A HERRING OIL AT VARIOUS STAGES OF PILOT-PLANT REFINING AND PARTIAL HYDROGENATION,
Saint Mary's Univ., Halifax (Nova Scotia). Dept. of Chemistry.
C. M. Elson, and R. G. Ackman.
Journal of the American Oil Chemist Society, Vol 55, No 8, p 616-618, 1978. 1 tab, 18 ref.

Descriptors: *Herrings, *Chemical analysis, Organic compounds, Cadmium, Arsenic, Mercury, Copper, Lead, Zinc, Public health, *Trace elements, Metals, Fish physiology, Animal metabolism, Biochemistry, Proteins, *Selenium,

Samples of a typical Atlantic herring oil at various stages of pilot-plant processing were analyzed for cadmium, selenium, arsenic, mercury, copper, lead, and zinc. The requirements for low levels of specific metals in edible oils were always difficult to meet completely in either a washed and bleached oil or in two lots of oil processed from one crude oil by the additional steps of partial hydrogenation and deodorization. The mercury content of the crude oil was relatively low and was not greatly affected by processing. The selenium level of 47 ppb in the crude oil was significantly lowered by hydrogenation and deodorization. Arsenic was removed by alkali-refining. The lead content was reduced by only 40% upon refining, probably because lead was present as an organometallic material. The concentration of the other heavy elements was generally lowered during processing. (EIS-Deal)
W78-13000

B. Sources Of Pollution

NUMERICAL MODELLING OF LIQUID WASTE INJECTION INTO POROUS MEDIA SATURATED WITH DENSITY-STRATIFIED FLUID: A PROGRESS REPORT,
Hawaii Univ., Honolulu. Water Resources Research Center.
C. W. Wheatcraft.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 721, Price codes: A03 in paper copy, A01 in microfiche. Technical Memorandum Report No. 55, December 1977. 23 p, 5 fig, 89 ref, append. OWRT A-071-HI(1), 14-34-0001-7026.

Descriptors: *Injection, *Finite element, *Finite difference, Buoyant plume, Dispersion, Ghyben-Herzberg lens, Darcy's law, *Mathematical models, *Model studies, *Path of pollutants.

Waste effluent injected into an aquifer saturated with denser ambient brackish salt water experiences a buoyant lift. As a result the effluent migrates both outward from the well and upward in response to the combined effects of injection head and buoyant force. After the injection process has begun several phenomena can affect the density, shape, and distribution in space and time of the resulting buoyant plume. The most important of these include convection and mechanical dispersion and molecular diffusion. Previous sandbox and Hele-Shaw laboratory modelling work provided a basic qualitative understanding of buoyant plume movement in a porous medium, but cannot correctly simulate dispersion phenomena which may have significant effects on buoyant plume movement and distribution. Thus it is necessary to mathematically model the problem using coupled sets of partial differential equations which take into account the effects of dispersion and diffusion as well as convection. For this problem there are four unknowns (density, concentration, velocity, and pressure) requiring four equations. The four governing equations are: motion (Darcy's law), continuity, dispersion, and state. Boundary and initial conditions must also be stipulated. This study used two sets of boundary conditons: conditions identical to those in the sandbox model studies, and geology models of a specific prototype area. Resulting governing equations and boundary and initial conditions are numerically solved by both the finite difference and element methods, and numerical models are calibrated with results of the sandbox model studies. Detailed formulation of the governing equations and initial and boundary conditions and preliminary finite difference modelling work are described.
W78-12102

EFFECT OF RAINFALL AND SUBSEQUENT DRYING ON NITROGEN AND PHOSPHORUS CHANGES IN A DRYLAND FALLOW LOAM,
Department of Agriculture, Swift Current (Saskatchewan). Research Station.
C. A. Campbell, V. O. Biederbeck, F. G. Warder, and G. W. Robertson.
Soil Sci Soc Am Proc. 37(6), p 909-915, 1973.

Descriptors: Ammonification, Bacteria, Drying, Dryland, *Loam(Fallow), Nitrates, Nitrification, *Nitrogen, *Phosphorus, *Rainfall, *Soil water movement.

36Chloride placed at 15- or 30-cm depth in 15-cm diameter cylinders of fallow loam was leached to at least 50 cm during and immediately following rainfall > 1.75 cm. As the soil dried following rainfall 36Cl moved upwards. Nitrate content of leachates from a lysimeter experiment corroborated the leaching aspects of the 36Cl experiment. In the 0- to 2.5-cm segment of a 2nd-yr fallow loam which was sheltered from rainfall, moisture was below the wilting percentage and NO3-N and bacterial numbers declined as the soil gradually dried out. In the 2.5- to 15-cm segment, moisture was in the available range, yet moisture and NO3-N changes were small. In unsheltered fallow loam, NO3-N production in the 0- to 2.5-cm was primarily a function of soil moisture change: Delta NO3-N = -0.55-1.11 Delta M, (r = -0.94 (per thousand)), and Delta NO3-N = -0.45 - 0.56 Delta M, (r = -0.81 (per hundred)) in the 2nd- and 1st-yr fallow, respectively; (M = % moisture and Delta = daily change). The increase in NO3-N during drying seemed to be more a result of upward movement than of nitrification. There was a negative linear relationship between Delta NO3-N and Delta bacteria in the 0- to 2.5-cm soil segment. Sodium bicarbonate soluble inorganic P (IP) generally exceeded NaHCO3 soluble organic P (OP). In 2nd-yr fallow, P was unaffected by environmental conditions. In 1st-yr fallow Delta IP in the 0- to 2.5-cm segment was directly related to rainfall (r = 0.98 (per thousand)), to Delta M (r = 0.97 (per thousand)), and to Delta bacteria (f = 88 (per thounsand)), and inversely related to Delta NO3- (r = -0.76). Copyright 1974, Biological Abstracts, Inc.
W78-12109

ESTIMATING RUNOFF POLLUTION FROM LARGE URBAN AREAS--THE DELAWARE ESTUARY,
Rutgers - The State Univ., New Brunswick, NJ.
W. Whipple, Jr., J. V. Hunter, R. C. Ahlert, and S. L. Yu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 719, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Research Institute, Rutgers University, Completion Report, July 1978, 73 p, 17 tab, 11 fig. OWRT B-059-NJ(1), B-063-NJ(1), 14-31-0001-5128, 14-34-0001-7124.

Descriptors: *Storm runoff, *Pollutants, *Biochemical oxygen demand, *Urban hydrology, *Urbanization, *Delaware River, Water pollution, Water quality, Water pollution sources, Nutrients, Model studies, *Nonpoint sources, *Urban runoff, Water quality modeling.

Research has been conducted on methods of estimating nonpoint source pollution from large areas, illustrated by the Delaware Estuary. Analyses of the BOD reaction indicate no serious inadequacies, in this case, of the usual approaches based on first order decay estimated from BOD rate determinations. Existing modeling methodologies were analyzed, and suggestions made for improved approaches. Subsequent quantitative analysis was made on the basis of storm event loading determinations, related statistically to storm characteristics and to land use. Such results can be projected to future conditions, and extended to similar areas elsewhere by land use coefficients. Considerable data, obtained in the Trenton and Philadelphia areas, are compared to experience of other investigators and extended to the urban areas adjacent to the Delaware Estuary. Comparisons are made with estimates made by others for the National Commission on Water Quality, and for Section 208 studies of the Delaware Estuary Region. Although urban runoff loads from cities adjoining the estuary are of considerable significance, they are far exceeded by loadings which presumably originate from combined sewers, industrial effluents, and areas upstream in tributary watersheds. For water quality management of large areas, neither a delivery nor a source sampling approach is adequate, because all of the various sources of major pollution loadings are not evaluated by either; and the delivery ratio for various pollutants is not determined by either. A sampling strategy to provide sufficient data for a more complete analysis is outlined.
W78-12111

DISTRIBUTION OF PHYTOPLANKTON IN VIRGINIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12122

DISTRIBUTION OF PHYTOPLANKTON IN TENNESSEE LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12123

SEPTIC TANK DISPOSAL SYSTEMS AS PHOSPHORUS SOURCES FOR SURFACE WATERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
R. A. Jones, and G. F. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 689, Price codes: A04 in paper copy, A01 in microfiche. Publication No EPA-600/3-77-129, November 1977. 61 p, 3 fig, 13 tab, 38 ref. R-804549.

Descriptors: *Septic tanks, *Phosphorus, *Water pollution sources, *Groundwater, *Surface waters, *Eutrophication, *Path of pollutants, Waste water disposal, Nutrients, Nitrogen, Phosphates, Nitrates, Wisconsin, Voyager Village(WI), Effluents, Limiting factors.

Although other parameters indicated phosphate transport near an active septic tank wastewater disposal system in sandy substrate at Voyager Village recreational development (Burnett County, Wisconsin), groundwater monitoring during 1972-76 showed no evidence of transport. It is therefore concluded that septic tank systems generally do not contribute excessive amounts of phosphorus to surface waters by means of groundwater transport, a conclusion supported by earlier studies. Although no phosphorus transport was found, even at the monitoring point closest to the tile field (about 15 m down groundwater gradients), limited nitrate transport occurred. Transport of septic tank effluent down groundwater gradient was also indicated by patterns of specific conductance, chloride, and alkalinity. While phosphorus-limited lakes receiving such groundwater would not be degraded, lakes which are nitrogen-limited during the maximum algal growth period could have experienced increased aquatic plant growth. Water samples for this study were collected from wells up and down groundwater gradient from the tile field, and were analyzed for specific conductance, pH, sodium, chloride, potassium, magnesium, calcium, soluble orthophosphate, total phosphorus, and various forms of nitrogen. For rare situations in which phosphorus transport from septic tank effluents to surface waters could occur, sewerage collection or tank modification is recommended. (Lynch-Wisconsin)
W78-12125

DISTRIBUTION OF PHYTOPLANKTON IN OHIO LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12126

DISTRIBUTION OF PHYTOPLANKTON IN NEW JERSEY LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-12127

DISTRIBUTION OF PHYTOPLANKTON IN GEORGIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12128

DISTRIBUTION OF PHYTOPLANKTON IN KENTUCKY LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-12129

EFFECT OF STORMWATER ON STREAM DISSOLVED OXYGEN,
Municipal Environmental Research Lab., OH.
R. Smith, and R. G. Eilers.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE4, Proceedings Paper 13932, p 549-559, August 1978. 5 fig, 1 tab, 8 ref, 2 append.

Descriptors: *Storm water, *Urban runoff, *Combined sewers, *Dissolved oxygen, *Model studies, Mathematical models, Water pollution, Sewage, Overflow, Storms, Storm runoff, Dispersion, Effects, Streams, Cities, Analytical techniques, Computer models.

Closed-form and numerical integration solutions for the dissolved oxygen deficit response in natural streams with dispersion resulting from storm and combined sewer overflows were presented. The closed-form solution for an impulsive load can be used with the superposition principle to compute dissolved oxygen deficit concentration as a function of time and distance from the entry point of the stormwater overflow event. Computed values for the peak dissolved oxygen deficit and the time from entry where it occurs were expressed as single-valued functions of nondimensional groupings. (Sims-ISWS)
W78-12139

HORIZONTAL BUOYANT JETS IN QUIESCENT SHALLOW WATER,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W78-12141

WATER RESOURCES AND THE LAND-WATER INTERFACE,
Illinois Univ. Urbana-Champaign. Dept. of Ecology, Ethology, and Evolution.
J. R. Karr, and I. J. Schlosser.
Science, Vol. 201, No. 4352, p 229-234, July 21, 1978. 4 fig, 2 tab, 100 ref. EPA G005140, 68-01-3584.

Descriptors: *Water resources, *Water quality, *Channel improvement, *Vegetation effects, Sediments, Runoff, Nutrients, Fertilizers, Channel morphology, Vegetation, Temperature, Water temperature, Suspended solids, Erosion, Sedimentation, Streams, Channels, *Land-water interfaces.

Development and implementation of local and regional plans to control nonpoint sources of pollution from agricultural land are major mandates of section 208 of Public Law 92-500. Many planners tend to equate erosion control as measured by the universal soil loss equation with improvements in water quality. Other implement channel management practices which degrade rather than improve water quality and thereby decrease the effectiveness of other efforts to control nonpoint sources. Planners rarely recognize the importance of the land-water interface in regulating water quality in agricultural watersheds. More effective planning can result from the development of 'best management systems' which incorporate theory from all relevant disciplines. (Sims-ISWS)
W78-12164

SULFUR ISOTOPE DISTRIBUTION IN SULFATES FROM SURFACE WATERS FROM THE NORTHERN JORDAN VALLEY, ISRAEL,
Weizmann Inst. of Science, Rehovot (Israel). Dept. of Isotope Research.
A. Nissenbaum.
Environmental Science and Technology, Vol. 12, No. 8, p 962-965, August 1978. 2 fig, 4 tab, 11 ref.

Descriptors: *Sulfur, *Isotope studies, *Salinity, Sampling, Chemical analysis, Surface waters, Lakes, Rivers, Springs, Rain water, Sea water, Water quality, Water pollution, Salts, Lake Kinneret(Israel), *Jordan Valley(Israel), *Israel, Saline springs.

Samples of surface waters from the Northern Jordan Valley, Israel, and Lake Kinneret (the Sea of Galilee) were analyzed for TDS, Cl, S04, and S34/S32 ratios of the dissolved sulfate. The delta S34 values for sulfur isotopes ranged from around +4 parts per thousand in the fresh water to +19 to 23 parts per thousand in the saline springs. The regular increase in S34/S32 with salinity was explained by a mixing model between rainwater-derived groundwater (delta S34 = +4 to +9 parts per thousand) and slightly evaporated seawater (delta S34 around +21 parts per thousand). The isotopic evidence argues against derivation of sulfate from oxidation of igenous or sedimentary sulfied, and the sulfied that occurs in the saline springs may originate from bacteriogenic reduction of marine-derived sulfate, at depth. (Sims-ISWS)
W78-12167

ADVANCEMENTS IN OIL SPILL TRAJECTORY MODELLING,
Dow Chemical Co., Freeport, TX. Process and Computer Engineering; and Texas A and M Univ., College Station.
D. R. Garver, and G. N. Williams.
In: Oceans '78, 'The Ocean Challenge', Fourth Annual Combined Conference, Marine Technology Society and Institute of Electrical and Electronics Engineers, held in Washington, DC on 6-8 September 1978. p 441-444, 8 ref.

Descriptors: *Oil pollution, *Path of pollutants, *Water pollution, Environmental effects, Resources development, Outer Continental Shelf, Trajectory modeling.

The continuing increase in offshore crude oil production and transportation is presently coupled with widespread concern over protection of the environment. This has led to interest by members of the petrochemical community in the development of suitable methods for quickly predicting the probable transport path and coastal impact time of a possible oil spill in the offshore environment. An oil slick simulator of the stochastic trajectory type has been enhanced in an effort to provide such methods. In particular, four areas are addressed. First, both the Fay radial spreading equations and a long-term dispersive algorithm are now provided. Additionally, the slick may now assume an elliptical shape. Secondly, wind and current forcing functions may now be generated with the use of Markov state transition matrices as well as through the use of input time histories. Thirdly, the model will adaptively calculate coefficients for the transport equations in an attempt to correct for deficiencies in the particular equations used. Finally, the model will now execute in a real-time mode with an on-line computer terminal to allow tracking to occur during an actual spill. (Sinha-OEIS)
W78-12173

MARINE POLLUTION IN KUWAIT,
Millersville State Coll., PA.
B. L. Oostdam.
In: Oceans '78, 'The Ocean Challenge', Fourth Annual Combined Conference, Marine Technology Society and Institute of Electrical and Electronics Engineers, held in Washington, DC on 6-8 September 1978. p 445-450, 3 fig, 7 ref.

Descriptors: *Water pollution, *Oil spills, *Industrial wastes, *Thermal pollution, Resources development, Environmental effects, Pollution abatement, Outer Continental Shelf, Kuwait.

Rapid development of a single natural resource and resulting industrialization and urbanization have put a severe stress on the fragile nearshore environment off Kuwait. Major pollution hazards are oil spills, industrial wastes, thermal pollution, fecal coliform, and solid waste. Good progress is reported in abatement of ammonia and hydrogen sulphide, chief pollutants in the Shuaiba Industrial Area. In Shuaikh, mercury pollution from chlorine plants associated with large desalination plants appear localized. Thermal pollution constitutes recirculation problems and fecal coliform and solid waste are serious along the Kuwait City Waterfront. Although very active in international programs, improvements are required in local cooperation so as to establish an effective environmental protection program to counteract the strong industrial development interests. (Sinha-OEIS)
W78-12174

STRATIFIED WATER CIRCULATION FORECASTING FOR WATER QUALITY MANAGEMENT PLANNING IN THE COASTAL ZONE,
Raytheon Co., Portsmouth, RI. Environmental and Oceanographic Services Dept.
S. G. Chamberlain, P. V. Tawari, and W. J. Comery.
In: Oceans '78, 'The Ocean Challenge', Fourth Annual Combined Conference, Marine Technology Society and Institute of Electrical and Electronics Engineers, held in Washington, DC on 6-8 September 1978. p 451-455, 3 fig, 1 tab, 15 ref.

Descriptors: *Water quality, *Coasts, *Forecasting, Management, Modeling, Environmental effects, Estuaries, Circulation, Rhode Island, Outer Continental Shelf, Coastal zone management.

Hydrodynamic and water quality models provide a capability to forecast the effects of coastal zone management decisions on waste-receiving coastal and estuarine waterways. This paper discusses the hydrodynamic component of the RAMSES Model, a management planning model designed to simulate stratified estuaries. The need for such a model to bridge the gap in complexity between the simple, but often limited, single layer models and the complex, but often expensive to apply, multi-strata models, is discussed. The model is described in terms of its basic hydrodynamic equations and its numerical solution approach. Processes incorporated in the model, including vertical entrainment and interfacial friction, are identified. The ability of the model to simulate stratified waterways is demonstrated by application to Penobscot Bay. (Sinha-OEIS)
W78-12175

OCEAN DISPOSAL IN THE MID-ATLANTIC BIGHT,
Environmental Protection Agency, Philadelphia, PA.
For primary bibliographic entry see Field 5E.
W78-12176

SIGNIFICANCE OF PHENOLIC COMPOUNDS IN THE DELAWARE ESTUARY,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W78-12190

INTERRELATIONSHIP OF GROUND AND SURFACE WATER QUALITY IN THE EL PASO-JUAREZ AND MESILLA VALLEYS,
New Mexico State Univ., University Park. Coll. of Engineering.
J. W. Hernandez.

tural Resources Journal, Vol 18, p 1-9, January 78. 5 ref, Spanish summary.

scriptors: *Water quality, *Surface-groundter relationships, *International waters, Mex-, New Mexico, Texas, Rio Grande River.

rious facets of surface water quality in the re-n along the Rio Grande from San Marcial, New exico to Fort Quitman, Texas were analyzed in 75 under the direction of the Bureau of Recla-tion. Data regarding chemical, biological and ysical characteristics of these waters are esented in this paper. One of the considerations the relationship between the quality of surface d ground waters. This study concludes that (1) rface water quality influences that of shallow ound water in the area, (2) shallow ground water ntains more salts than deeper ground water, (3) is possible to extrapolate shallow ground water ality from the quality of the drains, and (4) there little relationship between the quality of surface w and the quality of the best artesian aquifer stems in the El Paso-Juarez area. (Russell-rizona)
78-12225

HE SALT BALANCE OF THE MEXICALI, B.C. RRIGATION DISTRICT (EL BALANCE DE ALES DEL DISTRITO DE RIEGO DE MEXI-ALI, B.C.),
scuela Nacional de Agricultra, Chapingo Iexico). Dept. of Irrigation and Drainage.
or primary bibliographic entry see Field 3C.
78-12226

NTERNATIONAL EXTERNAL DISECONO-IES: THE COLORADO RIVER SALINITY ROBLEM IN MEXICO,
scuela Nacional de Agricultura, Chapingo Iexico); and Colorado State Univ., Fort Collins. ept. of Economics.
or primary bibliographic entry see Field 6E.
78-12231

FFECTS OF THE POLYCHLORINATED IPHENYL AROCLOR 1254 ON GROWTH, URVIVAL, AND BONE DEVELOPMENT IN ROOK TROUT (SALVE-LINUS FONTINALIS),
ish and Wildlife Service, Columbia, MO. Na-onal Fisheries Research Lab.
or primary bibliographic entry see Field 5C.
78-12236

37CS AND POTASSIUM IN FISH AND LIT-ORAL PLANTS FROM A HUMUS-RICH OLIGOTROPHIC LAKE 1961-1976,
und Univ. (Sweden). Dept. of Radiation Physics.
. Carlsson, and K. Liden.
ikos, Vol 30, p 126-132, 1978. 3 fig, 3 tab, 35 ref.

Descriptors: *Cesium, *Potassium, *Oligotrophy, Fallout, *Radioisotopes, Fish physiology, Animal metabolism, Plant physiology, Lakes, Seasonal, Trophic level, Food chains, Oligotrophy, Tissue analysis, Bioaccumulation.

Results of a 15 yr long-term study of the concentration of 137Cs from fallout in some species of fish and littoral plants in a humus-rich oligotrophic lake are presented. High concentrations of 137Cs were detected in the different species studied. This is in agreement with the general observation that organisms in oligotrophic lakes have higher concentrations of the radionuclide than in lakes of other limnological types. The maximum values of the concentration of 137Cs were found in 1964 or 1965, depending on the species studied. Since then the concentration of the radionuclide has decreased and in 1975 it was 20-30% of the maximum value. A seasonal variation in the concentration of 137Cs in fish was noted with the highest value during the first quarter of the year. This is explained by the strong temperature dependence of the excretion of 137Cs. No seasonal variation in the concentration of potassium was seen in fish. In the various species of fish studied a relationship was derived between the concentration of 137Cs and the size of the fish. The results are discussed in terms of changes in feeding habits and changes in the excretion of the radionuclide. The concentration of 137Cs in fish was observed to follow trophic level increase. The concentration is increased by a factor of two between each level. (EIS-Deal)
W78-12238

RECHERCHES DE POLLUANTS CHIMIQUES DANS LE TISSU GRAISSEUX'D UN DAUPHIN ECHOUE SUR LA COTE MEDITERRANEENNE (CHEMICAL POLLUTANTS IN BLUBBER TISSUE OF A DOLPHIN AGROUND ON THE MEDITERRANEAN COAST),
Aix-Marseille-2 Univ. (France). Lab. de Biologie Marine.
N. Vincente, and D. Chabert.
Oceanologica Acta, Vol. 1, No. 3, p 331-334, 1978. 1 fig, 26 ref.

Descriptors: *Pesticide residues, *Polychlorinated biphenyls, *Toxicity, Heavy metals, Metals, Copper, Cadmium, Lead, DDT, DDe, DDD, Pesticide toxicity, Mortality, Organic compounds, Path of pollutants, Water pollution effects, Environmental effects, Animal metabolism, Chlorinated hydrocarbon pesticides, Mammals, *Tissue analysis, *Bioaccumulation, *Dolphin.

Analyses of blubber tissue from a common dolphin (Delphinus delphis) aground on the French Mediterranean coast, show a relatively low concentration of heavy metals in microg/g wet weight for an animal at the top of the food chain: Cu, 32.5 ppm; Cd, none detectable; Pb, 3.3 ppm. On the other hand, concentrations of organochlorines (in microg/g dry weight) are very high: pp'DDT=324 ppm; pp'DDE=75 ppm; pp'DDD=2.7 ppm; gamma HCH=4 ppm; DP6=700 ppm. These concentrations, and particularly the concentration of PCB (DP6) are the highest so far observed by the authors, and were probably the cause of the death of the animal. (EIS-Deal)
W78-12240

BIODEPOSITED TRACE METALS AND MINERAL CONTENT STUDIES OF SOME TROPICAL MARINE ALGAE,
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
P. M. Sivalingam.
Botanica Marina, Vol. 21, p 327-330, 1978. 1 fig, 2 tab, 8 ref.

Descriptors: *Metals, *Marine algae, *Cyanophyta, *Rhodophyta, *Phaeophyta, *Chlorophyta, Zinc, Cadmium, Potassium, *Sodium, Magnesium, Manganese, Phosphorus, Copper, Lead, Heavy metals, Water quality, Water analysis, Deposition(Sediments), Tropical regions, Monitoring, *Biodeposition.

Investigations on the concentrations of trace metals in the waters of Batu Ferringhi, Penang Island, indicated that they fal within the category of water-type I for unpolluted waters. In collaboration studies on the biodeposited trace metals in one species of Cyanophyta, 9 of Rhodophyta, 4 of Phaeophyta and 6 of Chlorophyta showed values of a fairly high level as compared to those reported for benthic marine algae found in the same water-type category in the Oresund area (Sweden) with the exception of the element Zn which appeared to show corresponding values. Further, no significant correlation of the biodeposited trace metals among the algal groups was observed. Consequently, some algal species, though living in the unpolluted water-type I, had biodeposited trace metals of Zn, Cu, and Pb at concentrations of above 100, 20 and 10 ppm, respectively, which are values only observable in algal species from polluted areas. Concurrent studies on the biodeposited concentrations of elements such as Ca, K, Na, Mg, Mn, and P also showed similar trends as those of the trace metals mentioned above. Based on this investigation, the author proposed that certain algal species within the tropical zone could be employed as indicators for pollution studies in the near future. (EIS-Deal)
W78-12244

DISTRIBUTION AND IMPORTANCE OF PHYTOPLANKTON IN THE ATCHAFALAYA BASIN,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12246

DISTRIBUTION OF PHYTOPLANKTON IN DELAWARE LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-12248

ACTIVATED SLUDGE DEGRADATION OF NITRILOTRIACETIC ACID (NTA)--METAL COMPLEXES,
Environmental Protection Service, Ottawa (Ontario). Wastewater Technology Centre.
E. E. Shannon, N. W. Schmidtke, and B. A. Monaghan.
Technology Development Report EPS 4-WP-78-5, August, 1978, 16 p, 5 fig, 18 ref, 3 tab.

Descriptors: *Activated sludge, *Sludge digestion, *Nitrilotriacetic acid, *Biodegradation, Toxicity, *Chemical degradation, Metals, Aquatic environment, Temperature, Waste water treatment, *Bench scale batch experiments.

Bench scale batch activated sludge experiments were conducted to determine the biodegradability of nitrilotriacetic acid (NTA) complexes with calcium (Ca), iron (Fe), lead (Pb), chromium (Cr), copper (Cu), zinc (Zn), cadmium (Cd), nickel (Ni) and mercury (Hg). Degradation rates were evaluated at NTA levels of 8 and 16 mg per L as H3NTA, temperatures of 5 degrees and 15 degrees C, and various metal concentrations. It was determined that the NTA complexes with Ca, Fe, Al, Pb, Cr, Cu and Zn at temperatures of 10 degrees to 15 degrees C degraded readily, with first-order degradation coefficients in the range of minus 0.05 to minus 0.10 per hr. The heavy metal NTA complexes of Cd and Ni and Hg degraded poorly, with degradation coefficients of less than minus 0.02 per hr. With the exception of NTA complexes with Zn, all degradation rates were reduced considerably at 5 degrees C. The apparent degradation coefficient of zero for mercury is suspected to be due to a toxic effect on the activated sludge rather than to the formation of a bio-resistant complex. These experiments, reinforced by observations of other related studies, led to the conclusion that buildup of NTA in the aquatic environment even during low winter temperatures is extremely unlikely. (WATDOC)
W78-12250

SOURCES OF METALS AND METAL LEVELS IN MUNICIPAL WASTEWATERS,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
E. D. Atkins, and J. R. Hawley.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 80, Environmental Protection Service, Environment Canada, Ottawa, Canada, 408 p, 24 ref, 97 tab. (1978). 75-1-43.

Descriptors: *Metals, *Municipal water, *Industrial wastes, *Municipal wastes, *Waste water(Pollution), Sludge, Sludge digestion, Sludge disposal, Sewage treatment, Sewage sludge treat-

ment, Sewers, Effluent streams, Influent streams, Waste storage, Storm drains, Bleaching wastes, Data collections, Canada, *Metal levels, *Point-source treatment, *End-of-the-pipe treatment.

The main objective of this study was to compile information on typical sources of metals and metal levels in municipal wastewaters and to assess the relative benefits of point-source or end-of-the-pipe treatment for metals. The specific metal content of a large number of Ontario sewage plant influents, sludges and effluents is recorded in detail for the first time. This was done through a detailed sampling program at selected sewage treatment plants and through a review of the records of the Ontario Ministry of the Environment. Metal removal efficiencies are also recorded and range from 35 percent (low estimate) for lagoon-type treatment plants to 76 percent for activated sludge plants. The sewer-use by-laws of 57 Ontario municipalities were surveyed, showing that there is a wide fluctuation in metal levels allowed by them. It is recommended that these be standardized by strict implementation of a province-wide sewer-use by-law. The complete elimination of all industrial discharges to sanitary sewers would lower metal concentrations in sewage plant influents, sludges and effluents, but the survey indicates that significant problems would still remain because of the metal content of 'domestic' sewage. A product index, in which the general chemistry of each category is summarized, and a metal index which groups household products according to their contents, are included in this report. (WATDOC)
W78-12251

DISSOLUTION OF ARSENIC FROM WATER-LOGGED AND AERATED SOIL,
Missouri Univ.-Columbia. Dept. of Agronomy.
R. E. Hess, and R. W. Blanchar.
Journal of Soil Science Society of America, Vol. 41, No. 5, Sept-Oct 1977, p 861-865. 1 fig, 1 tab, 16 ref. OWRT A-068-MO(3), 14-31-0001-4025 and 5025.

Descriptors: *Arsenate solubility, *Alaminanic arsenate, Iron arsenate, Calcium arsenate, Lead arsenate, Manganese arsenate, Soil analysis.

Sharpsburg and Menfro soils containing 320 and 160 micro g As/g, respectively, were waterlogged with water or 1% dextrose. The Eh reached a minimum of -150 mV after 1 day of incubation and increased to about +300 mV after 12 days for both soils in 1% dextrose. The Eh remained constant in the Sharpsburg soil during incubation with water, but gradually decreased in the Menfro soil. In the 1% dextrose solution, As increased rapidly in both soils and became constant after 12 days. The As in solution increased more slowly when incubated with water, but also remained constant after 12 days. After freeze-drying and exposing the soil to the atmosphere, Eh increased and As decreased to initial levels. The values of pAl + 3pOH, pAl + pAsO4, pFe + 3pOH, pFe + pAsO4, 3pMn + 2pAsO4, 3pCa + 2pAsO4, and 3pPb + 2pAsO4 were computed. These measurements indicated that the soil solution of the Menfor and Sharpsburg soils contained less As than predicted for Mn and Pb arsenates.
W78-12267

EVALUATION OF DRAINAGE - WATER TABLE CONTROL SYSTEMS USING A WATER MANAGEMENT MODEL,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-12274

COLUMN CHROMATOGRAPHY FOR FIELD PRE-CONCENTRATION OF TRACE METALS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W78-12275

EFFECTS OF SKI AREA DEVELOPMENT AND USE ON STREAM WATER QUALITY OF THE SANTA FE BASIN, NEW MEXICO,
New Mexico Univ., Albuquerque. Dept. of Biology.
J. R. Gosz.
Forest Science, June 1977, Vol. 23, No. 2, p 167-179, 7 fig, 4 tab, 19 ref. OWRT B-053-NMEX(2).

Descriptors: Nutrients, Cycling nutrients, *Water pollution sources, Environmental effects, *Water quality, *Santa Fe basin(N Mex), *Ski area development, Sangre de Cristo Mountains, *New Mexico.

Studies have been made of a series of ski area developments in the Sangre de Cristo Mountains of New Mexico, U.S.A. These developments represent increasing impact severity on a single area as well as different areas subject to different types of impacts. Studies of nutrient budgets and water quality showed that the major factor affecting water quality was road salt application. Sewage disposal affected water quality to a minor degree while poma lift construction and light tree removal had no measurable effect on the water quality parameters studied. (Stockton-N Mex St)
W78-12277

CHARACTERIZATION OF URBAN RUNOFF,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr., B. B. Berger, C. D. Gates, R. M. Ragan, and C. W. Randall.
Water Resources Research, Vol. 14, No. 2, April 1978, p 370-372. 5 tab, 9 ref. OWRT C-5341 (No 4239)(10), 14-31-0001-4239.

Descriptors: *Water quality, Water pollution, Heavy metals, Nutrients, Suspended solids, *Storm sewers, *Urban hydrology, Biochemical oxygen demand, *Urban runoff pollution, Storm hydrograph loading, Storm event loadings, Unrecorded pollution.

Unrecorded pollution and nonpoint sources are too important to be neglected in water quality analysis, but the findings in the literature have been too scattered in place and time, and too diversely reported, to have been fully accepted. Such pollution is usually referred to as nonpoint source pollution, or in developed areas as urban runoff, in spite of the fact that considerable parts of it are delivered by large storm sewers and may originate partly from unrecorded urban point sources. For convenience, this usual terminology is employed in this paper. The work of each of five participating institutes was designed to evaluate urban runoff pollution from areas within that state and to relate those findings to differences in land use. Results have been reported in detail in the separate reports by the respective investigators. This report summarizes these findings and then draws conclusions which the five principal investigators agreed upon.
W78-12279

PHOSPHORUS INTERACTIONS WITH STREAM-BED SEDIMENTS,
South Dakota School of Mines and Technology, Rapid City. Dept. of Civil Engineering.
L. L. Harms, P. H. Vidal, and T. E. McDermott.
Journal of the Environmental Division, American Society of Civil Engineers, Vol 104, No EE2, Proceedings Paper 13682, p 271-288, April 1978. 10 fig, 3 tab, 24 ref, 1 append. OWRT B-046-SDAK(2).

Descriptors: *Phosphorus, *Sediments, *Streambeds, *South Dakota, Scour, Flow, Streamflow, Streams, Rivers, Water pollution, Water pollution sources, Sorption, Pollutants, Path of pollutants, Unsteady flow, High flow, Suspended solids, On-site investigations, *Rapid Creek(SD).

The objective of this research was to determine the role of stream bed sediments with respect to increased phosphorus concentrations during high flow periods. Both point and nonpoint sources were considered. Core samples of sediments were evaluated for total and organic phosphorus content. Total phosphorus, total filtrable phosphorus, and filtrable orthophosphate were determined on water samples. Stream bed sediments play a major role with respect to increased phosphorus concentrations of streams during high flow periods. (Sims-ISWS)
W78-12280

A MATHEMATICAL MODEL OF REGULARITIES IN POPULATION DYNAMICS OF PLANKTONIC BACTERIA AND DIATOMS IN SEVASTOPOL BAY (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
I. I. Kryshev, and Yu. A. Gorbenko.
Gidrobiol Zh 13(2), p 51-55, 1977.

Descriptors: *Mathematical models, Biomass, Diatoms, Plankton, Water pollution, *Aquatic ecosystems, Model studies, Ukrainian-SSr, USSR, *Volterra model.

Changes in the biomass of planktonic bacteria and diatoms in Sevastopol Bay (Ukrainian SSR, USSR) were studied in 1966-71. Coefficients for the Volterra model of a planktonic ecosystem were determined, and theoretically calculated values were compared with actual data. The Volterra Model, even in its simplest variant, gave fully satisfactory results in describing aquatic ecosystems.--Copyright 1978, Biological Abstracts, Inc.
W78-12282

DYNAMIC COPPER BALANCE IN A FRESH-WATER LAMELLIBRANCH SENTINEL: EFFECTS OF SUSPENDED MATTER (IN FRENCH),
Unite Enseign. Rech. Sci. Lab. Ecol. Biol. Gen., Limoges, Fr.
C. Chaisemartin.
CR Seances Soc Biol Fil 17(3), p 619-626, 1977.

Descriptors: *Copper, *Mussels, *Suspended solids, Sediments, Water pollution effects, Water pollution sources, Margaritifera-Margaritifera.

The fresh-water pearl mussel Margaritifera margaritifera was used as a bio-indicator in a study of mass Cu balance between sediment and suspended matter. The amount of Cu in the target species is a function of the balance between species contamination and surrounding contamination.--Copyright 1978, Biological Abstracts, Inc.
W78-12283

MICROBIOLOGICAL STATE OF THE KIEV RESERVOIR IN THE SIXTH-SEVENTH YEARS OF ITS EXISTENCE (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
L. E. Mikhailenko, L. A. Khoroshikh, and E. I. Dukhovnaya.
Gidrobiol Zh 13(2), p 45-50, 1977.

Descriptors: *Microbiology, Kiev Reservoir(USSR), Regulation, Reservoir operation, Mesotrophy, *Bacteria, Biomass, Plankton, Zooplankton.

Data on quantitative development of bacrterial populations in the reservoir are presented. The total bacteria content and amount of saprophytes were lower in the same region bedore regulation of the river. The annual bacterial flow from the reservoir was less than those incoming from the tributaries: The role of allochthonous bacterioplankton as a whole was insignificant. The average annual daily income was not in excess of 2% of the

erage annual stock. Bacterial reproduction rates dicate that the reservoir is of the mesotrophic pe. On the average, 7.2 kcal/m2 of bacterial omass was produced/surface unit in summer and as consumed mainly by zooplankton.--Copyright 78, Biological Abstracts, Inc.
78-12297

ACRO-NUTRIENTS IN THE LAKE GEORGE COSYSTEM,
ennselaer Polytechnic Inst., Troy, NY.
or primary bibliographic entry see Field 5C.
78-12304

HE USE OF CARBON AND SULFUR ISOTOP- RATIOS AND TOTAL SULFUR CONTENT OR IDENTIFYING THE ORIGIN OF BEACH ARS IN SANTA MONICA BAY, CALIFORNIA,
niversity of Southern California, Los Angeles.
ea Grant Program.
. A. Hartman.
.A. Thesis, Southern California University Sea rant Program Thesis/Dissertation Series No. SCSG-TD-02-78, June 1978. 112 p, 18 fig, 6 tab, 2 ref, 5 append. SG-04-6 -158-4418.

escriptors: *Oil pollution, *Seepage, *Oil spills, hemical analysis, Water pollution sources, alifornia, *Tars, *Santa Monica Bay(CA).

arbon and sulfur isotopic ratios and total sulfur ontent are evaluated as chemical fingerprints for ighly weathered petroleum in the marine environ- ent. Analysis is confined strictly to the asphal- ene fraction of petroleum owing to the insensitivi- y of the fraction to weathering processes. The echnique is applied to the problem of the source dentification of tar depositing on the coastline ad- acent to metropolitan Los Angeles, California. Comparison of the same parameters from beach ars collected during the 1976-1977 years to the arameters of the potential source oil suggests that 1% of the tars in Santa Monica Bay are derived rom natural oil seepage at Coal Oil Point, 31% rom natural oil seepage in Santa Monica Bay, and 8% from unknown sources. The chemical data, coupled with seasonal monitoring of tar deposition nd slick size at oil seeps, allow models of tar ransport to be deduced. The ultimate fate of tars depositing in Santa Monica Bay is transport into he Santa Monica Basin and incorporation into the ediment column. (NOAA)
W78-12311

DISCHARGE OF ALKANES DURING OFFSHORE OIL PRODUCTION IN THE BUCCANEER OILFIELD,
Houston Univ., TX. Dept. of Biophysical Sciences.
B. S. Middleditch, B. Basile, and E. S. Chang.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 59-65, 1978. 2 tab, 4 ref.

Descriptors: *Brines, *Oil spills, *Oil, *Brine disposal, Aromatic compounds, Organic compounds, Oil pollution, Path of pollutants, Water pollution sources, Gas chromatography, Industrial wastes, Oil wells, Gulf of Mexico, *Crude oil, Alkanes, Buccaneer oil field.

We have characterized the alkane content of the discharged brine from both production platforms in the Buccaneer oilfield over a period of eleven months. The mean concentration of C12-C36 alkanes was approximately 2 ppm (2mg/l). The mean rate of discharge of brine in the field is approximately 600 bbl (95,400 l) per day. The mean rate of discharge of alkanes per day, therefore, is 191 g. Additional research is required to determine the rate of dispersion of these alkanes, their pool size in the vicinity of the production platforms, ahnd their significance relative to alkanes of biogenic origin. (EIS-Deal)
W78-12355

PATTERNS OF TRACE METAL ACCUMULATION IN CRAYFISH POPULATIONS,
Northern Illinois Univ., De kalb. Dept. of Biological Sciences.
R. V. Anderson, and J. E. Brower.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 120-127, 1978. 5 tab, 21 ref.

Descriptors: *Cadmium, *Lead, *Crayfish, Metals, Heavy metals, Copper, Zinc, Spectrophotometry, Bioindicators, Path of pollutants, Animal metabolism, Animal physiology, Biochemistry, Monitoring, Tissue analysis, Bioaccumulation.

The effectiveness of crayfish as indicators of variation in trace metal input was found to be dependent on the physiological role of the metal. This was particularly true with sublethal environmental concentrations. As shown, the animals can control body concentrations of physiologically important metals. Cadmium and lead which do not have a physiological function occur in concentrations associated with environmental input. The crayfish, therefore, may be used to monitor inputs of these metals. (EIS-Deal)
W78-12358

MERCURY CONCENTRATIONS IN PACIFIC HAKE, MERLUCCIUS PRODUCTUS (AYERS), AS A FUNCTION OF LENGTH AND LATITUDE,
Oak Ridge National Lab., TN.
N. H. Cutshall, J. R. Naidu, and W. G. Pearcy.
Science, Vol 200, p 1489-1491, 1978. 1 fig, 2 tab, 29 ref.

Descriptors: *Mercury, Size, Weight, Fish physiology, Animal metabolism, Heavy metals, Latitudinal studies, Fish behavior, Food habits, Water analysis, Path of pollutants, Industrial wastes, Commercial fish, Tissue analysis, Bioaccumulation, *Hake, Merluccius.

Mercury concentrations in Pacific hake increase with fish size and with the latitude of collection. While the mercury-size trend is consistent with data for other species, the latitudinal trend is opposite to that reported for other fishes over the same geographical area. Consequently, latitudinal trends of mercury concentrations in fishes do not necessarily indicate trends of mercury concentrations in water. Food habits and metabolism may cause the observed variations. (EIS-Deal)
W78-12359

UPTAKE OF GLYCOLIC ACID BY A MARINE BIVALVE,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-12361

COMPOUNDS TOXIC TO FISH IN PULP MILL WASTE STREAMS,
British Columbia Research Council, Vancouver.
For primary bibliographic entry see Field 5C.
W78-12370

FORMS OF IRON IN RIVER WATERS,
Hokkaido Univ., Hakodate (Japan). Lab. of Marine Chemistry.
S. Fukase, K. Matsunaga, and Y. Maita.
Bulletin of the Faculty of Fisheries of Hokkaido University, Vol. 29, No. 1, p 65-69, 1978. 3 fig, 2 tab, 8 ref.

Descriptors: *Iron, *Phytoplankton, *Humic, *Fulvic acids, Metals, Sediments, Acids, Organic acids, Ions, Chemical analysis, Water analysis, Rivers, *Ligands.

Iron complexes with humic substances isolated from river sediments and decomposition products of phytoplankton were investigated with an anion exchange column. It was found that iron complexed only with humic substances and the complexes had negative charges. Dissolved, particulate (0.45-0.025 microns) and particulate (greater than or equal to 0.45 microns) iron in river waters were 25, 35, and 41% in total iron, respectively. Dissolved iron existed in river waters as complexes with humic substances and the residues or iron hydroxide or colloidal humic substances. (EIS-Deal)
W78-12371

A MULTIPLE APPROACH TO SOLVING THE GAS SUPERSATURATION PROBLEM,
Corvallis Environmental Protection Agency. Western Fish Toxicology Station.
For primary bibliographic entry see Field 5C.
W78-12377

PARASITIC INFECTIONS IN BLACK CHILDREN IN AN ENDEMIC SCHISTOSOMIASIS AREA IN NATAL,
South African Medical Research Council, Potchefstroom.
C. H. Schutte, J. M. Van deventer, and J. M. Eriksson.
South African Medical Journal (Cape Town), Vol 51, No 9, p 268-272. 1977.

Descriptors: *Human parasites, *Waterborne diseases, Public health, Eggs, Cercariae, Entamoeba, Taenia, Ascaris, Bilharzia, *Schistosomiasis, Schistosoma haematobium, Hookworm, Strongyloides, Engerobius, Hymenolepis, *Natal, South Africa.

Urine and stool specimens from 856 school children aged from 7 to 20 years, and from 80 Preschool children, were examined for Schistosoma haematoblum and intestinal helminths and protozoa. S. haematobium was present in 57% with a peak of 81% in 13-14 year old children. Peak intensity preceded peak incidence and egg loads gradually decreased with age. There was no clear-cut difference between boys and girls with regard to intestinal parasites, nor was there a close correlation between the incidence of Schistosoma spp and that of the intestinal parasites. There was a considerable reduction in the incidence of Ascaria lumbriocoides and Trichuris trichiura infestation with age. (So Afr Water Info Ctr)
W78-12396

SOUTH AFRICAN MARINE POLLUTION SURVEY REPORT 1974-1975,
Council for Scientific and Industrial Research, Johannesburg (South Africa).
C. E. Cloete, and W. D. Cliff.
South African National Scientific Programmes Unit Report No. 8, 1976, 65 ref, 16 fig, 6 tab.

Descriptors: *Marine pollution, *Estuaries, Thermal pollution, Radioactive pollutants, Fish processing wastes, Heavy metals, Bioindicators, Bacteria, Mercury, Table Bay, Richards Bay, Cape Peninsula, Saldanha Bay, Umbogintwini, Natal, Umzimkulu River, Berg River, Kosi Bay, Umlalazi River, Amatikuly River, Umgeni River, Ifafa River, Umtamvuna River, *South Africa.

A national marine pollution survey was initiated in 1974 to determine and assess pollution around the coast of South Africa. Impact area surveys, coastal of (including estuarine) reference surveys and oceanic reference surveys were undertaken. This report presents the results of the surveys undertaken up to the end of 1975. The impact areas studied were Richards Bay, the Durban area, sites on the Cape peninsula and Saldanha Bay. Coastal reference transects were undertaken as Umbogintwini and the Fynnlands sewage outfall (both between Durban Bay and Isipingo) and the Umzimkuly and Berg River esturaies were in-

vestigated. Results of earlier surveys of Kosi Bay and the Umlalazi, Amatikulu, Umgeni, Ifafa and Umtamvuna estuaries are also given. East coast oceanic reference transects were undertaken quarterly during 1974 and 1975, while the south and west coast transects were samples on four cruises during 1975. finally, results are given of some genera pollution studies as well as studies of coastal water dyanmics north of Cape Town. (So Afr Water Info Ctr)
W78-12400

BIBLIOGRAPHY ON MARINE POLLUTION IN SOUTH AFRICA,
Council for Scientific and Industrial Research, Johannesburg (South Africa).
D. A. Darracott, and C. E. Cloete.
South African National Scientific Programmes Unit Report No. 5, 1976, 337 ref.

Descriptors: *Viruses, Bacteria, *Bibliographies, *Marine pollution, Marine fisheries, Mollusca, Radioactive pollutants, Marine biology, Mariculture, Ecology, Environmental impact studies, Heavy metals, Fish processing wastes, Oil spills, Thermal pollution, Esturaies, *South African, East Coast, West coast.

The bibliography was compiled at the request of the Marine pollution section of the National Programme for environmental Sciences, and covers the following sugjects: Field studies of chemical pollutants introduced by man into the South African marine environment. Marine pollution related techniques and methods. The prevention and combating of marine pollution. 'Natural' pollution from 'Red tides Coastsl currents and freek hydrographic conditions. Sediment transport, marine biology and ecology. (So Afr Water Info Ctr)
W78-12404

MATHEMATICAL MODELS FOR SIMULATING MONTHLY WATER LEVELS AND SALINITIES IN SHALLOW LAKES,
University of the Witwatersrand, Johannesburg (South Africa).
For primary bibliographic entry see Field 2L.
W78-12411

HYDROCHEMICAL CHARACTERISTICS OF THE GORYN RIVER AND SOME OF ITS TRIBUTARIES (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
A. D. Konenko, I. D. Garasevich, and I. V. Grib.
Gidrobiol zh 13 (4), p 101-106, 1977.

Descriptors: *Domestic wastes, Water pollution sources, Calcium, *Industrial wastes, *Nitrogen, *Phosphorus, Self-purification, USSR, Wastes.

A literature review and observations indicated that the Goryn River basin (USSR) has a significant concentration of mineral and organic compounds of N and P. In areas below populated points, the sanitary quality of the water in rivers of this basin is reduced. Waters of the Goryn River and its largest tributary, the Sluch River, are moderately mineralized and belong to the hydrocarbonate class, Ca group. The Ustye, a lesser tributary is most seriously affected by industrial and household wastes, which occasionally alter the class and group of its water. Self-purification processes are intensive enough in all 3 of the studied rivers to make their waters qualify for the most part as pure and conditionally pure.-Copyright 1978, Biological Abstracts, Inc.
W78-12462

THE DISTRIBUTION OF NUTRIENTS IN SWARTVLEI, A SOUTHERN CAPE COASTAL LAKE,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
C. Howard-Williams.
Water, South Africa, Vol. 3, No. 4, p 213-217, 1977. 21 ref, 3 tab, 2 fig.

Descriptors: *Nutrient distribution, *Lake sediments, Macrophytes, *Nitrogen, *Phosphorus, Sediment analysis, Water analysis, Distribution patterns, Aquatic plants, Littoral zone, Plant tissue analysis, Standing stock, *Swartvlei, *South Africa, Oligotrophic lakes.

Like most other Southern Cape coastal lakes, Swartvlei has a large aquatic macrophyte community. As part of a continuing study to understand the role of these macrophyte beds, data on nutrient stocks in Swartvlei have been compiled. This paper gives nitrogen and phosphorus values in the macrophytes, the sediments and the waters of Swartvlei, and discusses the distribution patterns of these elements in the lake. (So Afr Water Info Ctr)
W78-12493

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: BENZOTRIAZOLES,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
L. N. Davis, J. Santodonato, P. H. Howard, and J. Saxena.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 366, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Toxic Substances, EPA 560/2-77-001, Feb. 1977. 14 fig, 45 tab, 240 ref.

Descriptors: *Chemical wastes, *Toxicity, *Corrosion control, Ultraviolet radiation, Corrosion, Path of pollutants, Oxidation, Hydrolysis, Chemical reactions, Environmental effects, Antifreezes, Plastics, Water pollution effects, Water pollution sources, Films, Copper, *Benzotriazoles, *Carcinogens, *Mutagens.

Benzotriazoles are produced in approximately 5-6 million pounds per year in the United States. The majority are used in anticorrosion applications. Approximately 20-30% are used as UV stabilizers, many of which are 2-substituted benzotriazoles. Small amounts are used for photographic applications. Information on production, use, transport and handling, environmental fate and toxicity are reviewed. (EIS-Katz)
W78-12513

EXCRETION OF MERCURY FROM FISH (IN JAPANESE),
Tokyo Univ. of Fisheries, (Japan).
T. Kikuchi, H. Honda, M. Ishikawa, H. Yamanaka, and K. Amano.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 44, No 3, p 217-222, 1978. 1 tab, 11 fig, 8 ref.

Descriptors: *Mercury, *Heavy metals, *Path of pollutants, *Self-purification, *Eels, *Marine fish, *Absorption, *Fish diets, Fish, Aquatic animals, Public health, Toxicity, Laboratory tests, Excretion, Tissue analysis, Decontamination, *Sea bream, Astroconger, Chrysophyrs, Bioaccumulation.

The possibility of removing mercury from fish heavily contaminated by methyl mercury was examined in two series of rearing experiments using two marine species of fish: conger eel and the sea bream. In the first series, conger eel, caught from Kagoshima Bay, which had natural levels of mercury of 1.0 ppm in the muscle tissue, 0.67 ppm in the spleen, and 1.8 ppm in the liver, were kept in plain sea water and fed with raw fish flesh for seven weeks. The mercury levels were reduced to one-half in 5 weeks for the muscle and spleen, and in 3 weeks for the liver. In the second series, sea bream were fed for 7 weeks with pellets containing either methyl mercury or mercuric chloride at a level of 1.0 ppm, and subsequently fed with either commercial pellet feed or pellets impregnated by a mixture of cysteine, pectin, and chitosan for another 7 weeks. The mercury concentrations at the end of the first feeding period were 0.9 ppm in the kidney and 0.25-0.4 ppm in the muscle, liver, brain, and spleen. However, during the subsequent feeding period, the mercury level was reduced to a level less than 0.2 ppm in every tissue examined, with best results in the group fed with the pellets supplemented by the mixture mentioned. In the case of feeding with pellets containing mercuric chloride, the mercury level in any part hardly reached the level of 0.2 ppm, even after a 7 weeks' period. This may suggest that mercury in this chemical form will excrete readily. (EIS-Katz)
W78-12515

METAL SURVEY OF THE MARINE CLAM PITAR MORRHUANA COLLECTED NEAR A RHODE ISLAND (USA) ELECTROPLATING PLANT,
Environmental Research Lab., narragansett, RI.
R. Eisler, M. M. Barry, R. L. Lapan, G. Telek, and G. W. Davey.
Marine Biology, Vol 45, p 311-317, 1978. 4 fig, 3 tab, 8 ref.

Descriptors: *Clams, *Benthic fauna, *Metals, *Industrial wastes, *Moisture content, *Absorption, *Water pollution sources, *Path of pollutants, *Cadmium, *Cobalt, *Chromium, *Copper, *Nickel, *Lead, *Zinc, Animal physiology, Food chains, Invertebrates, Mollusks, Shellfish, Benthos, Aquatic animals, Pitar morrhuana, *Narragansett Bay(Rhode Island), *Electroplating.

Benthic fauna were collected from 17 stations in mid-Narragansett Bay, Rhode Island, during September 1973 from the vicinity of the recently-closed Quonset Point electroplating facility. Despite repeated sampling, most of the 14 species of molluscs taken, including the widgeon clam Pitar morrhuana, were absent from stations in the immediate vicinity of plant coutfalls. In general, P. morrhuana captured near outfall sites exhibited high moisture content and elevated body burdens of silver, cadmium, cobalt, chromium, Copper, iron, manganese, nickel, lead, and zinc compared to clams of similar size from more distant stations. Observed changes in metal concentrations and moisture content of P. morrhuana were probably attributable to plant operations during the preceeding 30 years. (EIS-Katz)
W78-12516

EXCRETION RATE OF 65ZN; IS IT A USEFUL TOOL FOR ESTIMATING METABOLISM OF FISH IN THE FIELD,
National Marine Fisheries Service, Beaufort, NC. Beaufort Lab.
For primary bibliographic entry see Field 5C.
W78-12521

OCCURRENCE AND FATE OF ORGANIC AND INORGANIC CONTAMINANTS IN MARINE ANIMALS,
Torry Research Station, Aberdeen (Scotland).
K. J. Whittle, R. Hardy, A. V. Holden, R. Johnston, and R. J. Pentreath.
Annals of the New York Academy of Sciences, Vol 298, p 47-79, 1977. 1 fig, 11 tab, 137 ref.

Descriptors: *Organic compounds, *Marine animals, *Inorganic compounds, *Chemicals, Water pollution sources, Water pollution effects, Path of pollutants, Chemical wastes, Absorption, Animal metabolism, Animal physiology, Biodegradation, Pesticides, Heavy metals, Radioisotopes, Biochemistry, Aromatic compounds, Industrial wastes, Fish physiology, Crustaceans, Bioaccumulation, Depuration.

Most chemical contaminants occur in highest concentrations in coastal waters often maximized in very localized areas. In general, this situation represents the exposure pattern for marine animals. However, the availability of a contaminant to an oranism depends not only on its concentration but also on its chemical nature, its physical state, and whether the source of exposure is the surrounding seawater or the diet. Depending on the type of exposure, uptake occurs across absorptive surfaces, such as those of the respiratory apparatus or gastrointestinal tract, where selectivity may occur, even among neighboring homologs. Deposition in tissues, accumulation, degradation, or depuration depends on tissue type, metabolic processes, detoxification mechanisms, and the adaptive status of a particular animal. This hypothesis is examined briefly for hydrocarbons, pesticides, other miscellaneous organic contaminants, heavy metals, and radionuclides. It is concluded that most data relate to occurrence and distribution. Considerably less information is available on the underlying biochemical processes.
W78-12523

RIVER WATER QUALITY MODELLING: A COMBINED DETERMINISTIC-STOCHASTIC APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
D. S. Bowles, and W. J. Grenney.
In: Stochastic Processes in Water Resources Engineering, Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Sweden, August 2-4, 1976. Lars Gottschalk, et al. (Eds.), Water Resources Publications, Fort Collins, Colorado, 1977, Chapter 25, p 515-546. 12 fig, 3 tab, 31 ref.

Stream assessment studies examine important physical processes controlling stream water quality, often by identifying diffuse and point sources of quality parameters, collecting hydraulic and stream quality data, and proposing a model of the stream processes and biochemical reactions. Typically, the model is deterministic and facilitates physical interpretation of stream processes. However, stochastic considerations of uncertainties associated with the model, the data, or the model responses are usually ignored, and it is difficult to determine when the deterministic model, or its inputs, adequately represent the system. In contrast, purely empirical stochastic models provide statistically efficient models, in which all uncertainties are lumped together, but a priori understanding of the physical processes is ignored. The extended Kalman filter can be used to provide minimum variance estimates of water quality parameters and confidence limits on the estimates. The technique uses all the available information: (1) a deterministic model of the physical processes; (2) measurements of water quality parameters; and (3) prior estimates of the system state (water quality parameters) and uncertainty. Sequential extended Kalman filters are proposed as a method for combining deterministic and stochastic approaches to steady-state river water quality modeling. An example of a preliminary application of the technique to the Jordan River, Utah, is provided using real data. In addition, sensitivity studies and coefficient estimation procedures are described. Model application to the Jordan River is in a preliminary stage, with refinements required in the uncertainty specifications. (Bell-Cornell)
W78-12532

CHOICE BETWEEN RIVER QUALITY MODELS OF DIFFERENT DEGREES OF COMPLEXITY,
Nuclear Research Center, Karlsruhe (West Germany). Div. of Applied Systems Analysis.
H. Stehfest.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS-AISH Publication No 125, p 3-13, 1978. 6 fig, 10 ref.

Descriptors: *Water quality control, *Dynamic programming, *Streeter-Phelps model, *Rivers, *Ecological model, *Cost minimization, Waste water treatment, Standards, Optimization, Simulation analysis, Pollutants, Biochemical oxygen demand, Oxygen, Measurement, Flow time, Mass concentration, Decision theoretical arguments, Steady state, Rhine River(West Germany), Equations, Model studies, Systems analysis.

Using an example, the problem of how to choose between river quality models of different degrees of complexity is investigated. This problem can be solved only in view of the management task the model is being used to accomplish. Therefore, two river quality models have been applied to a steady-state optimal control problem on the Rhine River in West Germany. One model is the Streeter-Phelps model, the other is an ecological model having six state variables. The optimal control problem consists of finding the least-cost distribution of waste water treatment effort in the region so that standards for oxygen and non-degradable pollution are met. Making use of the special structure of the problem, the solution is found via dynamic programming, even for the high-dimensional ecological model. The differences between the optimal solutions are remarkable, though not as large as one might expect from the differences in model structure. For selecting one of the two solutions for implementation, a formal procedure based on decision theoretical arguments is proposed to find the solution having the lowest expected costs. (Bell-Cornell)
W78-12533

SOME CRITERIA FOR SELECTION BETWEEN CORRECTION OF THE INDICATIVE FLOW AND THE WASTE TREATMENT EFFICIENCY IN A SMALL RIVER BASIN,
Institute of Meteorology and Water Management, Warsaw (Poland).
For primary bibliographic entry see Field 5D.
W78-12535

WATER QUALITY MODELLING IN SURFACE WATER NETWORKS WITH SPECIAL REGARD TO QUALITY BREAKDOWNS,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
H. Baumert, and A. Becker.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, Convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS-AISH Publication No 125, p 269-276, 1978.

Descriptors: *Surface waters, *Networks, *Water quality, *Transverse mixing, *Water resources models, *Water quality models, *Sewage, *Simulation analysis, Decision making, Waste water(Pollution), Reach(Streams), Planning, Control, Optimum development plans, Computer programs, Dissolved oxygen, Real-time, Forecasting, Flowing waters, Quality breakdowns, Operations research.

If water quality models are to be used for decision making in water resources system planning and operation, in most cases they must be integrated in hierarchially-arranged comprehensive model systems. Aplied principles used in the development of such model systems are summarized. A model for simulating quality breakdowns in water networks, considering the propagation of instantaneous sewage loads, and a model of transverse mixing of waste water in flowing waters are presented as examples of quality models. The latter was successfully tested in different river reaches within the German Democratic Republic. Considered also is the position of water quality models within comprehensive water resources system (WRS) models. (Bell-Cornell)
W78-12537

COMPUTER PREDICTION OF THE CHANGES IN RIVER QUALITY REGIMES FOLLOWING LARGE SCALE INTER BASIN TRANSFERS,
Department of the Environment, Reading (England). Central Water Planning Unit.
A. B. Birtles, and S. R. A. Brown.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, Convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS-AISH Publication No 125, p 288-298, 1978. 11 fig, 2 tab, 7 ref.

Descriptors: *Inter-basin transfers, *Rivers, *Water quality, *Simulation analysis, Mathematical models, River flow, Synthetic hydrology, Systems analysis, Thames River(GB.), Data, Model performance, Chloride concentrations, Ortho-phosphate characteristics, Prediction.

Of the alternative proposed water resource development schemes to meet future demands in the southeastern part of England, one contender is a strategy to transfer water from the River Severn to the River Thames at appropriate times. Severn flows would be augmented when necessary from surface storages in Wales. Simulation experiments have been performed to estimate the water quality effects of inter-basin transfers on the recipient system. A range of nearly conservative river quality determinands has been investigated using river quality models. Examples of the results obtained are presented in a form which facilitates estimating (1) the size and cost of any treatment plant which may be necessary to make transferred water compatible with receiving waters, and (2) the adverse effects of transfers on organisms with known concentration tolerance levels. The production of long simulated concentration sequences is not in itself particularly useful, because the great volume of data generated is not readily susceptible to manual interpretation; there is a clear requirement for some kind of condensation which will allow the essential characteristics of the data to be presented in a concise form that enables, say, conformity with suitable defined standards or criteria to be judged quickly and accurately. (Bell-Cornell)
W78-12539

WATER QUALITY MODELLING AS A TOOL FOR DECISION MAKING IN HUNGARY,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5G.
W78-12541

ASSESSMENT TECHNIQUES FOR MODELLING WATER QUALITY IN A RIVER BASIN IMPACTED BY COAL RESOURCE DEVELOPMENT,
Geological Survey, Denver, CO.
T. D. Steele.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, Convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS-AISH Publication No. 125, p 322-332, 1978. 6 fig, 1 tab, 22 ref.

Descriptors: *Assessment, *Water quality control, *River basins, *Environmental effects, *Coal resource development, Evaluation, Water pollution, Reach(Streams), Reservoirs, Yampa River(Col. and Wyoming), Mathematical models, Systems analysis, Wastes, Travel times, High flow, Low flow, Dissolved solids, Simulation analysis, Regional analysis.

A regional water resources assessment in the Yampa River basin, Colorado and Wyoming, used modeling techniques applied in five component studies to evaluate the direct and indirect impacts of coal resource development. Modeling of the waste-load assimilative capacity of the Yampa River indicated exceedance of a proposed standard for non-ionized ammonia concentration using assumptions of anticipated population growth and treatment plant effluents. Travel times for a 50-km reach of the Yampa River ranged from 15.7 h for a seasonal high flow of 28 m/s to 120 h for a low flow of 0.8 m/s; measured reaeration coefficients for selected subreaches ranged from 6.04 to 33.4 per day. Modeling of alternative configurations of proposed reservoirs indicated a reduction of annual time-weighted dissolved solids concentrations downstream by an estimated 34 per cent. It is estimated that by 1990, an increase of between 9 and 27 thousand tonnes of sediment derived from surface mined areas will be transported annually in streams of the basin. Model simulations of a hypothetical 5000 mg/l conservative contaminant predicted its direction, rate, and dispersion in one of the major coal-bearing aquifers during a 200-year period. The benefits are demonstrated of integrating physically-based modeling components for assessing regional water resources management alternatives. (Bell-Cornell)
W78-12542

COMPARATIVE BACTERIOLOGICAL STUDY OF LETTUCE (LACTUCA SATIVA) FROM THE SANTIAGO AREA AND COASTAL REGIONS (IN SPANISH),
Instituto Bacteriologico de Chile, Santiago.
For primary bibliographic entry see Field 5C.
W78-12554

THE WASTES ENDURE,
J. Crossland.
Environment, Vol. 19, No. 5, p 6-13, June-July, 1977, 1 tab.

Descriptors: *Water pollution sources, *Waste disposal, *Sludge disposal, *Ultimate disposal, Hazards, Accidents, Groundwater, Leachate, Leaching, Runoff, Path of pollutants, Reduction(Chemical), Incineration, Biological treatment, Landfills, Waste treatment, Chemical wastes, Waste dumps.

An often ignored by-product of pollution control measures has been the creation of hazardous wastes by the operation of pollution control devices themselves. One of the most serious results of improper land disposal of toxic wastes has been the contamination of ground water by run off from sanitary landfills or by the process of leaching. Although a private hazardous waste processing industry exists, it presently operates at about 25% capacity because of a lack of demand. However, in keeping with recent legislation, efforts are now being made to control hazardous wastes. Emphasis is being placed on disposal and on engineering better landfills as well as treating chemicals to detoxify them. The federal Resource Conservation and Recovery Act of 1976, designed to fill the gaps in the states' efforts to handle the problem, should facilitate implementation of disposal programs. It requires the Environmental Protection Agency to develop by 1978 standards or regulations for safe handling of wastes, so that they will be accounted for from generation to disposal. This article also includes a list of references to waste accidents, and a table of sources of production of five hazardous chemicals. (Stump-Florida)
W78-12564

TOXIC POLLUTANTS CONTROL: PROGRESS AT LAST,
For primary bibliographic entry see Field 5G.
W78-12567

PREDICTION OF ASSIMILATION CAPACITY IN SMALL RECEIVING STREAMS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
D. F. Kincannon, A. F. Gaudy, E. R. Stasley, and R. N. DeVries.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 984, Price codes: A05 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Inst., Stillwater, Completion Report, (1978). 87 p, 31 fig, 36 tab, 18 ref. OWRT A-063-OKLA(1), 14-34-0001-8038.

Descriptors: Open jar(BOD) technique, *Waste assimilative capacity, *Oklahoma, Biochemical oxygen demand, Forecasting, *Estimating equations, *Dissolved oxygen, Reaeration, *Streeter-Phelps Equation, *Black Bear Creek,(Okla).

The usual procedure for predicting or estimating the assimilation capacity of a receiving stream involves application of the Streeter-Phelps Equation. However, such prediction has not provided sufficiently accurate estimates of the assimilation capacity. Previous laboratory research had indicated that if an open jar technique is used to replace the BOD bottle technique for obtaining the O2 utilization curve, the DO profile in the receiving stream can be more accurately predicted. A section of Black Bear Creek located in Noble and Pawnee Counties, Oklahoma was used to evaluate the open jar technique. Reaeration characteristics were estimated from the physical characteristics of the stream. O2 uptake data were determined by the open jar technique. A DO profile was predicted for a particular situation. A known waste water was introduced into Black Bear Creek (with permission of the Oklahoma Department of Pollution Control) and the resulting DO profile was measured. The open jar technique did predict the DO profile very well.
W78-12604

FLOW OF KAOLINITE AND SEWAGE-SLUDGE SUSPENSIONS IN SAND-SILT POROUS MEDIA,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
R. L. Uebler, and D. Swartzendruber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 985, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No. 113, August 1978. 87 p, 36 fig, 7 tab, 38 ref. OWRT A-034-IND(1).

Descriptors: *Suspension, *Hydraulic conductivity, *Porous media, *Sludge disposal, *Clogging, Suspended solids, Particle size, Saturated flow, Physical properties, Sludge, Attenuation, Kaolinite, Waste disposal, *Path of pollutants, Clays, Dual-Energy Gamma Ray Attenuation.

Land disposal of municipal sludge is a practice utilized for many years, but only recently is it being considered on a large scale. A potential problem is the physical clogging of the soil pores after extended sludge application. Movements of two water suspensions, kaolinite clay and sewage sludge into two sand-silt mixtures were studied by dual-energy gamma-ray attenuation. Equations were developed to describe the increase of suspension-particle bulk density at a given position in the sand-silt column and also the reduction in hydraulic conductivity with cumulative volume of outflow from the column. The capability of these equations for describing the observed experimental results was tested by nonlinear least squares regression. An exponential increase of suspension-particle density with time was found to describe the experimental results very well qualitatively. A slightly better quantitative fit was obtained with a logarithmic equation, but the exponential equation was preferred in an overall sense. The reduction in hydraulic conductivity was described very well by an exponential function of cumulative volume of outflow. A constant in this function, termed the clogging coefficient, was found capable of characterizing the clogging process for a given combination of suspension and porous medium. The clogging coefficient appeared to be reasonably related to such factors as particle size and initial water content of the porous medium, and to the nature of the applied suspension.
W78-12606

FLUCTUATION OF OXYGEN CONCENTRATION IN LAKE BLED DURING THE YEARS 1974-1976 (IN SLOVENIAN),
Ljubljana Univ. (Yugoslavia). Dept. of Biology.
D. Vrhovsek, A. Martincic, and F. Batic.
Biol Vestn 24(2), p 99-108, 1976.

Descriptors: *Yugoslavia, History, Data Collections, *Dissolved oxygen, Lakes, *Lake Bled(Yugo), Water pollution.

The fluctuation of dissolved O2 in eutrophic Lake Bled, Slovenia (Yugoslavia), during 1974, 1975 and 1976 is discussed. Dissolved O2 was measured at regular 14-21 day intervals. Before and after the artificial inflow of fresh water from Radovna stream, O2 was measured more frequently. In correlation with temperature stratification, vertical O2 concentration presents a characteristic curve. The introduction of fresh water every year at the end of autumn and in spring has a strong influence on the O2 budget in the lake.--Copyright 1978, Biological Abstracts, Inc.
W78-12613

ATMOSPHERIC NITROGEN AND PHOSPHORUS LOADING TO HARP LAKE, ONTARIO, CANADA,
Ontario Ministry of the Environment, Rexdale (Ontario). Water Resources Branch.
K. H. Nicholls, and C. M. Cox.
Water Resources Research, Vol. 14, No. 4, p 589-592, August 1978. 2 fig, 3 tab, 13 ref.

Descriptors: *Nitrogen, *Phosphorus, *Lakes, *Canada, Nutrients, On-site investigations, On-site data collections, Atmosphere, Water pollution sources, Precipitation(Atmospheric), Rain, Snow, Trees, Pollen, Hydrogen ion concentration, Water pollution, *Harp Lake(Ontario).

Nitrogen and phosphorus in precipitation and dry fallout (aeolian sources), as well as the pH of rainfall, were measured over Harp Lake in Ontario during 1974. Weighted mean concentrations of total N and total P during the ice-free period of collection were 1.91 mg N/l and 0.105 mg P/l. Winter concentrations of total N were similar, but total P concentrations were much lower, averaging 0.013 mg/l in fresh snow. Total atmospheric loading of P to the lake was 74.4 P/sq m yr, and the total N loading was 1600 mg N/sq m yr. About 52%, or 39.0 mg P/sq m yr, of the total P loading from the atmosphere was total dissolved P (0.22-micrometer filtrate), and 28%, or 20.6 mg P/sq m yr, of the total P loading was dissolved reactive P ('orthophosphate' P). Dissolved inorganic N loading at 1010 mg N/sq m yr comprised about 63% of the total N loading from the atmosphere. Pollen, from a variety of trees surrounding the lake, contributed about 20% of the total P input. The pH of rainfall samples ranged from 3.2 to 5.1 with a median value of 3.9(n = 14). (Sims-ISWS)
W78-12626

EFFECT OF PH ON THE ADSORPTION OF TRACE RADIOACTIVE CESIUM BY SEDIMENTS,
King Faisal Univ., Dammam (Saudi Arabia). Dept. of Soils and Water, and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
A. M. Elprince.
Water Resources Research, Vol 14, No 4, p 696-698, August 1978. 1 fig, 1 tab, 12 ref. ERDA E(40-1)-4851.

escriptors: *Hydrogen ion concentration, Cesium, *Adsorption, *Sediments, Trace elements, Radioactive wastes, Radioactivity, Model tudies, Mathematical models, Sampling, Surveys, aboratory tests, Water pollution, Streams, ivers.

he adsorption of trace radioactive cesium by ediments from the Savannah River Plant area fol- ows a theoretically expected linear relationship etween ln Kd* and the pH of the equilibrium olution, where Kd* is the equilibrium distribution oefficient: Cs adsorbed (meq/g)/Cs(+) in solution meq/ml). Theoretically the slope of these plots is roportional to the fraction of surface area occu- ied by pH dependent charges. Experimentally, he slope becomes 0 after removal of hydroxy Al nterlayers with citrate pretreatment. Thus, ydroxy Al interlayers are the main source for the H dependent charges making Cs+ adsorption pH lependent. (Sims-ISWS)
W78-12635

HISTORICAL AND CURRENT HEAVY METAL RESIDUES IN HUDSON RIVER FISH,
Marist Coll., Poughkeepsie, NY. Research Inst.
R. E. Rehwoldt, W. Mastrianni, E. Kelley, and J. Stall.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 3, p 335-339, 1978. 2 tab, 9 ref.

Descriptors: *Cadmium, *Lead, *Mercury, *Heavy metals, *Absorption, Animal behavior, Animal metabolism, Fish phsiology, *Industrial wastes, *Sediments, *Food habits, *Predation, *Food chains, Sampling, Path of pollutants, Metals, Toxicity, Freshwater fish, *Hudson River(NY), New York, Tissue analysis, Bioaccumulation.

This investigation deals with fish taken from the Hudson River during 1976 and 1977 and samples from the same water system originally captured in a time period ranging from 1934 to 1973. The data on tissue content of cadmium, mercury and lead did not follow any chronological relationship. The only pattern that emerged was a relationship between feeding behavior and heavy metal content. Predatory fish had a higher mercury content. Cadmium and lead appeared to be independent of feeding habits. (EIS-Deal)
W78-12671

MICROBIAL ECOLOGY STUDIES OF METULA SPILL IN THE STRAITS OF MAGELLAN,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-12673

BIOAVAILABILITY OF CRUDE OIL FROM EXPERIMENTALLY OILED SEDIMENTS TO ENGLISH SOLE (PAROPHRYS VETULUS), AND PATHOLOGICAL CONSEQUENCES,
National Marine Fisheries Service, Seattle, WA. Environmental Conservation Div.
B. B. McCain, H. O. Hodgins, W. D. Gronlund, J. W. Hawkes, and D. W. Brown.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 657-664, 1978. 5 fig, 1 tab, 28 ref.

Descriptors: *Oil, Fish physiology, *Bottom sediments, Animal pathology, *Aromatic compounds, *Enzymes, Oil pollution, Oil spills, Sediments, Path of pollutants, Water pollution effects, Animal metabolism, Organic compounds, Pathology, *Depuration, Liver, *Crude oil, Tissue analysis, Bioaccumulation, *Bioavailability, *Sole, *Naphthalenes, *Flatfish, Parophrys.

English sole were exposed to experimentally oiled sediments over a 4-mo period to assess the bioavailability and tissue hydrocarbon distribution kinetics in flatfish. Data were also obtained on hydrocarbon-related physiological changes and tissue pathology. Crude oil was mixed with aromatic hydrocarbon-free sediments to a concentration of 700 micrograms/g dry weight at the beginning of the experiment. During the 1st mo of the experiment this concentration decreased to 400 micrograms/g dry weight, and remained relatively stable during the remainder of the 4-mo period. Compositional changes were observed in the alkane and aromatic fractions, with a differential decrease in the substituted naphthalenes. Flatfish maintained in such oiled sediments readily took up alkane and aromatic petroleum hydrocarbons from these sediments, and accumulated these in skin, muscle, and liver. 1- and 2-methylnaphthalene and 1,2,3,4-tetramethylbenzene were accumulated to greater extent than other aromatics. Observations on growth changes and liver pathology indicate the need for further detailed study of fish growth abnormalities and pathology in the presence of petroleum hydrocarbons. (EIS-Deal)
W78-12674

DISTRIBUTION AND TOXICITY OF SELECTED WATER POLLUTANTS IN THE SPINY DOGFISH, SQUALUS ACANTHIAS,
National Cancer Inst., Bethesda, MD.
For primary bibliographic entry see Field 5C.
W78-12677

FATE OF POLYCYCLIC AROMATIC HYDROCARBONS IN CONTROLLED ECOSYSTEM ENCLOSURES,
Skidway Inst. of Oceanography Savannah, GA.
R. F. Lee, W. S. Gardner, J. W. Anderson, J. W. blaylocke, and J. Barwell-Clarke.
Environmental Science and Technology, Vol. 12, No. 7, p 832-838, 1978. 6 fig, 4 tab, 34 ref.

Descriptors: *Oil pollution, *Oil, *Aromatic compounds, Oil spills, Organic compounds, Water analysis, Zooplankton, Oysters, Bottom sediments, Microbial degradation, Biodegradation, Oxidation, Chemical analysis, *Crude oil, *Naphthalenes.

Prudhoe crude oil enriched with a number of polycyclic aromatic hydrocarbons was added as a dispersion to a controlled ecosystem enclosure suspended in Saanich Inlet, Canada. Concentrations of various aromatics were determined in water, zooplankton, oysters, and bottom sediments. These concentrations decreased at an exponential rate due to evaporation, photochemical oxidation, microbial degradation, and sedimentation. Only naphthalenes were significantly degraded by microbes with removal by this process of up to 5% per day from the water. Sedimentation and photochemical oxidation were responsible for the decrease in concentrations of the higher weight aromatics. (EIS-Katz)
W78-12678

RELATIONSHIPS BETWEEN SOIL SALINITY AND THE SALINITY OF APPLIED WATER IN THE SUISUN MARSH OF CALIFORNIA,
California State Dept. of Fish and Game, Sacramento. Wildlife Management Branch.
For primary bibliographic entry see Field 2G.
W78-12692

TEN-YEAR LOW MEAN MONTHLY DISCHARGE DETERMINATIONS FOR UNGAGED STREAMS NEAR WASTE-STABILIZATION PONDS IN WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-12723

USE OF LABORATORY DATA TO PREDICT SULFATE SORPTION DURING ARTIFICIAL GROUND-WATER RECHARGE,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-12724

UNSTEADY SOLUTE-TRANSPORT SIMULATION IN STREAMFLOW USING A FINITE-DIFFERENCE MODEL,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
L. F. Land.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 264, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 78-18, May 1978. 54 p, 4 fig, 6 ref.

Descriptors: *Ion transport, *Solutes, *Unsteady flow, *Model studies, *Computer models, Analytical techniques, Streamflow, Water quality, *Solute-transport simulation.

This report documents a rather simple, general purpose, one-dimensional, one-parameter, mass-transport model for field use. The model assumes a well-mixed conservative solute that may be coming from an unsteady source and is moving in unsteady streamflow. The quantity of solute being transported is in the units of concentration. Results are reported as such. An implicit finite-difference technique is used to solve the mass transport equation. It consists of creating a tridiagonal matrix and using the Thomas algorithm to solve the matrix for the unknown concentrations at the new time step. The computer program pesented is designed to compute the concentration of a water-quality constituent at any point and at any preselected time in a one-dimensional stream. The model is driven by the inflowing concentration of solute at the upstream boundary and is influenced by the solute entering the stream from tributaries and lateral ground-water inflow and from a source or sink. (Woodard-USGS)
W78-12726

STREAM QUALITY IN THE SAN LORENZO RIVER BASIN, SANTA CRUZ COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
M. A. Sylvester, and K. J. Covay.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 288, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 78-19, April 1978. 61 p, 12 fig, 8 tab, 30 ref.

Descriptors: *Water quality, *Streams, *Water pollution sources, *Septic tanks, Domestic wastes, Coliforms, Bacteria, Land use, Runoff, Streamflow, Water analysis, Benthic fauna, *California, *San Lorenzo River basin(Calif), Santa Cruz County(Calif).

Stream quality was studied from November 1973 through June 1975 in the San Lorenzo River basin, Calif., a rapidly developing mountainous area. Dissolved-ion concentrations indicate the basin can be divided into three water-quality areas corresponding to three geologic areas. Pronounced changes in water quality occurred during storms when streamflow, turbidity, nitrogen, phosphorus, potassium, and fecal-coliform bacteria concentrations increased, while dissolved-ion concentrations decreased owing to dilution. Total nitrogen and fecal-coliform concentrations exceeded State objectives in the Zayante and Branciforte Creek drainages probably because of domestic sewage from improperly operating septic-tank systems or the primary-treated sewage effluent discharged into a pit near Scotts Valley. Diel studies did not show appreciable dissolved-oxygen depletion in streams. Greater streamflows and residential

development appear responsible for reduced diversity of benthic invertebrates downstream of the residential areas in the basin. (Woodard-USGS)
W78-12734

AN EVALUATION OF PROBLEMS ARISING FROM ACID MINE DRAINAGE IN THE VICINITY OF SHASTA LAKE, SHASTA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-12735

WATER-QUALITY INVESTIGATION, UPPER SANTA CLARA RIVER BASIN, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div. and Geological Survey, Tallahassee, FL. Water Resources Div.
J. C. Bowers, and G. A. Irwin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 289, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-99, March 1978. 43 p, 1 fig, 11 tab, 10 ref.

Descriptors: *Water quality, *Path of pollutants, *Streams, *California, *Water analysis, Trace elements, Nitrogen, Phosphorus, Nutrients, Pesticides, Carbon, Detergents, Bottom sampling, Streamflow, Flow rates, Specific conductivity, Data collections, *Upper Santa Clara River basin(Calif).

Water-quality data are summarized for the upper Santa Clara River basin, California from studies beginning August 1974 through June 1976 and during past monitoring programs. Data were collected for nitrogen, phosphorus, total organic carbon, trace elements, detergents, and pesticide compounds. Because of the limited number of samples, the data are only an estimate of conditions that existed in the basin. Sampling was designed so that samples from each site would represent seasonal variations in discharge. Most constituents were fairly low in concentration near the headwaters at Ravenna and higher below the urban and agricultural area near Saugus. Mean specific conductance in the river ranged from 745 micromhos per centimeter at 25 deg C below the headwaters near Lang to 2,640 micromhos at the Los Angeles-Ventura County line. Results also indicate that discharge was not the single factor controlling the concentration variance for most constituents. Regression analyses indicated a high correlation between specific conductance and most major inorganic chemical constituents, and between specific conductance and discharge. (Woodard-USGS)
W78-12737

INTERIM REPORT ON STREAMFLOW, SEDIMENT DISCHARGE, AND WATER QUALITY IN THE CALABAZAS CREEK BASIN, SANTA CLARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-12738

PROGRESS REPORT ON BLACK MESA PROGRAM--1977.
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-12740

PHOSPHORUS SOURCE MANAGEMENT FOR EUTROPHIC LAKES. PHASE I: TRIBUTARY PHOSPHORUS LOADING,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Zoology; and Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
F. B. Trama, and R. C. Ahlert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 315, Price codes: A05 in paper copy, A01 in microfiche. A Completion Report by the Water Resources Research Institute, Rutgers University, September, 1978. 69 p, 11 fig, 11 tab, 34 ref, 2 append. OWRT A-047-NJ(5), 14-34-0001-7064.

Descriptors: Streams, *Storm runoff, *Phosphates, *Eutrophication, Reservoirs, Nutrients, *Phosphorus loading, *Waste loading, *Eutrophic lakes, Management, Water pollution, *New Jersey, Water quality, Data collections, Urban runoff, Non-point pollution sources, Storm flows.

Contribution of phosphorus during base and storm flows was studied on several New Jersey streams. Phosphorus concentrations were very stable in the absence of point sources and major disturbances. Large changes in concentration occurred with storm flows greater than 1000 l/s, and the dissolved phosphorus fraction usually increased during peak flow unless the major rainfall was a good distance upstream from the sampling site. Storms contributed from 50 to 75% of the true annual phosphorus load and a sizeable portion of this storm-related load was attributable to a few major storms during the year. Most of the storm-related phosphorus was associated with particulate matter. It was possible to predict storm phosphorus loads with a high degree of accuracy from a knowledge of the storm hydrograph and the stream's storm loading coefficient. Existing water quality data and flow records for Stony Brook and Millstone River above Lake Carnegie were examined in an attempt to calculate total annual phosphorus loading from point and non-point sources.
W78-12746

QUALITY AND QUANTITY OF STORM-WATER RUNOFF FROM THREE LAND-USE AREAS, BROWARD COUNTY, FLORIDA,
Geological Survey, Miami, FL. Water Resources Div.
H. C. Mattraw, Jr.
In: Proceedings of the International Symposium on Urban Storm-Water Management, University of Kentucky, Lexington, July 24-27, 1978. 5 p, 5 fig, 1 tab, 6 ref.

Descriptors: *Storm runoff, *Urban runoff, *Storm water, *Water quality, *Rainfall-runoff relationships, Urban hydrology, Data collections, Hydrologic data, Evaluation, Land use, Florida, *Broward County(Fla).

The U.S. Geological Survey has measured rainfall, runoff and runoff quality from storms for three urban sewered basins in Broward County, Fla. Approximately 2 years of records have been collected for a 47-acre single-family residential area; a 58-acre, 3,000 foot secondary divided-highway segment; and a 28-acre commercial shopping center. Approximately 100 rainfall-runoff periods per site were digitized from analog records and stored in an urban data management system. Sets of nutrient and heavy-metal water-quality data were collected for 30 or more storms at each of the three areas and stored in the system. Loads computed for the three areas indicate the importance of the hydraulic interconnection between impervious areas. Factors which affect storm-water runoff loads include land use, proportion of hydraulically interconnected impervious area, seasonal distribution of rainfall, and the antecedent dry period. (Woodard-USGS)
W78-12748

THE FREQUENCY, DISTRIBUTION, AND PATHOLOGY OF THREE DISEASES OF DEMERSAL FISHES IN THE BERING SEA,
National Marine Fisheries Service, Seattle, WA. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-12751

APPARATUS TO DETECT TOXIC IONS IN THE ATMOSPHERE OR DISSOLVED IN WATER,
Ministere des Armees, Paris (France). Delegation Ministerielle pour l'Armement.
For primary bibliographic entry see Field 5A.
W78-12798

LEAD AND COPPER IN THE WATERS OF RARITAN AND LOWER NEW YORK BAYS,
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
R. Waldhauer, A. Matte, and R. E. Tucker.
Marine Pollution Bulletin, Vol. 9, No. 2, p 38-42, February 1978. 2 fig, 1 tab, 34 ref.

Descriptors: *Water pollution effects, *Environmental effects, *Metals, New York, Lead, Copper, Industrial wastes, Resources development, *Outer Continental Shelf.

A survey of waters adjacent to this heavily urbanized and industrialized region showed concentrations of copper, to be the highest reported to date for estuarine waters. Correlations between distributions of dissolved and total metal concentration in the water column, hydrography, and metal in the sediment were related to benthic studies in this area. Laboratory studies are cited which show the potential for adverse effects on marine animals at these metal concentrations. (Sinha-OEIS)
W78-12811

SERIOUS MERCURY CONTAMINATION OF SEDIMENTS IN A NORWEGIAN SEMI-ENCLOSED BAY,
Norwegian Inst. for Water Research, Oslo (Norway).
J. M. Skei.
Marine Pollution Bulletin, Vol 9, No 7, p 191-193, July 1978. 1 fig, 1 tab, 25 ref.

Descriptors: *Sediments, *Mercury, *Water pollution sources, Water pollution effects, Environmental effects, Benthos, Industrial wastes, *Outer Continental Shelf, Norway.

Thirteen surface sediment samples from a shallow, semi-enclosed bay, Gunnekleivfjorden, South-West Norway, were analysed for total mercury. The concentrations ranged between 90 and 350 ppm dried sediment. The median value (250 ppm mercury) is more than twice the median value of sixteen sediment samples collected in Minamata Bay in 1963. The surface area of Gunnekleivfjorden is approximately 1 sq km, implying that minimum 10 tons of mercury is accumulated in the upper 5 cm of the sediments of the bay. The extensive contamination is caused by discharge of inorganic mercury from a chlor-alkali plant during the last 25 years. (Sinha-OEIS)
W78-12815

A CONCEPTUAL MODEL FOR RESPONSE TO ARCTIC OIL SPILLS,
Coast Guard Research and Development Center, Groton, CT.
I. M. Lissauer, and D. L. Murphy.
Environmental Management, Vol 2, No 4, p 341-346, July 1978. 3 fig, 6 ref.

Descriptors: *Oil spills, *Polar regions, *Water pollution control, *Arctic, Baseline studies, Environmental effects, Resources development, Planning, *Model studies, *Outer Continental Shelf, Petroleum resouces.

The potential for oil spills in Arctic regions has increased significantly because of the development of petroleum resources. Response to an oil spill in the Arctic is likely to be much slower than that in the temperate region because of the remoteness of the area and its severe climate. In the face of these unique problems, accurate prediction of the extent and subsequent movement of an oil spill is vital to any cleanup effort. Presented is the framework of a program to study the movement of oil spills in the Arctic. Existing models of oil spreading and polar ice dynamics are reviewed and areas where new model development is required are defined. A system design is developed that may be used for developing a plan to act in the event of a major spill. (Sinha-OEIS)
W78-12818

NATURAL RADON AND PHOSPHORUS AS LIMNOLOGIC TRACERS: HORIZONTAL AND VERTICAL EDDY DIFFUSION IN GREIFENSEE,
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
D. M. Imboden, and S. Emerson.
Limnology and Oceanography, Vol. 23, No. 1, p 77-90, January 1978. 7 fig, 5 tab, 22 ref.

Descriptors: *Tracers, *Phosphorus, *Radioisotopes, *Diffusion, Lakes, Water circulation, On-site data collections, Data processing, Theoretical analysis, Eddies, Temperature, Water temperature, Sediments, Limnology, *Radon, Eddy diffusion.

Two-dimensional interpretation of monthly measurements of natural radon-222 at different stations in Greifensee, Switzerland, results in hypolimnetic vertical and horizontal eddy diffusion coefficients (K sub z and K sub x) of 0.2-0.05 and 1,000-100 sq cm/s during the stagnation period in 1975. Application of the one-dimensional and three-dimensional horizontally well mixed models to the data from the midlake station produces errors of about a factor of two in the vertical eddy diffusion coefficient. With the hypolimnion mixing information, K sub z in the thermocline is estimated to be 0.025 + or - 0.015 sq cm/s by using dissolved phosphorus as a quasi-conservative tracer. The eddy diffusion coefficients calculated are in good agreement with those which would be predicted by empirical methods. The results when applied to phosphorus cycling indicate that P reflux from the hypolimnion and thermocline in eutrophic Greifensee is of the same magnitude as external inputs during the months of maximum photosynthesis. (Sims-ISWS)
W78-12849

VARIABILITY OF ANNUAL NUTRIENT AND SEDIMENT DISCHARGES IN RUNOFF FROM OKLAHOMA CROPLAND AND RANGELAND,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 5G.
W78-12858

AN ATTEMPT TO DETECT THE EFFECTS OF A STEELWORKS ON PRECIPITATION AMOUNTS IN CENTRAL HUNGARY,
Illinois Univ., Urbana-Champaign. Dept. of Ecology, Ethology, and Evolution; and Illinois Univ., Urbana-Champaign. Inst. for Environmental Studies.
W. P. Lowry, and F. Probald.
Journal of Applied Meteorology, Vol. 17, No. 7, p 964-975, July 1978. 4 fig, 4 tab, 15 ref. 2 append.

Descriptors: *Precipitation(Atmospheric), *Industries, *Effects, *Analytical techniques, Synoptic analysis, Statistics, Statistical methods, Air polluton, Air pollution effects, Environmental effects, Data processing, Climatology, Meteorology, *Hungary, Steelworks.

Daily precipitation amounts from a 20-station network within 50 km of a major steelworks at Dunaujvaros were analyzed in two ways for a decade preceding construction of the works in the late 1950's and a decade immediately following. The 'classical' method was by examination of isohyets of precipitation totals. The second method employed statistical testing of stratified inter-decadal differences at each station using Student's test. Stratification are by season (June and December) and by synoptic weather types. Post-industrial maps showing isohyets of mean monthly totals for June and for December bioth exhibited relative maxima to the northeast and the southeast of the steelworks at distances between 40 and 55 km. Aggregation of inter-decadel differences across synoptic types and seasons exhibited greater numbers of 'large' values of t, both positive and negative, than would be expected by chance. These two results by themselves suggest that an effect on precipitation due to the steelworks has been detected. The pre-industrial isohyetal map of monthly totals for June exhibits a distinctive maximum 50 km to the northeast of the steelworks, and post-industrial isohyetal maps for individual synoptic types showed no spatially coherent maxima or minima 'downwind' of the steelworks. Within synoptic types, inter-decadal differences considered statistically 'large' were neither spatially coherent in general nor of consistent sign between seasons in the single type having several large differences in both seasons. It was concluded, on balance, that no effect due to the steelworks has been detected, and then the implications of that conclusion were examined. It also was argued that this comparison of methods of analysis points up the need for both synoptic stratification and the statistical testing of temporal differences in attempts to detect anthropogenic effects on precipitation amount using standard climatological data. (Sims-ISWS)
W78-12860

CONCENTRATIONS OF HEAVY METALS IN SMALL NORWEGIAN LAKES,
Norsk Inst. for Vannforskning, Blindern.
A. Henriksen, and R. F. Wright.
Water Research, Vol. 12, No. 2, p 101-112, 1978. 7 fig, 4 tab, 27 ref.

Descriptors: *Heavy metals, *Water quality, *Water pollution, *Lead, *Cadmium, Water pollution sources, Analytical methods, Metals, Zinc, Public health, Toxicity, Pollutants, Copper, Chemical analysis, Copper compounds, Toxins, Lakes, *Norway, *Scandinavia.

As part of regional surveys of lakes in Norway, the concentrations of Zn, Pb, Cu, and Cd were measured in surface- and bottom-water samples collected from representative, small, pristine lakes (136 in southern Norway sampled in October 1974, 58 resampled in March 1975, and 77 in northern Norway sampled in March 1975). The lakes, a statistically representative sample of small lakes in Norway, were chosen because their watersheds are undisturbed. Thus, heavy metal concentrations in these lakes reflect only natural inputs and anthropogenic inputs via the atmosphere. The generally low concentrations (Zn 0.5-12.0 micrograms/L; Pb 0-2.0 micrograms/L; Cu 0-2.0 micrograms/L; Cd 0.1-0.5 micrograms/L) measured in lakes in central and northern Norway provide estimates of natural 'background' levels. These estimates may be too high because they include the global-scale deposition of heavy metals from the atmosphere which has increased as a result of industrial activities. Concentrations of Zn and Pb in lakes in southernmost and southeastern Norway lie above these 'background' levels, apparently because of atmospheric deposition associated with the precipitation that falls over southern Scandinavia. Increased heavy metal concentrations in acid lakes also may be due to increased mobilization of metals due to acidification of soil- and surface-waters. (Henley-ISWS)
W78-12861

MICROBIOLOGICAL STUDIES ON THE NITROGEN CYCLE IN AQUATIC ENVIRONMENTS -- IV, METABOLIC RATE OF AMMONIUM NITROGEN IN FRESHWATER REGIONS,
Kyoto Inst. of Oceanic and Fishery Science (Japan).
For primary bibliographic entry see Field 5C.
W78-12867

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN VIII. SEASONAL, DIURNAL, AND LATITUDINAL VARIATIONS IN ABUNDANCE OF EUTHECOSOMATA ALONG THE 110 DEGREE E. MERIDIAN,
Marine Products Export Development Authority, Calcutta (India).
For primary bibliographic entry see Field 5C.
W78-12869

STUDIES ON COPPER METABOLISM IN FISHES--II. THE SITE OF COPPER ACCUMULATION IN THE TISSUES OF CARP (IN JAPANESE),
Kyoto Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W78-12870

DENITRIFICATION OF AMMONIA FORMATION IN ANAEROBIC COASTAL SEDIMENTS,
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W78-12885

THE DISTRIBUTION OF NUTRIENTS IN SWARTVLEI, A SOUTHERN CAPE COASTAL LAKE,
Rhodes Univ., Grahamstown (South Africa). Inst. for Freshwater Studies.
C. H. Williams.
Water SA, Vol 3, No 4, p 213-217, October 1977. 2 fig, 3 tab, 21 ref.

Descriptors: *Nutrients, *Swartvlei(South Africa), *Macrophytes, *Saline lakes, *Littoral, *Sediments, *Distribution, Oligotrophy, South Africa, Lakes, Nitrogen, Phosphorus, Coasts, Potamogeton pectinatus, Chara globularis var. Kraussii, Lamprothamnium papulosum.

Nitrogen and phosphorus values are given for macrophytes, sediments, and water of Swartvlei, an unpolluted coastal lake on South Africa's Coastal Cape which despite its oligotrophic status supports a large aquatic macrophyte community. Very high community metabolic rates in the littoral, combined with large nutrient stocks bound up there, suggest that the littoral has an important influence on the lake's nutrient dynamics. In Swartvlei by far the largest standing stocks of both nitrogen and phosphorus were found in the sediments, followed by macrophytes. In waters, there was a large difference between soluble reactive phosphorus (phosphate-phosphorus) and total soluble phosphorus, and P-32 orthophosphate is strongly bound by humic materials. More specifically, the phosphorus appears bound to humic chelate complexes of iron and aluminum, indicating humic matter may play a significant role in the phosphorus cycle. All but one of the coastal lakes are connected to the sea, directly in the case of Swartvlei. Most are oligotrophic, and all have large macrophyte communities. Salinity varies 4-20%. The submerged plant community consists primarily of Potamogeton pectinatus, Chara globularis var. kraussii, and Lamprothamnium papulosum. In Swartvlei 30% of the lake area is occupied by macrophytes. Bottom waters are anaerobic, with hydrogen sulfide present much of the year, resulting in phosphate-phosphorus releases into the water. (Lynch-Wisconsin)
W78-12889

NORTH AMERICAN PROJECT--A STUDY OF U.S. WATER BODIES.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W78-12895

PLUTONIUM UPTAKE BY PLANTS FROM SOIL CONTAINING PLUTONIUM-238 DIOXIDE PARTICLES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
K. W. Brown, and J. C. McFarlane.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 000, Price codes: A02 in paper copy, A01 in microfiche. Publication No. EPA-600/3-77-052, May, 1977. 13 p, 3 fig, 2 tab, 21 ref.

Descriptors: Alfalfa, Vegetables, Crop production, Soil investigations, *Plutonium-238, Soil chemistry, *Radioisotopes, Water pollution sources.

Three plant species--alfalfa, lettuce, and radishes--were grown in soils contaminated with plutonium-238 dioxide (238PuO2) at concentrations of 23, 69, 92, and 342 nanocuries per gram (nCi/g). The length of exposure varied from 60 days for the lettuce and radishes to 358 days for the alfalfa. The magnitude of plutonium incorporation as indicated by the discrimination ratios for these species, after being exposed to the relatively insoluble PuO2, was similar to previously reported data using different chemical forms of plutonium. Evidence indicates that the predominant factor in plutonium uptake by plants may involve the chelation of plutonium contained in the soils by the action of compounds such as citric acid and/or other similar chelating agents released from the plant roots. (Skogerboe-Colorado State)
W78-12938

EVALUATION OF THE MAGNITUDE AND SIGNIFICANCE OF POLLUTION FROM URBAN STORM WATER RUNOFF IN ONTARIO,
American Public Works Association, Chicago, IL.; and Florida Univ., Gainesville.
R. H. Sullivan, W. D. Hurst, T. M. Kipp, J. P. Heaney, and W. C. Huber.
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada; Pollution Control Branch, Ontario Ministry of Environment, Toronto, Ontario, Canada, Research Report No. 81, 183 p, 34 fig, 65 ref, 51 tab, 4 append. 74-8-21.

Descriptors: *Storm water, *Storm runoff, *Pollution control, *Water pollution, Urban runoff, Sewerage, Land use, Human population, Biochemical oxygen demand, Methodology, Costs, Data collections, *Canada, *Ontario, Burlington, Guelph, Kingston, Kitchener, Milton, St. Catharines, Sault Ste Marie, Wet-weather flows, Dry-weather flows, Pollution loadings.

An assessment has been made of the magnitude and significance of the pollution loadings from urban runoff in the province of Ontario. The study was conducted under the provisions of the Canada-Ontario and Canada-United States Agreement on Great Lakes Water Quality. The selected local authorities were interviewed to obtain detailed local data. In addition, various maps and demographic information were supplied by the Ministry of the Environment. Methodology used by the American Public Works Association and the University of Florida for a study of similar problems in the United States provided a basis for data manipulation and preparation of cost estimates, modified where possible to reflect conditions relevant to Ontario. The cost estimate performed indicated that to obtain 25 percent control of BOD, an annual cost of $10,861,000 would be incurred. These costs are exclusive of the storm flow conveyance system. For BOD control at 75 percent, the annual cost would be $95,471,000. (WATDOC)
W78-12946

A MODEL SYSTEM TO STUDY THE DESORPTION AND BIOLOGICAL AVAILABILITY OF PCB IN HYDROSOILS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
M. T. Halter, and H. E. Johnson.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F. L. Mayer and J. L. /Hamelink, eds., American Society for Testing and Materials, p 178-195, 1977. 6 fig, 4 tab, 45 ref.

Descriptors: *Polychlorinated biphenyls, *Minnows, *Hydrosols(Soils), Aroclors, Chlorinated hydrocarbons pesticides, Testing procedures, Testing, Anaytical techniques, Absorption, Chlorine, Pesticide kinetics, Chemical analysis, Bioassay, Bioaccumulation, Tissue analysis.

Model aquatic systems incorporating hydrosoil, water, and fish components were used to measure the dynamics of Aroclor-1254 under both flowing and static water condtions. PCB desorption from hydrosoils was consistent with adsorption-desorption theory. Equilibrium PCB concentrations in water could be predicted under both static and continuous flow conditions with the distribution coefficient equation. Desorption favored the lower-chlorinated, more water-soluble components of Aroclor 1254. Fathead minnows allowed direct contact with PCB-contaminated hydrosoils accumulated PCB residues at six times the rates of those screened from direct exposure to sediments. Fish selectively bioaccumulated the higher chlorinated components of Aroclor 1254. (See also W78-06608) (EIS-Deal)
W78-12980

APPLICATION OF AN EVAPORATIVE LOSS MODEL TO ESTIMATE THE PERSISTENCE OF CONTAMINANTS IN LENTIC ENVIRONMENTS,
Purdue Univ., LaFayette, IN. Dept. of Forestry and Natural Resources.
A. Spacie, J. L. Hamelink, and R. C. Waybrant.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer, and J. L. Hamelink, eds., American Society for Testing and Materials, p 214-227, 1977. 4 fig, 3 tab, 1 p, 19 ref.

Descriptors: *Mathematical models, *Physicochemical properties, *Evaporation, Toxicity, *Water analysis, Persistence, Aquatic Environment, Organic compounds, Kinetics, Thermal stratification, DDE, DDT, Epilimnion, Hypolimnion, Pesticide kinetics, Path of pollutants, Hazards, Chemical properties, Lentic environment.

A simple two-layer model for predicting evaporative losses of nonionic synthetic chemicals from water is presented. Losses from well-stirred small vessels are predicted accurately. Losses from thermally stratified bodies of water were poorly predicted because turbulent mixing processes at the interfaces were retarded. (See also W78-06608) (EIS-Deal)
W78-12982

ACCUMULATION OF AMERICIUM 243 IN SELECTED BRACKISH AND MARINE INVERTEBRATES,
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
C. A. Murray, M. Hoppenheit, and H. Rade.
Helgolander Wissenschaftliche Meeresuntersuchungen, Vol 31, p 34-54, 1978. 15 fig, 19 ref.

Descriptors: *Radioisotopes, *Worms, *Copepods, *Amphipoda, *Radioecology, Path of pollutants, Physicochemical properties, Absorption, Hydrogen ion concentration, Radioactive wastes, Radioactive waste disposal, *Americium, *Polychaetes, *Bioavailability, *Tissue analysis, *Bioaccumulation.

As an initial step in a program designed to investigate factors which are of importance in affecting the behavior of actinides towards certain invertebrates found in estuarine and marine environments, laboratory procedures have been developed to study the accumulation of americium in three species: the polychaete worm Nereis diversiocolor, the brackish-water amphipod Gammarus duebeni and the harpacticoid copepod Tisbe holothuriae. It was found that large differences in concentration factors occurred for the same organisms, depending upon aging of the contaminated medium; much higher and more variable values being found when uptake was from freshly contaminated solutions than from those aged up to a week. The interaction of specimens with physico-chemical reactions of americium which appear to take place within the first few days after its introduction into water are considered to be responsible for these differences. Uptake from contaminated water that had been allowed to age in the absence of organisms appears to be unaffected by subsequent conditioning by specimens. The possibility that the mechanisms regulating the uptake of actinides in different species may depend upon pH is briefly discussed. (EIS-Deal)
W78-12988

CONCENTRATION OF MERCURY IN MARINE ANIMALS,
Hokkaido Univ., Hakodate (Japan). Lab. of Marine Chemistry.
K. Matsunaga.
Bulletin of the Faculty of Fisheries of Hokkaido University, Vol 29, No 1, p 70-74, 1978. 1 tab, 23 ref.

Descriptors: *Mercury, *Food chains, Metals, Heavy metals, Path of pollutants, Food habits, Fish physiology, Animal metabolism, Clams, Bass, Salmonids, Respiration, *Marine animals, *Tissue analysis, *Bioaccumulation, *Biomagnification.

About 200 marine animals were classified on the basis of food habit. The concentrations of mercury in them were measured and the mechanism of mercury accumulation was examined. Based on the results, it is likely that mercury accumulation in marine animals depends on food chain amplification. (EIS-Deal)
W78-12991

AN AQUEOUS AND SEDIMENTALOGICAL MODEL FOR HEAVY METAL CONTAMINATION OF STREAM SYSTEMS AFFECTED BY SULFIDE MINING IN THE EASTERN UNITED STATES,
Duke Univ., Durham, NC. Dept. of Geology.
E. L. Schrader, and W. J. Furbish.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 159-166, 1978. 1 fig, 3 tab, 13 ref.

Descriptors: *Mine wastes, *Sulfides, *Pyrite, Sulfur compounds, Water pollution sources, Water chemistry, Water analysis, Mine acids, Hydrogen ion concentration, Iron, Manganese, Heavy metals, Cadmium, Zinc, Copper, Nickel, Lead, Georgia, Model studies, Path of pollutants.

Small streams in the southeastern U.S. can be significantly contaminated by abandoned mining operations. Heavy metal contamination of such stream systems may be a function of the cyclic precipitation and dissolution of Fe-Mn oxyhydroxides. Since these mines are no longer operative and many of the original companies defunct, no private company is willing to regulate the rates of metal accumulation in stream waters. The unregulated waters pose a hazard for rural communities

nd natural ecological systems within the drainage asins. (EIStDeal)
W78-12999

5C. Effects Of Pollution

DISTRIBUTION OF PHYTOPLANKTON IN VIRGINIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
J. W. Hilgert, V. W. Lambou, F. A. Morris, R. W. Thomas, and M. K. Morris.

Descriptors: *Virginia, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Impoundments, *Bioindicators, *National Eutrophication Survey, Algae, Reservoirs, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, Claytor Lake(VA), John W. Flannagan Dam(VA), John H. Kerr Reservoir(VA), Occoquan Reservoir(VA), Smith Mountain Lake(VA), Lake Chesdin(VA), Chickahominy(VA), Rivanna Reservoir(VA).

Phytoplankton species composition and abundance were determined for eight Virginia lakes and impoundments; trophic status was also assessed using several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, and species diversity and abundance indices. The project was conducted in spring, summer, and fall 1973 as a component of the National Eutrophication Survey. Sampling lakes were selected because of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluents, (2) surface area of at least 40 ha, and (3) a minimum hydraulic retention time of 30 days. Sites included Claytor Lake, John W. Flannagan Dam, John H. Kerr Reservoir (Buggs Island Lake), Occoquan Reservoir, Smith Mountain Lake, Lake Chesdin, Chickahominy Lake, and Rivanna (South Fork) Reservoir. Phytoplankton data are summarized in an appendix organized by lake, which contains an alphabetical species list with concentrations for each species by sampling date, and results of application of the indices. Nygaard's trophic state indices assume that certain algal groups indicate nutrient enrichment levels; eutrophic indicators are Cyanophyta, Euglenophyta, centric diatoms, and Chlorococales, while desmids and many pennate diatoms are found only in oligotrophic waters. (Lynch-Wisconsin)
W78-12122

DISTRIBUTION OF PHYTOPLANKTON IN TENNESSEE LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
F. A. Hiatt, S. C. Hern, J. W. Hilgert, V. W. Lambou, and F. A. Morris.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 139, Price codes: A04 in paper copy, A01 in microfiche. Publication No. EPA-600/3-78-016, January 1978. 67 p, 1 tab, 11 ref, 1 append.

Descriptors: *Tennessee, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Reservoirs, *Impoundments, Bioindicators, Algae, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, National Eutrophication Survey, Barkley Lake(TN), Boone Reservoir(TN), Cheatham Reservoir(TN), Cherokee Lake(TN), Chickamauga Lake(TN), Douglas Lake(TN), Fort Loudon Lake(TN), Great Falls Lake(TN), Nickajack Reservoir(TN), Old Hickory Lake(TN), Watts Bar Lake(TN), Percy Priest Reservoir(TN), Tims Ford Reservoir(TN), South Holston Lake(TN), Reelfoot Lake(TN), Wood Reservoir(TN).

Phytoplankton species composition and abundance were determined for 16 Tennessee lakes and reservoirs; in addition, trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed were Barkley, Cherokee, Chickamauga, Douglas, Fort Loudon, Great Falls, Old Hickory, Watts Bar, South Holston, and Reelfoot Lakes, and Boone, Cheatham, Nickajack, Percy Priest, Tims Ford, and Woods Reservoirs. Data are summarized by lake in an appendix containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer indices incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, and one with 20 species. (Lynch-Wisconsin)
W78-12123

RELATIONSHIPS OF PRODUCTIVITY AND PROBLEM CONDITIONS TO AMBIENT NUTRIENTS: NATIONAL EUTROPHICATION SURVEY FINDINGS FOR 418 LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
L. R. Williams, V. W. Lambou, S. C. Hern, and R. W. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 452, Price codes: A04 in paper copy, A01 in microfiche. Publication No. EPA-600/3-78-002, January 1978. 20 p, 8 fig, 9 ref.

Descriptors: *National Eutrophication Survey, *Lakes, *Eutrophication, *Primary productivity, *Phosphorus, *Chlorophyll, *Reservoirs, Nutrients, Phytoplankton, Macrophytes, Algae, Aquatic weed control, Fisheries, Fishkill, Dissolved oxygen, Oxygen depletion, Hydraulic residence time, Stratification, Hydrogen ion concentration, Alkalinity, Nitrogen, Limiting factors, Ponds, Impoundments.

Data collected on 418 lakes, ponds and reservoirs east of the Mississippi River in 1972-73 for the National Eutrophication Survey were analyzed to determine correlations between chlorophyll-a (as an indicator of lake productivity), nutrients, and other water quality parameters. Conclusions include: (1) Productivity, as measured by mean chlorophyll-a concentrations, is strongly related to ambient phosphorus levels, especially in lakes with hydraulic retention time greater than 14 days. (2) Significant regional differences in chlorophyll-a response per unit total phosphorus exist; the reasons are being investigated. (3) Classifying lakes on the basis of stratification, dominant vegetation, or fishery type results in no differences in chlorophyll-a response to phosphorus. (4) No algal blooms occur in lakes with mean total phosphorus concentrations less than 19 micrograms/liter. (5) Nuisance aquatic weed growths generally occur at lower phosphorus levels than did algal blooms, and in many cases control of phosphorus inputs is unlikely to have much impact on macrophytes. (6) Fishkills are generally unrelated to mean phosphorus or chlorphyll-a levels, or even to chronic low-oxygen conditions. (7) Many oxygen problems in southeastern lakes arise from establishment of trout fisheries in marginal habitats. Positive correlations were found between chlorophyll-a and phosphorus, Kjeldahl nitrogen, pH, and total alkalinity and negative correlations with Secchi disc transparency and nitrogen/phosphorus ratio. (Lynch-Wisconsin)
W78-12124

SEPTIC TANK DISPOSAL SYSTEMS AS PHOSPHORUS SOURCES FOR SURFACE WATERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5B.
W78-12125

DISTRIBUTION OF PHYTOPLANKTON IN OHIO LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
J. W. Hilgert, V. W. Lambou, F. A. Morris, M. K. Morris, and L. R. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 140, Price codes: A06 in paper copy, A01 in microfiche. Publication No EPA-600/3-78-015, January 1978. 94 p, 4 tab, 11 ref, 1 append.

Descriptors: *Ohio, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Reservoirs, *Impoundments, Bioindicators, Algae, Distribution, Species diversity indices, Species composition, Floral lists, Data collections, National Eutrophication Survey, Beach City Reservoir(OH), Buckeye Reservoir(OH), Charles Mill Reservoir(OH), Deer Creek Reservoir(OH), Delaware Reservoir(OH), Dillion Reservoir(OH), Grant Lake(OH), Hoover Reservoir(OH), Indian Lake(OH), Loramie Lake(OH), Mosquito Creek Reservoir(OH), Pleasant Hill Lake(OH), Lake Saint Marys(OH), Atwood Reservoir(OH), Berlin Reservoir(OH), Holiday Lake(OH), O'Shaugnessy Reservoir(OH), Rocky Fork Lake(OH), Shawnee Lake(OH), Tappan Lake(OH).

Phytoplankton species composition and abundance were determined for 20 Ohio lakes and reservoirs; in addition, trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed were Beach City, Buckeye, Charles Mill, Deer Creek, Delaware, Dillion, Hoover, Mosquito Creek, Atwood, Berlin, and O'Shaugnessy Reservoirs; Grant, Indian, Loramie, Pleasant Hill, Holiday, Rocky Fork Shawnee, and Tappan Lakes; and Lake Saint Marys (Grant Lake). Data are summarized by lake in an appendix containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer indices incoporate two lists of organic pollution-tolerant taxa, one with 20 genera, and one with 20 species. (Lynch-Wisconsin)
W78-12126

DISTRIBUTION OF PHYTOPLANKTON IN NEW JERSEY LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
L. R. Williams, F. A. Morris, J. W. Hilgert, V. W. Lambou, and F. A. Hiatt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 680, Price codes: A04 in paper copy, A01 in microfiche. Publication No EPA-600/3-78-014, January 1978. 59 p, 3 tab, 11 ref, 1 append.

Descriptors: *New Jersey, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Reservoirs,

*Impoundments, Bioindicators, Algae, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, National Eutrophication Survey, Budd Lake(NJ), Greenwood Lake(NJ), Oradell Reservoir(NJ), Pinecliff Lake(NJ), Pompton Lake(NJ), Duehernal Lake(NJ), Farrington Lake(NJ), Lake Hopatcong(NJ), Lake Musconetcong(NJ), Paulinskill Lake(NJ), Spruce Run Reservoir(NJ), Union Lake(NJ), Wanaque Reservoir(NJ).

Phytoplankton species composition and abundance were determined for 13 New Jersey lakes and reservoirs; in addition, trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed were Budd Lake, Greenwood Lake, Oradell Reservoir, Pinecliff Lake, Pompton Lake, Duhernal Lake, Farrington Lake, Lake Hopatcong, Lake Musconetcong, Paulinskill Lake, Spruce Run Reservoir, Union Lake, and Wanaque Reservoir. Data are summarized by lake in an appendix containing alphabetical lists of plankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer indices incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, and one with 20 species. (Lynch-Wisconsin)
W78-12127

DISTRIBUTION OF PHYTOPLANKTON IN GEORGIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
F. A. Morris, M. K. Morris, L. R. Williams, W. D. Taylor, and F. A. Hiatt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 668, Price codes: A04 in paper copy, A01 in microfiche. Publication No EPA-600/3-78-011, January 1978. 63 p, 3 tab, 11 ref, 1 append.

Descriptors: *Georgia, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Impoundments, *Reservoirs, Bioindicators, Algae, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, National Eutrophication Survey, Allatoona Lake(GA), Blackshear Lake(GA), Chatuge Lake(GA), Clark Hill Reservoir(GA), Jackson Lake(GA), Lake Sidney Lanier(GA), Nottley Lake(GA), Lake Seminole(GA), Lake Sinclair(GA), Lake Eufaula(GA), Blue Ridge Lake(GA), Bartlett's Ferry Reservoir(GA), Lake Burton(GA), High Falls Lake(GA).

Phytoplankton species composition and abundance were determined for 14 Georgia lakes and reservoirs; in addition, trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed were Allatoona Lake, Blackshear Lake, Chatuge Lake, Clark Hill Reservoir, Jackson Lake, Lake Sidney Lanier, Nottley Lake, Lake Seminole (Jim Woodruff Reservoir), Lake Sinclair, Lake Eufaula (Walter F. George Reservoir), Blue Ridge Lake, Bartlett's Ferry Reservoir (Harding Lake), Lake Burton, and High Falls Lake. Data are summarized by lake in an appendix containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer indices incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, and one with 20 species. (Lynch-Wisconsin)
W78-12128

DISTRIBUTION OF PHYTOPLANKTON IN KENTUCKY LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
W. D. Taylor, F. A. Hiatt, S. C. Hern, J. W. Hilgert, and V. W. Lambou.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 667, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-78-013, January 1978. 28 p, 3 tab, 11 ref, 1 append.

Descriptors: *Kentucky, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Reservoirs, *Impoundments, Bioindicators, Algae, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, National Eutrophication Survey, Lake Cumberland(KY), Dale Hollow Reservoir(KY), Herrington Lake(KY), Kentucky Lake(KY), Barren River Reservoir(KY).

Phytoplankton species composition and abundance were determined for five Kentucky lakes and reservoirs; in addition, trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed were Lake Cumberland, Dale Hollow Reservoir, Herrington Lake, Kentucky Lake, and Barren River Reservoir. Data are summarized by lake in an appendix containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer indices incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, and one with 20 species. (Lynch-Wisconsin)
W78-12129

PROCEDURES FOR MEASURING COUGH (GILL PURGE) RATES OF FISH,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-12131

BIOASSAY PROCEDURES FOR THE OCEAN DISPOSAL PERMIT PROGRAM.
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5A.
W78-12132

BENZO(A)PYRENE METABOLISM IN THE AMERICAN OYSTER CRASSOSTREA VIRGINICA,
Sloan-Kettering Inst. for Cancer Research, Rye, NY. Donald S. Walker Lab.
R. S. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 390, Price codes: A02 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-78-009. Jan 1978. 18 p, 3 tab, 1 fig, 27 ref.

Descriptors: *Oysters, Bioassay, Methodology, *Animal metabolism, *Animal pathology, *Animal physiology, Commercial shellfish, *Enzymes, Polychlorinated biphenyls, Laboratory tests, *Carcinogens, *Benzo(a)pyrene, *Enzyme induction, Mono-oxygenase, Mixed function oxidases, Carcinogen metabolism, Oyster enzyme system.

This research program was initiated with the overall objective of determining the role of NADPH-dependent microsomal mono-oxygenase in the metabolism of the widespread environmental carcinogen benzo(a)pyrene (BP) by the oyster Crassostrea virginica. This enzyme system is important in detoxifying various xenobiotics and inactivating polycyclic aromatic hydrocarbons oncogens as BP. An NADPH-and O2-dependent aryl hydrocarbon hydroxylase (AHH) was shown to be located in the digestive glands of these bivalves associated with the microsomal subcellular fraction. The specific activity of oyster AHH was considerably lower than that of laboratory mice, but was consistently demonstrable. The BP metabolites produced were primarily water-soluble derivatives. There was some indication that oyster AHH was induced by chronic exposure of the animals to the environmental carcinogens BP and 3-methyl-cholanthrene. There was strong evidence that exposure to polychlorinated biphenyls (PCB) caused AHH induction. High-pressure liquid chromatography was used to identify BP metabolites produced by oyster AHH. (EIS-Katz)
W78-12133

BIOLOGICAL EFFECTS OF PESTICIDES ON THE DUNGENESS CRAB,
Oregon State Univ., Newport. Marine Science Center.
R. S. Caldwell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 978, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, November 1977. Report EPA 600/3-77-131, 125 p, 23 tab, 69 fig, 78 ref.

Descriptors: *Crabs, Commercial shellfish, *Bioassay, Methodology, Laboratory tests, Laboratory animals, Invertebrates, Toxicity, Mortality, Water pollution effects, *Pesticides, *Herbicides, Larvae, Larval growth stages, *Fungicide, *Chlorinated hydrocarbon pesticides, *Organophosphorus pesticides, Methoxychlor, Captan, Carbofuran, Chlordane, Malathion, 2,4-D, Propanil, DEF, Trifluralin.

The toxicity of nine pesticides to various life history stages of the Dungeness crab, Cancer magister, was examined to establish the most sensitive life stage of the crab, and the highest concentration of each pesticide having no discernible effect on that most sensitive stage during prolonged exposures. The compounds tested were the insecticides carbofuran, chlordane, malathion, and methoxychlor; the herbicides 2,4-D, DEF, propanil and trifluralin; and the fungicide captan. For each pesticide, the zoeal stages were found to be the most sensitive in long-term tests, approximately 5 to 10 times and 10 to 100 times more sensitive than juvenile and adult crabs, respectively, and were also affected at lower concentrations than those that affected egg hatching and prezoeal development. The maximum acceptable toxicant concentrations for continuous exposures of C. magister zoeae to each of the nine pesticides are: methoxychlor, 0.005 microg/l; chlordane, 0.015 microg/l; malathion, 0.02 microg/l; carbofuran, 0.05 microg/l; captan, 2 microg/l; DEF, 4 microg/l; trifluralin, 15 microg/l; propanil, 80 microg/l, and 2,4-D 1000 microg/l. The toxicity of each of these

pesticides to crabs is presented and compared with literature reports of their toxicity to other aquatic species. (EIS-Katz)
W78-12134

CALIFORNIA COASTAL PROCESSES STUDY - LANDSAT II. FINAL REPORT: LANDSAT INVESTIGATION NO 22200,
Army Engineer District, San Francisco, CA.
D. M. Pirie, and D. D. Steller.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-24553, Price codes: A08 in paper copy, A01 in microfiche. U.S. Army Engineer District, San Francisco Report to NASA, Goddard Space Flight Center, April 1977. 163 p, 8 tab, append. S54062A.

Descriptors: *California, *Coasts, *Baseline studies, *Shore protection, *Sediment transport, Littoral, Remote sensing, Resources development, Environmental effects, *Outer Continental Shelf, *Coastal processes, *Coastal zone management, Landsat II, Nearshore processes, Estuarine flushing, Outfall structures.

Landsat data are used in the analysis and description of long and short-term littoral and nearshore processes along the California coast. The effects of these processes on natural and modified shorelines and the capability to demonstrate the utility of Landsat derived information are important considerations of the U.S. Army Corps of Engineers in coastal protection, coastal zone management and engineering planning. The processes studied include sediment transport, river discharge, nearshore currents, and estuarine flushing. Landsat data as well as aerial photography and surface data covering a four year period were analyzed to determine the variability of coastal processes. The specific objectives of this investigation included the determination of sediment transport parameters measureable in the Landsat data and application of this information to everyday coastal planning and construction. (Sinha-OEIS)
W78-12179

SUBLETHAL EFFECTS OF SUSPENDED SEDIMENTS ON ESTUARINE FISH,
Maryland Univ., Solomons. Natural Resources Inst.
J. M. O'Connor, D. A. Neumann, and J. A. Sherk, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 646, Price codes: A05 in paper copy, A01 in microfiche. Report to Army Coastal Engineering Research Center Technical Paper No. TP-77-3, February 1977. 90 p, 15 fig, 19 tab, 64 ref, 4 append. DACW72-71-C-0003.

Descriptors: *Estuaries, *Fish, *Suspended solids, *Maryland, *Dredging, Resources development, Baseline studies, Environmental effects, Water resources, Water pollution effects, Engineering, Outer Continental Shelf, Sublethal effects.

The effects, if any, of sublethal concentrations of suspended materials on the fish in estuarine systems were determined. Experimental sediment suspensions reproduced the concentrations frequently found during flooding and at dredging sites and dredged-material disposal sites. The suspensions were of natural sediment, obtained from the Patuxent River estuary, Maryland, or commercially available fuller's earth. The selected fish species inhabited ecologically different sections of the estuary; therefore, the overall reactions of each species were unique. Seven species of estuarine fish were exposed to fuller's earth and natural sediment suspensions for timed periods and hematological changes were noted. The effects of various concentrations of fuller's earth suspensions on white perch gill tissue were determined. Oxygen consumption rates of striped bass, white perch, and toadfish were measured in filtered river Patuxent River water and compared to consumption rates in filtered river water suspensions of fuller's earth or Patuxent River sediment. Fish showed signs of stress in response to suspended sediments in most of the experiments. Results indicate that sublethal concentrations of suspended solids can affect estuarine fish. (Sinha-OEIS)
W78-12183

PECULIARITIES OF BIOLOGICAL PRODUCTIVITY OF WATERS NEAR BIRD'S BAZAARS IN THE NORTH OF NOVAYA ZEMIYA (SOBENNOSTI BIOLOGICHESKOI PRODUKTIVNOSTI VOD BLIZ PTICHIKA BAZAROV SEVERA NOVOI ZEMLI, LENINGRAD, 1972),
Sovetskii Natsionalnyi Komitet po Provedeniyu Mezhdunarodnoi Biologicheskoi Programmy, Moscow (USSR).
A. N. Golvkin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 499-T, Price codes: A07 in paper copy, A01 in microfiche. Translation for the Fish and Wildlife Service, and the National Science Foundation, 1976. 130 p.

Descriptors: *Birds, *Arctic Ocean, *Ecosystems, *Baseline studies, Nutrients, Resources development, Water resources, Hydrology, Plankton, *Productivity, Outer Continental Shelf, USSR, Novaya Zemlya, Technical translations, Plotus alle.

The book contains the articles summarizing the material on hydrology, hydrochemistry, phyto- and zooplankton and marine colonial birds collected by the Murmansk Marine Biological Institute expedition during August 1967. The main purpose of these investigations is to give characteristics of the conditions that caused high biological production ensuring nourishment of numerous sea birds. The inverse connection of birds with marine biocoenosis is also analyzed--the influence of water fertilization by bird excrements upon water biological productivity. Data are given on the distribution of biogenic elements, phyto- and zooplankton in the region of the Arkhangelsk gulf and the Vilkitaskii bay of Novaya Zemlya. An estimation of the number of marine colonial bird is carried out in this region. Characteristics of the feeding relationships of little auks (Plotus alle) with a pelagic association are given. The book contains the original material characterizing scarcely explored regions and throwing light on some regularities of the organic matter circulation in the sea. (Sinha-OEIS)
W78-12184

DEEP OCEAN MINING ENVIRONMENTAL STUDY (DOMES). PHYTOPLANKTON & PRIMARY PRODUCTIVITY STUDIES; PRELIMINARY REPORT,
Texas A and M Univ., College Station. Dept. of Oceanography.
S. Z. El-Sayed, S. Taguchi, G. Fryxell, and K. Buck.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 699, Price codes: A04 in paper copy, A01 in microfiche. NOAA, Environmental Research Laboratories, Deep Ocean Mining Environmental Study (DOMES), Unpublished Manuscript No. 2, May 1976. 56 p, 19 fig, 10 tab, 10 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Mining, *Baseline studies, Standing crops, Environmental effects, Outer Continental Shelf, Ocean mining, Deep Ocean Mining Environmental Study(DOMES).

While the objectives of the post RP-8-OC-76 cruise report were primarily to present data, this report dwells more on the analysis and interpretation of that data. The first objective is to provide the baseline information on the phytoplankton community which will be necessary to evaluate post mining populations to determine what, if any, effects mining has on them. The parameters of standing crop and primary production are used to define the baseline population. The physiological state and efficiency of the organisms, determined from pigment ratios, cell counts and assimilation ratios as well as the depth of the pigment and primary production maxima, the amount of standing crop and production below the 1% light level and the presence or absence of seasonal changes in standing crop and primary production are all factors which will be used to characterize this pre-mining population. The second objective of the study is to predict in advance what effects mining will have upon the phytoplankton of the DOMES region. In evaluating post-mining operations the effect upon individual stations should be considered. These post-mining effects may be subtle in nature and not easily identified, for instance, species changes may have a major affect upon higher trophic levels but could produce no noticeable differences in chlorophyll or production. Any post-mining environmental studies should be as intensive and detailed as the preliminary studies. (Sinha-EIS)
W78-12185

DIURNAL AND SEASONAL FLUCTUATIONS OF ORGANISMS IN A NORTH FLORIDA ESTUARY,
Florida State Univ., Tallahassee. Dept. of Biological Science.
K. J. Livingston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 464, Price codes: A03 in paper copy, A01 in microfiche. Reprinted from: Estuarine and Coastal Marine Science, Vol. 4, p 373-400, 1976. 9 fig, 6 tab, 63 ref. SG-04-3-158-43.

Descriptors: *Aquatic life, *Estuaries, *Environmental effects, *Water pollution, *Florida, Seasonal variations, Diurnal, Bioindicators, Fish, Invertebrates, Outer Continental Shelf, Species diversity.

Monthly samples of demersal fishes and invertebrates were taken in an unpolluted, river-dominated estuary in north Florida (Apalachicola Bay) for a 2-year period. Various methods of analysis were used to determine adequate sample size for comparative analysis of the results. Several species richness and diversity indices were compared. Regular diurnal (24-h) and seasonal variations of such parameters were related to complex interactions which included river flow, salinity variations and temperature changes. Although there were some variations, a general pattern of an annual double peak of fish and invertebrate richness and diversity was noted. Nocturnal patterns were more clearly defined than diurnal ones. Relative dominance remained high, with a seasonal succession of dominant fish and invertebrate species. It was postulated that there was a constantly changing series of interactions of the various community components that precluded a single mechanism for the observed phenomena. Apalachicola Bay was seen as an unpolluted system that underwent considerable seasonal fluctuations of richness and diversity in response to extreme variations of natural (physical) functions. Such changes were stable over time, and this form of variation was seen as a considerable limitation to the general use of species diversity as an indicator of pollution and other man-induced activities in such estuarine systems. (Sinha-OEIS)
W78-12186

SIGNIFICANCE OF PHENOLIC COMPOUNDS IN THE DELAWARE ESTUARY,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
S. D. Faust, W. H. Clement, and G. T. Hunt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 755,

Price codes: A02 in paper copy, A01 in microfiche. Report to National Science Foundation, Research Applied to National Needs (RANN) for the project 'Petroleum Industry in the Delaware Estuary', May 1975. 14 p, 3 fig, 1 tab, 6 ref. NSF-GI42282.

Descriptors: *Estuaries, *Aquatic life, *Water pollution effects, *Phenolic pesticides, Fish, Toxicity, Oysters, Outer Continental Shelf, Delaware Estuary, Chlorophenols, Phenol compounds.

An examination of data shows levels of phenolics exist in the Delaware Estuary that may be harmful to aquatic fauna. Many samples taken from the Delaware Estuary exceeded the 0.02 mg/l level, and are therefore capable of inducing lesions in fish. Although only a limited investigation of muds has been made, it appears that the phenolics may accumulate in the estuary sediments and muds. The potential exists for release of these higher concentrations of phenolics to the overlying waters. Scavengers and benthic species may be affected by these larger amounts of phenolics in the muds. Results of the first year survey detect two zones of 'high' phenolic concentrations in the estuary: (1) the area from Palmyra, New Jersey to below Pettys Island; and (2) a broader zone extending from the Wilmington-Penns Grove area to below the Delaware and Chesapeake Canal. Below this zone lie the important oyster beds. The danger (to the oyster) exists in that these phenolics in the estuary may be chlorophenols. Phenolic concentrations existing now in the Delaware Estuary must be considered as significant levels. This is especially true since the exact nature of these phenolic materials are, at present, unknown. (Sinha-OEIS)
W78-12190

EFFECT OF THERMAL SHOCK ON DEVELOPMENTAL STAGES OF ESTUARINE FISH,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
J. M. Dean.
Available from the National Technical Information Service, Springfield, VA 22161 as SRO 869-2, Price codes: A02 in paper copy, A01 in microfiche. Report to Energy Research and Development Administration, December 1976. 12 p, 3 fig, 1 tab. ERDA-E(38-1)869.

Descriptors: *Estuaries, *Fish, *Thermal stress, *Environmental effects, Baseline studies, Water resources, Resources development, Thermal pollution, Outer Continental Shelf, Fundulus heteroclitus, Thermal pollution, Thermal shock, Heat pollution.

Present dogma would have it that the larval and juvenile stages of aquatic species are most sensitive to environmental perturbations. However, there is some evidence that this might not be consistent for all species. The present study has examined the response of the larval and juvenile stages of the estuarine fish Fundulus heteroclitus to acute thermal shock. (Sinha-OEIS)
W78-12191

INTERIM ENVIRONMENTAL SYNTHESIS OF THE NORTHEAST GULF OF ALASKA.
Science Applications, Inc., Boulder, CO.
For primary bibliographic entry see Field 6G.
W78-12192

THE ATTACHMENT OF ZYGOTES AND GERMLINGS OF HALIDRYS SILIQUOSA (L.) LYNGB. (PHAEPHYCEAE, FUCALES),
Newcastle-upon-Tyne Univ. (England). Dept. of Biology.
F. G. Hardy, and B. L. Moss.
Phycologia, Vol. 17, No. 1, p 69-78, 1978. 18 fig, 25 ref.

Descriptors: *Halidrys siliquosa, *Zygotes, *Germlings, *Attachment, *Sessile algae, *Intertidal areas, *Estuarine environments, Phaeophyceae, Fucales, Phaeophyta, Algae, Rhizoids, Cytological studies, Electron microscopy, Thalli, Water movement.

Mode of development of the phaeophyte sessile alga Halidrys siliquosa and its characteristic attachment mechanism were studied. In all species of Fucales permanent attachment is accomplished by rhizoids produced throughout the life of the plant and which eventually form the holdfast. As there is considerable water movement in intertidal habitats, the free-floating oospheres must sink and become attached to the substratum soon after fertilization or be either swept out to sea or cast up in the drift weed. The length of time for rhizoids to appear after fertilization varies among species. In H. siliquosa there is a lapse of several days before rhizoids are produced from the zygote. In order to remain attached to the substratum until this time, the zygote rapidly secretes and deposits rigid adhesive with associated adhesive with associated adhesive mucilages. The cell wall proper is laid down inside this zygote wall. A multicellular spherical germling develops and once the rhizoid system has formed, the zygote wall is shed from the thallus in the form of a cap. Four primary rhizoids are followed by the production of more rhizoids thereafter, resulting in the progressive build-up of the holdfast of the adult. For this study fertile H. siliquosa material was collected from rock pools at Beadnell, Northumberland, Great Britain between January and March. (Lynch-Wisconsin
W78-12199

THE MORPHOLOGICAL VARIATION OF PTEROCLADIA CAERULESCENS (GELIDIALES, RHODOPHYTA) IN HAWAII,
Hawaii Univ., Honolulu. Dept. of Botany.
B. Santelices.
Phycologia, Vol. 17, No. 1, p 53-59, 1978. 4 fig, 37 ref.

Descriptors: *Plant morphology, *Pterocladia caerulescens, *Seasonal, *Plant growth, *Water movement, *Light intensity, Vertical distribution, Intertidal areas, Subtidal areas, *Algae, Rhodophyta, Gelidiales, *Hawaii, Oahu(HI), Thalli, Tetraspores, Apices, Phenology, Fertility.

Growth patterns of the rhodophyte alga Pterocladia caerulescens correlated best with seasonal changes of water movement and light intensity in a phenological investigation of Hawaiian reef populations. Response varied with vertical distribution. In subtidal plants the main axes elongated July-December, a period of increased water movement and decreased light intensity. Following additive growth, tetraspore formation, shedding, and apical decay occurred, thus shortening the axes and reducing the number of branches. This annual process, combined with apparently continuous growth in the breadth of main axes in plants older than one year, results in morphologically different sterile and tetrasporangial thalli. In intertidal populations, main axes are shorter, narrower, and less branched than subtidal plants. Intertidal thalli could not be found after January, correlating with increased average daily emersion time, but began appearing again in April-May; from July to December they displayed growth and reproduction patterns similar to subtidal populations. No evidence of morphologivcal differences between sterile and tetrasporangial plants was found in the annual intertidal population. Sampling was carried out monthly over one year (July 1973-June 1974) at two localities: a shallow, flat reef on the windward side of Oahu, and an artificial wall on the leeward side of Oahu. Changes in biomass, thallus size, and fertility were recorded. (Lynch-Wisconsin)
W78-12200

A COMPARISON OF THE ZOOPLANKTON OF LAKE KAINJI AND OF THE RIVERS NIGER AND SWASHI,
Reading Univ. (England). Dept. of Zoology.
N. V. Clarke.
Hydrobiologia, Vol. 58, No. 1, p 17-23, 1978. 3 tab, 9 ref.

Descriptors: *Zooplankton, *Niger River, *Swashi River(Nigeria), *Lake Kainji(Nigeria), *Impoundments, *Abundance, Rivers, Lakes, Nigeria, Baseline studies, Crustaceans, Faunal lists, Rotifers, Copepods, Cladocerans, Species composition, Lotic environment.

Changes in zooplankton abundance and species composition following creation of Lake Kainji, Nigeria through impoundment of the Niger River in August 1968 were determined using samples taken from the lake, the Niger River, and the Swashi River, a tributary. Zooplankton at the site of the future lake were studied in August 1965, and sampling was again done in August 1968 and during 1974-75. Results showed much greater zooplankton development in Lake Kainji than in the rivers. The cladoceran Bosmina spp and the clanoid copepod Tropodiaptomus banforanus were relatively more abundant in the lake than in the rivers, while the reverse was true for the cladoceran Moina micrura and the rotifers Brachionus falcatus and B. caudatus. Decapod larvae of the river prawn were common in river samples in 1965, but unknown in the lake in 1974-75. Occurrence of insect larvae and nymphs, water mites, and fish larvae were greater in 1965 river samples than in the lake. The scarcity of plankton in the Niger River has been attributed to low nutrient concentrations and poor light penetration, but zooplankton development has also been reported to be poor in flowing waters compared with impoundments. In the Swashi River significant variations in relative abundance of zooplankton species were found along the course of the river, probably determined by streamflow and transparency. (Lynch-Wisconsin)
W78-12201

AN INTRODUCTION TO THE LIMNOLOGY OF THE FRIESIAN LAKES,
Limnological Inst., Oosterzee (Netherlands). Tjeukemeer Field Station.
For primary bibliographic entry see Field 5A.
W78-12202

DIEL FEEDING AND RESPIRATION RHYTHMS IN ZOOPLANKTON,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
W. S. Duval, and G. H. Geen.
Limnology and Oceanography, Vol. 21, No. 6, p 823-829, November 1976. 5 fig, 2 tab, 18 ref.

Descriptors: *Zooplankton, *Diel rhythms, *Feeding, *Respiration, *Biorhythms, British Columbia(Canada), *Canada, Lakes, Darkness, Dawn, Dusk, Oligotrophy, Eutrophication, Eunice Lake(B.C.), Deer Lake(B.C.), Babine Lake(B.C.).

The extent and generality of diel feeding and respiration rhythms of mixed and single-species zooplankton samples from Eunice, Deer, and Babine Lakes in British Columbia, Canada were examined in laboratory experiments conducted in darkness at constant temperature. Typically bimodal endogenous rhythms in respiration and feeding were demonstrated at 10-22C with maximum rates at dawn and dusk and lowest values near midday. Dawn and dusk respiration rates were an average of 2.3 times higher than during midday and feeding rates were 6.6 times higher. Rhythms were observed in zooplankton from both oligotrophic and eutrophic lakes, in cladocerans and copepods, and at different times of the year. Three feeding and five respiration experiments were conducted over four years, each consisting of six consecutive four-hour experiments with animals from one of the lakes. All tests but one involved mixed species. Average respiration decreased by 1.9 times from dawn to midday, then increased by 2.7 times from noon to dusk. Average

feeding decreased by 6.1 times from dawn to noon, while noon to dusk rates increased by a factor of 7.1. As precise timing of maxima was not possible, observed changes in amplitude at dawn and dusk may be underestimated. Results support the hypothesis that timing of maxima is associated with the onset of dawn and dusk. (Lynch-Wisconsin)
W78-12203

INTERACTIONS BETWEEN SEDIMENTS AND OVERLYING WATERS IN AN EXPERIMENTALLY EUTROPHIED PRECAMBRIAN SHIELD LAKE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler, R. Hesslein, and G. Kipphut.
Freshwater Institute Reprint No. 487; Interactions Between Sediments and Fresh Water; Proceedings of an international symposium, Amsterdam, September 1976; p 235-243. 6 fig, 4 tab, 30 ref.

Descriptors: *Sediment-water interfaces, *Eutrophication, *Nutrient flux, *Lake 227(Ontario Canada), Lakes, Precambrian Shield, Canada, Ontario(Canada), Nutrients, Phosphates, Nitrogen, Dissolved oxygen, Hypolimnion, Model studies, Tracers.

Study of the role of sediments in the nutrient economy of Lake 227, a small artificially enriched Precambrian Shield lake in the Experimental Lakes Area of northwestern Ontario showed that: (1) Pore water gradients of phosphorus were absent or weak and concentrations were low. (2) Sediments did not release significant amounts of phosphorus to overlying waters under either oxic or anoxic conditions, as confirmed by mass-balance techniques. (3) Almost all sediment phosphorus was bound to the particulate fraction. (4) Steep gradients of ammonium-nitrogen in pore waters indicated that over 50% of summer epilimnetic total nitrogen could potentially be replaced from littoral sediments each day, though nutrients released from the hypolimnion or its sediments were not important in the maintenance of mid-summer epilimnetic algal blooms because vertical eddy diffusion in the thermocline region was less than .0001 sq cm/sec. Horizontal rather than vertical water movements were chiefly responsible for nitrogen and carbon distribution in the water column. Lead-210, cesium-137, radium-226, and added nutrients were used to measure recent sedimentation rates and mixing depths. Sedimentation averaged 1.0 mm/yr, and recently deposited material was found mixed to a depth of 5-10 cm. The half-time for establishing a new equilibrium between the sediment mixed layer and overlying water is estimated at 35 years. Data for this study covers 1969-75. (Lynch-Wisconsin)
W78-12204

INFLUENCES OF LIGHT REGIME ON POSTEMBRYONIC DEVELOPMENT IN TWO STRAINS OF DAPHNIA PULEX,
Dartmouth Coll., Hanover, NH. Dept. of Biological Sciences.
P. L. Starkweather.
Limnology and Oceanography, Vol. 21, No. 6, p 830-837, November 1976. 3 fig, 2 tab, 35 ref.

Descriptors: *Daphnia pulex, *Light, *Darkness, *Photocycles, *Growth stages, *Animal growth, Zooplankton, Cladocerans, Crustaceans, Ponds, Lakes, Molting, Instars, Nutrients, Eutrophication.

The development rates of preadults of two strains of the cladoceran Daphnia pulex reacted differently to variations in light regime. One strain, from a small pond at Ithaca, New York, developed more slowly when reared in continuous illumination or continuous darkness than when held in a photocycle. Relative length of the light and dark periods in 24-hr photocycles had no effect on development rate. The second strain, isolated from a large eutrophic lake near Saratoga Springs, New York, developed at comparable rates in both photocycle and continuous light regimes, but differed in primaparous instar timing. These effects were probably independent of nutritional differences. Both strains were reared for several parthenogenetic generations in the laboratory, and single females of each were selected to start cloned populations. The daphnids were fed axenically grown Chlamydomonas reinhardti; stocks of each clone were maintained under photocycles of LD 16:8 at 12C. Each animal in a cohort was observed once or twice daily for 5-6 instars, and individual carapace molts were recorded. Animals held in darkness were observed for a maximum of 10 minutes daily using a deep-red safelight. It is possible that continuous darkness or continuous illumination inhibits feeding and produces starvation-mediated retardation in the pond strain. (Lynch-Wisconsin)
W78-12205

PRODUCTION OF EPIBENTHIC SALT MARSH ALGAE: LIGHT AND NUTRIENT LIMITATION,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
C. D. Van Raalte, I. Valiela, and J. M. Teal.
Limnology and Oceanography, Vol. 21, No. 6, p 862-872, November 1976. 9 fig, 1 tab, 36 ref. NSF GA-28272, GA-28365, and GA-39722.

Descriptors: *Limiting factors, *Algae, *Light, *Nutrients, *Primary productivity, *Salt marshes, Great Sippewissed Marsh(MA), Massachusetts, Fertilizers, Urea, Phosphates, Nitrogen, Phosphorus, Seasonal, Benthic flora, Marsh plants, Grasses, Beneficial use, Sludge disposal, Model studies, Carbon radioisotopes.

Epibenthic algal production on test plots in Great Sippewisset Marsh, a salt marsh at Falmouth, Massachusetts was increased by high dosages of mixed fertilizer (25.2 g/sq m/wk), but not by treatment with urea or phosphate. The mix was 10% nitrogen, 6% phosphorus, and 4% potassium dried from secondary treatment plant sludge. Production followed a consistent seasonal pattern, with short-lived peaks in spring and fall. Algal production at the marsh surface was limited by shading from the marsh grass canopy; production of the grasses was also increased by fertilization. Additional plots were enriched with three levels of nitrogen, suspected as the limiting nutrient, to separate effects of light and nutrients; three levels of canopy cover were provided. Algal production was reduced by the shading and increased nitrogen fertilization. Predictions using a light-limitation model of epibenthic production compared well with observed measurements when grasses were dormant, but during the grass growing season the predicted production rate was higher than that observed. Fertilization was largely carried out at low tide on the plots, 10 m in radius. Mixed fertilizers were broadcast biweekly May-November at two levels, 25.2 and 8.4 g/sq m/wk. Urea (46% nitrogen by wt) was added at 5.6 g/sq m/wk. Phosphate granules, 20% phosphorus by wt, were added at 6.5 g/sq m/wk. A carbon-14 method was used to measure algal production. (Lynch-Wisconsin)
W78-12206

COMPARATIVE FINE-STRUCTURAL STUDIES ON FIVE MARINE SPECIES OF PYRAMIMONAS (CHLOROPHYTA, PRASINOPHYCEAE),
Washington Univ., Friday Harbor. Friday Harbor Labs.
R. E. Norris, and R. N. Pienaar.
Phycologia, Vol. 17, No. 1, p 41-51, 1978. 22 fig, 1 tab, 16 ref. NSF-GA-27310.

Descriptors: *Pyramimonas amylifera, *Cytological studies, *Scales, *Plant morphology, *Classification, *Identification, Algae, Phytoplankton, Pyramimonas parkeae, Pyramimonas disomata, Pyramimonas orientalis, Pyramimonas plurioculata, Chlorophyta, Electron microscopy, Washington, Lagoons, Oceans, Flagellates, Speciation.

The ultrastructure of five marine species of the chlorophyte genus Pyramimonas collected in waters surrounding San Juan Island, Washington was studied, with particular attention to body and flagellar scales and other cell details (such as pyrenoid structure) useful in delineating species. An electron microscope was essential for differentiating many species. Studied were Pyramimonas amylifera, P. parkeae, P. aff. disomata, P. orientalis, and P. aff. plurioculata. Surface water samples were collected from Jakle's Lagoon, Old Town Lagoon, Log Lagoon, and Argyle Lagoon in September 1974 during an unusually dry and warm period, and in November 1974 after rain and wind had filled the lagoons. Cells were cultured in Provasoli's medium. Pyramimonas has a more complex structure than most green algal flagellates, in large part due to production of six types of scales laid down in precise layers and positions on the cells. Cell shape and size are variable among species, but are often unreliable as distinguishing features, especially among smaller species. Species which can be identified using only light microscopy include P. parkeae, P. amylifera, and P. grossii. For other species electron microscopy is needed to discern the cell scales, which, when present, are often distinctive for a species. Scales in the intermediate layer on the cell body are especially useful. This paper includes a systematic discussion of the species. (Lynch-Wisconsin)
W78-12207

GROWTH IN VARYING CULTURE CONDITIONS OF EMBRYOS OF THREE HAWAIIAN SPECIES OF SARGASSUM (PYAEOPHYTA, SARGASSACEAE),
British Columbia Univ., Vancouver. Dept. of Botany.
R. E. De Wreede.
Phycologia, Vol. 17, No. 1, p 23-31, 1978. 2 fig, 10 tab, 9 ref.

Descriptors: *Sargassum echinocarpum, *Plant growth, *Cultures, *Embryonic growth stage, *Salinity, *Water temperature, Sargassum obtusifolium, Sargassum polyphyllum, Hawaii, Phaeophyta, Atolls, Intertidal areas, Phenology, Thalli, Rhizoids, Seasonal, Life history studies, Sargassaceae.

In order to clarify factors determining the seasonality and distribution of three Hawaiian species of Sargassum (Phaeophyta, Sargassaceae), embryos were grown 20 days at five salinities and four temperatures in seawater from four sources. Species investigated were Sargassum echinocarpum, S. obtusifolium, and S. polyphyllum. Elongation and expansion of leaf initials occurred in seawater from all sources except from outer reef surface water from Eniwetok Atoll. The other media were surface and deep (700 m) water from 16 km off the leeward coast of Oahu, and the same deep water enriched with Provasoli's medium (with vitamins omitted). Although growth occurred under almost all conditions, there was great variation in growth among the three species. Maximum elongation occurred most frequently at 24C and 30-35% salinity, typical of Hawaiian winter and early spring coastal waters when these Sargassum species are reproductive. At higher temperatures and lower salinities, which generally occur in summer and early fall in shallow inshore areas, growth was usually less. Variation in only one factor, with the other factor kept optimum, also decreased growth. Failure to grow in the Eniwetok Atoll medium reflects the general absence of Sargassum from Micronesian atoll waters, due possibley to iron limitation or lack of chelating agents in atoll waters. (Lynch-Wisconsin)
W78-12208

AN ASSESSMENT OF PRINCIPAL COMPONENT ANALYSIS FOR DESCRIPTION OF PHYTOPLANKTON PERIODICITY IN LAKE WINGRA,
Wisconsin Univ.-Madison. Lab. of Limnology.
S. M. Bartell, T. F. H. Allen, and J. F. Koonce.
Phycologia, Vol. 17, No. 1, p 1-11, 1978. 4 fig, 4 tab, 37 ref. NSF AG-199, DEB 76-00761.

Descriptors: *Principal component analysis, *Phytoplankton, *Ordination, *Lake Wingra(WI), *Seasonal, *Analytical techniques, *Statistical methods, Algae, Wisconsin, Madison(WI), Lakes, Species composition, Succession, Abundance, Biomass, Periodicity, Ice cover, Biological communities, Eutrophication.

Applicability of principal component analysis (PCA), an ordination approach, to the study of seasonal changes in phytoplankton species composition, was tested with data from Lake Wingra, Madison, Wisconsin. Other aspects evaluated were whether PCA can be used to find cause-effect relationships between species change and physico-chemical environmental changes, and the drawbacks of PCA in the study of species replacement. Compositional changes in Lake Wingra were examined during two sampling periods: (1) March 1970-April 1971 (56 samples), and (2) April 1972-August 1973 (58 samples). Analysis demonstrated a seasonal component in community composition, and summarized the dynamics of seasonal change in phytoplankton species composition. Two compositionally-stable periods (winter and summer) were found, separated by distinct spring and autumn transitional periods during which composition changed rapidly. A major advantage of the ordination approach is simultaneous consideration of all sampled species in describing community structures, possible with the chronological axis approach only for systems with very few species. Presence data, transformed as described in this paper, are concluded to provide sufficient resolution for summarizing seasonal changes in phytoplankton when treated by PCA. The specified transformations emphasize the dynamics of less-common species, normally obscured in quantitative analyses. (Lynch-Wisconsin)
W78-12209

CONTRIBUTIONS TO THE ROTIFER OF WEST BENGAL. II. GENUS LEPADELLABORY DE ST. VINCENT, 1826,
Zoological Survey of India, Calcutta.
B. K. Sharma.
Hydrobiologia, Vol 58, No 1, p 83-88, 1978. 3 fig, 20 ref.

Descriptors: *Lepadella, *Rotifers, *West Bengal, *India, *Classification, Calcutta(India), Zooplankton.

Fourteen taxa (13 species and one form) of rotifers of the genus Lepadella collected in Calcutta and environs neighboring regions of West Bengal, India are described systematically. Seven are reported for the first time in India, and the study includes descriptions of one new species and one new form. Only 11 species of Lepadella have previously been reported for the Indian subcontinent, and very little is known regarding distribution. With the current study, 14 lepadellid rotifers are known from West Bengal, and 17 taxa (16 species and one form) for India. The paper includes drawings made using a camera ludida. Taxa described are: Lepadella acuminata, L. aspicora, L. aspida, L. ehrenbergii, L. heterostylata, L. imbricata, L. ovalis, L. ovalis f. larga (new form), L. patella, L. quadricarinata, L. rhombiodes, L. rhombiodula, L. triprojectus (new form), and L. triptera. (Lynch-Wisconsin)
W78-12210

CULTURE STUDIES ON MARINE ALGAE FROM WEST GREENLAND, III. THE LIFE HISTORIES AND SYSTEMATIC POSITIONS OF POGOTRICHUM FILIFORME AND LEPTONEMATELLA FASCICULATA (PHAEOPHYCEAE),
Institute for Sporeplanter, Copenhagen (Denmark).
P. M. Pedersen.
Phycologia, Vol 17, No 1, p 61-68, 1978. 19 fig, 25 ref.

Descriptors: *Pogotrichum filiforme, *Leptonematella fasciculata, *Classification, *Litosiphon filiformis, *Life history studies, *Plant morphology, Phaeophyceae, Phaeophyta, Algae, Marine algae, Cultures, Litosiphon pusillus, Pogotrichaceae, Greenland, Denmark, Plurilocular sporangia, Uniocular sporangia, Thalli, Plant growth, Sporangia, Arctic.

As part of a revision of the algal order Dictyosiphonales (Phaeophyta), the systematic positions of Pogotrichum filiforme (Litosiphon filiformis) and Leptonematella fasciculata were assessed through life history studies. Comparison of the species referred to as Litosiphon filiformis with the type species of Litosiphon (L. pusillus) shows differences sufficient to warrant resurrection of the old generic name Pogotrichum for this species, to be called P. filiforme. A new family, Pogotrichaceae, is proposed to classify algae of this type at the head of the brown algal system. Both P. filiforme and Leptonematella fasciculata were studied under various sets of culture conditions through several successive generations. Clones of the two species were established in culture using plants from West Greenland. In Pogotrichum a simple life history has been found within swarmers from the plurilocular sporangia in the prostrate and erect parts of the thalli giving rise to new plants of similar morphology. Uniocular sporangia in Leptonematella fasciculata were found in culture for the first time, occurring only at low temperature and short day conditions. The development, morphology, and life history of L. fasciculata are rather similar to that of Litosiphon filiformis, suggesting a closer taxonomic relationship. As the genus Litosiphon had never before been typified, L. pusillus is here designated the type species. (Lynch-Wisconsin)
W78-12211

EFFECTS OF THE POLYCHLORINATED BIPHENYL AROCLOR 1254 ON GROWTH, SURVIVAL, AND BONE DEVELOPMENT IN BROOK TROUT (SALVE-LINUS FONTINALIS),
Fish and Wildlife Service, Columbia, MO. National Fisheries Research Lab.
W. L. Mauck, P. M. Mehrle, and F. L. Mayer.
Journal of the Fisheries Research Board of Canada, Vol 35, p 1084-1088, 1978. 4 tab, 29 ref.

Descriptors: *Aroclors, *Brook trout, *Fish eggs, *Toxicity, Polychlorinated biphenyls, Fish physiology, Animal metabolism, Growth stages, Growth rates, Fry, Mortality, Enzymes, Biochemistry, Vitamins, Path of pollutants, Water pollution effects, *Collagen, *Hydroxyproline, Bioaccumulation.

Eyed eggs of brook trout were exposed to Aroclor 1254 (0.43-13 microg/l) for 10 d before hatching and the fry for 118 d after hatching. Median hatching time, egg hatchability, and sac fry survival were not affected by Aroclor 1254 concentrations greater than or equal to 1.5 microg/l, but no significant differences in growth of surviving fry were observed at the end of the 118 d exposure. Mortality occurred in fry exposed to 13 microg/l within 48 d of exposure, and after 118 d of exposure significant mortality occurred in the three highest concentrations. Biochemical constituents in brook trout fry related to growth and development were affected by Aroclor 1254. Hydroxyproline and vitamin C concentrations in sac fry (38 d old) were decreased by greater than or equal to 3.1 microg/l. Backbone development in fry exposed for 118 d was signficantly altered. Collagen was significantly decreased in the backbone as was the phosphorus concentration, while the calcium concentration increased. Hydroxyproline concentration in collagen isolated from the backbone was also decreased. The no-effect exposure concentration on backbone composition was less than 0.43 microg/l. Whole body residues in fry exposed for 118 d were 40,000 to 47,000 times the concentration in water. (EIS-Deal)
W78-12236

LABORATORY EXPERIMENTS ON FEEDING, GROWTH, AND FECUNDITY OF AND EFFECTS OF CADMIUM ON PSEUDODIAPTOMUS,
Skidway Inst. of Oceanography, Savannah, GA.
G. A. Paffenhofer, and S. C. Knowles.
Bulletin of Marine Science, Vol 28, No 3, p 574-580, 1978. 3 fig, 1 tab, 19 ref.

Descriptors: *Cadmium, *Reproduction, *Copepods, Growth rates, Animal behavior, Aquatic animals, Toxicity, Water pollution effects, Environmental effects, Zooplankton, Estuarine environment, Phytoplankton, Metals, *Tissue analysis.

The influence of cadmium on feeding, growth, and food conversion, and reproduction of the estuarine copepod Pseudodiaptomus coronatus was studied at Cd-concentration of 5 microg x l-1. Grazing, ingestion, growth rates, and gross efficiencies did not differ. The only detectable effect was a reduction of the daily reproductive rate to 50% of copepods not exposed to Cd. (EIS-Deal)
W78-12237

137CS AND POTASSIUM IN FISH AND LITTORAL PLANTS FROM A HUMUS-RICH OLIGOTROPHIC LAKE 1961-1976,
Lund Univ. (Sweden). Dept. of Radiation Physics.
For primary bibliographic entry see Field 5B.
W78-12238

RECHERCHES DE POLLUANTS CHIMIQUES DANS LE TISSU GRAISSEUX'D UN DAUPHIN ECHOUE SUR LA COTE MEDITERRANEENNE (CHEMICAL POLLUTANTS IN BLUBBER TISSUE OF A DOLPHIN AGROUND ON THE MEDITERRANEAN COAST),
Aix-Marseille-2 Univ. (France). Lab. de Biologie Marine.
For primary bibliographic entry see Field 5B.
W78-12240

THE USE OF FISH AS A BIOLOGICAL SENSOR FOR TOXIC COMPOUNDS IN POTABLE WATER,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
For primary bibliographic entry see Field 5A.
W78-12241

EFFECTS OF A LIGNOSULFONATE-TYPE MUD ON DEVELOPMENT OF EXPERIMENTAL ESTUARINE MACROBENTHIC COMMUNITIES,
Environmental Research Lab., Gulf Breeze, FL.
M. E. Togatz, J. M. Ivey, H. K. Lehman, and J. L. Ogelsby.
Northeast Gulf Science, Vol. 2, No. 1, p 35-42, 1978. 1 fig, 3 tab, 22 ref.

Descriptors: *Drilling fluids, *Benthic fauna, Mud, Exploration, Oil industry, Estuarine environment, Plankton, Annelids, Mollusks, Water Pollution effects, Environmental effects, Biological communities, Drilling fluids, *Arthropods, *Coelenterates.

Drilling mud, as used in exploratory drilling for oil offshore, affected the composition of estuarine communities that developed from planktonic lar-

vae in aquaria containing sand and flowing estuarine water. Aquaria contained: sand only; a mixture (by volume) of 1 part mud and 10 parts sand; 1 part mud and 5 parts sand; or sand covered by 0.2 cm mud. For all environments, annelids, mollusks, arthropods, and coelenterates were the numerically dominant phyla collected in a 1 mm mesh seive after eight weeks exposure. Exposure to concentrations of drilling mud reduced not only the number of individuals, but also the frequency of occurrence of macrobenthic species. Thus, the average number of annelid species in 1 part mud: 5 parts sand aquaria or in mud-covered aquaria was significantly less than in control aquaria. The average number of arthropod species per aquarium was also significantly less in the mud-covered exposure than in the control. Discharge of large quantities of drilling mud at levels tested in the laboratory could adversely affect the colonization of various substrata by benthic animals in nature. (EIS-Deal)
W78-12243

BIODEPOSITED TRACE METALS AND MINERAL CONTENT STUDIES OF SOME TROPICAL MARINE ALGAE,
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
For primary bibliographic entry see Field 5B.
W78-12244

SUMMARY ANALYSIS OF THE NORTH AMERICAN (U.S. PORTION) OECD EUTROPHICATION PROJECT: NUTRIENT LOADING--LAKE RESPONSE RELATIONSHIPS AND TROPHIC STATE INDICES,
Texas Univ., at Dallas, Richardson. Center for Environmental Studies.
W. Rast, and G. F. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 984, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/3-78-008, Jan 1978; EPA; Corvallis Environmental Research Laboratory, Oregon. 455 p, 88 fig, 41 tab, 227 ref, 2 app. 1 BA608, R803356-01-0, R-803356-01-3.

Descriptors: *United States, *Lakes, *Eutrophication, *Trophic level, *Vollenweider models, *Nutrients, Water quality indices, Organization for Economic Cooperation and Development, Impoundments, Hydraulic residence time, Depth, Phosphorus, Chlorophyll, Nitrogen, Secchi disks, Model studies, Forecasting, Land use, Watersheds(Basins), Nutrient removal, Lake restoration, Water pollution control, Phytoplankton, Algae, Primary productivity.

A critical review of 21 studies of enriched bodies of water in the United States has been prepared for the eutrophication program of the Orgaization for Economic Cooperation and Development. The reports, published separately, analyze the response of 37 lakes and impoundments and one estuary to nutrient loading. This report reviews overall relationships, with particular emphasis on evaluating the Vollenweider nutrient load-trophic state formulations based on phosphorus loading as a function of mean depth/hydraulic residence time. The Vollenweider model correlated well with trophic classifications assigned by US-OECD investigators. Good correlation was also found between phosphorus loading (normalized as to hydraulic residence time and mean depth). Phosphorus and nitrogen loads were generally within a factor of + or -2 of loads predicted on the basis of average nutrient cncentrations in the bodies of water and land use in watersheds. Relationships developed in this study can be used to predict improvement in water quality which will result from reduction of phosphorus inputs to a phosphorus-limited water body. A new trophic state index system enables wate managers to calculate optimum phosphorus loadings to yield a certain chlorophyll level and water clarity. This sytem is based on actual vs permissible phosphorus loading as defined in the Vollenweider model. (Lynch-Wisconsin)
W78-12245

DISTRIBUTION AND IMPORTANCE OF PHYTOPLANKTON IN THE ATCHAFALAYA BASIN,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
S. C. Hern, W. D. Taylor, L. R. Williams, V. W. Lambou, and M. K. Morris.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 544, Price codes: A10 in paper copy, A01 in microfiche. Publication No. EPA-600/3-78-001, Jan. 1978. 194 p, 8 fig, 9 tab, 17 ref, 1 append.

Descriptors: *Atchafalaya Basin(LA), *Phytoplankton, *Distribution, *Species composition, *Species diversity, *Water quality indices, Eutrophication primary productivity, Algae, Louisiana, River basins, Rivers, Bays, Lakes, Marshes, Lake Verret(LA), Pat Bay(LA), Data collections, Diversity indices, Trophic level, Abundance, Habitats, Suspended solids, Diatoms, Floral lists.

A 1974-75 study of Louisiana's Atchafalaya Basin concludes that: (1) phytoplankton play a minor role in the basin's overall productivity due to high suspended sediments concentrations; (2) phytoplankton production was nearly an order of magnitude greater in three areas studied outside the basin than within the basin; and (3) diatoms and flagellates dominated algae in the basin, while flagellates and cyanophytes dominated algae outside the basin. During the study 120 stations were samples in the Atchafalaya Basin; from 86 samples examined, 107 genera and 287 species and varieties of algae were identified. For comparison, three areas outside the basin proper were sampled: a freshwater marsh south of Morgan City, Pat Bay, and Lake Verret. Data were analyzed using various water quality indices, including Ntygaard's trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices and abundance indices. Phytoplankton production was significantly lower in inlet waters than in the rest of the basin. Diatoms (especially centric diatoms) were the most abundant algal group in the study. Dominant genera, in order, wee Melosira, Cryptomonas, Oscillatoria, Skeletonema, and Nitzschia. Data are presented in an extensive appendix, and lists are given of phytoplankton occurrence and abundance by species and genera. (Lynch-Wisconsin)
W78-12246

PHYTOPLANKTON SAMPLING IN QUANTITATIVE BASELINE AND MONITORING PROGRAMS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5A.
W78-12247

DISTRIBUTION OF PHYTOPLANKTON IN DELAWARE LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
S. C. Hern, J. W. Hilgert, V. W. Lambou, F. A. Morris, and M. K. Morris.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 697, Price codes: A03 in paper copy, A01 in microfiche. Publication No. EPA-600/3-78-027, January 1978. 33 p, 4 tab, 11 ref, 1 append.

Descriptors: *Delaware, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Ponds, Bioindicators, Algae, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, National Eutrophication Survey, Killen Pond(DE), Moores Lake(DE), Noxontown Pond(DE), Silver Lake(DE), Williams Pond(DE), Trussum Pond(DE).

Phytoplankton species composition and abundance were determined for six Delaware lakes and ponds; in addition, trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed were Killen Pond, Moores Lake (Pond), Noxontown Pond, Silver Lake, Williams Pond, and Trussum Pond (Moores Pond). Data are summarized by lake in an appendix containing alphabetical lists of phytoplankton species with concentrations of each by sampling data, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer indices incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, and one with 20 species. (Lynch-Wisconsin)
W78-12248

GUIDELINES FOR ZOOPLANKTON SAMPLING IN QUANTITATIVE BASELINE AND MONITORING PROGRAMS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5A.
W78-12249

A MODEL FOR SOLAR RADIATION CONVERSION TO ALGAE IN A SHALLOW POND,
Purdue Univ., Lafayette, IN. School of Mechanical Engineering.
For primary bibliographic entry see Field 3E.
W78-12270

SALMONELLA SEROTYPES ISOLATED FROM THE AQUATIC ENVIRONMENT (WABASH RIVER, INDIANA, 1973-1976),
Purdue Univ., Lafayette, IN. Dept. of Veterinary Microbiology, Pathology and Public Health.
E. V. Morse, M. A. Duncan, and E. P. Myhrom.
The American Journal of Veterinary Research, Vol. 39, No. 4, April 1978, p 717-719. 1 tab, 12 ref. OWRT B-076-IND(3).

Descriptors: *Salmonella, *Fish, *Mussels, Water pollution effects, *Indiana, Pollutant identification, *Wabash River(Ind).

During 1973-1976, 833 isolations of salmonella were made from the aquatic biosphere of the Wabash River, Lafayette, Ind. Of the isolants, 643 were definitively serotyped. Salmonella typhimurium represented 34.4% of the cultures. Salmonella eimsbuettel previously had not been recognized in Indiana. A total of 35 serotypes and 1 untypable group C1 was obtained from the aquatic samples, ie, river water, river bottom sediment, fish, and mussels. Most of the isolants were presumed to be of human origin, because many samplings were made in close proximity to sewage treatment plant outfalls. During the survey period, epidemic salmonellosis had not been reported for the Lafayette-West Lafayette metropolitan area.
W78-12272

EXPERIMENTAL SALMONELLA INFECTIONS IN CRASSIUS AURATUS (GOLDFISH),
Purdue Univ., Lafayette, IN. Dept. of Veterinary Microbiology, Pathology, and Public Health.
E. V. Morse, D. E. Greenwood, E. P. Meyers, V. L. Anderson, and M. A. Duncan.

Journal of Environmental Science and Health A 13(4). 1978, p 325-335. 2 tab, 8 ref. OWRT B-076-IND(4).

Descriptors: *Salmonella, Salmonellosis, Water pollution effects, Pollutant identification, *Goldfish.

C. auratus, the common goldfish, has been experimentally infected with Salmonella typhimurium, isolated from river fishes, and S. typhimurium var. copenhagen, cultured from a pig. Infections had a duration of at least 91 days. Salmonellae colonized in the viscera of the fish and were in all probability shed in their feces. Fewer of the bacteria were present in the environmental water than were present within the fish during the period of the experiment. This finding confirms that colonization and multiplication of the Salmonella within the fish viscera had occurred.
W78-12273

EFFECTS OF SKI AREA DEVELOPMENT AND USE ON STREAM WATER QUALITY OF THE SANTA FE BASIN, NEW MEXICO,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-12277

DYNAMIC COPPER BALANCE IN A FRESHWATER LAMELLIBRANCH SENTINEL: EFFECTS OF SUSPENDED MATTER (IN FRENCH),
Unite Enseign. Rech. Sci. Lab. Ecol. Biol. Gen., Limoges, Fr.
For primary bibliographic entry see Field 5B.
W78-12283

CHARACTERISTICS OF PREDICTING SANITARY CONDITIONS OF WATER USE BY THE POPULATION IN NEW ECONOMIC AREAS IN THE EXAMPLE OF THE CENTRAL REGION OF THE BAIKAL-AMUR RAILWAY (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny, Moscow.
L. S. Gurvich, Yu. V. Novikov, and S. I. Plitman.
Gig Sanit (8), p 11-15, 1977.

Descriptors: *Pollutant identification, Water quality standards, Public health, Shigella, Water pollution effects, Bacilli, Enterococci, Enteroviruses, Picornaviruses, Russian-SFSR, USSR.

Data were obtained on the sanitary conditions (presence of intestinal bacilli, enterococci, Shigella, enteroviruses) of water used by human populations in newly developed areas near the Baikal-Amur railway (Russian SRSR, USSR). Methods were formulated for predicting sanitary conditions of these waters.--Copyright 1978, Biological Abstracts, Inc.
W78-12284

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF TRACE METALS IN SCANDINAVIAN WATERS. II. LEAD, IRON AND MANGANESE,
Uppsala Univ. (Sweden). Inst. of Zoology.
D. J. H. Phillips.
Marine Biology, Vol 46, No 2, 1978, p 147-156, 2 fig, 2 tab, 46 ref.

Descriptors: *Environmental effects, *Water pollution, Bioindicators, Trace elements, Iron, Lead, Manganese, Mussels, Absorption.

The indicator ability of the mussel for lead, iron and manganese was tested by considering local variations in relation to known industrial sources. Overall concentration profiles for lead and iron were similar with higher concentrations of each metal being evident in mussels from the low-salinity regions. Concentrations of manganese followed the same trend but the trend was weaker. Manganese concentrations were also unexpectedly high in some isolated locations in comparison to those of lead and iron. It was concluded that the mussel is an effective bioindicator for lead and iron but that its indicator ability for manganese is uncertain. (Chilton-ORNL)
W78-12288

BALANUS AMPHITRITE (CIRRIPEDIA: THORACICA)-A POTENTIAL INDICATOR OF FLUORIDE, COPPER, LEAD, CHROMIUM AND MERCURY IN NORTH ADRIATIC LAGOONS,
Instituto di Biologia del Mare, Venice (Italy).
A. Barbaro, A. Francescon, B. Polo, and M. Bilio.
Marine Biology, Vol 46, No 3, 1978, p 247-257, 1 fig, 7 tab, 48 ref.

Descriptors: *Environmental effects, *Water pollution, Bioindicators, Fluoride, Copper, Lead, Chromium, Mercury, Mollusks, Barnacles, Balanus amphitrite.

Results of this study showed that the barnacle used as a test animal has a high capacity to take up and retain fluoride (138 to 312 ppm dry weight), a considerable predisposition to accumulate copper (41 to 109 ppm) and lead (7.1 to 11.7 ppm) and a lower capacity for accumulation of chromium (2.10 to 3.89 ppm) and mercury (0.96 to 1.35 ppm). It was concluded that B. amphitrite possesses most of the characteristics considered essential for a biological indicator but that more research needs to be done in the area of response time of the barnacle to changes in environmental level. (Chilton-ORNL)
W78-12289

FACTORS AFFECTING METHYL AND INORGANIC MERCURY DYNAMICS IN MUSSELS AND SHRIMP,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
S. W. Fowler, M. Heyraud, and J. La Rosa.
Marine Biology, Vol 46, No 3, 1978, p 267-276, 5 fig, 5 tab, 26 ref.

Descriptors: *Environmental effects, *Water pollution, Mercury, Absorption, Mussels, Shrimp, Temperature, Methyl mercury, Bioaccumulation.

Investigations showed that methyl mercury was accumulated from both food and water to a greater extent than inorganic mercury by Mytilus galloprovincialis and Lysmata seticaudata. Small mussels tended to concentrate more mercury than larger ones. Higher temperatures tended to enhance both accumulation and elimination of mercury but the effect of temperature was relatively small. Methyl mercury was eliminated more slowly than the inorganic form by both species. Observation of mussels in their natural environment showed a more rapid metal turnover than for those observed in the laboratory. (Chilton-ORNL)
W78-12291

TOXIC EFFECT OF COPPER STUDIED BY ELECTRO-CARDIOGRAM IN CARP (CYPRINUS CARPIO) (IN FRENCH),
Ecole National Superieure Agronomique de Toulouse (France). Lab. de Ichtyologie Appliquee.
R. Labat, A. Chatelet, and J. Kugler.
Bull Soc Hist Nat Toulouse 112(1/2), p 188-198, 1976.

Descriptors: *Toxicity, *Carp, Electrocardiograms, *Copper, *Pollutant identification, Temperature, Water pollution effects.

The effect of 0.5, 1.0, and 1.5 ppm of Cu was tested in 200 carp at temperatures ranging 8-25 degrees C. ECG was taken every hour for the first 3 h, and then every 3 h. During the 1st h bradycardia appeared and between the 3rd and 6th h cardiac frequency stabilized but remained below initial levels. At 1.0 ppm fish survived for 48 h, but all died before the end of 72 h. ECG showed problems in conduction and repolarization which were increased with a rise in temperature.--Copyright 1978, Biological Abstracts, Inc.
W78-12293

EFFECTS OF ROTENONE TREATMENT ON THE ZOOPLANKTON IN A SMALL LAKE (IN NORWEGIAN),
Oslo Univ. (Norway). Dept. of Limnology.
D. Hongve.
Vatten 33(1), p 39-42, 1977.

Descriptors: *Rotenone, *Zooplankton, *Lakes, *Poisons, Fish control agents, Crustaceans, Piscicides, Larvae, Diptera, Fish food organisms, Water pollution effects, Chaoborus-flavicans, Crustacea, Extermination, Fish, *Norway(Southeast).

The small lake Ljogodttjern (Akershus, southeast Norway) was treated with rotenone in the autumn to give total fish extermination. Net samples of zooplankton showed that also the planktonic Crustacea were poisoned and they were nearly wiped out for several months. The planktonic larvae of Chaoborus flavians (Diptera) were not affected. The next summer the number of zooplankton organisms was greater than the 2 preceeding years, probably because of reduced predation by fish.--Copyright 1978, Biological Abstracts, Inc.
W78-12300

THE SHORE VEGETATION OF FRIER ESTUARY, TELEMARK, SE NORWAY (IN NORWEGIAN),
Bergen Univ. (Norway). Biological Station.
G. Holt.
Blyttia 35(2), p 53-56, 1977.

Descriptors: *Estuaries, *Vegetation, *Organic wastes, *Algae, *Shoreline cover, Salt marshes, Industrial wastes, Urban drainage, Urbanization, Nutrients, Chlorophyta, Cladophora, Enteromorpha, Water pollution, Algal mats, Cladophora-flexuosa, Distribution, Enteromorpha-intestinalis, Growth, Industrial, Nutrients, Phragmites-communis, Plant growth, Potamogeton-perfoliatus, Waste Zannichellia-palustris.

The Frier Estuary is situated in Telemark, southeast Norway, The salt march vegetation consists of potamogeton perfoliatus, Zannichellia palustris and Phragmites communis. The area is threatened by heavy organic pollution due to waste from industrial and urban growth. The high concentrations of plant nutrients favor growth of the green algae Caldophora flexuosa and Enteromorpha intestinalis, their algal mats now carpeting the shore and shallow water bays.--Copyright 1978, Biological Abstracts, Inc.
W78-12302

MACRO-NUTRIENTS IN THE LAKE GEORGE ECOSYSTEM,
Rennselaer Polytechnic Inst., Troy, NY.
D. B. Aulenbach.
Eastern Deciduous Forest Biome Memo Report No. 73-63, FWI Report No. 73-19 (1973). 13 p.

Descriptors: Aquatic environment, Abiotic environment, *Nutrient budget, Nitrogen cycle, Phosphorus, Freshwater, Inorganic compounds, Water quality, Lakes, Ecosystems, *Lake George(NY), New York.

Samples were secured to assess the nutrient levels in Lake George at the time of sampling and to compare these values with the concentrations observed in previous years. There appeared to be a slight increase in the orthophosphate levels in 1973

s compared with 1972. Concentrations of orthophosphate varied appreciably within 6 hours when samples over a 72 hour period, but there was no evidence of a 48 hour cycle as appeared to occur in 1972. Additional data will be secured to evauate these variations. (Rensselaer)
W78-12304

EFFECTS OF BENZENE (A TOXIC COMPONENT OF PETROLEUM) ON SPAWNING PACIFIC HERRING, CLUPEA HARENGUS PALLASI,
National Marine Fisheries Service, Tiburon, CA. Tiburon Lab.
J. W. Struhsaker.
Fishery Bulletin, Vol. 75, No. 1, January 1977, p 43-49, 1 fig, 5 tab, 14 ref.

Descriptors: *Environmental effects, *Water pollution, Oil, Herrings, Spawning, Eggs, Larvae, Embryos, Mortality, Toxicity.

Exposure of female Pacific herring to 800 ppb benzene for 48 h just prior to spawning resulted in reduction in survival of ovarian eggs (10-25%), embryos from fertilization to hatching (26%), and embryos and larvae through yolk absorption (43%). Premature spawning and aberrant swimming behavior was observed in both sexes. Comparison of these results with those from exposing other life history stages after spawning indicates that the spawning female and ovarian eggs are the most sensitive stages. (Chilton-ORNL)
W78-12313

OPTIMAL SALINITY AND TEMPERATURE INTERVALS OF LIMAPONTIA CAPITATA (OPISTHOBRANCHIA, SACOGLOSSA) DETERMINED BY GROWTH AND HEART RATE MEASUREMENTS,
Copenhagen Univ., Helsingoer (Denmark). Marine Biological Lab.
K. Jensen.
Ophelia, Vol. 16, No. 2, December 1977, p 175-185, 1 fig, 4 tab, 7 ref.

Descriptors: *Environmental effects, *Thermal pollution, Temperature, Salinity, Growth rate, Metabolism, Aquatic animals, Limapontia capitata.

Data collected in these investigations showed that L. capitata has an optimal temperature of about 15C with a range of tolerance from about 0 to 38 or 40C. Optimal salinity is approximately 30% although reproduction is abundant at 20 and 15% S. Death of osmotic stress occurs only at low salinities, < or = 5%. The only fact indicating any interaction of temperature and salinity is that it seems as if suboptimal temperatures are best tolerated at optimal salinity and extremely low salinities are best tolerated at suboptimal temperatures. (Chilton-ORNL)
W78-12319

TEMPERATURE DEPENDENCE OF ACTIVE METABOLISM AND SWIMMING SPEED OF THE BAIDAL GRAYLING, THYMALLUS ARCTICUS BAICALENSIS,
Akademiya Nauk SSSR, Novosibrisk, Inst. of Physiology.
A. Y. Stolbov, and Y. S. Alikin.
Journal of Ichthyology, Vol. 17, No. 1, 1977, p 178-179, 1 tab, 7 ref.

Descriptors: *Environmental effects, *Temperature, Fish behavior, Metabolism, Fish, Swimming, Velocity, Baikal grayling, Thymallus arcticus baicalensis.

Experimental data showed that the standard metabolism in the grayling is subject to the usual temperature relationship with the coefficient Q10 of around 2. An increase in temperatures of 4 to 12C increases oxygen consumption in a state of rest by 75%. During swimming the metabolism of fish increases. An absolute increase in oxygen consumption appeared to be dependent only on the intensity of work and not on temperature. The absolute increase in the rate of the total metabolism caused by temperature was almost the same at all regimes investigated and was determined primarily by the temperature dependence of the resting metabolism. It was concluded that energy expenditure on the performance of external mechanical work during swimming of the grayling does not in practice depend on water temperature. (Chilton-ORNL)
W78-12320

THE EFFECT OF TEMPERATURE ON THE EGG INCUBATION PERIOD OF TAENIOPTERYX NEBULOSA (PLECOPTERA),
Oslo Univ. (Norway). Zoological Museum.
J. E. Brittain.
Oikos, Vol. 29, No 2, 1977, p 302-305, 1 fig, 1 tab, 12 ref.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Temperature, Incubation, Hatching, Embryonic growth stage, Taeniopteryx nebulosa.

Eggs of T. nebulosa were incubated at temperatures approximating 2, 4, 8, 12, 16, 20 and 24C. The number of eggs/egg mass varied between 71 and 758. A linear relationship on logarithmic scales was found between water temperature (TC) and mean egg incubation period (Y days) for these temperatures. Low hatching success was observed at 2 and 24C, indicating that these temperatures are at or near the limits of the egg stage in T. nebulosa. (Chilton-ORNL)
W78-12321

THE EFFECT OF CONSTANT AND CHANGING TEMPERATURES ON THE THERMAL RESISTANCE OF LYMNAEA PEREGRA (MULLER),
Trinity Coll., Dublin (Ireland). Dept. of Zoology.
O. A. M. Al-Habbib, and J. N. R. Grainger.
Journal of Thermal Biology, Vol. 2, p 191-195, 8 fig, 31 ref. (1977).

Descriptors: *Environmental effects, Temperature, Thermal stress, Mortality, Snails.

In this study, snails were acclimated to temperatures of 6.5, 11.5, and 16.5C. Results showed that resistance of snails acclimated to 6.5C to high lethal temperatures was greater than that of 16.5C snails while the 11.5C acclimated snails were intermediate. Thermal resistance of snails kept under changing temperature conditions was also intermediate between the 16.5C and 6.5C snails. Snails acclimated to high temperature had higher low lethal temperatures than those acclimated to low temperature. Studies of the effect of seasonal variation showed that the relation between lethal and habitat temperatures was also paradoxical. (Chilton-ORNL)
W78-12323

GROWTH CHARACTERISTICS OF CHLAMYDOMONAS GEITLERI,
Ceskoslovenska Akademie Ved, Trebon. Lab. of Biotechnology.
K. Tetik, and J. Necas.
Archiv fur Hydrobiologie, Vol. 51, No. 2, 1977, p 164-183, 13 fig, 34 ref.

Descriptors: *Environmental effects, Temperature, Algae, Growth rate, Light, Laboratory investigations.

The strain of Chlamydomonas gieteri used in these studies was found to grow well at temperatures between 4 and 28C. It was able to grow and reproduce at a significant rate even at the temperature of 4C but exhibited an unfavourable response at 30C. An optimum irradiance was found to be 30 W/sq. m. Overirradiation was tolerated at lower temperatures but not at higher ones. (Chilton-ORNL)
W78-12324

THE MIGRATION OF ELVERS OF ANGUILLA ANGUILLA L. IN THE MEX CANAL, ALEXANDRIA, EGYPT,
Alexandria Univ. (Egypt). Dept. of Oceanography.
A. Ezzat, and S. El-Serafy.
Journal of Fish Biology, Vol. 11, No. 3, September 1977, p 249-256, 3 fig, 8 tab, 13 ref.

Descriptors: *Environmental effects, *Migration, Oxygen, Temperature, Sainity, Chlorine, Hydrogen ion concentration, Seasonal, Elvers, Anguilla anguilla.

Assessment of the effects of hydrographic factors on the upstream migration of elvers show that favourable factors probably include low oxygen content; a pH between 7.7 and 8.0; a chlorosity value between 2.1 and 2.3 Cl/l; and temperature between 20 and 25C. These factors interact to affect the number of elvers entering the canal. Elvers begin to arrive at the end of February, and continue to run up the Mex canal until June with the main bulk of elvers arriving in April and May. (Chilton-ORNL)
W78-12325

ASEXUAL PROPAGULES IN THE LIFE HISTORY OF POLYSIPHONIA FERULACEA (RHODOPHYTA, CERAMIALES),
North Carolina Univ. at Wilmington. Dept. of Biology.
D. F. Kapraun.
Phycologia, Vol. 16, No. 4, 1977, p 417-426, 21 fig, 37 ref.

Descriptors: *Environmental effects, Temperature, Light, Algae, Growth rates, Reproduction, Genetics.

Light intensity and temperature effects on growth, sexual reproduction and propagule formation in Polysiphonia ferulacea were studied. More than ten generations of a North Carolina isolate and six generations of a Bermuda isolate were studied. The two isolates were fully self-fertile but unable to hybridize with each other. In cross-gradient culture experiments, bot gametophytic and tetrasporophytic phases of the algae developed best at 25C and 2040-2570 lux illumination. In general, culture conditions favouring vegetative growth and sexual reproduction also initiated propagule formation. In nature, the N. Carolina isolate was collected during all seasons but attained maximum vegetative growth and reproduction during April and May. (Chilton-ORNL)
W78-12326

EARLY DEVELOPMENT OF THE SOUTH AFRICAN MAASBANKER TRACHURUS TRACHURUS AT CONTROLLED TEMPERATURES,
Department of Industries, Sea Point (South Africa). Sea Fisheries Branch.
D. P. F. King, M. J. O'Toole, and A. A. Robertson.
Fisheries Bulletin of South Africa, Vol. 9, 1977, p 16-22, 5 fig, 3 tab, 12 ref.

Descriptors: *Environmental effects, Temperature, Fish, Growth stages, Embryonic growth stage, Larvae, Horse mackerel, Maasbanker, Trachurus trachurus.

Egg and larval developmental rates of the maasbanker or horse mackerel were studied at ten constant temperatures ranging from 12.6 to 24.3C. During embryonic development the incubation time to any given developmental stage decreased exponentially with increasing temperature. At 12.6C, complete gastrulation required 36 hr. and at

24.3C complete gastrulation required 2 hr. The period to hatching was 84 hr at 12.6C and 20 hr. at 24.3C. Time of development from hatching to absorption of the yolk in the larvae was 5.5 days at 12.6C and 1 day at 24.3C. Maximum growth rate of resulting larvae was found at the highest temperature. (Chilton-ORNL)
W78-12327

'BASELINE MONITORING STUDIES, MISSISSIPPI, ALABAMA, FLORIDA, OUTER CONTINENTAL SHELF, 1975-1976' VOLUME III, RESULTS,
State Univ. System of Florida Inst. of Oceanography, St. Petersburg.
For primary bibliographic entry see Field 7C.
W78-12328

MACROPARASITES OF FISH FROM EAGLE MOUNTAIN LAKE, TEXAS,
Texas Christian Univ., Fort Worth. Dept. of Biology.
T. L. Gruninger, C. E. Murphy, and J. C. Britton.
The Southwestern Naturalist, Vol. 22, No. 4, October 1977, p 525-535, 1 fig, 1 tab, 41 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water pollution, Powerplants, Temperature, Fish, Parasitism, Heated water.

Fish representing three families (Centrarchidae, Ictaluridae, and Sciaenidae) were collected from stations within the area of a thermal plume from a steam-electric generating power plant and from a station outside the thermal plume. A total of 32 parasite species representing 22 families and 26 genera was identified from the fish examined. Data from this study indicated that when fish are provided free access to either heated or unheated waters, the incidence of parasitism in fish collected from the two areas will be approximately similar. (Chilton-ORNL)
W78-12329

SALINITY, TEMPERATURE, AND GROWTH REGULATOR EFFECTS ON SEED GERMINATION OF SALICORNIA EUROPAEA L.,
Ohio Univ., Athens. Dept. of Botany.
I. A. Ungar.
Aquatic Botany, Vol. 3, 1977, p 329-335, 5 fig, 16 ref. NSF BMS 74-19435 and DEB 76-00444.

Descriptors: *Environmental effects, Temperature, Salinity, Growth rates, Aquatic plants, Salt marshes, Germination, Seeds, Plant growth.

Salicornia europaea seeds were soaked for 7 days at 5C and then placed on a temperature gradient bar at temperatures of 10, 15, 20, 25, and 30C. Salinity concentrations of 0.0, 1.0, 2.0, 3.0, and 5.0% NaCl were used. Optimal seed germination occurred in distilled water treatments at 25C. Salinity increments inhibited germination at all test temperatures with treatments at 25C. Salinity increments inhibited germination at all test temperatures with treatments of 10C having the lowest germination percentages at all salinity regimes. Smallest decrease in germination from the control occurred in 1.0% NaCl at 25C. No seeds germinated in 5.0% NaCl at any temperatures. Treatment of seeds with gibberelic acid stimulated germination in salinities up to 5.0%. Kinetin solutions alone were not stimulatory to germination. (Chilton-ORNL)
W78-12331

THE INFLUENCE OF ABOVE-OPTIMAL CONSTANT TEMPERATURES ON SOUTH AFRICAN BIOMPHALARIA PFEIFFERI (KRAUSS) (MOLLUSCA: PLANORBIDAE),
Bilharzia Field Research Unit, Nelspruit (South Africa).
C. C. Appleton.
Transactions of the Royal Society of Tropical Medicine and Hygiene, Vol. 671, No. 2, 1977, p 140-143, 3 fig, 7 ref.

Descriptors: *Environmental effects, *Thermal pollution, Temperature, Hatching growth rate, Fecundity, Snails, Biomphalaria pfeifferi.

Eggs of B. pfeiffer were incubated at 25 + or - 0.4C, 28 + or - 0.2C, 29 + or - 0.2C and ambient temperature (mean 22.8C). Rates of oogenesis and spermatogenesis at 25C and ambient temperature were similar but they were slightly accelerated at 27C. Fecundity and survival at 27C were considerably reduced. At 29C hyperthermia was pronounced. Oogenesis and spermatogenesis were delayed and did not reach completion, there was an increase in the number of degenerating female germinal cells and no eggs were laid. Inadequate ovotestis development was coupled with retarded growth and poor survival. (Chilton-ORNL)
W78-12332

ADJUSTMENT OF THE COMPONENTS OF ENERGY BALANCE IN THE GASTROPOD CREPIDULA FORNICATA IN RESPONSE TO THERMAL ACCLIMATION,
Odense Univ. (Denmark). Biological Inst.
R. C. Newell, and L. H. Kofoed.
Marine Biology, Vol. 44, No. 3, 1977, p 275-286, 5 fig, 2 tab, 27 ref.

Descriptors: *Environmental effects, *Thermal stress, Temperature, Energy budget, Oxygen requirements, Aquatic animals, Gastropods.

Measurements were made of routine rate of oxygen consumption and clearance rate of Phaeodactylum tricornutum by Crepidula fornicata which had been acclimated to temperatures of 5, 10, 15, 20, and 25C. These measurements showed that the cost of activity (micro l 02 consumed/h/ml seawater cleared/h) increased in limpets exposed to short-term increases of temperature up to 30C. This increase was especially dramatic in limpets acclimated to 10C. Routine oxygen consumption shows lateral translation of the rate-temperature curve resulting in maintenance of a relatively uniform energy expenditure despite an increase in acclimation temperature from 10 to 25C. Lateral translation in response to warm acclimation results in an increase in the maximal clearance rate. It was concluded that lateral translation of the rate-temperature curves for feeding rates and for oxygen consumption in response to thermal acclimation may be linked to maintain a balance between energy gain and expenditure. (Chilton-ORNL)
W78-12333

SLOW, FAST- AND MEDIUM FAST RESPONSES OF ECTOTHERMS TO TEMPERATURE CHANGES: A NEW MECHANISM OF METABOLIC COMPENSATION IN HELIX POMATIA.,
Innsbruck Univ. (Austria). Inst. fuer Zoopjysiologie.
W. Wieser.
Journal of Thermal Biology, Vol. 2, 1977, p 197-201, 3 fig, 1 tab, 17 ref.

Descriptors: *Environmental effects, Temperature, Snails, Metabolism, Animal physiology, Enzymes.

Results of this investigation showed that the activities of pyruvate kinase (PK) and lactate dehydrogenase (LDH) from the foot of the snail are closely correlated with each other. If V max of PK and LDH measured at 20C is plotted against the average temperature prevailing on the day of collection a clearcut negative proportionality is obtained: the higher the temperature the lower the activities of both enzymes. PK activity is perfectly temperature-compensated while LDH activity increases slightly with temperature. Phospho-arginine (PArg) inhibits PK activity suggesting a phosphorylation/dephosphorylation mechanism. With an incubation time of 12-15 minutes, the degree of inhibition is dependent upon the concentration of PK as well as on individual features of the PK. It was suggested that interaction of PArg and PK might provide a mechanism by which rate of flow of PEP through this glycolytic branchpoint is controlled by temperature and by locomotory activity of the animal. (Chilton-ORNL)
W78-12339

THERMAL SHOCK TOLERANCES OF SIX FISHES AND ONE INVERTEBRATE FROM THE PACIFIC NORTHWEST,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
J. W. Young, and C. W. Apts.
BNWL-2289, September 1977, 8 pp, 2 tab, 9 ref.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Temperature, Mortality, Powerplants, Cooling water, Equilibrium, Fish behavior, Fish, Effluents.

The purpose of this study was to ascertain the temperatures at which selected estuarine fishes from the Pacific Northwest and one of their potential food organism would be incapacitated and killed after entering the thermal plume of an industrial cooling system. The species tested were shiner perch, coho salmon, Pacific sandlance, threespine stickleback, silverspotted sculpin, Pacific staghorn sculpin, and mysids. Information on temperature at which equilibrium loss and death occurred is presented in tabular form for each species. Mysids did not exhibit equilibrium loss. (Chilton-ORNL)
W78-12340

DOWNSTREAM MOVEMENT OF FISH IN A TRIBUTARY OF SOUTHERN LAKE SUPERIOR,
Bureau of Commercial Fisheries, Marquette, MI. Sea Lamprey Control Station.
P. J. Manion.
The Progressive Fish-Culturist, Vol 39, No 1, January 1977, p 14-16, 1 fig, 2 tab, 6 ref.

Descriptors: *Environmental effects, Temperature, Streamflow, Migration, Fish, Brook trout, Yellow perch, Sticklebacks, Sculpins.

The influence of stream flow and water temperature on the downstream movement of brook trout, brook sticklebacks, mottled sculpins, and yellow perch was investigated. During periods of normal water levels, brook trout and brook sticklebacks appeared to move downstream actively. The trout migrated in spring and fall at water temperatures of about 10C. Sticklebacks moved primarily in winter. Mottled sculpins apparently moved primarily during floods and may have been carried downstream passively. Yellow perch moved downstream in fall as water levels rose and temperatures decreased. (Chilton-ORNL)
W78-12341

THERMAL RESISTANCE OF THE CILIARY ACTIVITY IN THE GILLS OF THE FRESH WATER MUSSEL ANODONTA ANATINA,
Kiel Univ. (West Germany). Zoophysical Lab.
K. E. O. Senius.
Journal of Thermal Biology, Vol 2, 1977, p 233-238, 6 fig, 1 tab, 10 ref.

Descriptors: *Environmental effects, Thermal stress, Temperature, Mussels, Gills, Ciliary activity.

When intact A. anatina mussels were kept at a temperature of 24C, relatively rapid acclimation occurred in the thermal resistance of ciliary activity. After 2 days the resistance time of warm-acclimated mussels was higher at 39C than that of the control group kept at 14C. Thermal resistance of

cold-acclimated mussels did not differ from the control group. Resistance acclimation did not appear in isolated gills kept at 4, 14, and 24C for 1 to 3 days. After an acclimation period of 2 days the ciliary activity in mussels kept at 24C showed a significantly increased response to acetylcholine (ACh) at 39C. In isolated gills, thermal resistance was enhanced by ACh, choline, and tetramethylammonium and diminished by atropine and physostigmine. It was concluded that thermal resistance control in A. anatina is probably neural. (Chilton-ORNL)
W78-12342

EFFECT OF TEMPERATURE ON THE HATCHING TIME OF EGGS OF EPHEMERELLA IGNITA (PODA) (EPHEMEROPTERA: EPHEMERELLIDAE),
Freshwater Biological Association, Windermere (England).
J. M. Elliott.
Freshwater Biology, Vol 8, 1978, p 51-58, 4 fig, 1 tab, 36 ref.

Descriptors: *Environmental effects, *Temperature, Hatching, Embryonic growth stage, Aquatic insects.

Eggs of Ephemerella ignita were incubated in the laboratory at eight constant temperatures ranging from 5.9 to 19.8C. At temperatures of 10.0 - 14.2C, 85% of the eggs hatched with the percentages dropping to 39% to 5.9C and 42% at 19.8C. Hatching time also decreased as water temperature increased from 5.9 - 14.2C. Time for development expressed in units of degree-days above a threshold temperature showed that mean values were 552 degree-days above 4.25 for 10% of eggs hatched, 862 degree-days above 3.57C for 50% hatched, and 1385 degree-days above 3.14C for 90% hatched. These values were used to predict hatching times at temperatures below 14.68C for 10% hatched, 14.54C for 50% hatched and 14.45C for 90% hatched. Comparison of predictions with field observations showed good agreement. (Chilton-ORNL)
W78-12343

AN INVESTIGATION INTO THE GROWTH OF O-GROUP ROACH, (RUTILUS RUTILUS L.) WITH SPECIAL REFERENCE TO TEMPERATURE,
Hull Univ. (England). Dept. of Zoology.
N. M. Broughton, and N. V. Jones.
Journal of Fish Biology, Vol 12, 1978, p 345-357, 3 fig, 7 tab, 42 ref.

Descriptors: *Environmental effects, Temperature, Seasonal, Fish, Growth rates.

Growth of O-group roach in two waters (a chalk-fed river and a gravel pit) was compared. In both habitats, a good correlation existed between measurement of warmth and growth over a wide range of temperatures, with the correlation being highest with the number of degree-days above 14C. Water temperature, acting through the food supply, appeared to be the dominant factor affecting growth. (Chilton-ORNL)
W78-12344

EFFECT OF SOME ENVIRONMENTAL FACTORS ON SURVIVAL AND ACTIVITY OF FRESH WATER BIVALVE LAMELLIDENS CORRIANUS,
Gorakhpur Univ. (India). Dept. of Zoology.
S. Samant, and R. A. Agarwal.
Indian Journal of Experimental Biology, Vol 16, January 1978, p 26-28, 3 tab, 12 ref.

Descriptors: *Environmental effects, *Water pollution, Temperature, Salinity, Hydrogen ion concentration, Aquatic animals, Mussels, Mortality.

An investigation was made into the effect of temperature change, pH and salinity on the rhythmic activity and survival of Lamellidens corrianus. Rhythmic activity increased with rise in temperature from 25 to 40C with 100% survival from 20 - 30C. Optimum temperature for both activity and survival was between 32 and 35C. Preferred pH was 7.9 but a wide range of pH (5.5 to 8.5) was tolerated. The blood of this bivalve was found to be hyper-osmotic and the animals preferred a hypo-osmotic environment. Activity was reduced as salinity increased from 0 - 5%. (Chilton-ORNL)
W78-12345

OBSERVATIONS ON THE ECOLOGY OF CLINOSTOMUM MARGINATUM IN LARGEMOUTH BASS (MICROPTERUS SALMOIDES),
Wake Forest Univ., Winston-Salem, NC. Dept. of Biology.
T. C. Hazen, and G. W. Esch.
Journal of Fish Biology, Vol 12, 1978, p 411-420, 5 fig, 1 tab, 12 ref. ERDA No. E (38-1)-900 and (38-1)-819.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Largemouth bass, Diseases, Animal parasites, Seasonal, Reservoirs.

A seasonal periodicity for infection percentages of Clinostomum marginatum among largemouth bass collected in a reservoir receiving thermal effluent was found. Percentages of 25% were observed in January to June, dropping to a low of <10% in July with a rise to 30% in September to October and then a steady decline to <10% again in December. Body condition, body length or influence of thermal effluent did not appear to be related to percentage of infection. It was suggested that the cyclic nature of the infection is probably associated with a seasonal change in density and/or size structure of snail populations, the first intermediate host for C. marginatum. A significant rank correlation was seen between infection percentage and the amount of littoral zone present in the area from which fish were collected. Local bay effects may be the result of limited home and foraging ranges of the bass in relation to the amounts of littoral zone present in various locations of the reservoir. (Chilton-ORNL)
W78-12346

RELATIONSHIP OF SEASON, THERMAL LOADING AND RED-SORE DISEASE WITH VARIOUS HAEMATOLOGICAL PARAMETERS IN MICROPTERUS SALMOIDES,
Wake Forest Univ., Winston-Salem, NC. Dept. of Biology.
T. C. Hazen, G. W. Esch, A. B. Glassman, and J. W. Gibbons.
Journal of Fish Biology, Vol 12, 1978, p 491-498, 1 fig, 6 tab, 20 ref. ERDA No. EY-76-S-09-900 and E(38-1)-819.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Largemouth bass, Diseases, Seasonal, Animal parasites.

The blood of 150 largemouth bass collected from a cooling reservoir (equal numbers from the ambient and thermally altered areas of the reservoir) was measured for haematocrit, haemoglobin, iron, iron-binding capacity, thyroxine, sodium and potassium. The fish were examined for evidence of red-sore disease. Only the total iron-binding capacity was significantly higher in fish with red-sore disease. Bass from thermally altered areas exhibited consistently higher haematocrits in all seasons. In summer months, bass showed higher levels of circulating iron and thyroxine. It was concluded that infection with Aeromonas hydrophila does not elicit significant haematological changes in largemouth bass. Seasonal temperature rises and thermal loading conditions tended to lower body conditions of bass. It was noted that seasonal variability in feeding behavoir and availability of prey species may play a role in such results. (Chilton-ORNL)
W78-12347

LABORATORY MEASUREMENT OF PREFERRED BODY TEMPERATURE OF ADULT LARGEMOUTH BASS (MICROPTERUS SALMOIDES),
Oklahoma State Univ., Stillwater, School of Biological Sciences.
B. J. Venables, L. C. Fitzpatrick, and W. D. Pearson.
Hydrobiologia, Vol 58, No 1, 1978, p 33-36, 4 fig, 1 tab, 11 ref.

Descriptors: *Environmental effects, Temperature, Bass, Laboratory tests, Fish behavoir.

Preferred body temperature was measured in the laboratory by allowing adult bass to behaviorally thermoregulate in a horizontal temperature gradient while telemetering their body temperatures. Preferred temperature for adults was determined to be 27-32C. This prefernda is similar to that previously reported for sub-adults. (Chilton-ORNL)
W78-12348

A CASE OF THERMAL POLLUTION LIMITED PRIMARY PRODUCTIVITY IN A SOUTHWESTERN U.S.A. RESERVOIR,
North Texas State Univ., Denton. Dept. of Biological Sciences.
T. J. Stuart, and J. A. Stanford.
Hydrobiologia, Vol 58, No 3, 1978, p 199-211, 7 fig, 4 tab, 54 ref.

Descriptors: *Environmental effects, Powerplants, Entrainment, Productivity, Standing crop, Algae, Reservoirs.

Primary productivity, algal standing crop and organic carbon in North Lake were all conspicuously low when compared to other nearby southwestern U.S.A. reservoirs. The investigations reported in this study showed that these facts probably resulted from nutrient limitation aggravated by power plant caused evaporation and consequent dissolved solids accumulation. Precipitation of incoming dissolved nutrients such as P and N by excessively concentrated cations could be the ultimate cause of low production rather than immediate or instantaneous entrainment-linked inhibition. (Chilton-ORNL)
W78-12349

INCREASE IN RANGE OF TEMPERATURE TOLERANCE BY ACCLIMATION IN THE COPEPOD EURYTEMORA AFFINIS,
Maryland Univ., Baltimore County, Baltimore. Dept. of Biological Sciences.
B. P. Bradley.
The Biological Bulletin, Vol 154, No 2, April 1978, p 177-187, 5 tab, 16 ref.

Descriptors: *Environmental effects, Temperature, Resistance, Copepods, Acclimation.

The copepod, Eurytemora affinis, was tested to determine its temperature tolerance. It was found that acclimation to warm temperatures for several hours or days increased temperature tolerance. Females showed higher tolerance and acclimation than males. At higher salinity (13% vs. 0%), temperature tolerance was greater but acclimation was not. Acclimation to cold temperatures occurred more slowly than to hot temperatures and sexual differences at cold temperatures were less marked than for heat tolerance. Heat and cold tolerances in the same animals appeared to be positively related traits. (Chilton-ORNL)
W78-12350

THERMAL EFFECTS,
Oak Ridge National Lab., TN. Ecological Sciences Information Center.
S. S. Talmadge, and C. C. Coutant.
Journal of the Water Pollution Control Federation, June 1978, p 1514-1553, 8 tab, 401 ref.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Temperature, Reviews, Aquatic life.

This paper is a review of the 1977 literature on thermal effects to aquatic organisms. Information concerning the effects of temperature on reproduction, embryonic development, larval development, distribution, tolerance, oxygen metabolism, growth and temperature interactions with other stresses is presented in tabular form. The text of the article includes a section on site studies, producers, consumers, decomposers, diseases and beneficial uses. (Chilton-ORNL)
W78-12351

THE INFLUENCE OF IONIC CONCENTRATION ON POPULATION PARAMETERS, DEVELOPMENT TIME, ACTIVITY, AND RESPIRATION RATE OF ARCTODIAPTOMUS SPINOSUS (DADAY) (CALANOIDA, COPEPODA),
Oesterreichische Akademie der Wissenschaftern, Vienna. Limnologisches Inst.
P. Newrkla.
Oecologia, Vol 33, No 1, 1978, p 87-99, 7 fig, 6 tab, 37 ref.

Descriptors: *Environmental effects, *Population, Zooplankton, Alkalinity, Temperature, Standing crop, Respiration.

This study entailed an investigation into the popopulation dynamics of A. spinosus in a small temporary pool. Significant correlations were found between populatin parameters and alkalinity and temperature. For birth rate, 43.33% of variance was accounted for by the influence of alkalinity and 56.33% by combined alkalinity and temperature. 48.22% of the observed variances in nauplii hatching were accounted for by alkalinity and 70.23% by alkalinity and temperature. Individual activity was not affected by differences in alkalinity within the normal range of concentration when sufficient time was allowed for adaptation. Although ionic concentration did not appear to influence embryonic development, significant increases in time of development of nauplii and of copepodites were observed at both low and high ionic concentrations. Lowest respiration rates occurred at an alkalinity of 100 meq/l. (Chilton-ORNL)
W78-12352

HISTOPATHOLOGICAL AND PHYSIOLOGICAL RESPONSES OF FUNDULUS HETEROCLITUS TO NAPHTHALENE EXPOSURE,
Delaware Univ., Newark. Coll. of Marine Studies.
L. DeMichele, and M. H. Taylor.
Journal of the Fisheries Research Board of Canada, Vol 35, p 1060-1066, 1978. 3 fig, 3 tab, 22 ref.

Descriptors: *Toxicity, *Fish physiology, Organic compounds, Absorption, Animal metabolism, Fish diseases, Animal pathology, Radioactivity techniques, Aromatic compounds, Industrial wastes, Path of pollutants, Mortality, Oil, Oil spills, *Mummichogs, *Naphthalenes, Histology, Tissue analysis, Bioaccumulation, *Cortisol.

Mummichogs were exposed to naphthalene concentrations ranging from 30 to 0.002 mg/l over time periods ranging from 1 to 15 d. Histopathology of exposed animals was evaluated. Major effects were found in the brain, liver, and pancreas down to 0.2 mg/l for a 15-d exposure. The results of these experiments indicate that the toxicity of naphthalene in this fish is due primarily to its effect on blood components. There was also evidence of neurosensory damage at exposures as low as 0.02 mg/l for 15 d. In addition, serum glucose, protein, and cortisol were measured in animals exposed to low levels of naphthalene for 15 d. All were significantly elevated, indicating metabolic stress at exposures as low as 0.02 mg/l. 14C-naphthalene uptake was measured at two concentrations of naphthalene. Naphthalene was found to accumulate in significant amounts in organs most susceptible to pathology. The distribution of naphthalene was found to be independent of its water concentration in all organs tested except the spleen. (EIS-Deal)
W78-12353

EFFECTS OF AN ORGANOPHOSPHOROUS INSECTICIDE ON THE CHOLINESTERATIC ACTIVITIES OF BUFO ARENARUM (H),
San Luis Univ. (Argentina). Lab. of Pharmacology.
J. A. Guzman, and T. Guardia.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 52-58, 1978. 4 tab, 9 ref.

Descriptors: *Toxicology, *Insecticides, *Organophosphorous pesticides, *Toads, Animal metabolism, Seasonal, Amphibians, Animal physiology, Path of pollutants, Pesticide toxicity, Biochemistry, Enzymes, *Parathion, Bufo, Tissue analysis.

This research involves the survival and modification of cholinesteratic activity in a Parathion fumigated medium. In both exposed groups the plasma cholinesteratic activity was decreased. Cholinesteratic activity is quickly recovered when the toads are transferred to a Parathion-free medium. In summer the cholinesteratic activity is usually higher than in winter. The higher significant difference is observed in liver tissue. (EIS-Deal)
W78-12354

REDUCTION OF HEAVY METAL TOXICITY TO XENOPUS EMBRYOS BY MAGNESIUM IONS,
Vermont Univ., Burlington. Dept. of Zoology.
J. C. Miller, and R. Landesman.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 93-95, 1978. 1 tab, 6 ref.

Descriptors: *Magnesium, *Manganese, *Lead, *Cadmium, *Toxicity, Metals, Heavy metals, Animal metabolism, Growth stages, Embryonic growth stage, Biochemistry, Animal physiology, Growth rates, Animal pathology, *Xenopus.

The data demonstrates the ability of magnesium ions to moderate the toxicity of lead, cadmium and manganese ions. Since the magnesium content of Xenopus embryos is constant regardless of environmental levels, this suggests that there may be competition occurring for some common carrier mechanism which transports divalent cations into the embryos. Similar mechanisms have been shown to exist in microorganisms. (EIS-Deal)
W78-12356

A PRELIMINARY STUDY OF THE EFFECTS OF DIFLUBENZURON AND METHOPRENE ON RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON),
Manitoba Univ., Winnipeg. Dept. of Entomology.
D. J. Madder, and W. J. Lockhart.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 66-70, 1978. 3 tab, 19 ref.

Descriptors: *Growth rates, *Rainbow trout, *Toxicity, Organic compounds, Fish physiology, Animal metabolism, Environmental effects, Path of pollutants, Biochemistry, Chemical analysis, Pesticide toxicity, Water pollution sources, Insecticides, *Insect growth regulators, *Methoprene, *Diflubenzuron.

Recent research has shown insect growth regulators to be environmentally less objectionable than many older insecticides. Diflubenzuron and Methoprene are two insect growth regulators which are expected to be used on a large scale within the next few years. However, exposure of non-target organisms is inevitable. In this experiment, the effect of Diflubenzuron and Methoprene on rainbow trout blood serum chemistry was analyzed. Increasing concentrations of Diflubenzuron were associated with decreasing serum GOT levels. During exposure to Methoprene the rainbow trout became visibly lethargic in comparison to the control fish. Values for hematocrit, lipid, glucose, and sodium are also presented. (EIS-Deal)
W78-12357

PATTERNS OF TRACE METAL ACCUMULATION IN CRAYFISH POPULATIONS,
Northern Illinois Univ., De kalb. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W78-12358

MERCURY CONCENTRATIONS IN PACIFIC HAKE, MERLUCCIUS PRODUCTUS (AYERS), AS A FUNCTION OF LENGTH AND LATITUDE,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W78-12359

UPTAKE OF GLYCOLIC ACID BY A MARINE BIVALVE,
Florida State Univ., Tallahassee. Dept. of Oceanography.
D. A. DiDomenico, and R. L. Iverson.
Journal of Experimental Marine Biology and Ecology, Vol. 28, p 243-254, 1977. 1 tab, 4 fig, 47 ref.

Descriptors: *Clams, *Mollusks, *Metabolism, *Biochemistry, *Kinetics, *Energy transfer, Carbon radioisotopes, Invertebrates, Animal physiology, Absorption, Laboratory tests, Nutrient removal, Nutrients, Energy equation, *Glycolic acid, *Gills, *Tissue analysis, *Nutrient sources.

Glycolic acid is accumulated by in vitro preparations of gill tissue from the quahog clam, Mercenaria sp., by a process indicating diffusion kinetics. Carbon-14 from labelled glycolic acid was found in the lipid fraction of the gill tissue. Evolution of labelled carbon dioxide suggests that the glycolic acid is metabolized in gill tissue. (EIS-Katz)
W78-12361

TEMPERATURE ACCLIMATION IN ACTINIA EQUINA L. (ANTHOZOA),
Natal Univ., Pietermaritzburg (South Africa). Dept. of Zoology.
R. J. Griffiths.
Journal of Experimental Marine Biology and Ecology, Vol. 28, p 285-292, 1977. 4 fig, 17 ref.

Descriptors: *Water temperature, *Heated water, *Invertebrates, *Intertidal areas, *Animal physiology, *Feeding rates, Temperature, Salinity, Reproduction, Environmental effects, Mortality, Stress, Seasonal, Laboratory tests, Distribution patterns, *Actinia equina, *Thermal stress, *South Africa, *Anemones, *Acclimation.

Respiratory adaptation to different sea temperatures on the Natal (east) and Table Bay (west) coasts of southern Africa demonstrated in Actinia equina. Animals are able to acclimate to lower sea temperatures but are unable to adapt to an increase of 3C or more above summer sea temperatures. Acclimation to elevated water temperatures may be limited by thermal sensitivity of the tissues

and by lack of feeding when under thermal stress. The successful colonization of the Natal littoral zone by A. equina may be attributed partially to metabolic adaptability but also to its brooding ability, tolerance of desiccation, and capacity to retain water within the coelenteron. Slow exudation of this water enables evaporative cooling of the tissues during low tide. Other actinian species from Natal lack this range of features and are hence limited to damp habitats at lower tidal levels. (EIS-Katz)
W78-12362

SUPPRESSION OF CORAL POPULATIONS BY FILAMENTOUS ALGAE WITHIN DAMSELFISH TERRITORIES,
Australian National Univ., Canberra (Australia). Dept. of Environmental Biology.
D. C. Potts.
Journal of Experimental Marine Biology and Ecology, Vol. 28, p 207-216, 1977. 1 fig, 1 tab, 31 ref.

Descriptors: *Growth rates, *Marine fish, *Coral, *Biological communities, Environmental effects, *Grazing, *Sediments, *Fish behavior, Benthic fauna, Aquatic animals, Marine animals, Invertebrates, Mortality, Metabolism, Aquatic populations, Sediments, Aquatic habitats, Seasonal, *Acropora, *Dischistodus, *Damselfish, *Territories.

Transplanted pieces of the coral Acropora palifera simulating colonies 2-4 years old were adversely affected by dense algal-sediment mats developed in response to reduced grazing pressures within territories of the damselfish. Coral growth was initially prolonged in autumn, but was subsequently suppressed during winter and spring. There was heavy mortality only in mid-winter when corals died rapidly from the base. It is suggested that the algal mat caused the corals to expend energy to keep their surfaces clean, so that death followed the exhaustion of metabolic reserves during periods of minimum nutrient availability, and that the abundance of D. perspicillatus is sufficient to explain the paucity of small Acropora palifera colonies in an otherwise favorable habitat. (EIS-Katz)
W78-12363

GROWTH OF THREE PLANKTON DIATOM SPECIES IN OSLOFJORD WATER IN THE ABSENCE OF ARTIFICIAL CHELATORS,
Oslo Univ. (Norway). Dept. of Marine Biology and Limnology.
E. Paasche.
Journal of Experimental Marine Biology and Ecology, Vol. 29, p 91-106, 1977. 2 tab, 7 fig, 32 ref.

Descriptors: *Plankton, *Diatoms, *Growth rates, *Chelation, *Succession, *Aquatic populations, Laboratory tests, Environmental effects, Methodology, Water quality, Nutrients, Aquatic microorganisms, Seasonal, Phytoplankton, Biological communities, *Skeletonema, *Thalassiosira, *Lauderia, *EDTA, *Oslofjord(Norway), *Species succession.

Cultures of the plankton diatoms Skeletonema, Thalassiosira, and Lauderia were grown in seawater samples collected in the inner Oslofjord on 11 occasions between February 1976 and January 1977. The growth experiments were carried out in silicone-coated culture flasks, with nitrate, phosphate, and silicate added in excess, and under standardized conditions of a temperature of 10C and a saturating light intensity. Growth rates, as measured during exponential growth over a period of 5-6 days, were, with very few exceptions, close to the maximum rates obtained in a complete medium. The addition of ethylenediaminetetraacetic acid (EDTA) to the water samples did not lead to improved growth, nor did EDTA have an effect on the initial lag phase. The lack of a seasonal variation in the observed growth responses was in marked contrast to the large fluctuations in the phytoplankton populations in the fjord. These findings give no support to the hypothesis that species successions among marine plankton diatoms are influenced by organic chelators or other extracellular substances produced by planktonic algae. (EIS-Deal)
W78-12364

TOXICOLOGICAL AND PHYSIOLOGICAL ASPECTS OF THE ACTION OF HERBICIDE, SODIUM SALT OF 2,4-D ON ASELLUS AQUATICUS L. (ISOPODA),
Polish Academy of Sciences, Warsaw. Lab. of Ecological Bioenergetics.
D. Zimakowska-Gnoinska.
Polskie Archiwum Hydrobiologii, Vol. 24, No. 3, p 389-411, 1977. 8 fig, 3 tab, 76 ref.

Descriptors: *2,4-D, *Pesticide toxicity, *Isopods, Herbicides, Pesticides, Animal physiology, Toxicity, Mortality, Oxygen demand, Respiration, Carbon dioxide, Water pollution effects, Mode of action, Animal behavior, Persistence, Water analysis.

Sodium salt of 2,4-D, 24h-C50 and 48h-C50 concentrations tested on A. aquaticus were 1.07 and 0.53 g/l, respectively. An important aspect of this poison is its prolonged action, coefficient T of poison persistence is less than 1. The mortality of animals exposed to 0.17-5.00 mM solutions for 24 h and subsequently transferred to pure water was 100% after 150 days in pure water. The oxygen consumption changes under the herbicide influence in different ways, being the highest in 5 mM solution. Herbicide causes increased CO2 excretion, which was the highest in 5 mM solution. (EIS-Deal)
W78-12365

THE EFFECT OF SODIUM SALT OF 2,4-D ON OXYGEN CONSUMPTION OF MISGURNUS FOSSILIS L. DURING EARLY EMBRYONIC DEVELOPMENT,
Polish Academy of Sciences, Warsaw. Lab. of Ecological Bioenergetics.
R. Z. Klekowski, B. Korde, and M. Kaniewska-Prus.
Polskie Archiwum Hydrobiologii, Vol. 24, No. 3, p 413-421, 1977. 4 fig, 1 tab, 30 ref.

Descriptors: *2,4-D, *Oxygen demand, *Pesticide toxicity, Oxygen requirement, Respiration, Fish physiology, Fish reproduction, Embryonic growth stage, Herbicides, Pesticides, Water pollution effects, Path of pollutants, Fish eggs, Toxicity, Mortality, *Loach, Misgurnus.

The effect of sodium salt of 2,4-D on the oxygen consumption during early embryogenesis in eggs of loach was studied. Investigations covered the period from fertilization till the completion of gastrulation (18th hour of development). Addition of herbicide after 4 h to the developing eggs did not change the oxygen consumption as compared with control. If eggs were fertilized in water and subsequently transferred to a herbicide solution, then the inhibitory effect of this compound on the oxygen consumption manifested itself after 9 h. On the other hand, if the egg fertilization took place in a 15 mM solution of herbicide, the inhibition of respiration began as early as after 7 h. (EIS-Deal)
W78-12366

RATES OF MORTALITY, GROWTH AND BIOMASS PRODUCTION OF LYMNAEA PALUSTRIS DURING CHRONIC EXPOSURE TO LEAD,
Canada Centre for Inland Waters, Burlington (Ontario).
U. Borgmann, O. Kramar, and C. Loveridge.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 1109-1115, 1978. 6 fig, 7 ref.

Descriptors: *Lead, *Mortality, *Growth rates, *Snails, Toxicity, Biomass, Growth stages, Analytical techniques, Statistical methods, Absorption, Water analysis, Chemical analysis, Spectrophotometry, Reproduction, Tissue analysis.

Lymnaea palustris, a freshwater snail, was exposed to lead in a continuous-flow system from newly laid eggs until reproductive maturity. Lead, at concentrations as low as 19 microg L-1, caused a significant increase in the mortality rate, although the growth rate was not affected. The lead-induced mortality was proportional to the lead concentration raised to the exponent 2.5. The mortality rate, unlike the percent mortality, is independent of time and can be combined directly with the growth rate to estimate the biomass production rate. A 50% drop in the rate of biomass production was observed at 36 microg L-1 and a drop to 0 production at 49 microg L-1. Lead uptake in whole snails was found to be proportional to the lead concentration in the water, giving a concentration factor of 8500 on a dry weight basis. (EIS-Deal)
W78-12368

DEVELOPMENT OF A RAPID FISH TOXICITY TEST UTILIZING A FREEZE CONCENTRATION TECHNIQUE FOR ROUTINE PETROLEUM REFINERY WASTEWATER MONITORING,
Imperial Oil Ltd., Toronto (Canada).
For primary bibliographic entry see Field 5A.
W78-12369

COMPOUNDS TOXIC TO FISH IN PULP MILL WASTE STREAMS,
British Columbia Research Council, Vancouver.
J. M. Leach, and A. N. Thakore.
Progress in Water Technology, Vol 9, p 787-798, 1977. 8 tab, 26 ref.

Descriptors: Pulp wastes, *Toxicity, *Resins, *Organic acids, Industrial wastes, Water pollution sources, Chemical wastes, Pulp and paper industry, Wood wastes, Chemical analysis, Pollutant identification, Waste water identification, Waste water treatment, Rainbow trout, Sockeye salmon, Organic compounds, Resin acids, Kraft pulping wastes, Sulphite pulping, Mechanical pulping, Wood debarking, Chlorolignins, Abietic acid.

The major toxic factors in effluents from Canadian softwood kraft, sulphite and mechanical pulping operations, and in wood debarking effluents, were seven resin acids; dehydroabietic, abietic, isopimaric, palustric, primario, sandaracopimaric, and neoabietic. Contributions of the identified materials to effluent toxicity are described in terms of the toxic units concept. The toxicants are discussed in relation to their origin, to effluent discharge regulations, and to the choice of effluent treatment techniques. (EIS-Deal)
W78-12370

EFFECT OF INSECTICIDES: CHLORPHENVINPHOS, CARBARYL AND PROPOXUR ON AQUATIC ORGANISMS,
Wroclaw Technical Univ. (Poland). Inst. of the Environment Protection Engineering.
B. Lejczak.
Polskie Archiwum Hydrobiologii, Vol 24, No 4, p 583-591, 1977. 5 tab, 18 ref.

Descriptors: *Pesticide toxicity, Insecticides, Toxicity, Bacteria, Algae, Protozoa, Crustaceans, Daphnia, Sphaerotilus, Pesticides, Organic compounds, Animal physiology, Water pollution effects, Biomass, Growth rates, Inhibitors, Mortality, Trophic level, *Chlorophenphos, *Carbaryl, *Propoxur.

Studies were carried out on the toxic effect of the insecticides Chlorphenvinphos, Carbaryl (Sevin) and Propoxur on representatives of: filamentous

bacteria, algae, protozoans, curstaceans, and fish. The chemical compounds under examination had a strong toxic effect on tested organisms. The effect was the strongest in the case of fish and the weakest in the case of bacteria. Chlorphenvinphos had the most poisonous effect on fish, whereas Carbaryl and Propoxur had the strongest effect on protozoans and crustaceans. (EIS-Deal)
W78-12372

EXPERIMENTAL TREATMENT OF WASTE EFFLUENT FROM CHEMICAL PLANTS 'POLICE' BY USING IT IN CARP CULTURES,
Wyzsza Szkola Rolnicza, Szczecin (Poland). Dept. of Hydrozoology.
For primary bibliographic entry see Field 5D.
W78-12373

SOME REMARKS ON NITROGEN EXCRETION BY FISH,
Polish Academy of Sciences, Warsaw. Lab. of Ecological Bioenergetics.
Z. Fischer.
Polskie Archiwum Hydrobiologii, Vol 24, No 3, p 355-360, 1977. 2 fig, 1 tab, 19 ref.

Descriptors: *Nitrogen compounds, *Fish physiology, Animal metabolism, Ammonia, Urea, Animal growth, Weight, Size, Carp, Biochemistry, Proteins, Amino acids, Organic compounds, Nutrients, Growth rates, Eels.

This is a survey paper discussing quantitative aspects of excretion of common nitrogen compounds (ammonia, urea, total nitrogen) by fish in various feeding conditions and as dependent on body weight. Excretion of ammonia seems to be an index of condition of fish. Well fed and rapidly growing fish excrete a greater percentage of nitrogen in form of ammonia then fish in poor condition. (EIS-Deal)
W78-12374

EFFECT OF ONISCUS ASELLUS FEEDING ON BACTERIAL AND NEMATODE POPULATIONS OF SEWAGE SLUDGE,
State Univ. of New York at Syracuse. Dept. of Forest Zoology.
B. A. Brown, B. L. Swift, and M. J. Mitchell.
Oikos, Vol 30, p 90-94, 1978. 4 tab, 20 ref.

Descriptors: *Isopods, *Trophic level, *Activated sludge, Population, Bacteria, Nematodes, Sewage sludge, Animal populations, Respiration, Biodegradation, Animal behavior, Invertebrates, Municipal wastes, Decomposing organic matter, Tissue analysis.

Feeding by the terrestrial isopod, Oniscus asellus, affected the densities of bacterial and nematode populations of activated sludge. Total bacteria, viable bacteria, nematodes and respiration generally increased after the uneaten sewage sludge was ingested and expelled as feces. This stimulatory effect of isopod feeding may have been influenced by trophic interactions between the nematodes and their bacterial food source. (EIS-Deal)
W78-12375

RECENT ADVANCES IN FISH TOXICOLOGY -- A SYMPOSIUM.
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 500, Price codes: A10 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-085, July 1977, 203 p.

Descriptors: Methodology, *Toxicity, *Bioassay, Laboratory studies, Laboratory investigations, Supersaturation, Freshwater fish, Pesticides, Herbicides, Environment, Water pollution effects, Path of pollutants, Chlorine, Bass, Fish physiology, Behavior, Hydrogen ion concentration, *Copper, *Nitrites.

The papers contained in this report were presented at the symposium--Recent Advances in Fish Toxicology--held in Corvallis, Oregon on January 13-14, 1977. The Corvallis Environmental Research Laboratory, U.S. Environmental Protection Agency and the Oregon State University Department of Fisheries and Wildlife cosponsored the symposium to encourage the rapid communication of recent findings among fish toxicologists. The sumposium was dedicated to Professor Peter Doudoroff on his retirement from a long and active research and teaching career. 11 papers are included in the Symposium. (See also W78-12377 thru W78-12387) (EIS-Katz)
W78-12376

A MULTIPLE APPROACH TO SOLVING THE GAS SUPERSATURATION PROBLEM,
Corvallis Environmental Protection Agency. Western Fish Toxicology Station.
R. R. Garton, and A. V. Nebeker.
In: Recent Advances in Fish Toxicology, Environmental Protection Agency, Ecological Research Series, EPA 600/3-77-085, July 1977, p 4-19. 1 tab, 4 fig, 28 ref.

Descriptors: *Supersaturation, *Columbia River, Mortality, Bioassay, Laboratory tests, *On-site investigations, Fish behavior, Water temperature, Depth, Environmental effects, Engineering, Entrainment, *Dams, Sockeye salmon, Fish pathology, Chinook salmon, Rainbow trout, Juvenile fish, Fish migration, Supersaturation, *Snake River, Depth compensation.

Gas supersaturation of water was first recognized as a serious problem in the Snake and Columbia rivers of the Pacific Northwest. To solve the problem, a multiple approach was used combining laboratory and field studies to determine sources, effects, persistence, and prevention of supersaturation. Classical bioassays were used to determine effect, but additional tests were needed because of the unique nature of supersaturation. These tests included assessment of avoidance capability of fishes, assessment of depth compensation and temperature effects, and field surveys of aquatic organisms distribution in the affected areas. Data from the combined approaches were used to set safe levels for aquatic organisms. In addition, engineering expertise from other groups was applied in an attempt to prevent or mitigate the effects of supersaturation. (See also W78-12376) (EIS-Katz)
W78-12377

EFFECTS OF KEPONE ON ESTUARINE ORGANISMS,
Environmental Research Lab., Gulf Breeze, FL.
D. J. Hansen, D. R. Nimmo, S. C. Schimmel, G. G. Walsh, and A. J. Wilson, Jr.
In: Recent Advances in Fish Toxicology, Environmental Protection Agency, Ecological Research Series, EPA 600/3-77-085, July 1977, p 20-30. 4 tab, 1 fig, 14 ref.

Descriptors: *Insecticides, *Pesticides, Mortality, *Bioassay, Toxicity, Laboratory test, Estuarine environment, Estuarine fisheries, Marine fish, *Marine algae, Mollusks, Crustaceans, Growth, Shrimp, Crabs, Methodology, Juvenile fish, *Bioconcentration factor, *Kepone, *Mysids, Sheepshead minnows, Chronic bioassays.

Laboratory toxicity tests were conducted to determine the effects and accumulations of Kepone in estuarine algae, mollusks, crustaceans, and fishes. Nominal Kepone concentrations calculated to decrease algal growth by 50% in static bioassays lasting seven days were: 350 microg/l, Chlorococcum sp., 580 microg/l, Dunaliella tertiolecta; 600 microg/l, Nitzschia sp.; and 600 microg/l, Thalassiosira pseudonana. Measured Kepone concentrations calculated to cause 50% mortality in flowing-seawater toxicity tests lasting 96 hours were: 1(microg/l for the mysid shrimp; 120 microg/l for the grass shrimp; greater than 210 microg/l for the blue crab; 70 microg/l for the sheepshead minnow; and 6.6 microg/l for the spot. Bioconcentration factors (concentration in whole animals divided by concentration measured in water) in these tests were greatest for fishes (950 to 1,900) and less for grass shrimp (420 to 930). Survival, growth, and reproduction of mysids and sheepshead minnows were decreased in chronic bioassays lasting 14 to 64 days. Growth of mysids and sheepshead minnows was reduced by exposure to 0.07 microg/l and 0.08 microg/l respectively. Bioconcentration factors for sheepshead minnows in the chronic bioassay averaged 5,200 (range, 31,00-7,000) for adults exposed for 28 days and 7,200 (3,600-20,000) for juveniles exposed for 36 days. The chronic toxicity and bioconcentration potential of Kepone are more important factors than its acute toxicity in the laboratory evaluations of environmental hazard. (See also W78-12376) (EIS-Katz)
W78-12378

COLLAGEN METABOLISM IN FISH EXPOSED TO ORGANIC CHEMICALS,
Fish and Wildlife Service, Columbia, MO. Fish-Pesticide Research Lab.
F. L. Mayer, P. M. Mehrle, and R. A. Schoettger.
In: Recent Advances in Fish Toxicology, Environmental Protection Agency, Ecological Research Series, EPA 600/3-77-085, June 1977, p 31-54. 4 tab, 7 fig, 41 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclor, Pesticides, Insecticides, Toxicity, Herbicides, Chlorinated hydrocarbon pesticides, Bioassay, Toxicity, Mortality, Fish physiology, Biochemistry, *Pathology, Rainbow trout, Brook trout, Channel catfish, *Toxaphene, *Aroclor 1254, Phenoxyacetic acid, Di-2-ethylhexylphthalate, Chlorinated camphene, Metabolism, Chronic toxicity metabolism, *Collagen.

One major function of collagen is to serve as the structural support for bones. Fish grow throughout life and the vertebrae were assumed to enlarge and elongate in proportion to growth. The synthesis of vertebral collagen and hydroloproline was examined as an indicator of growth, and as a sensitive predict of the chronic effects of toxaphene, Aroclor 1254, the dimethylamine salt of 2,4-D, and di-2-ethylhexyl phthalate. Rainbow Trout (Salmo gairdneri), brook trout (Salvelinus fontinalis), fathead minnows (Pimephales promelas), and channel catfish (Ictalurus punctatus) were the species tested in chronic toxicity experiments, and collagen was reduced by all four chemicals. Interpretation of collagen synthesis data required information on vitamin C distribution in liver and bone since the vitamin is involved in the hydroxylation and detoxification of organic chemicals in liver and of collagen synthesis in bone. Toxaphene reduced the vitamin C content of vertebrae in channel catfish, but vitamin C content in the liver remained constant or showed a slight increase. The reduction of vitamin C in bone is thought to inhibit collagen formation. Within limits, collagen synthesis can be interpreted as a sensitive indicator and predictor of fish growth. (See also W78-12376) (EIS-Katz)
W78-12379

EFFECTS OF SHORT-TERM EXPOSURES TO TOTAL RESIDUAL CHLORINE ON THE SURVIVAL AND BEHAVIOR OF LARGEMOUTH BASS (MICROPTERUS SALMOIDES),
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
G. L. Larson, and D. A. Schlesinger.
In: Recent Advances in Fish Toxicology, Environmental Protection Agency, Ecological Research Series, EPA 600/3-77-085, July 1977, p 55-70. 1 tab, 5 fig, 9 ref.

Descriptors: *Methodology, *Bioassay, Mortality, Laboratory tests, Toxicity, *Chlorine, Bass, Powerplants, Fish behavior, Laboratory tests, Laboratory equipment, Chlorination, *Acute toxicity, Survival, Largemouth bass, *Sublethal exposure.

Largemouth bass were subjected to short-term exposures of total residual chlorine. Two different time-toxicant concentration curves similar to those of chlorinated discharges from power generation plants were used as models for the tests. Acute toxicity tests included a comparison of the effects of square and spike exposures and comparative tests of the effects of square exposures of varying frequency and duration. Fish behavior was observed during acute and sublethal square and spike exposures. There were no obvious differences in acute toxicity between the two types of exposures when mortality (in probits) was plotted against the areas under the time-concentration curves. The same results were obtained in tests of one and two 90- and 150-min. exposure. Thus, measurement of the areas under the time-concentration curves are a useful means of studying effects of different kinds and durations of exposures and different exposure frequencies. Bass exhibited several behavioral changes during the acute toxicity tests. Many behavioral responses occurred in sublethal tests of square and spike exposures. The behavioral changes caused by acute and sublethal exposures probably are detrimental to the well-being and survival of the fish in the field. (See also W78-12376) (EIS-Katz)
W78-12380

AN APPROACH FOR STUDYING THE EFFECTS OF MIXTURES OF ENVIRONMENTAL TOXICANTS ON WHOLE ORGANISM PERFORMANCES,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
C. F. Muska, and L. J. Weber.
In: Recent Advances in Fish Toxicology, Environmental Protection Agency, Ecological Research Series, EPA 600/3-77-085, July 1977, p 71-87. 2 fig, 19 ref.

Descriptors: *Copper, *Nickel, *Metals, Laboratory tests, Laboratory equipment, *Methodology, Mortality, Bioassay, Toxicity, Laboratory animals, Growth, Foods, Water pollution effects, Environment, Mathematical studies, Mathematical models, *Guppies, *Toxicant mixtures, Toxicant interactions, Quantal responses.

An extensive methodology has been developed to evaluate the toxicity of individual environmental pollutants for a variety of test animals; however, an approach is needed to study the possible interactions of toxicants found together in the environment. A promising model has previously been proposed for predicting quantal (all or none) responses or organisms to mixtures of two or more toxicants. In our laboratory, toxicity studies using the common guppy, Poecilia reticulata, as a test organism have demonstrated the utility of this model for predicting their lethal response to a variety of toxicant mixtures. The usefulness of this approach to environmental toxicity problems is evaluated in terms of its applicability to sublethal studies. The model under investigation and results from experiments studying the effects of copper, nickel, and their mixtures on the gross growth efficiency, relative growth rate, and food consumption of guppies are discussed. (See also W78-12376) (EIS-Katz)
W78-12381

RELATIONSHIP BETWEEN PH AND ACUTE TOXICITY OF FREE CYANIDE AND DISSOLVED SULFIDE FORMS TO THE FATHEAD MINNOW,
Minnesota Univ., St. Paul. Dept. of Enterology, Fisheries, and Wildlife.
S. J. Broderius, and L. L. Smith, Jr.
In: Recent Advances in Fish Toxicology, Environmental Protection Agency, EPA 600/3-77-085, July 1977, p 88-117. 6 tab, 4 fig, 31 ref.

Descriptors: *Bioassay, *Toxicity, Mortality, Methodology, Ammonia, Freshwater fish, Hydrogen ion concentration, Laboratory tests, Fish physiology, Biochemistry, Rainbow trout, *Sulfides, Permeability, *Free cyanide, Sulfide forms, Fathead minnow.

The changes in tolerance limits for the fathead minnow to free cyanide and dissolved sulfide forms were studied as a function of pH because the toxicity of weak acids and bases is known to be pH dependent. Experimental results could largely be explained by one of the gill permeability theories. (See also W78-12376) (EIS-Katz)
W78-12382

THE ACUTE TOXICITY OF NITRITE TO FISHES,
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
R. C. Russo, and R. V. Thurston.
In: Recent Advances in Fish Toxicology, Environmental Protection Agency, Ecological Research Series, EPA 600/3-77-085, July 1977, p 118-131. 3 tab, 2 fig, 24 ref.

Descriptors: *Nitrite, *Nitrate, *Ammonia, Bioassay, Chloride, Hydrogen ion concentration, Mortality, Aquiculture, Rainbow trout, Freshwater fish, Water pollution effects, Juvenile fish.

Bioassays indicated exposure to nitrite causes an increase in methemoglobin concentration in free blood. Rainbow and cutthroat trout are much more susceptible to nitrite than fathead minnows or sculpins. Rainbow trout fry are less susceptible to nitrite than larger rainbow trout. The toxicity of nitrite is related to nitrite ion concentration not nitrous acid concentration and changes in pH in the range of 7.5-8.5 do not affect nitrite toxicity and an increase in chloride concentration causes a decrease in nitrite toxicity. (See also W78-12376) (EIS-Katz)
W78-12383

COPPER TOXICITY: A QUESTION OF FORM,
Corvallis Environmental Research Lab., OR. Western Fish Toxicology Station.
G. A. Chapman, and J. K. McCrady.
In: Recent Advances in Fish Toxicology, U.S. Environmental Protection Agency, Ecological Research Series, EPA 600/3-77-085, July 1977, p 132-151. 1 tab, 11 fig, 14 ref.

Descriptors: *Metals, *Copper, Toxicity, Bioassay, Laboratory tests, Water pollution effects, Path of pollutants, Water quality, Chinook salmon, Alkalinity, Methodology, Daphnia, *Cupric ion.

A series of bioassays were conducted to evaluate the toxicity of copper to fish with its chemical form. Even if acutely lethal copper ions can be determined on the basis of cupric ion activity, a similar relationship with chronic toxicity is not assured. Field studies, chronic toxicity studies, application factors or short-term indicator tests would still be required to estimate safe levels. The data relating copper toxicity to cupric ion activity are far from being definitive. (See also W78-12376) (EIS-Katz)
W78-12384

THE ROLE OF CYANIDE AS AN ECOLOGICAL STRESSING FACTOR TO FISH,
Concordia Univ., Montreal (Quebec). Dept. of Biological Sciences.
G. Leduc.
In: Recent Advances in Fish Toxicology, Environmental Protection Agency, Ecological Research Series, EPA 600/3-77-085, July 1977, p 152-182. 17 fig, 34 ref.

Descriptors: Bioassay, Methodology, *Water pollution effects, Mortality, Toxicity, Fish physiology, Biochemistry, *Pathology, Laboratory tests, Laboratory equipment, Salinities, Industrial wastes, Path of pollutants, Stress, Environmental effects, Arsenic compounds, *Water quality standards, *Free cyanide, *Maximum permissable level, Toxicology, Cyanides.

Cyanide, at concentrations as low as 0.01 mg l-1 HCN, produces individual stresses on fish which, when integrated into a single total response, so seriously affect the energy supply processes, that both the range and scope for activity are reduced. The proposed toxicological model suggests that, at least under laboratory conditions, the fish could not continue to exist as populations. Not all physiological parameters were equally affected by cyanide but it appears that the greater energy-demanding processes, such as fat biosynthesis, osmoregulation and swimming were more seriously affected by this respiratory poison. These results were integrated into a single ecophysiological response-curve - a Relative Performance Index - which was used to develop a cyanide-stressed Scope for Activity model. This model suggests a 50% reduction in the overall performance of the fish at 0.01 mg l-1 HCN and supports the previously established water quality criteria for cyanide, i.e., a maximum permissible level of 0.005 mg l-1 HCN. (See also W78-12376) (EIS-Katz)
W78-12385

AN ASSESSMENT OF APPLICATION FACTORS IN AQUATIC TOXICOLOGY,
Environmental Research Lab.-Duluth, MN.
D. I. Mount.
In: Recent Advances in Fish Toxicology, Environmental Protection Agency, Ecological Research Series, EPA 600/3-77-085, July 1977, p 183-190. 1 tab, 10 ref.

Descriptors: *Toxicity, *Mortality, Bioassay, Methodology, *Lethal limit, Water quality, Water pollution effects, Laboratory tests, Mathematical analysis, *Water quality standards, Growth, Reproduction, *Aquatic toxicology, Application factors, *MATC, LC50.

In the early 1950's, application factors to estimate 'safe' concentrations from LC50's were proposed. Later, an experimental method of estimating the numerical value of the application factor was proposed to replace arbitrary values such as 1/10. Both measured values and arbitrary ones have been widely employed in water quality criteria by regulatory agencies. An examination of the data base for establishing application factors for various pollutants in different water types and for various species, reveals an unacceptable spread in their numerical value. Several factors such as chemical effects of the water on the pollutant, experimental error and biological variability must be contributing to this spread thereby making a determination of their real validity difficult. A better method to predict concentrations that will not affect survival, growth, and reproduction is needed for present toxicological requirements. (See also W78-12376) (EIS-Katz)
W78-12386

CLOSING REMARKS--AN OLD FROG CROAKS AN APPEAL FOR LOGIC,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5G.
W78-12387

TOXICITY STUDIES ON MARINE ANIMALS,
Cape Town Univ. (South Africa). Dept. of Zoology.
A. C. Brown.
South African Journal of Science, Vol. 72, No. 7, p 197-199, 1976. 14 ref.

Descriptors: *Toxicity, *Marine pollution, Synergism, Animal survival, Susceptibility, Bioindicators, Bioassay, Laboratory studies, Pollution effects, Toxins, Trace elements, Metals, Animal behaviour, Temperature effect, Salinity, Environmental effects, Crustacea, Embryonic growth stage, Oil spills, Bivalves, Short term pollution effects, Arniston, Agulhas, South Africa, Chloromytilus, Parechinus, Bullia.

Incompetent research is lamented which has been done in the past in determining the thresholds of toxicity on various aquatic creatures for given pollutants, and no consideration had been given in this type of work to the fact that some stages in life history of an animal may be far more sensitive than others, or that sub-lethal concentrations may place the animal under stress, affect its metabolism, influence its reproductive ability, change its behaviour or reduce its life-span. It is suggested that our knowledge of toxicity will remain rudimentary unitl we are able to predict the effects of pollution, not only on individuals of a species but also on the community or the ecosystem as a whole. (So Afr Water Info Ctr)
W78-12424

SUSPECTED KILLER UNDER THE MICROSCOPE.
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W78-12446

BLUE-GREEN ALGAE IN THE NORTHERN DONETS-DONETS BASIN CANAL (IN RUSSIAN),
Central Control Research Project, Donetsk (USSR). Research Water Lab.
A. I. Kovrizhnykh.
Gidrobiol Zh 13(2), p 62-65, 1977.

Descriptors: *Cyanophyta, *Canals, Eutrophication, Algae, Donets-Donets Basin Canal(USSR), Water pollution, Anabaena-Flos-Aquae, Anabaena-Variabilis, Aphanizomenon-Flos-Aquae, Distribution, Microcystis-Aeruginosa.

Changes in the numbers and distribution of planktonic blue-green algae (Aphanizomenon flos-aquae, Microcystic aeruginosa, Anabaena variabilis, A. flos-aquae) were studied in the Northern Donets-Donets Basin Canal (USSR). Changes in the studied parameters were the result of an increase in the water released from krasnooskol Reservoir, the canals source of algae and changes in the hydrological conditions of the canal itself on the other.-Copyright 1978, Biological Abstracts, Inc.
W78-12464

OCCURRENCE OF NANNOCYTES IN MICROCYSTIS,
J. A. Pretorius, and J. N. Eloff.
South African Journal of Science, Johannesburg, Vol 73, No 8, p 245-246, 1977. 9 ref.

Descriptors: Pure cultures, Algae cultures, Reproduction, Propagation, *Eutrophication, South Africa, *Nannocytes, microcystic, *Cyanophyceae.

Nannocytes' are the small cells formed by Chlorogloca microcystoides and Gleocapsa Crepidinum. Nannocytes play a role in the propagation of Microcystis rather than in overwintering during wintering during unfavourable conditions. Nannocytes could play an important part in the sudden bloom formation typically associated with Microcystis in nature. Nannocytes were also observed in other isolates of Microcystis growing in the authors laboratory as well as in several naturally occuring blooms, suggesting that the formation of nannocytes by Microcystic is a widespread phenomenon. (So Afr Water Info Ctr)
W78-12474

WATER EUTROPHICATION - A 20TH CENTURY PROBLEM, PART 1,
Council for Scientific and Industrial Research (South Africa). National Inst. for Water Research.
J. Hemens.
Chemsa, (Johannesburg), Vol 3, No 11, p 185, 186, 187, 1977, 2 ref, 1 tab, 1 fig.

Descriptors: *Eutrophication, Ecology, Human activity, Deoxygenation, Algae, Effluent, Stormwater runoff, Detergents, Phosphorus, Biomass, Nitrogen fixation, Nutrient enrichment, South Africa.

Eutrophication caused by excessive enrichment of water with plant nutrients derived from areas of high population density and industrial development reduces the value of water resources in several ways. The causes and effects of eutrophication are described. (So Afr Water Info Ctr)
W78-12487

NITROGEN AND PHOSPHORUS INPUT TO THE MIDMAR DAM, NATAL,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
J. Hemens, and D. E. Simpson.
Water South Africa, Vol. 3, No. 4, p 193-201, 1977.

Descriptors: *Nitrogen, *Phosphorus, *Nutrient enrichment, Surface runoff, Surface loading, Algal growth, Available nutrients, Oligotrophic lakes, Mesotrophic lakes, Dry deposition, Catchment areas, Anthropogenic effects, Land use, Atmospheric precipitation, River flow, Growth limiting nutrients, *Eutrophication, Midmar dam, South Africa, Umgeni catchment.

From March 1973 to February 1974 the mass of nutrients carried to the Midmar Dam by surface drainage was equivalent to a surface loading rate of 0,62 g total phosphorus and 8,49 g total soluble nitrogen m-2a-1. The mean annual rate of phosphorus is probably approximately half this value. Throughout the same period algal growth in the dam water was limited by the amount of phosphorus available, and the dam was in an oligotrophic-mesotrophic condition. Atmospheric nutrient depostion in the dam catchment was measured during 1975-76 and this source probably provides a small but significant contribution to the total annual input. The vegetation and soil of the catchment retains most of the nutrients reaching the land surface. In view of possible development in the catchment the increase in phosphorus loading rate that could be permitted without development of algae-associated problems is discussed. (So Afr Water Info Ctr)
W78-12491

CAMPS BAY BEACH. A POLLUTION SURVEY,
G. A. Eagle, and A. H. Fricke.
South African Journal of Science, Johannesburg, Vol 73, No 11, p 342-345, 1977. 8 ref, 4 tab, 3 fig.

Descriptors: Pollution survey, Sewage disposal, Ocean outfall, Analysis results, Site investigations, Biological samples, Chemical analysis, Bacteriological examination, Camps Bay beach, South Africa.

Analytical results of water and sediment samples, collected from Camps Bay beach prior to the start of sewage disposal, reveal that the beach is well suited for recreational purposes. No fecal bacteria were found, nutrient and oxygen concentrations were well within the limits expected for clean beaches and meiofaunal populations were not limited by any chemical considerations. (So Afr Water Info Ctr)
W78-12507

MODEL EXPERIMENTS ON POLIOMYELITIS SURVEILLANCE IN AN URBAN POPULATION OF THE RUHR VALLEY (ESSEN) BY IN VESTIGATIONS OF THE SEWAGE WATER (I GERMAN),
Essen Univ. (Gesamthochschule) West Germany) Abt. fuer Medizinische Virologie und Immu nologie.
For primary bibliographic entry see Field 5A.
W78-12511

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS BENZOTRIAZOLES,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
For primary bibliographic entry see Field 5B.
W78-12513

STUDIES OF PHYTOPLANKTON BIOGENIC ELEMENT REQUIREMENTS IN DIFFERENT TYPES OF LAKES USING A METHOD OF PLANNED SUPPLEMENTS (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
N. A. Petrova, G. F. Raspletina, and B. L. Gusakov.
Bot Zh (Leningr) 62(7), p 984-989, 1977.

Descriptors: Ankistrodesmus-pseudomirabilis-var-s, Asterionella-formosa, Didymocystis-planctonica, Dinobryon-cylindricum-var-palustre, Dinobryon-cylindricum-var-palustre, Dinobryon-sociale-var-stipitatum, Lyngbya-contorta, Melosira-ambigua, Melosira-distans-var-alpigena, Melosira-granulata, Melosira-islandica-ssp-helvetica, Oscillatoria-subtillissima, Scenedesmus-bijugatus, Thalassionema, *USSR, Eutrophication, *Oligotrophy, *Mesotrophy, Lakes.

Mineral element requirements of phytoplankton (Melosira islandica ssp. helvetica, M. distans var. alpigena, Asterionella formosa, M. ambigua, M. granula, Oscillatoria subtillissima, Lyngbya contorta, Scenedesmus bijugatus, Ankistrodesmus psudomirabilis var. spiralis, Didymocysis planctonia, Dinobryon cylindricum var. palustre, D. sociale var. stipitatum, and Thalassionema) in oligotrophic (Lake Onega) and mesotrophic (Lake Lacha and Vozhe) lakes in the USSR according to seasonal development were analyzed and compared. The method involved a complete factoral experiment which permitted a statistical analysis and qualitative evaluation of phytoplankton requirements. Biogenic elements were introduced in the form of readily soluble salts (NaH2P04, NH4C1, NaNO3, and FeS04). Determining limiting factors of development and phytoplankton productivity at different levels of mineral nutrition permitted assumptions on ecological specificities to be made.--Copyright 1978, Biological Abstracts, Inc.
W78-12514

EXCRETION OF MERCURY FROM FISH (IN JAPANESE),
Tokyo Univ. of Fisheries, (Japan).
For primary bibliographic entry see Field 5B.
W78-12515

METAL SURVEY OF THE MARINE CLAM PITAR MORRHUANA COLLECTED NEAR A RHODE ISLAND (USA) ELECTROPLATING PLANT,
Environmental Research Lab., narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-12516

EXPERIMENTAL STUDIES ON THE RELATIONSHIP BETWEEN NATURAL COPPER COMPLEXES AND THEIR TOXICITY TO PHYTOPLANKTON,
Laboratoire de Physique et Chimie Marines, Villefrance-sur Mer (France). Station Marine.
M. Gnassia-Barelli, M. Romeo, F. Laumond, and D. Pesando.

Marine Biology, Vol 47, p 15-19, 1978. 2 fig, 2 tab, 2 ref.

Descriptors: *Copper, Plant physiology, Phytoplankton, *Toxicity, *Organic compounds, Metabolism, Metals, Chelation, Chemical analysis, Primary productivity, Path of pollutants, Cytological studies, Bioavailability.

Toxicity of copper to phytoplankton depends on the physiochemical form of the metal. Organic substances liberated into the culture medium by the phytoplankton species Cricophaera elongata are able to detoxify and complex copper. The molecular weight range of these organic substances has been determined by ultrafiltration. (EIS-Deal)
W78-12518

ECOLOGICAL EFFECTS OF MARINE OIL POLLUTION,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
J. Baker, J. Addy, B. Dicks, S. Hainsworth, and D. Levell.
Rapports et Proces-verbeaux des Reunions, Conseil International Pour L'Exploration de la Mer, Vol 171, p 196-201, 1977. 18 ref.

Descriptors: *Intertidal areas, *Oil spills, *Oil wastes, *Dispersion, *Toxicity, *Water pollution effects, *Salt marshes, On-site investigations, Methodology, Biological communities, Oil pollution, Environmental effects, Laboratory tests, Oil industry, Invertebrates, Mollusks, Coastal marshes, *Sub-lethal effects, Arenicola, Littorina.

Field surveys in the intertidal zone provided information on the effects of oil spills, cleaning treatments and refinery effluents. More precise results for rocky shores, saltmarshes and lugworm beds were obtained by field experiments. The survey and experimental methods are briefly described, and results for the different biological communities summarized. Effects of oils and effluents vary considerably according to type and quantity of oil, cleaning treatment (if any), effluent characteristics, and hydrography and biology of the area affected. Related laboratory work concerns the toxicity ranking of oils, dispersants, effluents and effluent constituents; and behavioral responses of some organisms to sub-lethal doses of pollutants. Offshore surveys in Milford Haven, and the Celtic and North Seas, were initiated and are briefly referred to. (EIS-Katz)
W78-12519

CHEMICAL CHARACTERISTICS OF LAKE MARYUT, A POLLUTED LAKE SOUTH OF ALEXANDRIA, EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
For primary bibliographic entry see Field 5A.
W78-12520

EXCRETION RATE OF 65ZN; IS IT A USEFUL TOOL FOR ESTIMATING METABOLISM OF FISH IN THE FIELD,
National Marine Fisheries Service, Beaufort, NC. Beaufort Lab.
D. E. Hoss, D. S. Peters, W. F. Hettler, and L. C. Clements.
Journal of Experimental Marine Biology and Ecology, Vol 31, p 241-252, 1978. 2 fig, 7 tab, 23 ref.

Descriptors: *Fish physiology, *Animal metabolism, *Zinc, *Metabolism, Biochemistry, Sea basses, Oxygen demand, Food habits, Feeding rates, Size, Respiration, Methodology, Laboratory tests, *Pinfish, Bioaccumulation.

Several experiments were conducted with pinfish and black sea bass to determine the practicality of using the rate of loss of 65Zn to estimate the metabolic rate of fish under natural conditions. No significant correlations were found between this and oxygen consumption, feeding rate, fish size, or temperature. Restricting fish movement had no consistent effect on zinc loss nor did elevated levels of inorganic zinc in the diet. Because of the lack of positive results, it was concluded that the rate of loss of 65Zn is not a practical method for estimating field metabolism of fish. (EIS-Deal)
W78-12521

THE EFFECT OF SEWAGE EFFLUENT ON GRASMERE (ENGLISH LAKE DISTRICT) WITH PARTICULAR REFERENCE TO INORGANIC NITROGEN TRANSFORMATIONS,
Freshwater Biological Association, Windermere (England).
G. H. Hall.
Freshwater Biology, Vol 8, p 165-175, 1978. 5 fig, 5 tab, 41 ref.

Descriptors: *Sewage effluent, *Hypolimnion, *Eutrophication, *Nitrogen cycle, *Nitrogen compounds, Waste water treatment, Sewage treatment, Bacteria, Oxygen demand, Nitrification, Phosphorous, Nutrients, Ammonia, Denitrification, Chemical reactions, Water pollution sources, Environmental effects, Lakes, *Grasmere, English Lake District.

In the summer of 1971, the village of Grasmere was converted from septic tank to mains drainage with sewage treatment at an activated sludge plant. The effluent was discharged into the River Rothay, the main inflow of a nearby small lake (Grasmere). This paper describes some of the effects on the lake. The mean areal hypolimnetic oxygen deficit increased with an accompanying marked increase in the degree of deoxygenation in the hypolimnion. Plate counts of bacteria in the surface water increased for 2 years but this increase was not sustained. The mean summer soluble reactive phosphorous concentration did, however, increase significantly, but the same was not true of nitrate levels. Analyses of the main inflow have shown that 50-98% of the ammonia and 10-40% of the nitrate entering in this river was derived from the sewage effluent. The concentrations in the main body of the lake were usually lower, possibly due to assimilation and denitrification in the shallower reaches of the lake. Seasonal changes in the inorganic nitrogen species in the hypolimnion showed three distinct phases of activity, ammonification, nitrification, and denitrification. Nitrification accounted for approximately a quarter of the oxygen uptake in the hypolimnion. (EIS-Deal)
W78-12522

OCCURRENCE AND FATE OF ORGANIC AND INORGANIC CONTAMINANTS IN MARINE ANIMALS,
Torry Research Station, Aberdeen (Scotland).
For primary bibliographic entry see Field 5B.
W78-12523

ASSESSMENT TECHNIQUES FOR MODELLING WATER QUALITY IN A RIVER BASIN IMPACTED BY COAL RESOURCE DEVELOPMENT,
Geological Survey, Denver, CO.
For primary bibliographic entry see Field 5B.
W78-12542

COMPARATIVE BACTERIOLOGICAL STUDY OF LETTUCE (LACTUCA SATIVA) FROM THE SANTIAGO AREA AND COASTAL REGIONS (IN SPANISH),
Instituto Bacteriologico de Chile, Santiago.
R. Lobos, J. Garcis-M, and C. Aquilar-A.
Bol Inst Bacteriol Chile 18(1/2), p 33-37, 1976.

Descriptors: Bacteriology, *Lettuce, Coasts, *Bacteria, Irrigation water, Water pollution sources, *Chile, *Coliforms, *E. Coli, Ponds, *Salmonella, Sedimentation, *Shigella.

The existence of enteropathogenic bacteria (Salmonella, Shigella and Escherichia coli) and coliforms in lettuce from Santiago and coastal areas of Chile was studied. The percentages of contamination by enteropathogenic bacteria were 18.5 and 3.4 for Santiago and the coastal areas, respectively. The orgin of these enteropathogens and coliforms was probably the contaminated water used for irrigation. The use of sedimentation ponds for the treatment of irrigation water was suggested.--Copyright 1978, Biological Abstracts, Inc.
W78-12554

MICROBIOLOGICAL CONDITIONS OF THE WATERS AROUND THE AUGUSTA ROADSTEAD (IN ITALIAN),
Messina (Italy). 1st. di Idrobiologia.
S. Genovese, and M. De Domenico.
Atti Soc Peloritana Sci Fis Mat Nat 21, p 157-168, 1975.

Descriptors: *Microbiology, Surveys, Industrial wastes, *Pollutant identification, Water pollution effects, *Bacteria, *Coliforms, *Eutrophication, Italy, Microorganisms.

Two surveys were made during Dec. 1970 and Jan. 1971 on Ionian waters beyond the Augusta Roadstead, Italy. Eutrophication level of this area which borders a highly industralized area was measured. The role played by mineralizing microorganisms, mainly coliform bacteria, was analyzed.--Copyright 1978, Biological Abstracts, Inc.
W78-12556

SOME REGULARITIES IN THE CHANGES IN LAKE ECOSYSTEMS IN CONNECTION WITH ANTHROPOGENIC FACTORS (IN RUSSIAN),
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 2H.
W78-12557

SEASONAL VARIABILITY IN THE BIOCHEMICAL COMPOSITION OF PLANKTON IN THE MINGECHAUR AND VARVARA RESERVOIRS (IN RUSSIAN),
Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Inst. Zoologii.
For primary bibliographic entry see Field 2H.
W78-12560

ENERGETICS OF A SALMON LAKE ECOSYSTEM (IN RUSSIAN),
Akademiya Nauk SSR, Moscow. Inst. Biologii Vnutrennykh Vod.
Y. I. Sorokin, and E. B. Pavel'eva.
Zh Obshch Biol 38(4), p 512-527, 1977.

Descriptors: Autotrophy, Heterotrophy, *Primary production, Lakes, Ecosystems, *Lake Dalnce(Russian SFSR), USSR, *Plankton, Detritus.

Energy flow diagrams of the pelagic ecosystems of Lake Dalnce (the Kamchatka peninsula (Russian SFSR, USSR) were made during warm (1970) and cold (1971) seasons. In 1971 the food chain was shorter and, consequently, the efficiency of utilization of the primary production was higher than in 1970; 16-70% of the primary energy input was used in the ecosystem in the form of detritus. Seasonal succession in the planktonic community passes through autotrophic and heterotrophic phases.--Copyright 1978, Biological Abstracts, Inc.
W78-12614

SPECIES COMPOSITION OF PHYTOPLANKTON FROM DIFFERENT TYPES OF LAKES IN THE CENTRAL KARELIAN ISTHMUS (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
I. S. Trifonova, and V. I. Martynova.
Bot Zh (Leningr) 62(7), p 990-998, 1977.

Descriptors: Ecology, *Productivity, *Phytoplankton, Lakes, Russian SFSR, USSR, Cyanophyta, Chrysophyta, Bacillariophyta, Pyrrophyta, Euglenophyta, Xanthopyta, Chlorophyta.

Data on species composition, ecology and maximum numbers of phytoplankton from 4 lakes (Krasnoe, Pravdinskoe, Vishnevskoe, and Michurinskoe) of the Karelian Isthmus (Russian, SFSR, USSR) are presented. The lakes were compared according to area, depth, transparency, pH, N-NO3, P-PO4, Si-SiO2, and Fe content, biological productivity and phytoplankton composition. Phytoplankton composition consisted of 7 groups (Cyanophyta, Chrysophyta, Bacillariophyta, Pyrrophyta, Euglenophyta, Xanthopyta, and Chlorophyta) are included 133 spp.--Copyright 1978, Biological Abstracts, Inc.
W78-12620

ATMOSPHERIC NITROGEN AND PHOSPHORUS LOADING TO HARP LAKE, ONTARIO, CANADA,
Ontario Ministry of the Environment, Rexdale (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5B.
W78-12626

CURRENT CONDITIONS AND INTENSITY OF SELF-PURIFICATION IN THE UPPER REACHES OF THE SUKHONA RIVER (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
D. N. Aleksandrova, T. D. Slepukhina, N. Yu. Senatskaya, A. V. Kuleshev, and L. F. Zhekhnovskaya.
Gidrobiol Zh 13(2), p 86-91, 1977.

Descriptors: Bacteria, Benthos, Biochemical oxygen demand, Oligochaetes, Pollution, USSR, Sukhoma River(USSR), Self-purification, Lake Kubenskoye(USSR), Bioindicators.

A 42-km segment of the Sukhona River was studied in conjunction with the projected diversion of its waters and their consequent effect of Lake Kubenskoye, USSR. Twenty-six hydrological, hydrochemical and biological indices were analyzed. Intensity of biological processes and changes in indices along the course of the river were determined. The extent of pollution and self-purification of the water and bottom sediments were evaluated on the basis of total quantity of oligochaetes, index of macrobenthos species variety, bacteria/saprophyte ratio and biochemical oxygen demand. The wastes of cellulose-paper industry located on the river present a particularly significant threat to water quality in Lake Kubenskoye.--Copyright 1978, Biological Abstracts, Inc.
W78-12654

EFFECT OF ADDITIONS OF FERTILIZER AND VEGETATION ON GROWTH OF MAJOR INDIAN CARPS IN PONDS CONTAINING GRASS CARP,
Central Inland Fisheries Research Inst., Cuttack (India). Fisheries Research Station.
P. R. Sen, N. G. S. Rao, R. D. Chakrabarty, S. L. Kar, and S. Jena.
The Progressive Fish Culturist, Vol. 40, No. 2, p 69-70, 1978. 3 tab, 3 ref.

Descriptors: Freshwater fish, *Nutrients, *Aquiculture, Fertility, *Fertilizers, Fish establishment, Fish harvest, Commercial fishing, *Waste treatment, Animal growth, Survival, Animal wastes(Wildlife), Carp, Polyculture ponds, Fish excreta, Grass carp, Ctenopharyngodon idella, Indian carp, Catla, Rohu, Labeo, Mrigal, Cirrhinus, Manure.

Observations of fish growth in polyculture ponds suggest that fertilization of pond water by the excreta of grass carp (Ctenopharyngodon idella) may enhance the growth of the indigenous Indian carps catla (Catla catla) rohu (Labeo rohita) and mrigal (Cirrhinus mrigala) to about the same extent as fertilization by the addition of manure. (EIS-Katz)
W78-12669

SEASONAL ASPECTS OF OVERGROWTH OF BIOCENOSES, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
I. A. Skal'skaya.
Gidrobiol Zh 12(4), p 49-54, 1976.

Descriptors: *Biocenoses, Caddis-fly, Diversity, Electric power plants, Invertebrates, Larvae, Mussels, Overgrowth, *Seasonal, Temperature, Thermal pollution, Water pollution effects.

The seasonal changes in biocenoses of artificial woody substrate overgrowths were considered in the Gorky reservoir (USSR) within the warm water zone near the Kostroma State electric station and beyond. In the hottest period (July-Aug.) in the warm zone the hydrobionts endured a negative effect of high temperature near the station and in the bay where warm water is delivered. Here the substrate was populated weakly by zebra mussel, caddisfly larvae and other organisms. In autumn, the substrate is more highly populated by hydrobionts and the fauna is more diverse than it is beyond the limits of the station's warming effects.--Copyright 1977, Biological Abstracts, Inc.
W78-12670

HISTORICAL AND CURRENT HEAVY METAL RESIDUES IN HUDSON RIVER FISH,
Marist Coll., Poughkeepsie, NY. Research Inst.
For primary bibliographic entry see Field 5B.
W78-12671

TRACE METALS IN SEA SCALLOPS, PLACOPECTEN MAGELLANICUS, FROM EASTERN UNITED STATES,
National Marine Fisheries Service, Milford, CT. Milford Lab.
For primary bibliographic entry see Field 5A.
W78-12672

MICROBIAL ECOLOGY STUDIES OF METULA SPILL IN THE STRAITS OF MAGELLAN,
Maryland Univ., College Park. Dept. of Microbiology.
R. R. Colwell, A. L. Miller, J. D. Walker, P. Garcia-Tello, and V. Campos-P.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 573-580, 1978. 4 fig, 11 tab, 11 ref.

Descriptors: *Oil, *Oil spills, *Microbial degradation, *Bacteria, *Biological communities, *Beaches, *Ecology, Oil pollution, Organic compounds, Water pollution effects, Biodegradation, Population, Sediments, Littoral, Chromatography, Microorganisms, *Oil tankers, *Crude oil, Metulla oil spill.

The grounding of the tanker V.L.C.C. Metula in the Straits of Magellan in August of 1974 provided a unique opportunity to study a massive spill in a cold region on a long-term basis. Removal of spilled oil was solely by in situ physiochemical and biological mechanisms. Microbiological studies undertaken in May 1976 showed increased heterotrophic bacterial populations at oil-impacte sites. A cold-tolerant population of petroleu degrading bacteria was observed. Fro biodegradation studies, we concluded that o degradation under in situ conditions proceeds rel tively slowly, with marked persistence of oil in th Straits of Magellan 2 yr after the original spil (EIS-Deal)
W78-12673

BIOAVAILABILITY OF CRUDE OIL FROM EX PERIMENTALLY OILED SEDIMENTS TO EN GLISH SOLE (PAROPHRYS VETULUS), AN PATHOLOGICAL CONSEQUENCES,
National Marine Fisheries Service, Seattle, WA Environmental Conservation Div.
For primary bibliographic entry see Field 5B.
W78-12674

PATHOLOGICAL CHANGES IN A MARINE FISH AFTER A 6-MONTH EXPOSURE TO PETROLEUM,
Fisheries and Marine Service, St. John' (Newfoundland). Biological Station.
J. F. Payne, J. W. Kicenink, W. R. Squires, and G. L. Fletcher.
Journal of the Fisheries Research Board o Canada, Vol. 35, p 665-667, 1978. 1 tab, 13 ref.

Descriptors: *Oil, *Oil pollution, *Oil spills *Cytological studies, *Animal pathology *Poisons, *Fish physiology, *Animal metabolism *Toxicity, *Mortality, *Marine fish, Organic com pounds, Ecosystems, Path of pollutants, Wate pollution effects, *Crude oil, *Tissue analysis *Cunner, *Tautogolabrus.

Cunners (Tautogolabrus adspersus) were chronically exposed to Venezuelan crude in a flow-through seawater system. The survival rate was greater than 95%. The following parameters were examined: appearance of fish and internal organs from a series of color photographs; fish condition index; hematocrit; somatic indices of liver, heart, spleen, and gonads; eye lens diameter; and plasma chloride. Liver, kidney, heart, spleen, gonad, gill, muscle, and gut tissues were also examined from paraffin sections for pathological changes. There were significant differences in testis somatic index, lens diameter, and plasma chloride between the two fish groups. No histopathological changes were observed. (EIS-Deal)
W78-12675

PETROLEUM TAINTING IN FISH,
Torry Research Station, Aberdeen (Scotland).
P. Howgate, P. R. Mackie, K. J. Whittle, J. Farmer, and A. D. McIntyre.
Rapports et Proces-Verbaux de Reunions, Conseil International Pour L'Exploration de la Mer, Vol. 171, p 143-146, 1977. 2 tab, 12 ref.

Descriptors: *Organoleptic properties, *Taste, *Commercial fish, *Benthic fauna, *Oil, *Water pollution effects, *Shrimps, *Lobsters, *Odor, *Pollutant identification, Fish diets, Chemical properties, Laboratory test, Commercial shellfish, Invertebrates, Marine fish, Bottom sediments, *Tainting, *North Sea crude oil, Pleuronectes, Nephrops, Crangon, Plaice.

'Petroleum' taints in fish flesh do not necessarily arise by petroleum contamination. Such taints are well known in certain fisheries and have been traced to natural dietary components. Tainting of the flesh which is due to petroleum contamination however is usually accompanied by the presence in the flesh of hydrocarbons derived from the contaminating source, but these hydrocarbons are not necessarily responsible for the taint. Experimental tainting studies in benthic organisms by using sediment contaminated with a North Sea crude oil are described. (EIS-Deal)
W78-12676

STRIBUTION AND TOXICITY OF ELECTED WATER POLLUTANTS IN THE INY DOGFISH, SQUALUS ACANTHIAS,
ational Cancer Inst., Bethesda, MD.
M. Guarino, G. Rieck, S. Arnold, P.
nstermacher, and J. Bend.
ie Bulletin, Mount Desert Island Biological aboratory, Salsbury Cove, Maine, Vol. 16, p 50- , 1976. 2 tabs.

escriptors: *Oil, *Oil spills, Fish physiology, nimal pathology, Biochemistry, Toxicity, Water llution effects, *Phenols, Detergents, Surfac- nts, Methodology, Bioassays, Radioactive otopes, Radioactivity, Spiny dogfish, Squalus anthius, Octane, Sodium lauryl sulfate, Tissue ncentrations.

study was made of the pharmacologic disposi- on of two know components of crude oil, octane d phenol, as well as a detergent, sodium lauryl lfate. The test organism used was the spiny dog- sh. Phenol was localized in the liver and muscle. henol is rapidly cleared by gill mechanisms. Fish ave more ways of protecting themselves from the cute toxicity of xenobiotics than do most ter- strial animals. (EIS-Katz)
78-12677

ROWTH AND CELL CONSTITUENTS OF EVERAL YEASTS ON THE PULP MILL VASTE LIQUOR (IN KOREAN),
eoul National Univ. (Republic of Korea). Dept. f Botany.
ong Ky. Ju.
orean J Microbiol 14(1), p 1-7, 1976.

escriptors: Carbohydrates, Cryptococcus-luteo- s, Debaryomyces-castelli, Debaryomyces-phaf- i, Fodder, Lipids, Proteins, *Cytological studies, Yeasts, Nutrients, *Growth rates.

ffects of some nutrients on the growth of 3 yeast trains in the pulp mill waste liquor was deter- nined during an attempt to lower the BOD biochemical O2 demand) content of the waste iquor and to produce fodder yeast. The strains sed were Debaryomyces castelli Capriotti, D. phaffi Capriotti and Cryptococcus luteolus (Saito) Skinner. The necessity of the addition of 0.2% NH4)2SO4, 0.5% yeast extract, 0.2% KH2PO4 nd 0.1% MgSO4.7H2O for the best growth of all 3 trains in waste liquor was ascertained. After a 3 lay growth of yeast cells on the waste liquor, the BOD content was lowered by about 60-70%. Har- vested yeast cells contained about 75% water with .5-3% lipid, 40-46% protein, 50% carbohydrate nd 3-5% ash on the dry weight basis, indicating he possibility of being utilized as the fodder yeast.--Copyright 1978, Biological Abstracts, Inc.
W78-12680

AN EPIDEMIOLOGICAL SURVEY ON THE CLONOCHIASIS IN THE HAN RIVER SIDES (IN KOREA),
Hanyang Univ., Seoul (Republic of Korea). School of Medicine.
Y. S. Yun, and B. P. Chang.
Korean Cent J Med 29(4), p 361-369, 1975.

Descriptors: Acanthorhodeus-assmussi, Clonorchiasis, *Clonorchis-sinensis, *Epidemiology, Fishes, *Han River, Hemibarbus-labeo, Hemibarbus-longirostris, *Human diseases, *Korea, Opsariichthys-bidens, Parafossarulus-manchouricus, Pseudogobio-esocinus, Pseu- .a-parva, Rivers, South, Zacco-platypus, Carp.

The prevalance of Clonorchis sinensis in Han River (South Korea) banks was studied. Intradermal tests for clonorchiasis were performed for 664 inhabitants of river bank villages. Microscopic examination for metacercaria were conducted in 1399 fresh water fish of 19 spp. obtained from north and south Han River during the period July 1974-Aug. 1975. Incidence rates of clonorchiasis in various villages on the right and left banks are presented. Clonorchiasis was higher in male inhabitants than in females. In the 20-60 yr age group, 88-98% male and 31-57% females admitted eating raw fresh water fish. The snail (Parafossarulus manchouricus) was present in all the areas surveyed, in various types of water bodies such as ditches, streams and reservoirs in the low flat area. Of 19 spp. of fresh water fish examined, 9 contained metacercaria of C. sinensis, (Hemibarbus longirostris, Opsariichthys bidens, Pseudogobio esocinus, Carassius carassius, H. labeo, cyprinus carpio, Pseudorasbora parva, Zacco platypus, and Acanthorhodeus assmussi).--Copyright 1977, Biological Abstracts, Inc.
W78-12682

DISSOLVED NUTRIENTS IN A PEATLAND NEAR HOUGHTON LAKE, MICHIGAN,
Utah State Univ., Logan. Dept. of Wildlife Science.
J. A. Kadlec.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium Held at the Univ., of MI., Ann Arbor, May 10-11, 1976, p 25-50. 1976. 4 fig, 5 tab, 12 ref.

Descriptors: *Nutrients, *Wetlands, *Peatland, Phosphorus, Nitrogen, Microbial degradation, Peat, Litter, *Michigan, *Houghton Lake(Mich).

General levels of most of the mineral nutrients in the Porter Ranch peatland are not particularly low in comparison with other surface waters and peat interstitial waters. A high degree of annual and spatial variability exists. Surface waters tended to be reasonably uniform in May and late fall when water levels are high. In late August, surface waters were very different among years and areas, especially in forms of nitrogen. Presumably at low water levels, local influences are dominant. Dissolved nutrients were sprayed on study plots. Nutrient additions had a very small impact on the peatland. Large amounts of nitrogen and phosphorous were tied up in surficial, mostly dead, organic materials. Apparently, very little penetrated to the roots of the vascular plants. Horizontal spreading also diluted the applications. (See also W78-12707) (Stihler-Mass)
W78-12709

PRODUCTIVITY AND NUTRIENT CONTENT OF EMERGENT MACROPHYTES IN TWO WISCONSIN MARSHES,
Wisconsin Univ.-Milwaukee. Dept. of Botany.
D. Lindsley, T. Schuck, and F. Stearns.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium Held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 51-75, 1976. 4 fig, 1 tab, 15 ref.

Descriptors: *Nutrients, *Primary productivity, *Freshwater marshes, *Wisconsin, Wetlands, *Marshes, Rooted aquatic plants, Cattails, Wild rice, Soils, Sands, Phosphorus.

McNaughton Marsh, an infertile marsh in north-central Wisconsin, was studied and compared to the previously studied Theresa Marsh, a marsh in southeastern Wisconsin characterized by high nutrient values. Production in McNaughton Marsh varied greatly with species composition and density. Total net annual production probably ranges between 4 and 12 Tm/ha, considerably less than that estimated for Theresa Marsh. In general, nutrient concentrations in the above ground tissue tended to drop during the season. In contrast, roots accumulated nutrients as the top growth declined. Although species differed, the range of mineral nutrient levels in McNaughton Marsh plants were unexpectedly similar to levels in plants of Theresa Marsh. Apparently, soil nutrient concentrations are not low enough to limit growth at McNaughton Marsh. Presumably, the short growing season has the greater effect in reducing maximum biomass. Greenhouse studies using P32 indicate that nutrients in sand are more rapidly available than those in muck substrates. (See also W78-12707) (Stihler-Mass)
W78-12710

PLANT GROWTH, NUTRIENT ACCUMULATION AND DECOMPOSITION IN A CENTRAL MICHIGAN PEATLAND USED FOR EFFLUENT TREATMENT,
Michigan Univ., Ann Arbor. School of Natural Resources.
C. J. Richardson, W. A. Wentz, J. P. M. Chamie, J. A. Kadlec, and D. C. Tilton.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 77-117, 1976. 12 fig, 6 tab, 53 ref.

Descriptors: *Waste water treatment, *Sewage effluents, *Biological treatment, *Wetlands, Peat, Litter, Soils, Nitrogen, Phosphorus, Nutrient removal, Nutrients, Michigan, Rooted aquatic plants, Productivity, Biomass.

Various levels of simulated sewage treatment effluent were applied to a peatland with vegetation typical of northern peat wetlands. No significant differences in nitrogen (N) and phosphorus (P) concentrations due to treatment levels 1X and 2X (X = concentrations of nutrients from domestic sewage effluent) were found in the vegetation analyzed. This is probably due to the unavailability of nutrients resulting from absorption and adsorption by the litter. Sedges in the 4X and 10X treatment plots showed a higher aboveground biomass along with higher N and P concentrations than controls. Grasses and asters showed decreased growth. The slow rate of subsurface movement (approx. 30 cm/day), high denitrificaton rates for waterlogged soils, high nutrient sorption capacity of organic litter and peat soils and nutrient uptake by some plant species all indicate that a peatland ecosystem has potential as a biological filter for treatment plant effluent. (See also W78-12707) (Stihler-Mass)
W78-12711

EFFECTS OF SEWAGE EFFLUENT ON ECOSYSTEM DYNAMICS IN CYPRESS DOMES,
Florida Univ., Gainesville. Center for Wetlands.
K. C. Ewel.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 169-195, 1976. 10 fig, 5 tab.

Descriptors: *Sewage effluents, *Swamps, *Florida, *Biological treatment, Wetlands, Sediments, Floating plants, Trees, Plant growth, Litter, Water quality, Pathogenic bacteria, Viruses.

After 2-1/2 years of discharging secondarily treated sewage into cypress domes in north-central Florida, results are beginning to show that these swamp ecosystems may be capable of taking up nutrients at a rapid rate. Duckweed settles to the bottom, and anaerobic decomposition processes seem to break down the organic matter at a rapid enough rate to prevent filling of the dome with sediments. Groundwater quality is slightly altered, but pathogens seem to have been effectively removed by the ecosystem. Long-term observations are necessary in order to ensure that this system does indeed work. (See also W78-12707) (Stihler-Mass)
W78-12714

PHOSPHORUS SOURCE MANAGEMENT FOR EUTROPHIC LAKES. PHASE I: TRIBUTARY PHOSPHORUS LOADING,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Zoology; and Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
For primary bibliographic entry see Field 5B.
W78-12746

EFFECTS OF INJECTED ORGANOCHLORINES ON NATURALLY INCUBATED HERRING GULL EGGS,
Canadian Wildlife Service, Ottawa (Ontario).
A. P. Gilman, D. J. Hallett, G. A. Fox, L. J. Allan, and W. J. Learning.
Journal of Wildlife Management, Vol. 42, No. 3, p 484-493, 1978. 1 fig, 4 tab, 33 ref.

Descriptors: *Chlorinated Hydrocarbon Pesticides, *Gulls, *Reproduction, Non-game birds, Water birds, Water pollution effects, Environmental effects, Polychlorinated biphenyls, DDE, Embryonic growth stage, Mortality, Toxicity, Absorption, Animal populations, Organic compounds, Pesticide toxicity, Pesticide residues, *Photomirex, *Mirex, Hexachlorobenzene, *Tissue analysis.

Organochlorine contaminants were extracted from Lake Ontario herring gull (Larus argentatus) eggs and injected into relatively uncontaminated, unincubated gull eggs on Kent Island, New Brunswick. Synthetic mixtures of PCB's, DDE, mirex, photomirex, and hexachlorobenzene were injected in a similar fashion. All eggs were incubated by their natural parents. No increases in embryonic or chick mortality were observed in any contaminant injected group when compared to the injected controls. The embryonic uptake of pollutants was similar in naturally contaminated eggs and injected eggs. The significance of these findings with regard to the reproductive failure of Lake Ontario herring gulls is discussed. (EIS-Deal)
W78-12750

THE FREQUENCY, DISTRIBUTION, AND PATHOLOGY OF THREE DISEASES OF DEMERSAL FISHES IN THE BERING SEA,
National Marine Fisheries Service, Seattle, WA. Northwest Fisheries Center.
B. B. McCain, M. S. Myers, W. D. Gronlund, S. R. Wellings, and C. E. Alpers.
Journal of Fish Biology, Vol. 12, p. 267-276, 1978. 6 fig, 25 ref.

Descriptors: *Fish diseases, *Pathology, *Commercial fish, Pacific Ocean, Marine fish, Marine fisheries, Alaska, Water pollution effects, Public health, *Commercial fisheries, Bering Sea, Yellowfin, Rock Sole, Pacific cod, *Disease frequency, *Disease distribution.

During September and October, 1975, bottom-dwelling fish from the Bering Sea were examined for diseases. The three most commonly observed diseases and their frequency of occurrence were epidermal papillomas of rock sole, 1.0%; lymphocytis of yellowfin sole, 2.1%; and epidermal tumors of the pseudobranch of adult Pacific cod, 7.4%. Both the appearance and the histological characteristics of epidermal papillomas on rock sole resembled those found on several species of flatfish in Puget Sound. The frequency of tumor-bearing rock sole ranged from 1-23% with the highest occurrence at sampling stations around the periphery of the Bering Sea in water depths of 20-30 fathoms. The frequency of lymphocytis was 1-15%, with a gradual increase of prevalence from the northern to the southern sampling stations. Tumor-bearing cod were most commonly found in the south and south-eastern Bering Sea and the frequency of affected cod ranged from 0-100%. (EIS-Katz)
W78-12751

EFFECTS OF MICROBIAL ACTIVITY ON AQUATIC POLLUTANTS,
Maryland Univ., College Park. Dept. of Microbiology.
M. J. Voll, J. Isbister, L. Isak, M. McCommas, and R. R. Colwell.
Annals of the New York Academy of Sciences, Vol. 298, p 104-110, 1977. 1 fig, 3 tab, 20 ref.

Descriptors: *Biodegradation, Microorganisms, *Bacteria, *Fungi, *Oil pollution, *Microbial degradation, Chesapeake Bay, Mercury, Polychlorinated biphenyls, Metabolism, Biochemistry, Cytological studies, Organic compounds, Chemical analysis, Oil, Bioassay, *Ames System, *Mutagens, *Carcinogens.

Bacteria and fungi present in estuarine and marine water and sediment accomplish significant degradation of crude oil, refined oils, polychlorinated biphenyls, and organomercurials, with the rate and extent of degradation varying with species, geographic source, temperature, and other biologic and environmental parameters. Out biodegradation studies have been extended to determine if physical weathering and/or microbial degradation of oil by microorganisms present in Chesapeake Bay water and sediment produces potentially carcinogenic substances. Water and sediment from an area of Chesapeake Bay that receives heavy input of oil and from a relatively unpolluted site have been assayed for mutagenic ability of use of the Ames method, which is a bacterial assay and is highly sensitive. Preliminary findings indicate the presence of mutagenic substances in samples collected from the polluted site. Extract of oil subjected to microbial degradation under controlled laboratory conditions did not yield detectable mutagenic activity. In situ studies are in progress. (EIS-Katz)
W78-12752

SYSTEMATIC COLLABORATIVE STUDIES ON NEOPLASMS IN MARINE ANIMALS AS RELATED TO THE ENVIRONMENT,
British Columbia Univ., Vancouver. Cancer Research Centre.
H. F. Stich, A. B. Acton, K. Oishi, F. Yamazak, and T. Harada.
Annals of the New York Academy of Sciences, Vol. 298, p 374-388, 1977, 9 fig, 40 ref.

This study reports on a world-wide survey of skin papillomas in flatfish. The frequency of skin papillomas was found to be higher in contaminated waters near populated area than in less polluted regions. Possible mechanisms for tumor genesis were presented. The usefulness of fish neoplasms as a carcinogen monitoring system was discussed. (EIS-Katz)
W78-12753

CHEMICAL POLLUTANTS IN RELATION TO DISEASES IN FISH,
Chicago Medical School, IL. Dept. of Microbiology.
E. R. Brown, T. Sinclair, L. Keith, P. Beamer, and J. J. Hazdra.
The Annals of the New York Academy of Sciences, Vol. 298, p 535-546, 1977. 6 tab, 7 ref.

Descriptors: *Fish diseases, *Water analysis, *Disinfection, *Cytological studies, Water pollution effects, Path of pollutants, Chemical analysis, Animal pathology, Organic compounds, Metals, Heavy metals, Toxicity, Mortality, Sewage effluents, *Carciongens, *Tissue analysis, *Neoplasma.

This paper discusses the following points: a chemical survey of two water systems (pollution-free Canadian 'Lake of the Woods' and polluted 'Fox River') and laboratory experiments that employed some chemicals, a brief summary of various fish diseases found in these watersheds, laboratory tests on chemical carciongens, and interrelationships of human pathogens to aquatic problems in the health field. (EIS-Katz)
W78-12754

EFFECTS OF CRUDE OIL INGESTION ON PLASMA OSMOREGULATION IN SALT STRESSED WHITE PEKIN DUCKS (AUAS PLATYRHYNCHUS),
Mount Desert Island Biological Lab., Salsbury Cove, ME.
D. S. Miller, C. J. Bunker, E. B. Burnham, M. C. Ratner, and D. B. Peakall.
The Bulletin, Mount Desert Island, Biological Laboratory, Salsbury Cove, Maine, Vol. 16, p 79-80, 1976. 1 fig.

Descriptors: *Oil, *Oil spills, Water pollution effects, *Animal physiology, Biochemistry, Laboratory tests, Domestic animals, Laboratory animals, *Water birds, Pekin ducks, Kuwait Crude Oil, *Osmoregulatory behavior.

To determine if petroleum hydrocarbons affect salt and water balance in white Pekin ducks, 0.2 ml of Kuwait crude oil was administered to Pekin ducks. Results indicate that petroleum induced osmoregulatory impairment in marine birds involves a slightly reduced capacity to obtain solute free water from 100% sea water and a delayed ability to recover when water of lower salinity is available. (EIS-Katz)
W78-12755

VARIATION IN TOXICITY TESTS OF BIVALVE MOLLUSC LARVAE AS A FUNCTION OF TERMINATION TECHNIQUE,
Washington State Dept. of Fisheries, Brinnon. Shellfish Lab.-Point Whitney.
For primary bibliographic entry see Field 5A.
W78-12756

EFFECTS OF CHLORDANE AND HEPTACHLOR ON THE MARINE DINOFLAGELLATE EXUVIELLA BALTICA LOHMANN,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
B. Magnani, C. D. Powers, C. F. Wurster, and H. B. O'Connors, Jr.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 1-8, 1978. 3 fig, 1 tab, 16 ref.

Descriptors: *Heptachlor, *Chlorinated hydrocarbon pesticides, *Dinoflagellates, Insecticides, Organic compounds, Pesticides, Phytoplankton, Growth rates, Chlorophyll, Productivity, Food webs, Cytological studies, Toxicity, Photosynthesis, Biomass, *Chlordane.

Chlordane and heptachlor at 50 microg/l reduced cell density, chlorophyll a per unit volume of culture, 14C uptake per cell and carbon fixation per unit of chlorophyll a in the marine dinoflagellate Exuviella baltica Lohmann. The concentrations of chlorophyll a per cell was not reduced, however, by treatment with either compound. Chlordane was more toxic than heptachlor at this concentration, and caused the disintegration of many cells, thus affecting particle size distribution in the cultures. In nature, such an inhibition and shift in size class distribution could affect the availability of food for particle-feeding herbivores. (EIS-Deal)
W78-12757

THE EFFECT OF PRUDHOE BAY CRUDE OIL ON A TIDAL-FLAT ECOSYSTEM IN PORT VALDEX, ALASKA,
Alaska Univ., College Station.
A. S. Naidu, H. M. Feder, and S. A. Norrell.
In: Proceedings Tenth Annual Offshore Technology Conference, held in Houston, TX, May 8-11, 1978, Vol 1, p 97-104, 1978. 2 fig, 2 tab, 18 ref. OTC No. 3055.

escriptors: *Water pollution effects, ediments, *Ecosystems, *Alaska, Metals, eavy metals, Copepods, Baseline studies, esources development, *Outer Continental elf, *Tidal flats.

he tidal flat sediments of Port Valdez display sigficant lateral variations in lithological, chemical d biological subfacies. The glacially derived eposits are organically low poorly sorted gravels clays with admixtures of sand and silt. Summer cterial counts are relatively low with 243 aerobic olony forming units (CFU) and 30 anaerobic CFU er gram times 10 of sediment. Meiofaunal species e restricted to the upper 3-cm oxygenated sedient layers, and consist primarily of nematodes nd harpacticoid copepods. Simulated crude oil ills in an oxic muddy site resulted in no changes sediment organic carbon and in the dissolved xygen contents. Bacterial populations were also ot significantly affected by application of up to 000 ppm of crude oil for several days at a series f low tides. The general lack of organic carbon nd bacterial change in oiled sediments may be atributed to the rapid removal of oil from tidal flat urfaces. Harpacticoid copepods were not adverely affected by crude oil; on the other hand, a sigificant increase in density of one species Halectinosoma gothiceps) was noted at chronic il dosages. Nonetheless a significant decrease in he concentrations of Cu, Zn, Ni and V has been bserved in the tidal deposits, subsequent to the iling of the sediments. It is concluded that crude il stranded on tidal flat surfaces even for a relaively short moment during tidal cycles probably lters the sediment pH and Eh relationships sigificantly to mobilize the heavy metals from the dsorbed/exchangeable sites of sediment particles o the overlying tidal waters. (Sinha-OEIS)
W78-12803

BEHAVIOR OF THE BOUCHARD NO. 65 OIL SPILL IN THE ICE-COVERED WATERS OF BUZZARDS BAY,
For primary bibliographic entry see Field 5G.
W78-12806

ENVIRONMENTAL ASSESSMENT OF THE BUCCANEER OIL AND GAS FIELD OFF GALVESTON, TEXAS: AN OVERVIEW,
W. B. Jackson, K. N. Baxter, and C. W. Caillouet.
In: Proceedings Tenth Annual Offshore Technology Conference, held in Houston, TX, May 8-11, 1978, Vol. 1, p 277-284, 1978. 1 fig, 3 tab, 6 ref. OTC No 3081.

Descriptors: *Water pollution effects, *Environmental effects, *Baseline studies, *Ecosystems, Resources development, Oil spills, Water quality, Texas, Gulf of Mexico, *Outer Continental Shelf, Drilling effluents.

In 1975, the Galveston Laboratory of the National Marine Fisheries Service (NMFS) was given responsibility for project management of a comparative environmental assessment of an active oil and gas field in the northwestern Gulf of Mexico. The Buccaneer Oil and Gas Field was selected as the study area because it has been in development and production since 1960, thus allowing ample time for the development of oilfield-associated marine communities. Present studies in this field are determining the concentration of pollutants in major components of the marine ecosystem, including water, sediment, suspended particulate matter, ichthyoplankton, sessile organisms, pelagic finfishes, and demersal finfishes and macro-crustaceans. Effects of oilfield discharge effluents are being assessed by acute and chronic effects bioassays on shrimp and fishes, by observing alteration of composition and abundance of biotic communities, and by investigating accumulation of contaminants in biotic and abiotic components of the ecosystem. Special attention is being given to food web dynamics and to physicochemical modes of transport of pollutants into and away from the marine ecosystem in the field. (Sinha-OEIS)
W78-12807

ASSESSMENT OF ENVIRONMENTAL IMPACT OF OFFSHORE PRODUCTION IN THE BUCCANEER OIL FIELD: SEDIMENTOLOGIC AND GEOCHEMICAL RESULTS,
Rice Univ., Houston, TX.
R. B. Wheeler, R. R. Schwarzer, and J. B. Anderson.
In: Proceedings Tenth Annual Offshore Technology Conference, held in Houston, TX, May 8-11, 1978, Vol 1, p 285-290, 1978. 3 fig, 2 tab, 13 ref, append. OTC No 3082.

Descriptors: *Water pollution effects, *Environmental effects, *Sediments, *Trace elements, Oil pollution, Geochemistry, Resources development, Texas, *Outer Continental Shelf, Buccaneer Oil and Gas Field.

The Buccaneer oil/gas field, offshore Galveston, Texas, has been in operation for some 15 years and thus provides a good example of the effects of offshore exploration and production on the marine environment. As sediments are the ultimate sink for contaminants in the marine environment, a careful study of the sedimentology and trace element geochemistry of the sediments was performed. The intimate relationships between trace elements and sedimentary parameters such as grain size, clay mineralogy, organic carbon and carbonate content are discussed along with other important considerations regarding site selection, data interpretation, etc. Sediment samples collected near platforms are compared with control samples and/or BLM-STOCS data for concentrations of Ba, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Sr and Zn. There is evidence for Ba, Cd, Ni, Pb, Sr and Zn contamination of sediments in the study area. Possible sources of contamination related to exploration and production are enumerated and an attempt is made to relate contaminants to sources in the Buccaneer study area. (Sinha-OEIS)
W78-12808

ENVIRONMENTAL HAZARDS ON THE ATLANTIC OUTER CONTINENTAL SHELF OF THE UNITED STATES,
For primary bibliographic entry see Field 6G.
W78-12810

LEAD AND COPPER IN THE WATERS OF RARITAN AND LOWER NEW YORK BAYS,
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5B.
W78-12811

SERIOUS MERCURY CONTAMINATION OF SEDIMENTS IN A NORWEGIAN SEMI-ENCLOSED BAY,
Norwegian Inst. for Water Research, Oslo (Norway).
For primary bibliographic entry see Field 5B.
W78-12815

ACUTE TOXICITY OF ALKYL LEADS TO SOME MARINE ORGANISMS,
Istituto di Ricerca Sulla Acque, Milano (Italy).
R. Marchetti.
Marine Pollution Bulletin, Vol 9, No 8, p 206-207, August 1978. 2 fig, 1 tab, 5 ref.

Descriptors: *Water pollution effects, *Toxicity, *Metals, *Lead, Environmental effects, Algae, Fish, Bacteria, Outer Continental Shelf, Alkyl lead, Adriatic Sea, Tetramethyl lead, Tetraethyl lead, Dunaliella tertiolecta, Artemia salina, Morone labrax.

Following the wreck of the cargo ship Cavtat in the Adriatic Sea and the danger of pollution by alkyl lead antiknock compounds, the acute toxicity of alkyl leads to marine organisms at different trophic levels has been determined in the laboratory. The shipment included 325 metric tons of three different alkyl lead antiknock formulations. Although toxic effects of inorganic lead are fairly well known, the effects of alkyl lead compounds are almost completely unknown. This report refers to the acute toxicity of tetramethyl lead and tetraethyl lead determined for some marine organisms belonging to different trophic levels. (Sinha-OEIS)
W78-12816

POLAR CONTINENTAL SHELF PROJECT. TITLES AND ABSTRACTS OF SCIENTIFIC PAPERS SUPPORTED BY PCSP.
Department of Energy, Mines and Resources, Ottawa (Ontario) Polar Continental Shelf Project.
Canada Department of Energy, Mines and Resources, Polar Continental Shelf Project, 'Titles and Abstracts of Scientific Papers', Vol 3, December 1977, 191 p. Hobson, G. D. and Voyce, J. (compilers).

Descriptors: *Polar Regions, *Baseline studies, *Water pollution effects, *Bibliographies, Oil spills, Arctic, Resources development, Water quality, Outer Continental Shelf, Polar Continental Shelf Project.

This bibliography of 1090 references provides abstracts to the world literature on the nature of the Polar Regions to serve as a frame of reference in the study of the effects of pollution on the Arctic environment. (Sinha-OEIS)
W78-12819

THE EFFECTS OF THE OCEAN DISPOSAL OF MUNICIPAL WASTES.
Southern California Coastal Water Research Project, El Segundo.
Southern California Coastal Water Research Project Report, 'The Effects of the Ocean Disposa of Municipal Wastes,' 1978. 27 p, append.

Descriptors: *Waste disposal, *Water pollution effects, *Water quality, California, Outfall sewers, Metals, Industrial wastes, Municipal wastes, *Outer Continental Shelf, *Ocean dumping.

The Project has collected and published data on the quantity and kind of materials discharged through the six principal outfall pipes since 1971. The objective of this report is to communicate the Project's essential ideas, findings, and recommendations to the general public. During the past 7 years, there has been a substantial reduction in the levels of the two most important pollutants--the pesticide DDT and the polychlorinated biphenyls (PCB's). There has also been a drop of at least 20% in emission of most trace metals, oil and grease, and ammonia nitrogen. Emissions of chromium and zinc have decreased approximately 50% during this period. Among the recommendations are: useful foods and nutrients, such as those contained in human wastes, should not be prevented from reaching the sea, as long as the amounts of these substances do not build up on the ocean bottom; metals in wastes at the present levels have not been found to cause damage to marine life and unless such damage can be demonstrated, no improvement in controlling metals is needed; more research is needed in several areas that have been identified by the work to date; and the most sensible public policy relating to waste disposal is to take whatever actions are least damaging to the overall environment.
W78-12820

NATURAL RADON AND PHOSPHORUS AS LIMNOLOGIC TRACERS: HORIZONTAL AND

VERTICAL EDDY DIFFUSION IN GREIFENSEE,
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
For primary bibliographic entry see Field 5B.
W78-12849

EXPERIMENTAL AND FIELD STUDIES ON ECOLOGICAL ENERGETICS OF ASELLUS AQUATICUS L. (ISOPODA), III. POPULATION DYNAMICS ON THE BACKGROUND OF MACROBENTHOS OCCURRENCE IN THE LITTORAL ZONE OF POWSINSKIE LAKE,
Polish Academy of Sciences, Warsaw (Poland). Dept. of Ecological Bioenergetics.
T. Prus.
Ekologia Polska, Vol. 25, No. 1, p 59-74, 1977. 8 fig, 2 tab, 8 ref.

Descriptors: *Powsinskie Lake(Poland), *Macrobenthos, *Benthic fauna, *Asellus aquaticus, *Crustaceans, *Life history studies, *Population dynamics, Lakes, Poland, Invertebrates, Age, Sex, Size, Seasonal, Eutrophication, Isopods, Heat budget, Littoral, Energy budget.

A general outline of seasonal and annual changes in macrobenthos occurrence in highly eutrophic Powinskie Lake, Poland, focuses on the isopod crustacean Asellus aquaticus. Changes in numbers, biomass, and calorific equivalent of benthic invertebrates (except Mollusca) provide background information on population dynamics of A. aquaticus. Age, sex, and size structure of A. aquaticus were investigated; population, abundant in spring (2700/sq m), declined during summer (100/sq m) and tended to increase again in autumn. A long-term population decline over the three-year study period (1972-74) was noted, however. A total of 1310 samples were collected over the six-to-seven month vegetation seasons (about April-October) at four stations. Maximum occurrence of both A. aquaticus and the total macrobenthos community was in June; maximum density of A. aquaticus was 2700 individuals/sq m, biomass (dry wt) was 1.7 g/sq m, and calorific equivalent was 4.5 kcal/sq m, while for the community maximum density was 18,000/sq m, dry wt was 7 g/sq m, and calorific equivalent was 35 kcal/sq m. A. aquaticus formed 10-20% of total macrobenthos during peak occurrence, and 5-10% during other periods. The abrupt and permanent decline of A. aquaticus was probably due to a natural population pattern, but other possible causes include: (1) pesticide pollution, (2) migration due to bottom oxygen depletion, or (3) predation. (Lynch-Wisconsin)
W78-12865

THE ECOLOGY OF RAOCH, RUTILUS (L.), IN THE BARBEL REGION OF THE POLLUTED PILICA RIVER. III. LIPIDS, PROTEIN, TOTAL NITROGEN AND CALORICITY,
Lodz Univ. (Poland). Inst. of Environmental Biology.
T. Penczak, M. Molinski, E. Kusto, B. Ichinowska, and M. Zalewski.
Ekologia Polska, Vol. 25, No. 1, p 75-88, 1977. 1 fig, 3 tab, 33 ref.

Descriptors: *Roach, *Rutilus rutilus, *Water pollution effects, *Pilica River(Poland), *Lipids, Fish, Poland, Sex, Age, Rivers, Sewage disposal, Seasonal, Caloricity, Proteins, Weight, Nitrogen, Electro-fishing.

A study of the effects of different levels of sewage pollution at two sites in the Pilica River, Poland, on lipid and protein level and body caloricity in the cyprinid fish Rutilus rutilus (roach) showed a statistically significant correlation only with season, although observable effects of sewage concentration were recorded. Age and sex did not correlate. Weight, hydration, body caloricity, and lipid weight were also investigated for statistical relationship. Body caloricity of roaches at more heavily polluted Site 2 was higher than at Site 1, but the difference was not statistically significant. A statistically significant positive correlation was found between body weight and weight of lipids, and a significant negative correlation was found between body hydration and percentage of lipids. A positive (but not statistically significant) correlation was also found between increase of lipids and increase of body caloricity. Lipid level and body caloricity were highest in autumn, and lowest in January-March. Lipids in all age groups decreased strongly but temporarily in September. The 474 roach specimens analyzed in the study were caught in nine electro-fishings at the two study sites, which differed by one class of water pollution according to Polish water quality standards. (Lynch-Wisconsin)
W78-12866

MICROBIOLOGICAL STUDIES ON THE NITROGEN CYCLE IN AQUATIC ENVIRONMENTS -- IV, METABOLIC RATE OF AMMONIUM NITROGEN IN FRESHWATER REGIONS,
Kyoto Inst. of Oceanic and Fishery Science (Japan).
M. Sugiyama, and A. Kawai.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 44, No. 4, p 351-355, 1978. 7 fig, 2 tab, 5 ref.

Descriptors: *Ammonium compounds, *Nitrogen cycle, *Metabolism, *Ponds, *Dissolved oxygen, Fish farming, Aeration, Tracers, Nitrogen, Freshwater, Ammonia, Denitrification, Organic matter, Mitsuike Pond(Japan), Japan, Kawachibuna, Carassius cuvieri, Mud, Bacteria, Domestic wastes.

A fish-culturing pond in Japan and experimental aquaria with and without aeration were used to clarify the pathways of ammonium nitrogen and to estimate the rate of each process in freshwater with different levels of dissolved oxygen. The turnover rate of ammonium nitrogen was estimated to be 2.9%/hr in the pond, 4.5%/hr in the aerated aquarium, and 0.6% in the stationary aquarium. The metabolic rate of nitrogenous compounds was reflected in water quality. A high rate of ammonia oxidation was observed in water bodies with high dissolved oxygen levels, while denitrification proceeded more rapidly in water which lacked sufficient dissolved oxygen. The field experiment was conducted in Mitsuike Pond, Neyagawa, Osaka, Japan, in which Kawachibuna (Carassius cuvieri) has been cultivated with an aeration system. The pond is about 0.73 ha in area, has a depth of about 1.4 m, and is located at the edge of a residential area from which it receives domestic wastewater. The aquaria contained bottom mud, but the pond was too deep to include mud in the experiment. Bacteria in water and bottom mud were identified, and water and mud quality determined. For metabolic rate measurement the nitrogen-15 tracer technique was used. The field test was carried out in a transparent polyethylene bag suspended in the pond, supplemented with ammonium sulfate with heavy nitrogen. (See also w77-12878 and W72-07948) (Lynch-Wisconsin)
W78-12867

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN IV. NUMERICAL TREATMENT IN SITE-SPECIES DATA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Mathematics and Statistics.
For primary bibliographic entry see Field 5A.
W78-12868

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN VIII. SEASONAL, DIURNAL, AND LATITUDINAL VARIATIONS IN ABUNDANCE OF EUTHECOSOMATA ALONG THE 110 DEGREE E. MERIDIAN,
Marine Products Export Development Authority, Calcutta (India).
M. Sakthivel.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 5, p 663-671, 1977. 1 fig, 1 tab, 13 ref.

Descriptors: *Abundance, *Zooplankton, *Euthecosomata, *Indian Ocean, *Species composition, *Seasonal, Mollusks, Vertical migration, Ecosystems, Distribution patterns, Diurnal, Latitudinal studies, Oceans, Creseis virgula, Hyalocylis striata, Diacria quadridentata, Cavolinia, Limacina, Styliola subula, Cuvierina columnella, Clio pyramidata.

Zooplankton were sampled at 16 stations along the 110 degree E. meridian by vertical hauls ranging in depth from 200 m to the surface at about midday and midnight to determine seasonal variations of Euthecosomata in tropical and subtropical parts of the southeastern Indian Ocean. Records of 18 species monitored seasonally and diurnally are available as an accessory publication. Three groups of species were identified: (1) species of tropical dominance, (2) species of subtropical dominance, and (3) species of both tropical and subtropical dominance (warm-water cosmopolites). Several species reached peak abundance in the northern tropical water mass between 9 and 20 degrees S. during the southeast monsoon (May-September), including Creseis virgula, Hyalocylis striata, Diacria quadridentata, and Cavolinia longirostris. The maximum abundance of these species was north of 14 degrees N. A few species reached maximum abundance at other times of the year in the subtropical water mass south of 20 degrees S., such as Limacina lesueuri, Styliola subula, Cuvierina columnella, and Cavolinia inflexa. Limacina bulimoides was at maximum around 14 degrees S. during September-November, with a second maximum around 23 degrees S. during different months. Nocturnal increase in occurrence and abundance was observed in L. lesueuri, L. helicina rangii, Clio pyramidata, C.p. lanceolata, S. subula, Cuvierina columnella, D. quadridentata, and Cavolinia inflexa. (See also W78-12868) (Lynch-Wisconsin)
W78-12869

STUDIES ON COPPER METABOLISM IN FISHES--II. THE SITE OF COPPER ACCUMULATION IN THE TISSUES OF CARP (IN JAPANESE),
Kyoto Univ. (Japan). Dept. of Fisheries.
Y. Yamamoto, T. Ishii, and S. Ikeda.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 11, p 1327-1332, 1977. 23 ref, 2 fig, 4 tab.

Descriptors: *Carp, *Copper, *Fish physiology, *Proteins, *Biochemistry, *Metals, *Bioassay, *Absorption, Laboratory tests, Metabolism, Nutrients, Separation techniques, Animal physiology, Cytological studies, *Bioaccumulation, Tissue analysis, *Ceruloplasmin, *Hepatopancreas.

The site of copper accumulation was investigated in carp exposed to 0.1 ppm copper solution for 2 weeks. Ceruloplasmin and direct-reacting copper contents in the serum of copper-exposed carp significantly increased as compared to those of normal carp. By copper loading, a statistically apparent increase of copper content was observed in the hepatopancreas, gills, intestine, and kidney. Among these tissues, the highest copper content was found in the hepatopancreas. In the hepatopancreas, more than 70% of the copper was found in the supernatant fraction. Little, if any, copper was found in the ultrafiltrate from the supernatant treated with DIAFLO UM-2 membrane. Sephadex G-75 gel filtration analysis of the supernatant fraction demonstrated that the most part of copper accumulated in the hepatopancreas was

ound to the relatively lower molecular weight rotein. (EIStKatz)
/78-12870

IETAL TOXICITY TO EMBRYOS AND LARAE OF EIGHT SPECIES OF FRESHWATER ISH - II. COPPER,
nvironmental Research Lab., Duluth, MN.
M. McKim, J. G. Eaton, and G. W. Holcombe.
ulletin of Environmental Contamination and oxicology, Vol. 19, p 608-616, 1978. 3 fig, 2 tab, 4 ref.

Descriptors: *Copper, *Toxicity, *Larval growth tage, *Juvenile growth stage, *Embryonic growth tage, *Rainbow trout, *Brown trout, *Lake trout, Brook trout, *Herrings, *Pikes, *Mortality, Growth rates, *Fish physiology, *Biomass, Growth stages, Freshwater fish, Water pollution ffects, *Sensitivity

Fish larvae and early juveniles of all species tested brook trout, rainbow trout, brown trout, lake rout, northern pike, white sucker, herring, and mallmouth bass) were more sensitive to copper han the embryos. Embryo survival was affected nly at the higher concentrations tested, for all pecies except the rainbow trout. The concentraions of copper that caused significant effects on he larval standing crop were similar for all species except the northern pike, which seemed to be considerably more resistant. Copper concentrations shown to have no significant effects on the early developmental stages of these species are considered close estimates of the copper concentrations that would have no measureable adverse effects during a complete life cycle toxicity test under similar test conditions. (See also W78-06151) (EIS-Deal)
W78-12874

ECONOMIC ASPECTS OF THE EFFECTS OF POLLUTION ON THE MARINE AND ANADROMOUS FISHERIES OF THE WESTERN UNITED STATES OF AMERICA,
Food and Agriculture Organization of the United Nations, Rome (Italy). Dept. of Fisheries.
For primary bibliographic entry see Field 5G.
W78-12876

CHLOROPLAST PIGMENTS OF A GREEN PHYTOPLANKTER FROM THE HUDSON ESTUARY, U.S.A.,
Dalhousie Univ., Halifax (Nova Scotia) Dept. of Oceanography.
S. S. Bates, and J. S. Craigie.
Phycologia, Vol. 17, No. 1, p 79-84, 1978. 3 fig, 3 tab, 29 ref.

Descriptors: *Hudson River, *Phytoplankton, *Chlorophyta, *Chloroplasts, *Pigments, *HR-1, *Classification, Estuaries, algae, Chlorophyll, Carotenes, Xanthophylls, Identification, Rivers, Extraction.

Extraction and chromatographic fractionation of chloroplast pigments from a nonmotile green phytoplankter, HR-1, isolated from the lower Hudson River, New York in December 1972, provided a basis for assigning the alga to the Chlorophyceae. The 5-micrometer diameter nonflagellated phytoplankter has been studied with respect to effects of light intensity and ammonium on nitrate uptake, but has not yet been assigned to a genus or species. Observations by light microscopy were inconclusive, due to its similarity to members of several algal classes. Analysis revealed chlorophylls-a and -b, beta-carotene, lutein, violaxanthin, and neoxanthin. Chromatographic properties and visible absorption maxima are reported for two minor unidentified carotenoids, one of which occurred in the carotene fraction. The presence of chlorophyll-b and three zanthophylls associated with Chlorophyceae justify assignment to this class. This study reports a procedure successfully used to extract pigments from this thick-walled chlorophyte. Pigment extraction consisted of boiling cells for three min in five ml distilled water with three ml of 1% w/v magnesium carbonate, then cooling immediately in an ice bath. After centrifugation the water was decanted and replaced with absolute methanol. Pigments were extracted from the pellet after 30 min in cold and darkness. (Lynch-Wisconsin)
W78-12884

DENITRIFICATION OF AMMONIA FORMATION IN ANAEROBIC COASTAL SEDIMENTS,
Tokyo Univ. (Japan). Ocean Research Inst.
I. Koike, and A. Hattori.
Applied and Environmental Microbiology, Vol. 35, No. 2, p 278-282, February 1978. 1 fig, 3 tab, 17 ref.

Descriptors: *Sediments, *Anaerobic conditions, *Denitrification, *Ammonia, *Nitrogen, *Path of pollutants, Coasts, Mangoku-Ura(Japan), Simoda Bay(Japan), Tokyo Bay(Japan), Japan, Tracers, Radioisotopes, Nitrates, Particulate organic nitrogen, Cycling nutrients, Nutrient flux, Eutrophication, Bays, Microorganisms, Bacteria, Sediment-water interfaces.

Nitrogen-15 tracing was used to simultaneously determine nitrogen gas production, ammonia, and particulate organic nitrogen (PON) formation in coastal sediments of Mangoku-Ura, Simoda Bay, and Tokyo Bay, Japan. Transformation of nitrogen and its recycling in coastal sediments contribute significantly to eutrophication in coastal areas, but there is little quantitative information on denitrification in marine sediment. In the sediment surface layer the rate of nitrogen gas production was about .01 microgram atom of N/g/hr, irrespective of sediment location. Nitrogen-15 ammonia and PON accounted for 20-70% of the three products; after several hours of incubation, the major fraction of nondenitrified nitrogen-15 in Mangoku-Ura and Simoda Bay sediments was recovered as ammonia. In Tokyo Bay sediments, PON was produced at a greater rate than ammonia. The reduction rate data suggest that the pathway of nitrate reduction to ammonia is important in coastal sediments. Samples were collected from deep sediments with a Phleger corer, and from shallow sediments by divers with plastic tubes. Organic nitrogen contents ranged from 0.56-7.8 mg N/g. The water above Tokyo Bay sediments was anoxic, but in the other area oxygen was present. Bacterial denitrification in coastal sediments is about proportional to nitrate concentrations in the range of 0-30 microgram atom of N/liter.
W78-12885

GROWTH OF HETEROTROPHIC BACTERIA AND ALGAL EXTRACELLULAR PRODUCTS IN OLIGOTROPHIC WATERS,
Montana State Univ., Bozeman. Dept. of Microbiology.
G. A. McFeters, S. A. Stuart, and S. B. Olson.
Applied and Environmental Microbiology, Vol. 35, No. 2, p 383-391, February 1978. 5 fig, 1 tab, 40 ref. CX-12004B025, CX-6000-3-087 and 292-0-P20067.

Descriptors: *Bacteria, *Heterotrophic bacteria, *Coliforms, *Chlorella, *Bioindicators, *Biological communities, Grand Teton National Park(WY), Wyoming, National Parks, Oligotrophy, Streams, Ecology, Mountains, Garnet Creek(NY), Water pollution sources, Benthic flora, Symbiosis, Organic matter, Algae, Carbon radioisotopes, Tracers, Human diseases, Water quality control.

A study of a community of Chlorella algae and coliform bacteria in an alpine stream in Grand Teton National Park, Wyoming suggests that substantial numbers of coliform bacteria may be found in uncontaminated waters without the presence of warm-blooded animals. These findings indicate use of coliforms as sanitary indicators is not always valid and the potentially pathogenic bacteria, such as enteropathogenic E. coli and Klebsiella species, could originate in an unpolluted environment. During a 1973-75 surveillance program in the park total coliform bacterial counts were low in most waters studied, but in the outlet stream of Surprise Lake (altitude 2916 m) coliform counts were consistently greater than 200 per 100 ml in midsummer. The pristine stream flows a vertical distance of 234 m before entering Garnet Creek; fauna is limited to marmots and picas. Although no obvious source of elevated bacterial counts was found, emergence of a benthic algal community containing Gleocapsa, Stigonema, and Chlorella coincided with high coliform counts in late July-August. Bacteria grown under laboratory conditions in supernatant from Chorella culture increased by 2-3 orders of magnitude at 13C. Radioactive organic products from Chlorella fed carbon-14 labelled bicarbonate became incorporated into the particulate fraction of coliforms as they reproduced, and were released as they died. (Lynch-Wisconsin)
W78-12886

THE ROLE OF SURFACE AND EXTRACELLULAR PHOSPHATASES IN THE PHOSPHORUS REQUIREMENT OF OCHROMONAS,
Queens Coll., Flushing, NY. Dept. of Biology.
S. Aaronson, and N. J. Patni.
Limnology and Oceanography, Vol. 21, No. 6, p 838-845, 1976. 9 tab, 55 ref. NSF GB 20825.

Descriptors: *Phosphorus, *Ochromonas danica, *Phosphomonoesterases, *Algae, *Nutrients, Phosphatases, Organic compounds, Inorganic compounds, Phosphates, Surfaces, Extracellular, Secretion.

Previous research shows that algae and other microorganisms have phosphomonoesterases (PME) at their surface or secrete them into their environment. This paper demonstrates how surface or extracellular PME may function in an alga's phosphorus metabolism using the chrysomonad Ochromonas danica as a model. Results show that acid and alkaline PME activity of phosphorus-depleted O. danica can be partially but not completely repressed by exogenous inorganic phosphate (Pi). Acid and alkaline PME activity was found in the plasma membrane as well as the cytosol, and acid PME was secreted into the cell's environment. Extracellular and surface PME could provide the necessary phosphate for the growth of phosphorus-depleted algae in the presence of organic phosphates; specific organic phosphates, glucose-1-phosphate (G-1-P) and glucose-6-phosphate (G-6-P), supported growth with small inocula. Other organic phosphates were inactive. G-1-P and G-6-P induced almost double the normal secretion, and this extra secretion is shown to be sufficient to provide for the growth of phosphorus-depleted cells inoculated in relatively small numbers. In the tests O. danica was maintained in the medium of Aaronson and Baker, and phosphorus-depleted cultures were prepared by growning the culture in low orthophosphate (Pi; 0.011 mM) medium for at least two months. (Lynch-Wisconsin)
W78-12887

COMPARISON OF LIGHT AND ELECTRON MICROSCOPIC DETERMINATIONS OF THE NUMBER OF BACTERIA AND ALGAE IN LAKE WATER,
Lund Univ., (Sweden). Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W78-12888

THE DISTRIBUTION OF NUTRIENTS IN SWARTVLEI, A SOUTHERN CAPE COASTAL LAKE,
Rhodes Univ., Grahamstown (South Africa). Inst. for Freshwater Studies.

For primary bibliographic entry see Field 5B.
W78-12889

SIGNIFICANCE OF PREDATOR INFLUENCE ON COMPOSITION OF BOSMINA SPP. POPULATIONS,
Goteborg Univ. (Sweden). Dept. of Zoology.
J. A. E. Stenson.
Limnology and Oceanography, Vol 21, No 6, p 814-822, November 1976. 4 fig, 6 tab, 31 ref.

Descriptors: *Bosmina coregoni, *Bosmina longirostris, *Predation, Fish, Size, *Bioindicators, Cladocerans, Zooplankton, Crustaceans, Net plankton, Perch, Perca fluviatilis, Roach, Leuciscus rutilus, Sweden, Lakes, Trophic level, Eutrophication, Oligotrophy.

Fish in eight small Swedish lakes of very similar physical and chemical characteristics clearly preferred the larger of two species of the cladoceran genus Bosmina, B. coregoni. B. coregoni and B. longirostris have been regarded as trophic indicators, with B. coregoni associated with oligotrophic and B. longirostris with eutrophic waters. These findings show that vertebrate and invertebrate predators may influence distribution and numeric relations between the two species. Lakes number one, two, three, six and eight have dense reproducing fish populations dominated by perch and roach, while lakes number four, five and seven have scarce non-reproducing salmonid populations. Comparison of fish and net plankton samples showed the fish preferred B. coregoni, regardless of the relative proportions of the two species in the surrounding water. Bosmina was never found in salmonids' stomachs, but was present in 114 of 486 perch and roach stomachs between 1970-72. The mean size of Bosmina was higher in salmonid lakes as expected, and B. longirostris was dominant in the perch and roach lakes (with the exception of lake eight, where predation was less than in the other perch and roach lakes). Absolute abundance differed similarly, with numbers of B. longirostris higher in the perch and roach lakes. The greater abundance of B. longirostris in lakes with higher fish predation appears due to predation of these fish on larger invertebrates which either feed on or compete with B. longirostris. (Lynch-Wisconsin)
W78-12890

VERTICAL MIGRATION IN ZOOPLANKTON AS A PREDATOR AVOIDANCE MECHANISM,
Washington Univ., Seattle. Dept. of Zoology.
T. M. Zaret, and J. S. Suffern.
Limnology and Oceanography, Vol. 21, No. 6, p 804-813, November 1976. 4 fig, 4 tab, 40 ref. NSF GB 12557.

Descriptors: *Zooplankton, *Vertical migration, *Diel migration, *Predation, *Copepods, *Light, Fish, *Gatun Lake(Panama), *Panama, *Fuller Pond(CN), *Connecticut, Lakes, Ponds, Adaptation, Diaptomus gatunensis, Diaptomus galeata mendotae, Melaniris chagresi, Notemigoneus crysoleucas, Golden shiner, Seasonal, Biorhythms, Seasonal, Food habits

Field data from Gatun Lake, Panama, and Fuller Pond, Connecticut, and laboratory feeding experiments support the hypothesis that vertical migration among zooplankton is related to adaptation to visually-dependent predation. In the two cases studied the diel vertical migration of copepod species appeared to respond to intense selective pressures from fish predators dependent on sufficient light for feeding. In unstratified Gatun Lake, the calanoid copepod Diaptomus gatunensis is dominant numerically and in terms of total biomass and is the largest potential food item; but it was rarely found in stomach contents of the dominant planktivorous fish, Melaniris chagresi. Laboratory tests showed M. chagresi capable of eating D. gatunensis. Investigation of D. gatunensis diel vertical migration showed adults concentrated just above sediments during the daytime when M. chagresi is able to feed, and in the top four m of surface water just after dusk. In addition, migration response of adults, copepodids, and nauplii reflect relative food preferences of the fish. In Fuller Pond only Diaptomus galeata mendotae is an important prey organism for the dominant planktivore Notemigonus crysoleucas (golden shiner). Vertical migration patterns of D. galeata mendotae similarly responded to feeding activity of the visually-depndent predator. Seasonal changes in predation intensity were also correlated with vertical migration. (Lynch-Wisconsin)
W78-12891

SOME CONSEQUENCES OF DISTRIBUTIONAL HETEROGENEITY OF PHYTOPLANKTON AND ZOOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. M. Mullin, and E. R. Brooks.
Limnology and Oceanography, Vol 21, No 6, p 784-796, November 1976. 4 fig, 3 tab, 28 ref. ERDA AT(11-1) GEN 10,P.A. 20.

Descriptors: *Homogeneity, *Heterogeneity, *Phytoplankton, *Zooplankton, *Methodology, *Model studies, Calanus pacificus, Copepods, Distribution, Respiration, Feeding rates, Food habits, Biomass, Grazing, Vertical distribution, Carbon, Primary production, Euphotic zone.

This study criticaly examines assumption of homogeneous distribution of phytoplankton and zooplankton commonly utilized in simple models of plankton dynamics, and assesses computational consequences of possible heterogeneous distribution. As an illustration, the effects of heterogeneity on simple calculation of zooplankton ingestion rate are presented, and the range of rates likely to be found at any one time is described. Measurements of small-scale vertical distribution of phytoplankton and the copepod Calanus pacificus were used to determine food biomass available to an average animal, and to test the assumption of homogeneity. At many points sampled, the copepod population was apparently not able to meet its metabolic requirement, and ecological consequences are deemed dependent on the rapidity with which turbulence, imbalance of primary production and grazing, and vertical plant and animal movement rearrange the spatial pattern of malnutrition and surplus. Some possibly oversimplified assumptions of homogeneity included in models are: (1) Phytoplankton growth occurs in a thoroughly mixed and homogeneous euphotic zone. (2) Such growth is governed by mean light intensity, mean temperature, and mean nutrient concentration. (3) Biological processes affecting phytoplankton and zooplankton biomass occur at the same rate throughout the euphotic zone and over a wide horizontal area. (4) All phytoplankton are equally available to, and nutritious for, zooplankters. (Lynch-Wisconsin)
W78-12892

NITROGEN AND PHOSPHORUS INPUT TO THE MIDMAR DAM, NATAL,
National Inst. for Water Research, Cogella, (South Africa).
J. Hemens, D. E. Simpson, and R. J. Warwick.
Water SA, Vol 3, No 4, p 193-201, October 1977. 3 fig, 5 tab, 25 ref.

Descriptors: *Nitrogen, *Phosphorus, *Midmar Dam(South Africa), *Impoundments, *Nutrients, Natal(South Africa), South Africa, Oligotrophy, Mesotrophy, Trophic level, Algae, Fallout, Runoff, Vollenweider models, Water quality indices.

Nitrogen and phosphorus inputs to Midmar Dam, the uppermost impoundment in the Umgeni catchment, Natal Province, South Africa, are given. The Umgeni basin is the most heavily utilized water source in the province. Although Umgeni River water was of generally good quality in a 1967 survey, rapid urban and industrial development in the basin has made assessment of nutrient enrichment in the impoundments necessary. In March 1973-February 1974 the mass of nutrients carried to the dam by surface drainage was equivalent to a surface loading rate of 0.62 g total phosphorus and 8.49 g total soluble nitrogen/sq m/yr. Mean annual rate for phosphorus is probably about half this value. Algal growth in dam water during this period was phosphorus limited. Atmospheric nutrient deposition in the dam catchment, measured in 1975-76, probably provides a small but significant contribution to total annual input. Most of the nutrients reaching the land surface are retained in vegetation and soil of the catchment. The Midmar Dam was classified oligotrophic-mesotrophic on the basis of the modified Vollenweider eutrophication model (1972), guidelines proposed by the U.S. National Eutrophication Survey, and a tentative classification developed by Toerien, et al (1975). An increase in total phosphorus input to 0.5 g/sq m/yr could probably be tolerated without development of algal blooms at the present mean hydraulic residence time of one year. (Lynch-Wisconsin)
W78-12893

NUMBERS AND BIOMASS OF THE LITTORAL FAUNA IN MIKOLAJSKIE LAKE AND IN OTHER MASURIAN LAKES,
Polish Academy of Science, Warsaw. Dept. of Hydrobiology.
E. Pieczynski.
Ekologia Polska, Vol 25, No 1, p 45-57, 1977. 5 fig, 5 tab, 10 ref.

Descriptors: *Mikolajskie Lake(Poland), *Littoral, *Benthic fauna, *Periphyton, *Habitats, *Abundance, *Biomass, *Species composition, *Dominance, Lakes, Lake Beldany(Poland), Lake Flosek(Poland), Lake Sniardwy(Poland), Lake Taltowisko(Poland), Lake Talty-Rynskie(Poland), Seasonal, Invertebrates, Phragmites communis, Schoenoplectus lacustris.

Seasonal abundance and biomass of benthic and macroperiphytonic invertebrate fauna of littoral habitats in Mikolajskie Lake and five other Masurian lakes (Poland) were studied June 1971-October 1972. Abundance and biomass of benthic fauna were much higher in littoral habitats overgrown by emergent macrophytes. Macroperiphytonic fauna living on reeds (Phragmites communis) dominated over fauna living on bulrushes (Schoenoplectus lacustris), both in terms of numbers and biomass. In shallow littoral habitats, benthic fauna were higher in numbers and in biomass than macroperiphytonic fauna. Seasonal changes in numbers and dominance of benthos were different in each littoral habitat, and varied also over the two study years. Abundance of macroperiphytonic fauna likewise varied seasonally and biennially, but dominance on both reeds and bulrushes was relatively consistent, with a preponderance of Chironomidae. In Mikolajskie Lake three sites were sampled monthly, while sampling was conducted only once in Lakes Beldany, Flosek, Sniardwy, Taltowisko, and Talty-Rynskie. The three Mikolajskie Lake habitats, all about 0.5 m deep, were: (1) littoral without emergent macrophytes, high exposure to waves, sand and mud bottom; (2) littoral overgrown by bulrush, low wave exposure, mud and sand bottom; and (3) littoral overgrown by reed, medium wave exposure, hard sandy and stony bottom with a thin mud layer. (Lynch-Wisconsin)
W78-12894

NORTH AMERICAN PROJECT--A STUDY OF U.S. WATER BODIES.
Corvallis Environmental Research Lab., OR.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 674, Price codes: A24 in paper copy, A01 in microfiche. Publicaton No EPA-00/3-77-086, July 1977. 537 p,

3 fig, 215 tab. Seyb, L. and Randolph, K., compilers. 1 BA031.

Descriptors: *United States, *Lakes, *Trophic level, *Eutrophication, Limnology, *Nutrients, Indicators, Water management, Basic data collections, Impoundments, Phytoplankton, Algae, Primary productivity, Bioindicators, Vollenweider models, Sewage disposal, Hydraulic residence time, Limiting factors, Phosphorus, Model studies, Water quality indices, Runoff, Diversion, Water pollution control, Water pollution effects, Watersheds(Basins), Oligotrophy, Mesotrophy.

Twenty-one papers analyze the limnology of 22 water bodies in the United States (primarily lakes), compiled for the Water Management Sector Group of the Organization for Economic Cooperation and Development. In 1971 the Water Management Sector Group established a steering group on eutrophication control to develop a series of cooperative projects for monitoring eutrophication in inland waters; this volume covers the North American Project, United States section. A major goal was comparability of data on nutrient budgets, chemical balances, and biological productivity in water bodies, reflected in the standardized format of each paper. The following are generally discussed: (1) geography, (2) morphometry and hydrology, (3) limnology, and (4) nutrient budgets. There is usually an attempt to determine the trophic status of the water body being studied, often employing the Vollenweider plot of phosphorus loading as a function of mean depth/hydraulic residence time. Other indicators of trophic state are also used. The studies include recommendations for optimal eutrophication control strategies. Papers are divided into sections on Florida (one paper), Minnesota (five papers), New York (three papers), Ohio (one paper), Oregon (one paper), Washington (two papers), Wisconsin (three papers), and Multiple-State Lakes and Special Topics (five papers). All studies deal with lakes and impoundments, with the exception of one on the Potomac Estuary. (See also W78-12896 thru W78-12915) (Lynch-Wisconsin)
W78-12895

ANALYSIS OF TROPHIC CONDITIONS AND EUTROPHICATION FACTORS IN LAKE WEIR, FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
P. O. Brezonik, and J. J. Messer.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 1-24, 6 fig, 9 tab, 30 ref.

Descriptors: *Lake Weir(FL), *Trophic level, *Mesotrophy, *Limnology, *Eutrophication, *Florida, Lakes, Phytoplankton, Chlorophyll, Algae, Nutrients, Nitrogen, Phosphorus, Primary productivity, Cyanophyta, Vollenweider models.

Present water quality of Lake Weir in central Florida is good and a mesotrophic classification is appropriate. Biological parameters in the lake reflect a diverse, moderately productive ecosystem exhibiting no nuisance conditions associated with excessive growth of macrophytes or algae. Two independently-derived trophic state indices bear out biological delineation of the mesotrophic status. Nitrogen and phosphorus concentrations indicate borderline eutrophic conditions, and there is evidence of a significant increase in phosphorus in the lake in recent years. Lake Weir has a low flushing rate making it sensitive to nutrient loading, and application of lake data to the Vollenweider input-output model shows that areal phosphorus loading rates are at the danger level. Lake Weir is a 2200-ha soft water lake located on the central Florida ridge; it has a watershed dominated by citrus groves, and it receives no permanent surface streams or wastewater influents. Chlorophyll analyses demonstrate that chlorophyll-a is the only important chlorophyll in the water column; phaeopigments were rarely encountered except in surface samples. Mean chlorophyll-a concentration was 8.24 mg/cu m in 1974. Phytoplankton is dominated by Cyanophyta, especially Oscillatoria submembranosa and Microcystis aeruginosa. (See also W78-12895) (Lynch-Wisconsin)
W78-12896

AN OVERVIEW OF LIMNOLOGICAL CHARACTERISTICS OF SHAGAWA LAKE, MINNESOTA,
Corvallis Environmental Research Lab., OR.
K. W. Malueg, D. W. Schults, and D. P. Larsen.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 25-46, 11 fig, 4 tab, 13 ref.

Descriptors: *Shagawa Lake(MN), *Limnology, *Eutrophication, *Trophic level, *Phosphrous, *Waste water treatment, Tertiary treatment, Nitrogen, Phytoplankton, Algae, Cyanophyta, Chlorophyll, Lakes, *Minnesota, Water pollution effects, Water pollution control.

Shagawa Lake, adjacent to Ely in northeastern Minnesota, is classified as eutrophic on the basis of measured limnological variables, a status extremely rare among the predominantly oligotrophic lakes in this region of Minnesota. The lake has received municipal wastewater effluents since 1901; primary treatment began in 1912, secondary treatment in 1954, and tertiary treatment for phosphorus removal in 1973. Most data used in this study was from 1972. During the past eight years the Environmental Protection Agency has intensively studied Shagawa Lake to evaluate lake restoration by wastewater phosphorus removal. Indications of eutrophic conditions during the summer include: (1) high pH in the epilimnion, (2) anaerobic conditions in the hypolimnion, (3) low Secchi disk vaues, and (4) large variations of nitrogen and phosphorus with time and depth. Summer phytoplankton are predominantly cyanophytes, and chlorophyll values reach about 60 micrograms/lite. Spring-time soluble reactive phosphorus and inorganic nitrogen levels are generally at or above critical bloom concentrations of 0.01 and 0.3 mg/l, respectively, as determined for 17 Wisconsin lakes. About 80% of the phosphorus and 27% of the nitrogen entering the lake are attributable to municipal wastewater. Initiation of tertiary treatment in 1973 reduced phosphorus loading by 80%, and the trophic condition is changing from eutrophy to mesotrophy. (See also W78-12895) (Lynch-Wisconsin)
W78-12897

LAKE SALLIE, MINNESOTA,
North Dakota Univ., Grand Forks. Dept. of Biology.
J. K. Neel.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 47-63, 2 fig.

Descriptors: *Limnology, *Lake Sallie(MN), *Eutrophication, *Water pollution control, *Sewage treatment, Waste water treatment, *Minnesota, Lakes, Phytoplankton, Algae, Waste water disposal, Biochemical oxygen demand, Coliforms, Municipal wastes, Septic tanks, Water pollution effects, Trophic level, Effluents, Lake restoration, Harvesting, Agricultural runoff.

Lake Sallie, near the city of Detroit Lakes in western Minnesota, is late mesotrophic or early eutrophic. It is culturally enriched by wastewater effluents which have been discharged into the lake from Detroit Lakes for over 70 years, by drainage from 168 septic tanks, and by groundwater inflow from agricultural lands. Sewage treatment in recent years has been very effective for such parameters as biochemical oxygen demand and coliforms. Waste discharges have put in 7,000-20,000 kg phosphorus and 5,000-11,000 kg nitrogen per year; surface land runoff has contributed up to 474 kg phosphorus and 610 kg nitrogen; direct precipitation has added up to 18 kg phosphorus and 24 kg nitrogen; and groundwater inflow was supplied up to 1552 kg phorphorus and 8750 kg nitrogen annually. Thermal stratification usually comes and goes during summer and early fall, but has been known to endure continuously for about two months. When present the hypolimnion occupies a relatively small volume. Weed and fish harvest has not removed more than a fraction of annual nitrogen and phosphorus increments. Complete removal of the biota would eliminate only part of the annual phosphorus load, and significant removal of nutrients from inflowing water appears the only practicable method of lake restoration. Weed harvesting resulted in an increase in phytoplankton mass and photosynthesis. (See also W78-12895) (Lynch-Wisconsin)
W78-12898

THREE OLIGOTROPHIC LAKES IN NORTHERN MINNESOTA,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
S. J. Tarapchak, and R. F. Wright.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 64-90, 1 fig, 13 tab, 14 ref.

Descriptors: *Trophic level, *Dogfish Lake(MN), *Meandor Lake(MN), *Lamb Lake(MN), *Forest fires, Water pollution effects, Watersheds(Basins), Lakes, Mesotrophy, Eutrophication, Water chemistry, Oligotrophy, Phytoplankton, Nutrients, Algae, Hydrology, Limnology, Model studies, Salinity, *Minnesota, Vollenweider models.

Effects of a severe forest fire in May 1971 on the watersheds and water quality of two oligotrophic lakes in northeastern Minnesota--Meander Lake and Lamb Lake--were investigated. A third oligotrophic lake, Dogfish Lake, served as control. Analysis of water chemistry, phytoplankton, nutrient budgets, and hydrology showed that increased phosphorus export from the watersheds of Meandor and Lamb Lakes were not high enough to change their classification from oligotrophic to mesotrophic as judged by Vollenweider's nutrient loading/trophic state model. The lands surrounding the lakes, on the Precambrian Shield, consist primarily of virgin deciduous-coniferous forest which has been largely undisturbed except for some timbering, and construction of a camp, trail, and dirt road. The May 1971 fire, which burned 5900 ha, destroyed 70% of the overstory in the Meandor Lake watershed, and 65% in the Lamb Lake drainage basin. The three lakes are low in salinity, with concentrations and ionic proportions of major anions and cations similar to those reported for the Experimental Lakes Region in Ontario, Canada. On the basis of Vollenweider's trophic scale for northern temperate lakes, the annual average phytoplankton biomass would classify Dogfish and Meander Lakes as oligotrophic (1.5-5.0 mg/l), and Lamb Lake as eutrophic. Chlorophyll-a and total phosphorus levels would place Dogfish and Meandor Lakes in either oligotrophic or mesotrophic categories, while Lamb Lake would again be categorized as eutrophic. (See also W78-12895) (Lynch-Wisconsin)
W78-12899

PHYTOPLANKTON, PHOSPHORUS, AND SEWAGE EFFLUENTS IN LAKE MINNETONKA,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Ecology.
R. O. Megard.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 91-116, 7 fig, 7 tab, 21 ref.

Descriptors: *Lake Minnetonka(MN), *Phytoplankton, *Phosphorus, *Water pollution control, *Photosynthesis, *Trophic level, Sewage disposal, *Minnesota, Lakes, Algae, Nutrients, Effluents, Municipal wastes, Water pollution effects, Diversion, Sediments, Limnology, Chlorophyll, Equations, Analytical techniques, Forecasting.

Diversion of sewage effluents away from Lake Minnetonka, near Minneapolis, Minnesota has significantly decreased phosphorus concentrations and phytoplankton densities. Construction of secondary sewage treatment plants in area villages was begun in 1927, and disposal of sewage into the lake resulted in a decline in water quality. Minimum Secchi disk transparency in Lower Lake Minnetonka (the largest basin) decreased from 2.5 m in 1937 to 0.9 m in 1969, and maximum phytoplankton densities increased fourfold. Effluents were diverted from the lower lake during 1971-72. Phosphorus was identified as the limiting factor for phytoplankton growth during the summers of 1968-69. After diversion annual phosphorus inputs decreased from 0.5 to 0.1 g/sq m, mean phosphorus concentration decreased from 48 mg/cu m during the summer of 1968 and 1969 to 34 mg/cu m during the summers of 1973 and 1974, and mean chlorophyll-a levels decreased from 37 mg/cu m to 17 mg/cu m at the rate of 1.0 mg Chl per mg of phosphorus decrease. Annual mean phosphorus concentration decreased from 62 mg/cu m in 1969 to 47 mg/cu m in 1973, or 50% of the decrease required to attain the steady state concentration predicted with a balance equation for phosphorus in a perfectly mixed basin. The trophic state before and after diversion is described objectively by changes in the relative integral photosynthetic rate. (See also W78-12895) (Lynch-Wisconsin)
W78-12900

REPORT ON THE MINNEAPOLIS CITY LAKES,
Minnesota Univ., Minneapolis. Limnologica Research Center.
J. Shapiro.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 117-134, 3 fig.

Descriptors: *Minneapolis, *Lakes, *Storm runoff, *Eutrophication, *Water pollution effects, *Biocontrol, Brownie Lake(MN), Cedar Lake(MN), Lake of the Isles(MN), Lake Calhoun(MN), Lake Harriet(MN), Water levels, Cooling water, Trophic level, *Minnesota, Zooplankton, Grazing, Algae, Phytoplankton, Daphnia, Fish, Environmental control.

The five lakes composing the Minneapolis Chain of Lakes have become increasingly eutrophic in recent years due to attempts to alleviate chronic low water levels with water inputs from various sources. Brownie Lake, Cedar Lake, Lake of the Isles, and Lake Calhoun are connected by manmade channels, while southernmost Lake Harriet is isolated. The four upper lakes have had low water problems because of their connection with the groundwater table, which is too low to sustain them. Measures to augment water level have included: (1) storm drainage from Minneapolis directed into the lakes since 1912, (2) groundwater used by industry for cooling discharged to the four upper lakes, and (3) Mississippi River water and city drinking water pumped into the lakes during recent dry years. Storm drain inputs have been the major contributor to eutrophication. Summer chlorophyll levels, transparency, and algal abundance suggest that Lake of the Isles is becoming less eutrophic while Calhoun and Harriet Lakes are becoming more so. Whereas nutrient budgets apparently have not changed in recent years, transparency correlates well with Daphnia abundance, indicating that algal density is affected by zooplankton grazing, which in turn may be related to zooplanktivorous yellow perch abundance. The possibility of using carnivorous fish to control zooplanktivorous fish is under investigation. By most criteria, the order of the lakes from most to least eutrophic is: Lake of the Isles, Brownie, Calhoun, Harriet, and Cedar. (See also W78-12895) (Lynch-Wisconsin)
W78-12901

A DESCRIPTION OF THE TROPHIC STATUS AND NUTRIENT LOADING FOR LAKE GEORGE, NEW YORK,
Rensselaer Polytechnic Inst., Troy, NY. Fresh Water Inst.
J. J. Ferris, and N. L. Clesceri
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 135-181, 14 fig, 23 tab, 24 ref.

Descriptors: *Lake George(NY), *Trophic level, *Oligotrophy, *Nutrients, *Phosphorus, Geologic history, *New York, Model studies, CLEANX model, Lakes, Limnology, Sediments, Phytoplankton, Zooplankton, Algae, Floral lists, Macrophytes, Primary productivity, Succession.

Investigation of the geography, morphology, hydrology, limnology, and nutrient budgets of Lake George, New York, demonstrates that geologic history largely determined its present trophic status. Estimated phosphorus loading is 0.0684 gm/sq m/yr, and with a mean depth of 18 m and a mean retention time of eight years, the lake can be classified as oligotrophic. Even if the lake's two basins are measured separately an oligotrophic classification is warranted, despite the south basin having a shoreside human population four to six times that of the north basin, and having two sewage treatment plants within its watershed. The lake, lying in a long, narrow channel bordered by heights exceeding 600 m above the lake surface, has a ratio of drainage basin surface area to lake surface area of only 4.3. Only a thin soil cover overlies much of the basin, and fits Vollenweider's oligotrophic soil category. Precipitation is the only form of hydrologic import. Simulation using the process model CLEANX shows a close fit between predicted and observed levels of zooplankton and phytoplankton biomass, and indicated that nutrient inputs from streams with subsequent internal recycling are the principal nonphysical driving forces in the Lake George ecosystem. High spring nutrient loadings result in a pulse of phytoplankton biomass, principally the net plankton Asterionella formosa; mean daily rises to 1.5 gm C/sq m/day or higher. Zooplankton predation (especially dicuspidatus) follows. (See also W78-12895) (Lynch-Wisconsin)
W78-12902

THE LIMNOLOGY OF CAYUGA LAKE, NEW YORK--A SUMMARY,
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
R. T. Oglesby.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 182-204, 3 fig, 6 tab, 57 ref.

Descriptors: *Limnology, *Cayuga Lake(NY), *Trophic level, *Mesotrophy, *Eutrophication, *New York, Lakes, Glaciation, Oligotrophy, Chlorophyll, Primary productivity, Industrial wastes, Nutrients, Phosphorus, Dissolved oxygen, Benthic fauna, Fish, Phytoplankton, Algae, Zooplankton, Bioassay, Nitrogen, Nitrates, Macrophytes.

Cayuga Lake, a moderately large and deep cold-water lake north of Ithaca, New York, affected by a variety of human influences, is representative of north temperate glacial lakes. Its relatively uncomplicated morphology--characterized by low shoreline development, restricted littoral zone (except at the tail end), and a single basin--make Cayuga Lake an excellent site for illustrating limnological principles. Most biotic and abiotic descriptive properties categorize the lake as mesotrophic, although for certain parameters and at specific times a eutrophic or oligotrophic classification would be more appropriate. Dominant phytoplankton groupings are typical of both oligotrophic conditions (Cyclotella, Tabellaria, Chrysomonads, and Sphaerocystis) and eutrophic conditions (Myxophyceae and Melosira). The mesotrophic categorization is correlated by: (1) mean summer euphotic zone chlorophyll concentrations of 5-10 mg/cu m; (2) annual primary production rates of about 160 mg C/sq m/day; (3) minimum hypolimnetic dissolved oxygen concentration of about six mg/liter; (4) faunal composition, with fishes including both salmonids and carp; and (5) standing crop of profundal benthos (0.5-1.0 gm organic matter/sq m). Comparison of data from 1910-30 with data from 1950-74 indicates that productivity has increased. Making trophic state a function of total phosphorus loading vs mean depth, or vs mean depth to water residence time, indicates eutrophication, with total phosphorus loadings above the dangerous level. (See also W78-12895) (Lynch-Wisconsin)
W78-12903

TROPHIC STATUS AND NUTRIENT BALANCE FOR CANADARAGO LAKE,
New York State Dept. of Environmental Conservation, Albany.
L. J. Hetling, G. W. Fuhs, and S. P. Allen.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 205-241, 12 fig, 20 tab, 38 ref.

Descriptors: *Canadarago Lake(NY), *Trophic status, *Eutrophication, *Nutrients, *Sewage disposal, *Phosphorus, *Waste water treatment, *Tertiary treatment, Lakes, *New York, Algae, Phytoplankton, Nutrient removal, Dissolved oxygen, Limnology, Stratification, Water pollution effects, Nitrogen, Cyanophyta.

Data gathered primarily from 1968-74 on limnological conditions in Canadarago Lake (east-central New York) prior to initiation of tertiary sewage treatment in the village of Richfield Springs, indicate strongly eutrophic conditions. In this stratified lake of moderate size (759 ha), eutrophication appears to be caused by input of raw sewage from the village and from summer camps and cottage septic systems. Dense cyanophyte blooms are more severe than would be expected from the lake's morphometry (seven m mean depth), which would be more likely to produce moderate eutrophication. Construction of a modern tertiary treatment facility was completed in 1973, and by fall 1974 the lake showed clear signs of recovery. The new plant removes 93-94% BOD and up to 90% phosphorus, providing a maximum effluent concentration of 0.5 mg P/liter. The major emphasis of the study was to develop nutrient budgets and to relate them to the lake's trophic status. In 1969-70, 44.1% of phosphorus input came from the village sewage treatment plant which had not been operational for several years; 42.4% was due to the lake's four major tributaries, 9.4% from the ungauged portion of the watershed, 2.3% from lakeside dwellings, and 1.7% from direct precipitation on the lake surface. Net phosphorus accumulation for 1969-70 (one year) was 790 kg/yr, of which 68.9% of the soluble phosphorus came from the treatment plant. Phosphorus loading is calculated at 0.8 g/sq m/yr. (See also W78-12895) (Lynch-Wisconsin)
W78-12904

LIMNOLOGICAL AND GEOCHEMICAL CHARACTERISTICS OF THE TWIN LAKES WATERSHED, OHIO,
Kent State Univ., OH. Center for Urban Regionalism and Environmental Systems.
G. D. Cooke, D. W. Waller, M. R. McComas, and R. T. Heath.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 242-270, 3 fig, 40 tab, 19 ref.

Descriptors: *Twin Lakes(OH), *Watersheds(Basins), *Trophic level, *Eutrophication, *Mesotrophy, *Limnology, Geochemistry, Macrophytes, Phytoplankton, Algae, Aluminum sulfate, Chemical precipitation, Aphanizomenon flos-aquae, Diatoms, Bioindicators, Stratification, Sewage disposal, Septic tanks, Diversion, Phosphorus, *Ohio, Lakes.

The Twin Lakes (Ohio) Project was established in 1971 to measure the response of East and West Twin Lakes to septic tank sewage diversion in 1973. Monitoring data for 1972-74 are reported here. Both lakes are small, kettle-type, dimictic second-class lakes. According to changing plankton characteristics, East Twin Lake is early eutrophic and West Twin Lake is mesotrophic, but the trend since diversion is toward mesotrophy in both lakes. Also: (1) Oxygen deficits are lower than often found in eutrophic lakes (0.0223 mg 02/sq cm/day in West Twin Lake and 0.0300 in East Twin Lake in 1974). (2) While the cyanophyte Aphanizomenon flos-aquae now dominates the phytoplankton, diatoms constitute an increasing fraction. (3) Mean cell vulume in 1972-74 was 1.05-5.86 microliters/liter in West Twin Lake, and 3.44-6.59 in East Twin Lake; Vollenweider has suggested 3-5 as the borderline between mesotrophy and eutrophication. (4) Mean summer photic zone chlorophyll-a is at the low end of Sakamoto's range of 5-140 mg Chl-a/cu m for eutrophic lakes. (5) Maximum net plankton community photosynthesis has dropped since diversion from 3400 mg C/sq m/day to 474 in East Twin Lake, and to 575 in West Twin Lake, which are in the range of borderline eutrophic lakes. However, if macrophytes are included in the analysis, the lakes must be classified eutrophic. (See also W78-12895) (Lynch-Wisconsin)
W78-12905

WALDO LAKE, OREGON,
Corvallis Environmental Research Lab., OR.
C. F. Powers, W. D. Sanville, and F. S. Stay.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 271-287, 1 fig, 8 tab, 10 ref.

Descriptors: *Waldo Lake(OR), *Limnology, *Oligothropy, *Phosphorus, *Trophic level, Recreation, *Oregon, Lakes, Mountain lakes, Mountains, Stratification, Water chemistry, Nutrients, Nitrogen, Baseline studies, Model studies, Vollenweider models.

Waldo Lake, located near the summit of Oregon's Cascade Mountains, is ultraoligotrophic, ranking among the most pristine lakes of the world. Recent development of access roads and campground facilities prompted a study of the possible response of the lake to pressures of increased recreational use. Waldo Lake's position on the lower left portion of the diagram on Vollenweider's scale implies that a relatively small increase in phosphorus loading could strongly alter the trophic status. Several different estimating methods place phosphorus loading at 0.028 g/sq m/yr and nitrogen loading at 0.44 g/sq m/yr; the nitrogen/phosphorus loading ratio is 15.7. The lake has no permanent tributaries, and the hydrologic and nutrient budgets are not amenable to accurate measurement. The relative importance of phosphorus in the lake is uncertain because of the very low concentrations of all measured nutrients. Comparisons with two other well-known ultraoligotrophic lakes, Crater Lake and Lake Tahoe, show that Waldo Lake's specific conductance is 1-2 orders of magnitude lower, its total dissolved solids one order of magnitude lower, and primary productivity and phytoplankton abundance lower. No zooplankton have been found in the lake. The ratio of mean depth to retention time is 1.68. (See also W78-12895) (Lynch-Wisconsin)
W78-12906

LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Zoology.
W. T. Edmondson.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 288-300, 2 tab, 17 ref.

Descriptors: *Lake Washington(WA), *Limnology, *Eutrophication, *Nutrients, *Water pollution control, *Estuaries, Algae, Cyanophyta, Primary productivity, Trophic level, Zooplankton, Sewage disposal, Diversion, Water pollution effects, Benthic fauna, Phytoplankton, *Washington.

Basic data for Lake Washington (Washington) on geography, limnology, and nutrient budget are given, primarily for the years 1957-76. In the 1890s Lake Washington was connected to Lake Union, and in 1916 a canal was opened between Lake Union and Puget Sound. In the 1940s and 1950s a transitory layer of very dilute seawater formed in the deepest parts of Lake Washington. The lake has characteristically had a spring diatom bloom dominated by Stephanodiscus, Fragilaria, Melosira, and Asterionella. In 1933 and 1950 the summer population was mostly a mixture of chlorophyte species and some flagellates. During the period of eutrophication this basic pattern had superimposed on it a dense population of cyanophytes in the summer, including Oscillatoria rubescens, O. agardhii, Microcystis, Anabaena, and Aphanizomenon. Most abundant zooplankton are Diaptomus ashlandi, Epischura lacustris, Cyclops, Diaphanosoma leuchtenbergianum, Bosmina longirostris, and the rotifers Keratella cochlearis and Kellicottia longispina. Bottom fauna is dominated by chironomids, with lesser numbers of tubificids and small mollusks (Pisidium). Maximum input of treated secondary effluent was in 1962, and in March 1963 diversion was begun. Sewage was decreased from about 76,000 cu m per day (20 million gal); the project was completed in 1968. Nutrient inputs have varied greatly with the increase in sewage, and then with diversion. Data are presented by year on nutrient income and loading. (See also W78-12895) (Lynch-Wisconsin)
W78-12907

NUTRIENT LOADING AND TROPHIC STATE OF LAKE SAMMAMISH, WASHINGTON,
Washington Univ., Seattle. Dept. of Civil Engineering.
E. B. Welch, T. Wiederholm, D. E. Spyridakis, and C. A. Rock.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 301-320, 3 fig, 4 tab, 15 ref. EPA R-800512; NSF GB-36810X.

Descriptors: *Lake Sammamish(WA), *Nutrients, *Mesotrophy, *Water pollution control, *Trophic level, *Eutrophication, Limnology, Lakes, *Washington, Diversion, Water pollution effects, Sewage disposal, Iron, Sediment-water interfaces, Stratification, Primary productivity, Phytoplankton, Algae, Phosphorus.

Lake Sammamish, Washington maintains its mesotrophic status, despite eutrophic levels of nutrient loading, through an internal iron-controlled sediment-water interchange mechanism which regulates incoming phosphorus available to phytoplankton. Total iron correlates closely with total phosphorus as oxygen is exhausted in the hypolimnion during August-October; the oxygen deficit rate is consistently high, about 0.05 mg/sq cm/day. Although phosphorus increases in surface waters following lake turnover in late November, phosphorus is rapidly complexed--probably by ferric hydroxides. Much of the released phosphorus is thereby resedimented and rendered unavailable to the phytoplankton when light is adequate in April and May. Lake Sammamish has been mesotrophic for over 100 years, according to sediment core analysis. The lake has been continuously monitored since 1969. Because of early signs of eutrophication, secondary effluent from the town of Issaquay and dairy processing wastes were diverted in 1968, amounting to one-third of the lake's phosphorus loading. The internal control mechanism can resist phosphorus loading changes over a range of at least 0.66-1.0 g P/sq m/yr; stability is not likely to persist over a much greater range. Maximum total phosphorus is at overturn, reaching 40 micrograms/l (which, before diversion, exceeded 100). Total phosphorus loading is 0.66 g/sq m/yr and total nitrogen is 13 g/sq m/yr. Phytoplankton biomass, primary productivity, and benthic communities all indicate mesotrophy. (See also W78-12895) (Lynch-Wisconsin)
W78-12908

LAKE MENDOTA - NUTRIENT LOADS AND BIOLOGICAL RESPONSE,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
J. M. Lopez, and G. F. Lee.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 321-336, 2 fig, 9 tab, 22 ref.

Descriptors: *Lake Mendota(WI), *Eutrophication, *Nutrients, *Phosphorus, *Water pollution control, *Wisconsin, Lakes, Madison(WI), Trophic level, Limnology, Agricultural runoff, Urban runoff, Algae, Phytoplankton, Aquatic weed control, Oxygen depletion, Stratification, Water pollution effects, Nitrogen, Chlorophyll, Urbanization, Cyanophyta.

Nutrient loading data and other parameters for eutrophic Lake Mendota, Madison, Wisconsin show that, even with a five-fold reduction of phosphorus loadings, a dangerous level would persist. Increased urbanization in the watershed coupled with runoff from dairy farming operations make it likely that water quality will continue to deteriorate, with increased frequency of severe summer blue-green algal blooms and excessive growth of attached algae and macrophytes in the littoral zone. Control efforts should be directed at reduction of phosphorus inputs from agricultural drainage (especially animal manure) and urban storm drainage. While combined use of alum to precipitate phosphorus, herbicides, and mechanical weed harvesting would result in significant improvement, local public opposition makes use of chemicals unlikely. Hypolimnetic waters in Lake Mendota become devoid of oxygen during summer stratification, and after fall reoxygenation oxygen depletion again occurs in bottom waters during late winter. Algal populations include bloom-forming Microcystis, Oscillatoria, and Lyngbya, and the acetylene-reducing genera Anabaena, Aphanizomenon, Nostoc, Calothrix, and Gloeotrichia. Summer blue-green counts are typically one million cells/liter, and total chlorophyll averages 5000 kg during the summer. Current phosphorus loading (1.2 g/sq m/yr) is about 10 times Vollenweider's permissible level. (See also W78-12895) (Lynch-Wisconsin)
W78-12909

REPORT ON NUTRIENT LOAD - EUTROPHICATION RESPONSE OF LAKE WINGRA, WISCONSIN,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
W. Rast, and G. F. Lee.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 337-372, 9 fig, 11 tab, 28 ref.

Descriptors: *Lake Wingra(WI), Madison(WI), *Eutrophication, *Nutrients, *Phosphorus, *Limnology, *Water pollution control, Lakes, Trophic level, Algae, Phytoplankton, Myriophyllum spicatum, Eurasian water milfoil, Water pollution effects, Watersheds(Basins), Aquatic weed control, Nitrogen, Urban runoff, Vollenweider models, *Wisconsin.

Eutrophic Lake Wingra in Madison, Wisconsin receives over 80% of its total phosphorus (980 kg/yr) and 90% of dissolved reactive phosphorus (570 kg/yr) from urban runoff. Very little dissolved reactive phosphorus enters the lake between storms; precipitation, dry fallout, and springflow contribute almost equal amounts (25, 21, and 30 kg/yr respectively). The Vollenweider loading curve values are 0.88 g/sq m/yr for phosphorus loading and 5.5 m/yr for mean depth/hydraulic residence time. The lake's eutrophic status as determined by these values is consistent with the physical, chemical, and biological characteristics of the lake. It is a shallow lake without a thermocline, the hypolimnion volume is low or absent, and transparency is low. Wind-generated mixing promotes nutrient cycling and a high degree of eutrophication. Blue-green algae usually dominate during summer. About one-third of total drainage comes from the University of Wisconsin Arboretum, and two-thirds is urban runoff. Reduction of phosphorus from urban runoff, such as through better street cleaning, would significantly reduce nutrient loadings to the lake. Total elimination of phosphorus input from urban runoff, although unlikely, would lower annual phosphorus loading to 0.23 g/sq m/yr and place Lake Wingra in the oligotrophic category. This article includes information on geography, hydrology, morphology, water chemistry, biota, and nutrient budgets. (See also W78-12895) (Lynch-Wisconsin)
W78-12910

REPORT ON NUTRIENT LOAD - EUTROPHICATION RESPONSE OF SELECTED SOUTH-CENTRAL WISCONSIN IMPOUNDMENTS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
M. D. Piwoni, and G. F. Lee.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 373-401, 2 fig, 17 tab, 21 ref.

Descriptors: *Eutrophication, *Trophic level, *Water quality indices, *Nutrients, *Impoundments, *Wisconsin, Lakes, Recreation, Phosphorus, Land use, Runoff, Water pollution sources, Algae, Cyanophyta, Macrophytes, Lake Redstone(WI), Dutch Hollow Lake(WI), Lake Virginia(WI), Lake Camelot(WI), Sherwood(WI), Lake Blackhawk(WI), Lake Stewart(WI), Cox Hollow Lake(WI), Twin Valley Lake(WI), Vollenweider models.

All of ten recreational impoundments assessed in central and southern Wisconsin were moderately to highly eutrophic, according to an eight-parameter trophic index. Nutrient loadings were estimated, and a comparison between nutrient load and trophic status was made through application of Vollenweider's logarithmic plot relating phosphorus loading to mean depth/hydraulic residence time. All ten impoundments were plotted in the region of the graph designated as eutrophic. The impoundments included six lakes created to improve real estate values--lake Redstone, Virginia, Camelot North and South, and Sherwood, and Dutch Hollow Lake-- and four public recreation lakes--Blackhawk, Stewart, Cox Hollow, and Twin Valley. Trophic state index parameters were Secchi depth, chlorophyll-a, dissolved oxygen depletion, winter and summer orthophosphate, winter and summer total phosphorus, and organic nitrogen. The index was modified from Lueschow, et al, 1970. All the impoundments suffer from excessive macrophyte growth in littoral areas, to greater or lesser degrees. Cyanophyte algae were dominant in all impoundments on at least two occasions during the summers of 1971 and 1972. From least to most eutrophic, with trophic state index, the lakes are: Camelot North (11), Sherwood (18), Camelot South (26), Redstone (41), Stewart (45), Blackhawk and Twin Valley (53), Cox Hollow (54), Virginia (55), and Dutch Hollow (67). (See also W78-12895) (Lynch-Wisconsin)
W78-12911

THE JOHN H. KERR RESERVOIR, VIRGINIA - NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
C. M. Weiss, and J. H. Moore.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 426-464, 2 fig, 25 tab, 5 ref.

Descriptors: *John H. Kerr Reservoir(VA NC), *Limnology, *Trophic level, *Nutrients, *Vollenweider models, *Reservoirs, *Virginia, *North Carolina, Multiple-purpose reservoirs, Stratification, Data collections, Nitrogen, Phosphorus, Hydraulic residence time, Flushing rate, Municipal wastes, Industrial wastes, Water pollution effects, Impoundments.

The 48,000-acre John H. Kerr Reservoir in Virginia and North Carolina receives substantial nitrogen and phosphorus loading from upstream municipal and industrial wastewater discharges. As the flow into the Roanoke arm is 80-90 times greater than into the Nutbush arm, residence time of the former is much shorter (60 days) than the latter (1800 days). Nutrient budgets for April 1974-March 1975 show that about 50% of phosphorus and 16% of nitrogen were retained in the impoundment. The validity of areal loading and total phosphorus as predictive dimensions (Vollenweider models) when retention time is high was verified by examination of phosphorus budget parameters and the response of the systems of each arm divided into five segments. Several variables describing conditions for algal growth were compared to growth as determined by chlorophyll-a and productivity; consistent high correlations of the Nutbush arm as compared to the low correlations or noncorrelations of the Roanoke arm indicate the systems' dependence on flushing rate to establish growth-limiting conditions. Analysis of secondary productivity, total zooplankton numbers, and algal cell density shows a correlation or value of -.340 in the Roanoke arm, compared with .871 in the Nutbush arm. Impoundments with high phosphorus retention coefficients can remove considerable phosphorus, and even in those with comparatively short residence time, such as the Roanoke arm, considerable phosphorus may be removed by absorption onto iron-rich sediments. (See also W78-12895) (Lynch-Wisconsin)
W78-12912

TROPHIC STATUS AND NUTRIENT LOADING FOR LAKE TAHOE, CALIFORNIA - NEVADA,
California Univ., Davis. Div. of Environmental Studies.
C. R. Goldman.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 465-480, 3 fig, 2 tab, 10 ref.

Descriptors: *Lake Tahoe(CA NV), *Trophic level, *Nutrients, *Oligotrophy, *Limnology, *Primary productivity, Phytoplankton, Algae, Eutrophication, Nitrogen, Phosphorus, *California, *Nevada, Lakes, Sewage disposal, Diversion, Sediments, Limiting factors, Nutrient flux.

Lake Tahoe in California and Nevada, a subalpine, ultraoligotrophic lake with record Secchi readings to 40 meters, has in recent years been subjected to increased nutrient inputs resulting from resident and tourist population growth and basin development. Because of its relatively small watershed and great volume, Lake Tahoe is at the extreme lower end of classifications based on loading; probably for the same reasons it is very sensitive to nutrient loading, as seen in data on primary productivity for 1959-74. By 1962 even treated sewage discharge was found to greatly stimulate phytoplankton primary productivity in the nutrient-poor water. Productivity apparently stopped increasing by 1974 in response to extensive sewage diversion, mostly completed by 1970. Daphnia and Bosmina are no longer dominant zooplankters, and ultraplankton have increased at the lower end of the euphotic zone. Oxygen shows no measurable depletion, even at depths of 500 meters, and the dilute rain of organic matter into the abyssal zone is almost completely mineralized before it reaches the sediment. At present nitrogen levels the lake is rather insensitive to phosphorus and is an excellent example of a nitrogen-limited system. The lake appears highly sensitive to nitrogen loading, which has caused an increase in primary productivity of about 5%/year. Total phosphorus loading is about 0.047 g/sq m/yr, and nitrogen is 0.5156 g/sq m/yr (1969). (See also W78-12895) (Lynch-Wisconsin)
W78-12913

REPORT ON NUTRIENT LOAD - EUTROPHICATION RESPONSE FOR THE OPEN WATERS OF LAKE MICHIGAN,
Texas Univ. at Dallas, Richardson, Center for Environmental Studies.
M. D. Piwoni, W. Rast, Jr., and G. F. Lee.
In: North American Project--A Study of U.S. Water Bodies; Publication No EPA-600/3-77-086, July 1977. p 481-498. 1 fig, 5 tab, 18 ref.

Descriptors: *Lake Michigan, *Nutrient removal, *Phosphorus, *Trophic level, *Sewage treatment, *Pelagic zone, Great Lakes, Lakes, Oligotrophy, Mesotrophy, Vollenweider models, Hydraulic residence time, Phytoplankton, Algae, Nearshore zone, Limiting factors.

Effects of reductions of effluent phosphorus into Lake Michigan on loading and quality of open waters are assessed. Bordering states adopted regulations in 1968 aimed at 80% reduction of phosphorus input from waste treatment plants by December 1972. Reductions should result in a small improvement in water quality of open waters in several years, manifested in reduced phytoplankton growth. The greatest improvement will probably occur in nearshore waters where phosphorus is or can be made the factor limiting planktonic and attached algal growth. In areas of restricted circulation, such as southern Green Bay, there will be little or no improvement in water quality, as 80% phosphorus removal would be insufficient to make phosphorus the limiting element for algal growth. This paper considers phosphorus loading estimates, problems in estimating nutrient loads and hydraulic residence time, and productivity. Estimated total phosphorus loading to the lake decreased from 18.1 million lbs/yr in 1971 to 12.4 million lbs/yr in 1974, reflecting improved treatment plant phosphorus removal. Use of the Vollenweider plot of phosphorus loading as a function of mean depth/hydraulic residence time places Lake Michigan open waters at the oligotrophic-mesotrophic boundary in 1971 and in the oligotrophic zone in 1974. Nearshore waters were mesotrophic in 1971 And oligotrophic-mesotrophic in 1974. (See also W78-12895) (Lynch-Wisconsin)
W78-12914

TROPHIC STATUS AND NUTRIENT LOADING FOR LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 499-536, 5 fig, 6 tab, 64 ref.

Descriptors: *Lake Michigan, *Indicators, *Trophic level, *Phytoplankton, *Nutrients, *Silica, Environmental effects, Water pollution effects, Phosphorus, Bioindicators, Great Lakes, Lakes, Limnology, Algae, Limiting factors, Eutrophication, Chlorophyll, Primary productivity, Zooplankton, Benthic fauna, Fish, Species composition, Ecosystems, Nitrates.

Effects of nutrient loading on the biochemistry of Lake Michigan are assessed, and current and past

rophic conditions are described. Phosphorus mits phytoplankton growth and primary produc- on in the lake, as is the case in Lakes Superior nd Huron. Of Lake Michigan biota, only hytoplankton can be used to monitor changes in rophic state. Due to the relative insensitivity of hytoplankton biomass or chlorophyll-a concen- ration as indicators in Lake Michigan, however, it s proposed that silica and nitrate depletion in the utrophic zone during summer stratification be sed as trophic state indicators. The benthic com- nunity has not shown significant qualitative hanges from nutrient enrichment, and quantita- ive changes in standing crop must be large to be letectible. Zooplankton data are inadequate for ong-term assessments of standing crop. Varia- ions in fish abundance and species composition ave not been correlated with trophic status. On he other hand, changes in phytoplankton species composition apparently reflect nutrient en- richment, and the replacement of diatoms by cyaophytes as dominant phytoplankters cor- responds to silica depletion in the eutrophic zone during summer. The most serious changes in the lake have occurred relatively recently (in the last 20 years). Modelling indicates a considerable delay between the beginning of phosphorus loading (which began probably in the 1940s) and effects on the biological system. (See also W78-12895) (Lynch-Wisconsin)
W78-12915

PROCEEDINGS OF THE 3RD AQUATIC TOXICITY WORKSHOP HELD IN HALIFAX, NOVA SCOTIA, NOVEMBER 2-3, 1976.
Environmental Protection Service, Halifax (Nova Scotia).
For primary bibliographic entry see Field 5A.
W78-12952

CHEMISTRY IN THE DETERMINATION OF TOXICITY OF CHEMICALS TO AQUATIC FAUNA,
Fisheries and Marine Service, St. Andrews (New Brunswick).
For primary bibliographic entry see Field 5A.
W78-12956

A DISCUSSION ON THE USE OF BEHAVIOR BY GAMMARUS PSEUDOLIMNAEUS BOUSFIELD IN EVALUATING ENVIRONMENTAL STRESS,
Fisheries and Marine Service, Halifax (Nova Scotia).
For primary bibliographic entry see Field 5A.
W78-12958

A FIELD TECHNIQUE FOR STUDYING THE AVOIDANCE OF FISH TO POLLUTANTS,
Fisheries and Marine Service, Vancouver (British Columbia). Habitat Protection Directorate.
For primary bibliographic entry see Field 5A.
W78-12959

ASSESSMENT OF THE TOXICITY OF LANDFILL LEACHATES BY THE RESIDUAL OXYGEN BIOASSAY,
EVS Consultants Ltd., New Westminister (British Columbia).
For primary bibliographic entry see Field 5A.
W78-12960

AN EVALUATION OF DEATH BY HYPOXIA IN A MARINE FISH AS AN INDICATOR OF OIL DEPRESANT TOXICITY,
Fisheries and Marine Service, St. John's (Newfoundland).
For primary bibliographic entry see Field 5A.
W78-12962

APPLICATION OF TISSUE CULTURE SYSTEMS TO EVALUATE AQUATIC TOXICANTS,
Fisheries and Marine Service, Halifax (Nova Scotia). Halifax Lab.
For primary bibliographic entry see Field 5A.
W78-12964

COMPARISON OF RAPID BIOASSAY PROCEDURES FOR MEASURING TOXIC EFFECTS OF BLEACHED KRAFT MILL EFFLUENT TO FISH,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 5A.
W78-12965

PRESENT APPROACHES TO TOXICITY TESTING - A PERSPECTIVE,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-12967

A MECHANICAL TOXICANT INJECTOR FOR FLOW-THROUGH TOXICITY TESTS,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-12971

METHOD FOR ASSESSING ADDITIVE TOXICITY OF CHEMICAL MIXTURES,
Fish and Wildlife Service, LaCrosse, WI. Fish Control Lab.
For primary bibliographic entry see Field 5A.
W78-12973

BIOASSAYS WITH A NATURAL ASSEMBLAGE OF BENTHIC MACROINVERTEBRATES,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
For primary bibliographic entry see Field 5A.
W78-12976

UTILITY OF TOXICITY TESTS WITH EMBRYOS AND FRY OF FISH IN EVALUATING HAZARDS ASSOCIATED WITH THE CHRONIC TOXICITY OF CHEMICALS TO FISHES,
EG and G, Bionomics, Wareham, MA.
For primary bibliographic entry see Field 5A.
W78-12977

UPTAKE, CLEARANCE, AND BIOCONCENTRATION OF 14C-SEC-BUTYL-4-CHLORODIPHENYL OXIDE IN RAINBOW TROUT,
Dow Chemical Co., Midland, MI.
For primary bibliographic entry see Field 5A.
W78-12979

AN EVALUATION OF FENITROTHION TOXICITY IN FOUR LIFE STAGES OF RAINBOW TROUT, SALMO GAIRDNERI,
Fisheries and Marine Service, Winnipeg (Manitoba).
J. F. Klaverkamp, M. Duangsawasdi, W. A. MacDonald, and H. S. Majewski.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, eds., American Society for Testing and Materials, p 231-240, 1977. 4 fig, 1 tab, 37 ref.

Descriptors: *Pesticide toxicity, *Rainbow trout, *Insecticides, *Toxicity, Organic pesticides, Organic compounds, Water pollution effects, Environmental effects, Fish physiology, Growth stages, Embryonic growth stage, Fry, Mortality, Enzymes, Biochemistry, Animal metabolism, Fish behavior, *Fenitrothion.

Lethal and sublethal effects of fenitrothion, an organophosphate insecticide, were investigated in rainbow trout embryos, sac fry, fingerlings, and adults. Based on acute mortality tests, the embryological life stage was the least sensitive, the sac fry was intermediate, and the life stages of fingerlings and adults were the most sensitive. The sublethal responses, cholinesterase inhibition in fingerling and the cough response in adult trout, were sensitive to 0.75 and 0.5 mg/liter fenitrothion. (See also W78-06608) (EIS-Deal)
W78-12983

ACUTE TOXICITY TO AND BIOCONCENTRATION OF ENDOSULFAN BY ESTUARINE ANIMALS,
Environmental Research Lab., Gulf Breeze, FL.
S. C. Schimmel, J. M. Patrick, Jr., and A. J. Wilson, Jr.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, eds., American Society for Testing and Materials, p 241-252, 1977. 3 tab, 23 ref.

Descriptors: *Pesticide toxicity, *Pink shrimp, *Mullet, *Insecticides, *Toxicity, Chlorinated hydrocarbon pesticides, Shrimp, Path of pollutants, Water pollution effects, Organic compounds, Environmental effects, Animal metabolism, Animal physiology, Fish physiology, Estuarine environment, *Toxicity testing, *Bioconcentration, *Endosulfan, *Tissue analysis, *Pinfish.

Acute 96-h flow-through toxicity tests with endosulfan (Thiodan) were conducted with several estuarine animals. The test species were: pink shrimp, grass shrimp, pinfish, spot, and striped mullet. Our studies suggest that endosulfan in the estuarine environment would be a hazard because of its acute toxicity and bioconcentration potential, but animals surviving exposure and moving to areas free of endosulfan would lose the chemical rapidly. (See also W78-06608) (EIS-Deal)
W78-12984

THE EFFECT OF SUBACUTE PARATHION EXPOSURE ON THE LOCOMOTOR BEHAVIOR OF THE BLUEGILL SUNFISH AND LARGEMOUTH BASS,
Raytheon Co., Portsmouth, RI. Oceanographic and Environmental Dept.
G. M. Rand.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J.L. Hamelink, eds., American Society for Testing and Materials, p 253-268, 1977. 8 fig, 5 tab, 27 ref.

Descriptors: *Pesticide toxicity, *Sunfishes, *Bass, Bioassay, Water pollution effects, Environmental effects, Fish behavior, Fish physiology, Animal metabolism, Chemical properties, Organophosphorus pesticides, Insecticide, Pesticide kinetics, *Parathion, *Toxicity testing.

The effects were studied of a 24-h exposure to a subacute concentration of parathion on the locomotor orientation of the bluegill sunfish and largemouth bass in response to a food odor in water and water without odor. In sunfish, prior to parathion exposure, odor/Flow II was more attractive than any other condition. Following exposure, the response to Flow II and to odor/Flow II was avoidance, that to odor/Flow I remained attractive, thus causing a parathion by flow interaction. Two weeks after exposure, the relative response to the treatments was similar to that of unexposed fish. In bass, prior to parathion exposure, the odor/Flow II was also more attractive than any other condition but the fish were unable to discriminate between odor/Flow I and Flow I alone. Following exposure, the fish were unable to discriminate between odor/Flow I and Flow I alone. Flow I (the control), whereas particularly odor/Flow I and, to a lesser extent, Flow II were avoided. Thus, there was a significant interaction

between odor and flow. After a two-week interval, all treatments were attractive, but the most significant relative attraction was that to odor/Flow I. The general activity in all experimental conditions was also depressed following parathion exposure. (See also W78-06608) (EIS-Deal)
W78-12985

DIET QUALITY IN FISH TOXICOLOGY: EFFECTS ON ACUTE AND CHRONIC TOXICITY,
Fish and Wildlife Service, Columbia, MO. Fish-Pesticide Research Lab.
P. M. Mehrle, F. L. Mayer, and W. W. Johnson.
In: Aquatic Toxicology and Hazard Evaluation, ASTM STP 634, F.L. Mayer and J. L. Hamelink, eds., American Society for Testing and Materials, p 270-280, 1977. 4 fig, 1 tab, 23 ref.

Descriptors: *Pesticide toxicity, *Fish diets, *Fish physiology, Foods, Nutrient requirements, Nutrients, Toxicity, Vitamins, Polychlorinated biphenyls, DDT, Dieldrin, Pesticides, Rainbow trout, Proteins, Animal metabolism, Channel catfish, Amino acids, Biochemistry, Sunfishes, Growth rates, Methodology, *Toxicity testing, *Chlordane, *Tissue analysis, *Toxaphene.

The importance of diet quality in toxicological research with fish was illustrated in several studies. The acute toxicity of chlordane to rainbow trout was dependent upon the type of diet fed before toxicity testing. In flow-through toxicity studies, rainbow trout, bluegill, and channel catfish fed a diet containing casein and gelatin as a protein source had a greater tolerance to PCBs than those fed a diet with fish meal and soybean meal as the primary protein sources. By increasing the concentration of the amino acid methionine in the diet of rainbow trout, the toxicity of DDT increased while dieldrin toxicity decreased. In studies with channel catfish, the concentration of vitamin C in the diet influenced the chronic effects of toxaphene on growth and skeletal development. These studies illustrate that the type of diet fed before acute toxicity testing and during chronic toxicity testing is important, and that consideration for nutritious standard diets in toxicological research with fish is needed. (See also W78-06608) (EIS-Deal)
W78-12986

ACCUMULATION OF AMERICIUM 243 IN SELECTED BRACKISH AND MARINE INVERTEBRATES,
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
For primary bibliographic entry see Field 5B.
W78-12988

TOXICOLOGY OF PHTHALIC ACID ESTERS IN AQUATIC ORGANISMS,
Fish and Wildlife Service, Columbia, MO. Fish-Pesticide Research Lab.
F. L. Mayer, Jr., and H. O. Sanders.
Environmental Health Perspectives, Experimental Issue, No 3, p 153-157, 1973. 6 tab, 21 ref.

Descriptors: *Acids, *Toxicity, *Sockeye salmon, *Reproduction, Path of pollutants, Animal metabolism, Fish physiology, Water pollution effects, Chemical properties, Chemical wastes, Industrial wastes, Ecosystems, Biodegradation, Organic compounds, *Esters, *Phthalates, *Phthalic acid esters.

The low degree of toxicity and the high excretion rate of di-n-butyl and di-2-ethylhexyl phthalates might suggest that these compounds would be relatively safe as far as aquatic organisms are concerned. However, the present data indicate that these compounds can be detrimental to the reproduction of aquatic organisms at low chronic concentrations. The concentrations of phthalic acid esters presently found in waters of the United States are, in some cases, detrimental to aquatic invertebrates in view of laboratory results. Phthalic acid esters are produced in large amounts, they are in wide use as plasticizers, and they are entering aquatic ecosystems. Thus, these compounds should be considered as environmental pollutants, and a more detailed evaluation of toxicological effects of phthalic acid esters is needed to elucidate their impact on aquatic ecosystems. (EIS-Deal)
W78-12989

PREVENTIVE MEDICINE IN FISH DISEASES AND ENVIRONMENTAL ASPECTS OF TROUT FARMING,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark).
N. O. Christensen.
Rivista Italiana di Piscicoltura e Ittiopatologica, Vol 13, No 1, p 7-9, 1978.

Descriptors: *Fish farming, *Fish management, *Fish diseases, *Trout, Animal pathology, Salmonids, Fish populations, Water chemistry, Water analysis, Fish parasites, Viruses, Pathogenic bacteria, Fish genetics, Fish diets.

This report gives a survey of the various types of diseases which may occur in trout farms and the measures to be taken to avoid them or give them a less severe course. Such securing of a satisfactory health condition in the trout farm, naturally influences favorably, the production and economic results of the operation. It is evident that many of the occurring problems may be overcome by clever and skillful management, proper feeding and rather simple other measures. (EIS-Deal)
W78-12990

CONCENTRATION OF MERCURY IN MARINE ANIMALS,
Hokkaido Univ., Hakodate (Japan). Lab. of Marine Chemistry.
For primary bibliographic entry see Field 5B.
W78-12991

SOME EFFECTS OF EXPOSING RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) TO PHENOL SOLUTIONS,
Ministry of Agriculture, Fisheries and Food, London (England). Salmon and Freshwater Fisheries Lab.
D. J. Swift.
Journal of Fish Biology, Vol 13, p 7-17, 1978. 3 fig, 6 tab, 32 ref.

Descriptors: *Phenols, *Absorption, *Fish physiology, *Rainbow trout, Aromatic compounds, Toxicity, Mortality, Path of pollutants, Freshwater fish, Chemical wastes, Industrial wastes, Chemical analysis, Chemical properties, Animal pathology, *Tissue analysis, *Bioaccumulation.

Phenol at non-lethal concentrations in hard water had no effect on the urine flow rate or hematocrit or rainbow trout for exposure times of 24 h. Phenol was detected in the urine in a non-conjugated form and unchanged phenol was also extracted from muscle, blood, and brain. Uptake of phenol into tissue was found to be rapid with an equilibrium concentration being reached in 3 h. Loss of phenol after exposure was as rapid. The equilibrium concentration for muscle was similar to the phenol concentration to which the fish were exposed. Blood and brain contained smaller amounts. Close to or above the lethal threshold concentration the fish had higher than ambient concentrations in their tissues most notably in the brain. Above the lethal threshold there is evidence of a large uptake of phenol by erythrocytes. (EIS-Deal)
W78-12992

SPONTANEOUS SKELETAL DEFORMITIES IN THE ZEBRA DANIO (BRACHYDANIC RERIO) BRED FOR FISH TOXICITY TESTS,
Unilever Research Colworth/Welwyn Lab., Bedford (England). Environmental Safety Div.
For primary bibliographic entry see Field 5A.
W78-12993

BREEDING THE CONVICT CICHLID (CICHLASOMA NIGROFASCIATUM) FOR USE IN LABORATORY FISH TOXICITY TESTS,
Unilever Research Colworth/Welwyn Lab., Bedford (England). Environmental Safety Div.
For primary bibliographic entry see Field 5A.
W78-12994

BACTERIOLOGICAL ASPECTS OF FIN EROSION IN MULLET EXPOSED TO CRUDE OIL,
Mississippi State Univ., Mississippi State. Dept. of Microbiology.
R. C. Giles, L. R. Brown, and C. D. Minchew.
Journal of Fish Biology, Vol 13, p 113-117, 1978. 2 tab, 8 ref.

Descriptors: *Fish diseases, *Oil, *Mullets, *Pathogenic bacteria, Oil pollution, Water pollution effects, Animal pathology, Microorganisms, Cytological studies, Bacteria, Oil spills, Organic compounds, Biochemistry, Microbial degradation, *Crude oil, *Fin rot, *Vibrio.

An investigation was undertaken to detemine the effect of two types of crude oil on mullet. The data presented in this report establishes a relationship between the exposure of the mullet to crude oils and the outbreak of fin rot. The data also indicates that the diversity of the microflora on the exterior of the mullet was reduced from 5-6 to 1-2 colonial types, one of which was consistently a species of the genus Vibrio. (EIS-Deal)
W78-12995

TOXICITY OF ALTOSID AND DIMILIN TO JUVENILE RAINBOW TROUT AND COHO SALMON,
British Columbia Research Council, Vancouver.
McKague, and R. B. Pridmore.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 167-169, 1978. 10 ref.

Descriptors: *Toxicity, *Pesticide toxicity, *Insecticides,, *Rainbow trout, *Sockeye salmon, Growth stages, Juvenile growth stage, Biodegradation, Insect control, Bioassay, Chemical properties, Diptera, Fish physiology, Chemical analysis, Animal metabolism, Larvicides, *Toxicity testing, *Altosid, *Dimilin.

Dimilin was not toxic to either trout or coho salmon up to 150 mg/l, the maximum concentration tested for a 96-h period. A 15-min exposure to 1 g/l Dimilin also did not result in any fish mortality. The 96-h LC50 for Altosid for rainbow trout was 106 mg/l and for coho salmon was 86 mg/l. The toxicity of Altosid and Dimilin is very low compared with reported values for black fly larvicides presently in use. The low toxicity of Altosid and Dimilin to these important species of fish indicates use of these materials for black fly control should be considered in planning future programs. (EIS-Deal)
W78-12996

FURNACE FOR CONTROL OF CYTOPHAGA PSYCHROPHILA THE CAUSATIVE AGENT OF COLD-WATER DISEASE IN COHO SALMON,
Oregon Dept. of Fish and Wildlife, Clackamas.
R. A. Holt, J. F. Conrad, and J. L. Fryer.
The Progressive Fish Culturist, Vol 37, No 3, p 137-139, 1975. 1 fig, 8 ref.

Descriptors: *Sockeye salmon, *Fish diseases, *Myxobacteria, Juvenile growth stage, Fry, Pathogenic bacteria, Aquatic microorganisms,

Fish mangement, Animal pathology, Cytological studies, Mortality, Water temperature, Aquiculture, *Furanace.

Cold-water disease (CWD) is an acute septicemic infection of young coho salmon. The purpose of this study was to test the efficacy of Furanace to control CWD. The results obtained in this investigation demonstrate that Furanace can be effectively administered merely by adding the chemotherapeutic to water containing the fish. Because CWD may become severe in sac-fry, which do not take medicated feed, this treatment porcedure could be very valuable. (EIS-Deal)
W78-12997

THE EFFECTS OF PHENYLMERCURIC ACETATE ON THE GROWTH OF CHLAMYDOMONAS VARIABILIS DANG,
Paris-11. Univ., Orsay (France). Lab. de Cryptogamie et de Biologie Cellulaire.
A. Delcourt, and J. C. Mestre.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 145-148, 1978. 3 fig, 5 ref.

Descriptors: *Mercury, *Toxicity, *Growth rates, *Chlamydomonas, Water analysis, Aquatic populations, Aquatic algae, Water pollution effects, Phytoplankton, Cytological studies, Chemical propeties, Biological membranes, Membrane processes, *Phenylmercuric acetate.

Two characteristics of the toxic action of phenylmercuric acetate on the growth of C. variabilis were determined. The existence of a threshold concentration below which there was no toxicity evident was revealed. The threshold dose was proportional to the algal cell concentration. A lag phase, which was the first preceptible sign of toxicity was also noted. The duration of the lag phase increased with decreasing initial algal cell concentration and also increased with increasing concentrations of phenylmercuric acetate. (EIS-Deal)
W78-12998

5D. Waste Treatment Processes

MANAGEMENT OF SWINE MANURE FOR THE RECOVERY OF PROTEIN AND BIOGAS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. Boersma, E. Gasper, J. Miner, J. Oldfield, and H. Phinney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 722, Price codes: A14 in paper copy, A01 in microfiche. Agricultural Experiment Station Special Report No. 507, May, 1978. 264 p. OWRT B-044-ORE(3).

Descriptors: Water reuse, Energy recovery, *Waste treatment, *Protein recovery, Management, *Farm wastes, *Biogas recovery, Nutrients, Gases, Biodegradation, Algae, Bacteria, Biological treatment.

Major findings of an investigation into the concept of nutrient and energy recovery from a swine waste management system are reported. Algae and bacteria were used to convert swine manure into methane-rich fuel gas and supplemental protein for animal feed. Waste heat from electricity generating plants was simulated to test its value in enhancing the biological recovery of nutrients and energy. The experimental facility was built adjacent to the Swine Research Center at Oregon State University and consisted of animal quarters with solid concrete floor and gutter to house 50 pigs, an anaerobic digester with a volume of 14 m3, and 12 outdoor algae basins with a combined surface area of 24 m2 and a combined volume of 6,000 l. Manure was removed from the animal quarters by a gutter flushing system. The solids were separated from the liquids by gravity settling and then pumped into the digester for solubilization and recovery of biogas. The liquid phase of the diluted manure was pumped into the outdoor basins to serve as nutrient substrate for the growth of the high temperature strain 211/8K of Chlorella vulgaris as the predominant algal species. The algal biomass was concentrated by centrifugation and freeze dried. Its nutritional value as a protein source was determined by feeding trials with Long-Evans rats.
W78-12108

CONTROL OF ACTIVATED SLUDGE TREATMENT,
Delaware Univ., Newark. Dept. of Chemical Engineering.
M. M. Denn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 068, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, October 1977. 17 p. OWRT A-033-DEL(1), 14-34-0001-7016.

Descriptors: *Activated sludge, Control systems, Mathematical models, *Sewage treatment, *Sludge treatment, Waste water treatment.

The activated sludge process for wastewater treatment consists of a biochemical reactor followed by a settler, with recycle of sludge from the settler to the reactor. The process is subject to large influent variations over a twenty-four hour cycle. Published dynamic simulations of continuous sedimentation assume that only discrete layers of constant concentration can exist. This assumption is not valid for all changes in feed concentration and underflow rate. A dynamic simulation model was developed which accounts for the possible regions of continuous concentration variation. Simulations show that the dynamics of the activated sludge process are governed under certain conditions by interactions between the reactor and the settler through sludge recycle. Settler underloading can lead to extremely sluggish recycle. Settler underloading can lead to extremely sluggish system response, indicating that effective sludge height regulation is an important control objective. This objective may be in conflict with the need to maintain small variations in reactor solids concentration. An effective compromise can be achieved by using ratio control on both sludge recycle and settler underflow. This control policy does not require sludge storage.
W78-12117

SEWAGE BIOCHEMICAL PURIFICATION APPTS. - HAS MAIN TANK FILLED WITH PERFORATED PLASTIC FILM ON WHICH THE BIOMASS FORMS.
Soviet Patent SU-567-675. Issued August 26, 1977.
Derwent Soviet Inventions Illustrated, Vol. A. No. 24, p 10-11, July, 1978. 1 fig.

Descriptors: *Biological treatment, *Semipermeable membranes, *Spraying, *Plastics, *Patents, Biological membranes, Storage tanks, Pumps, Biomass, Biodegradation, Waste water treatment, Municipal wastes.

A patented biochemical waste water treatment system supports an excess of biomass on a perforated plastic film mounted on vertical screens. Raw waste water flows through a pipe into a storage tank containing recirculated effluent. The mixed liquor is pumped into the treatment tank through a pipe terminating in a sprinkler distribution system. As the waste water flows down through the perforated plastic film, it becomes saturated with air. The air-saturated effluent and biomass collect in a chamber below the vertical screens for further treatment. Treated effluent collects in channels located around the periphery of the treatment tank; it is allowed to settle before it is drawn off through another pipe. Unoxidized biomass and a portion of the effluent are returned to the storage tank for mixing with raw influent. (Lisk-FIRL)
W78-12120

CLEANING RAKE ARRANGEMENT FOR A DRAIN CHANNEL GRID - IS OF LOW, STABLE CONSTRUCTION AND SUITABLE FOR GRIDS WITH STRAIGHT BARS.
For primary bibliographic entry see Field 8G.
W78-12121

FLOCCULATING AND DRAINAGE SLUDGE FROM EFFLUENT PURIFICATION PLANT - IN LOW COST LOW ENERGY POTENTIALLY MOBILE FILTER PLANT.
French Patent FR 2363-524. Issued May 5, 1978.
Derwent French Patents Abstracts, Vol. A, No. 22, p 4, July, 1978.

Descriptors: *Flocculation, *Filtration, *Sludge treatment, *Dewatering, *Patents, Design data, Equipment, Filters, Deflection, Sewage sludge, Sludge disposal, Waste water treatment, Municipal wastes.

A rotating drum apparatus flocculates and filters sewage sludge, producing a homogeneous, dewatered product. The sewage sludge is flocculated in a rotating drum with a central inlet and outlet. Surrounding the flocculation drum and sharing the same axis is a counter-rotating filter drum. As the inner drum rotates, filrate passes through perforations in the drum wal and is distributed laterally by a series of paddles and deflectors attached to the drum walls. The filter drum contains a continuous filter band pressed against the drum's periphery by an outer driving filter band; successive filter band configurations are zig-zagged between pressure rollers. The system is amenable to packaged, mobile operation at several sites and provides simple operation with minimum maintenance and supervision. (Lisk-FIRL)
W78-12140

SEPARATOR OF ACTIVE SLUDGE FROM TREATED EFFLUENT - HAS FILTERING ELEMENTS WITH POSITIVE CONALITY SET VERTICALLY DIRECTLY ABOVE DISTRIBUTOR.
Soviet Patent SU-565-885. Issued July 21, 1977.
Derwent Soviet Inventions Illustrated, Vol. A, No. 23, p 4, July, 1978. 1 fig.

Descriptors: *Separation techniques, *Activated sludge, *Filtration, *Distribution systems, *Patents, Bubbles, Aeration, Sludge treatment, Cleaning, Equipment, Design data, Waste water treatment, Municipal wastes.

An aeration and filtration system to separate activated sludge from treated effluent has been patented. The separation unit consists of a reservoir tank containing vertical filter elements located above a water-air distribution system. Influent is introduced along a pipeline at the tank base into the distributor, along with previously treated effluent bearing dissolved air at 3-4 atmospheres. The waste water is evenly distributed over the bottom of the reservoir tank and passed upwards through filter elements which have positive slopes in the range of 1:20-25. As the effluent rises, suspended particles are entrapped in air bubbles and compacted on the filters. Concentrated sludge is scraped from the filters and discharged through a trough. Treated effluent is removed through an annular outlet for partial recirculation with influent. The surfaces of the filter elements are continuously regenerated by the upward movement of the air bubbles. (Lisk-FIRL)
W78-12153

TRAVELLING SLUDGE SCRAPER BRIDGE FOR - EFFLUENT TANKS.
German Patent DS 1957-685. Issued May 24, 1978.
Derwent German Patents Abstracts, Vol. A, No. 22, p 1, July, 1978.

Descriptors: *Sludge treatment, *Hydraulic design, *Patents, *Settling basins, *Hydraulic structures, Pipes, Engineering structures, Design

data, Equipment, Waste water treatment, Separation techniques, Municipal wastes.

A sludge scraper bridge apparatus has been patented for dual waste water tanks. One end of the sludge scraper mechanism is supported on a winch-driven trolley located on the central partition between the tanks. The winch is directed by a circular guide pipe. The sludge scrapers are mounted on two webs attached to either side of the trolley. The other end of the scraper bridge assembly is supported by three radial guide rollers on the outer treatment tak wall; one guide roller is mounted on a horizontal axis. The free ends of the two scraper webs have free-moving castors which roll along the tank wall. The simple design of the scraper bridge provides efficient operation, even under heavy snow conditions. (Lisk-FIRL)
W78-12166

REACTION WHEEL WASTE WATER SPRAY FOR PERCOLATING FILTER BED - SPRAYS TWO CONCENTRIC BEDS FROM DIFFERENT SOURCES OF LIQ.
French Patent FR 2364-066. Issued May 12, 1978. Derwent French Patents Abstracts, Vol. A, No. 23, p 3, July, 1978.

Descriptors: *Spraying, *Application equipment, *Percolation, *Filtration, *Patents, Design data, Sprays, Equipment, Percolating water, Application methods, Waste water treatment, Municipal wastes.

A patented reaction wheel sprayer system permits simultaneous spraying of liquids from two separate sources onto concentric trickling filter beds. Two coaxial sets of radial spray arms, mounted on the reaction wheel, rotate the wheel horizontally to distribute the effluent. A vertical central pipe supplies liquid to one set of spray arms connected to a rotating hollow hub with sleeves. An annular rotary jacket, coaxially encasing the hollow hub, provides a channel for the liquid supplied to the second set of radial arms. The reaction wheel assembly is rotary sealmounted on a fixed support box which conveys the liquid effluent to the rotary jacket. The reaction wheel system permits the space-saving concentric filter bed configuration via its ability to simultaneously or separately distribute two different effluents. The spray arms are designed to rotate independently or integrally, depending upon the fixed or rotating attachment of the rotary jacket to the hollow hub. (Lisk-FIRL)
W78-12170

APPARATUS FOR FORMING SEWAGE TREATMENT SILICATE PRODUCTS - INCLUDES MIXING TUBE WITH STATIC HIGH SHEAR DEVICE.
Netherlands Patent NL 7614-162. Issued June 22, 1978. Derwent Netherlands Patents Report, Vol A, No 27, p 1, August, 1978.

Descriptors: *Coagulation, *Silicates, *Alkali metals, *Aluminum, *Patents, Mixing, Dispersion, Salts, Shear, Design data, Intakes, Outlets, Waste water treatment, Municipal wastes.

A high-shear mixing tube apparatus has been patented for the production of a complex aluminum silicate compound used for coagulating waste water. The mixing tube is equipped with two or more inlets, one outlet, and stationary shear devices located along the internal channel. Water is fed into the second inlet and a soluble aluminum salt is introduced into the tube through one of the other outlets. The inner baffles cause the two feed streams to spiral through one tube and mix to form a stable aqueous dispersion which is recovered at the outlet. The outlet solution pressure is about 40 lbs/sq inch less than the initial inlet pressure. The static shear mixing of the solutions produces a material containing up to 5% silicate as SiO2 with a pH ranging 3.0-7.5, determined by the silicate content; the dispersion products, used as a coagulant in waste water treatment, is soluble in hydrochloric acid. The static configuration of the mixing apparatus provides high shear mixing with low control requirements. (Lisk-FIRL)
W78-12180

REMOVING ORGANIC MATERIAL, NITROGEN CPDS. AND PHOSPHATE(S) FROM WATER - BY COMBINED USE OF MICROORGANISMS AND POWDERED MINERAL.
French Patent FR 2364-859. Issued May 19, 1978. Derwent French Patents Abstracts, Vol. A, No. 24, p 3, July, 1978.

Descriptors: *Calcite, *Mineralogy, *Biological treatment, *Nutrient removal, *Patents, Organic compounds, Biodegradation, Aeration, Settling basins, Nitrification, Denitrification, Chemical precipitation, Oxidation, Biomass, Activated sludge, Separation techniques, Waste water treatment, Municipal wastes.

A patented process to remove organic compounds and nutrients from waste water with a powdered mineral and microorganisms requires fewer stages and smaller treatment equipment than conventional methods. From 1-200 g/liter of finely powdered calcite, hematite, or gibbsite with particle sizes of <0.297 mm is sustained as a microbial growth medium. The microorganism-bearing mineral is mixed with waste water in an oxidation zone where the dissolved oxygen concentration is maintained at 1-2 mg/liter. Biodegradable solids are oxidized to CO2 and nitrogen compounds are oxidized to nitrates and nitrites; the powdered metal ions simultaneously precipitate phosphorus from the effluent. The O2 concentration of the waste water is <1 mg/liter when it is transferred to the settling zone. Phosphate precipitation and denitrification continue in the settling area where the dissolved O2 concentration diminishes to <0.5 mg/liter. The biomass and solids are allowed to settle; effluent, bearing residual biomass, is then transferred to the clarifying zone where an O2 concentration of <1 mg/ml is maintained. Clarified effluent is decanted from the tank and the activated sludge is either returned to the initial oxidation tank or aerated and recycled to the clarifier. (Lisk-FIRL)
W78-12194

LIQUOR REMOVAL FROM LAGOON SURFACES - USING FLOATING TAKE OFF LINE WITH COMPENSATION FOR LEVEL CHANGES.
For primary bibliographic entry see Field 8C.
W78-12195

REMOVAL OF ORGANIC COMPOUNDS FROM AQUEOUS INDUSTRIAL EFFLUENTS - BY CONTACTING THE LATTER WITH ATMOSPHERIC OXYGEN IN PRESENCE OF HYDROGEN PEROXIDE.
Soviet Patent SU-567-683. Issued August 25, 1977. Derwent Soviet Inventions Illustrated, Vol A, No 24, p 12, July, 1978.

Descriptors: *Chemical wastes, *Oxidation, *Atmospheric pressure, *Patents, *Alcohols, Acids, Aeration, Oxygen, Organic compounds, Autoclaves, Heat treatment, Pressure, Waste water treatment, Industrial wastes.

A patent has been issued for an oxidation process utilizing hydrogen peroxide and atmospheric oxygen to remove organic compounds from chemical plant effluents. Hydrogen peroxide is added to the effluent in an amount which is 10-50% of the stoichiometric quantity required for reaction with the organic compounds; the temperature is maintained at 140-160C. In an example cited, none liter of effluent from the production of organosilicon lacquers, bearing 6 g/liter ethanol and 6.5 g/liter butanol, was placed in an autoclave and mixed with 16.1 g/liter hydrogen peroxide, equivalent to 25% of the amount required for the complete oxidation of alcohol. The effluent was oxygenated for 60 min at 150C and an air pressure of 30-50 atm. No alcohols were present in the treated effluent. (Lisk-FIRL)
W78-12222

CONCENTRATING AQUEOUS EFFLUENTS CONTAINING CALCIUM SULPHATE AND GLYCEROL - BY SPRAYING INTO HOT GAS STREAM, USING INSUFFICIENT HEAT TO CAUSE COMPLETE DRYING.
Netherlands Patent NL 7613-246. Issued May 30, 1978. Derwent Netherlands Patents Report, Vol A, No 24, p 1, July, 1978.

Descriptors: *Heat treatment, *Gases, *Calcium sulfate, *Food processing industry, *Patents, Saturation, Drying, Dewatering, Evaporators, Spraying, Design data, Waste water treatment, Industrial wastes, Oilseed crops.

A patent has been issued for a calcium sulfate and glycerol concentration process in which aqueous effluents from edible oil processing are sprayed into a hot gas stream. The effluent is condensed to a higher dry solids content than the saturation point by employing a quantity heat that is insufficient to completely dry the effluent. The temperature difference of the hot gas between entering and leaving the system is maintained at a value lower than that required to completely evaporate the liquid effluent. This process is considered more efficient than combustion, which can have high energy requirements for low waste concentrations. Conventional evaporation can result in saturation as the effluent concentration increases. Caking caused by the glycerol can occur when spray drying is employed for concentrating the effluent. (Lisk-FIRL)
W78-12223

OIL REMOVAL FROM AQUEOUS WASTE EMULSIONS - USING CATIONIC SURFACTANTS, E.G. PRIMARY AMINE(S) AS FLOTATION AGENTS.
Soviet Patent SU-567-681. Issued August 25, 1977. Derwent Soviet Inventions Illustrated, Vol A, No 24, p 12, July, 1978.

Descriptors: *Flotation, *Cations, *Surfactants, *Patents, *Oily water, Foam separation, Oil industry, Aeration, Emulsions, Separation techniques, Waste water treatment, Industrial wastes.

A patent has been issued for an oil flotation process which alleviates the need for strict pH control and reduces the flotation agent concentration by utilizing cationic surfactants. Preferred cationic surfactants include primary amines, polyethylene polyamine, or colophony amine acetate. The process involves carging a 50 by 300 mm flotation column with 200 ml of emulsified stable machine oil in particle sizes ranging over 0.5-5.0 micrometers. The oil concentration in the pH 6.5 emulsion is 500 mg/liter; 4 mg/liter of colophony amine acetate in an 0.1% aqueous solution or another one of the recommended cationic surfactants is added to the emulsion. The column is aerated through its porous base for 20 min at a rate of 120 ml/min. The process, which is operational at pH 4-10 and 15-60C, can reduce the residual oil concentration in the emulsion to 3 mg/liter. The cationic flotation process is applicable to effluents from the petroleum, metal, and food processing industries. (Lisk-FIRL)
W78-12224

METHOD OF TREATING WASTE WATER WITH ACTIVATED SLUDGE,
Idemitsu Kosan Co. Ltd., Tokyo (Japan). (Assignee).
Y. Kobayashi, M. Iwata, S. Yoshida, and H. Akatuka.

United States Patent 4,105,546. Issued August 8, 1978. Official Gazette of the United States Patent Office, Vol 973, No 2, p 736, August, 1978. 1 fig.

Descriptors: *Activated sludge, *Oily water, *Oil wastes, *Organic compounds, *Patents, *Chemical oxygen demand, Oil industry, Hydraulic design, Waste water treatment, Industrial wastes.

A patent has been issued for an activated sludge process to treat oily waste water by adding a mineral oil hydrocarbon. The hydrocarbon fraction, bearing 4-20 carbon atoms/molecule, is added in a volume that is between 0.0000275 and 0.0000625 times the product of the sludge concentration, the aeration tank capacity reduced by a factor of 0.06, the flow rate, and the COD level of the waste water. Additional reactor parameters maintained during treatment include: 1,000-8,000 ppm activated sludge; an aeration tank capacity of 1,000 cu m; 30-65 ppm COD; and a flow rate of 50-140 cu m/hr. After mineral oil addition, the waste water is mixed with the activated sludge during aeration for a period adequate to reduce the COD concentration. The mixture is then passed to a sedimentation tank for separation of sludge and effluent. (Lisk-FIRL)
W78-12235

ACTIVATED SLUDGE DEGRADATION OF NITRILOTRIACETIC ACID (NTA)--METAL COMPLEXES,
Environmental Protection Service, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5B.
W78-12250

SOURCES OF METALS AND METAL LEVELS IN MUNICIPAL WASTEWATERS,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5B.
W78-12251

APPARATUS FOR PURIFYING SEPTIC TANK EFFLUENT,
J. LaRaus.
United States Patent 4,104,166. Issued August 1, 1978. Official Gazette of the United States Patent Office, Vol. 973, No. 1, p 278, August, 1978. 1 fig.

Descriptors: *Ozone, *Septic tanks, *Filtration, *Storage tanks, *Patents, Atmospheric pressure, Pipelines, Intakes, Outlets, Equipment, Design data, Waste water treatment, Domestic wastes.

A septic tank waste treatment system which purifies filtered effluent in a series of ozonation tanks has been patented. A large tank, laid adjacent to the septic tank, contains a smaller filter through which septic tank effluent passes at atomspheric pressure for solids removal. The filter tank inlet is connected to a septic tank effluent conduit; the effluent passes through a filter towards an outlet at the opposite end of the filter tank. Connected to the outlet are multiple ozonation tanks arranged in series within the large tank. The ozonation tanks, connected to an external gas supply system, are arranged to form a 16-ft long configuration. Effluent passing through the last tank in the series is discharged into the storage area formed by the unoccupied space between the large exterior tank and the filter and ozone tanks. Excess treated effluent is discharged from the storage space through an outlet leading from the last ozonation tank to a soil disposal field. (Lisk-FIRL)
W78-12263

ELIMINATION OF ODORS FROM ORGANIC WASTES,
Weiss and Co., Stockholm (Sweden). (Assignee).
J. Weiss.
United States Patent 4,108,771. Issued August 22, 1978. Official Gazette of the United States Patent Office, Vol. 973, No. 4, p 1820, August, 1978.

Descriptors: *Chemical precipitation, *Odor, *Oxidation, *Sulfur compounds, *Patents, Iron compounds, Solubility, Nitrates, Alkali metals, Waste water treatment, Sewage sludge, Air pollution, Municipal wastes.

A process for eliminating ordor-producing organic compounds from domestic wastes, organic industrial wastes, and sewage sludge by means of an aqueous acid solution and an oxidizing agent has been patented. The wastes are mixed with a sufficient volume of an aqueous solution containing alkali metals, 3-25% by weight sulfuric acid 3-20% by weight of an oxidizing agent, and 10-40% of a sulfur precipitating agent. The oxidizing agent is selected from a group of water soluble compounds including persulfates, nitrates, and chlorates; permanganates of ammonium and alkali metals are added to oxidize and deodorize the wastes. The sulfur precipitating agent is selected from the water soluble ferrous or ferric compound groups. The waste water is maintained at a pH of 6.5 or less during deodorization. (Lisk-FIRL)
W78-12265

APPARATUS FOR PURIFYING WASTE WATERS.
United States Patent 4,104,167. Issued August 1, 1978. Official Gazette of the United States Patent Office, Vol. 973, No. 1, p 278, August, 1978.

Descriptors: *Equalizing reservoirs, *Aerated lagoons, *Activated sludge, *Settling basins, *Patents, Separation techniques, Design data, Aeration, Equipment, Waste water treatment, Municipal wastes.

A patent has been issued for a waste water treatment apparatus containing equalization, aeration and sludge separation, and clarification zones. Waste water in the equalization zone is transferred into the top of a second tank which is divided into aeration and sludge separation zones by an inclined plate. Spaced apart from the tank floor and sides, the plate defines an upper, triangular aeration zone and the lower sludge settling aera; an intake aeration channel is located in the lower corner of the tank and an outlet is positioned in the upper regions of the tank. Waste water bearing activated sludge is circulated up through the aeration channel and down through the aeration zone; the lower end of the slanted plate inhibits the circulation of the aerated water and increases the velocity along the bottom of the tank. A portion of the rapidly moving water enters the sludge separation zone where a fluidized bed of active media is formed. Effluent moving up through the fluidized bed is drawn into the clarification tank from the top of the sludge separation zone. (Lisk-FIRL)
W78-12268

WET AIR OXIDATION: EFFECT ON SLUDGE COMPOSITION,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W78-12269

REAL TIME CONTROL OF STORAGE IN A COMBINED SEWER SYSTEM,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
B. H. Bradford.
In: Proceedings of the National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, July 1976. UKY BU111, College of Engineering, University of Kentucky, Lexington, December, 1976, p 287-296. 11 fig, 8 ref. OWRT C-6174(5218) (2).

Descriptors: *Combined sewers, *Water pollution control, *Linear programming, *Methodology, *Optimization, *Alternative planning, *Storage, Constraints, Computers, Detention storage, Aggregation, Mass balance, Sanitary sewage systems.

A control algorithm for automated operational management of detention storage in a combined sewer system is applied to a version of the proposed San Francisco Master Plan for Wastewater Management. The system is modeled with control objectives and physical system constraints expressed as a large scale linear programming problem. The algorithm presented transforms the large scale control problem to a multi-level series of smaller subproblems which are amenable to computer solution in real time. The objective of the control for the combined storm water and sanitary sewage systems is to minimize street flooding and overflow of untreated sewage and to maximize the delivery to the treatment plant. The problem's 2000 variables and 1000 constraints are aggregated into a multi-level control algorithm of 39 linear programming problems amenable to computer solution in realtime. Four example situations have been selected to simulate the use of the control algorithm for real time operation of the system. The control algorithm determines the operation of each detention reservoir in the system based on a predicted spatially and temporally varied storm. Results of the examples indicate the success of the methodology in obtaining optimal or nearly optimal solutions to the large scale problem in real time. (See also W77-10846; W75-05608; W75-04552) (Bell-Cornell)
W78-12286

ORGANIZATION OF SANITARY PROTECTION OF THE ENVIRONMENT (AIR, WATER BODIES, WATER SUPPLY, SOIL) IN DONETSK (IN RUSSIAN),
Donetsk Municipal Sanitation Disinfection Station (USSR).
V. P. Grishchenko, N. V. Grin, and V. I. Solovev.
Gig Sanit (5), p 78-83, 1977.

Descriptors: *Water quality standards, Environment, Water supply, Soils, Public health, Potable water, *Industrial wastes, Water pollution control, *Water reuse, Treatment facilities, *Ukrainian-SSR, USSR.

Sanitary protection of the environment in the large industrial center of Donetsk (Ukrainian SSR, USSR) is described. Key elements include oversight of construction plans and zoning by the municipal sanitation bureaucracy, laboratory monitoring of the content of noxious substances in the atmosphere and water bodies of the city, testing of industrial devices for pollution control and furthering experimentation and implementation of re-use of industrial water effluents, improvement of sewer systems and demineralization of mine water effluents.--Copyright 1978, Biological Abstracts, Inc.
W78-12287

HYGIENIC ASSESSMENT OF THE EFFECTIVENESS OF BIOLOGICAL TREATMENT OF EFFLUENT FROM SLEEPER IMPREGNATION PLANTS (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Inst. (I) (USSR).
M. V. Bodganov.
Gig Sanit 11, p 40-44, 1976.

Descriptors: *Biological treatment, *Waste water treatment, Effluents, *Water quality standards, Public health.

A hygienic assessment (using rats, mice and guinea pigs) of biologically treated effluents from sleeper impregnation plants (plant for treating railroad ties) showed their sanitary-toxicologic index to be most important. In respect to this index the effluents should be diluted at least 250 times. The quality of water in a water body, wherein the

biologically treated effluents from the sleeper impregnating plants are discharged, did not meet the hygeinic requirements.--Copyright 1978, Biological Abstracts, Inc.
W78-12296

PROTRACTED RECHARGE OF TREATED SEWAGE INTO SAND: PART II - TRACING THE FLOW OF CONTAINATED GROUND WATER WITH A RESISTIVITY SURVEY,
Rensselaer Polytechnic Inst., Troy, NY.
W. B. Fink, Jr., and D. B. Aulenbach.
Contribution No. 166 from the Eastern Deciduous Forest Biome, US-IBP, FWI Rpt. 74-4, (1974). 12 p.

Descriptors: Recharge, Sands, Sewage treatment, Waste water treatment, Path of pollutants, Treatment facilities, Biochemical oxygen demand, Nitrogen, Phosphorus, Coliforms, Waste disposal, Chlorides.

To aid in determining the direction of groundwater flow after the effluent from the Lake George Village sewage treatment plant is discharged onto natural delta sand beds, resistivity studies were made in the soil (sand) in the vicinity of the recharge beds. Groundwater having high dissolved solids is identified as producing lower resistivity readings. The sewage effluent has a higher dissolved solids content than the existing groundwater in the area. The path of the recharged sewage effluent, as identified by lower resistivity readings, appears to flow in a northerly direction from the sewage treatment plant along Gage Road toward West Brook. Due to interferences, the resistivity studies could not show whether the high conductivity groundwater flows into or under West Brook. (Rensselaer)
W78-12305

PROTRACTED RECHARGE OF TREATED SEWAGE INTO SAND: PART I - QUALITY CHANGES IN VERTICAL TRANSPORT THROUGH THE SAND,
Rensselaer Polytechnic Inst., Troy, NY.
D. B. Aulenbach, T. P. Glavin, and J. A. Romero Rojas.
Contribution No. 165 from the Eastern Deciduous Forest Biome, US-IBP, FWI Rpt. 71-1, (1974), 25 p.

Descriptors: *Recharge, Sands, *Sewage treatment, *Waste water treatment, Path of pollutants, Treatment facilities, Biochemical oxygen demand, Nitrogen, Phosphorus, Coliforms, *Waste disposal, Chlorides.

When the Lake George Village Sewage treatment plant was put into operation in 1939, it was described as a 'complete treatment' plant. This was because the treated effluent is discharged onto natural delta sand seepage beds which are 'at least 25 deep.' Studies were made to determine the removal efficiency in the sand beds of coliforms, BOD, chlorides, and the nitrogen and phosphorus compounds. It was found that when beds were dosed, they were no longer saturated with water at 15 feet. Ten feet of sand were found to remove coliforms by 99% and BOD by 96%. However, nitrates, phosphates, and chlorides remained in significant concentrations after filtration through 10 feet of sand. Phosphate removal in an infrequently used sand bed was greater than in a continuously used bed. (Rensselaer)
W78-12306

EXPERIMENTAL TREATMENT OF WASTE EFFLUENT FROM CHEMICAL PLANTS 'POLICE' BY USING IT IN CARP CULTURES,
Wyzsza Szkola Rolnicza, Szczecin (Poland). Dept. of Hydrozoology.
L. Szlaver.
Polskie Archiwum Hydrobiologii, Vol 24, No 4, p 593-602, 1977. 6 tab, 10 ref.

Descriptors: *Chemical wastes, *Carp, *Fry, *Biological treatment, Industrial wastes, Animal growth, Fertilizers, Nutrients, Nitrogen compounds, Effluents, Sewage treatment, Water pollution sources, Phytoplankton, Zooplankton, Growth rates, Aquaculture.

Waste effluents from chemical plants producing mineral fertilizers, containing 0.147 g N/l, were applied to ponds stocked with fry of carp. The obtained production was 1210 kg/ha (without additional food supply) and the reduction of nitrocompounds-1.15 N mg/l per day. (EIS-Deal)
W78-12373

RECYCLING AND DISPOSAL OF PLASTICS WASTE IN SOUTH AFRICA,
Council fo Scientific and Industrial Research, Johannesburg (South Africa).
R. H. Nurse, N. C. Symington, G. R. de V. Brooks, and L. J. Heyl.
South Africa National Scientific Programmes Unit, Report No 4, 1976. 14 ref, 13 tab, 2 fig.

Descriptors: *Solid wastes, *Plastics wastes, *Recycling, Wastes recovery, Polyethylene, Polyvinyl chloride, Polystyrene, Polypropylene, Resources conservation, Wastes utilization, Waste disposal, Landfills, Consumption, *South Africa.

Only the main thermoplastic types (high and low density polyethylene, polyvinyl chloride, polystyrene and polypropylene) are recyclable. These plastic types represent 67% of the total consumption of plastics in 1974. Approximately 130 000 tons of plastic waste generated in 1975 were available for recycling. Economic gain for the recycler is the strongest motivation for recycling. Resource conservation, reduction of waste disposal costs and ecological considerations are less important factors. Approximately 15 000 tons, or 12% of recyclable plastic is currently being recycled. A growth rate in recycled plastic of 12.5% per annum is expected until 1981. Due to the fact that plastic wastes provide no special problems in currently used waste disposal systems, it is concluded that there is no need for further research directed specifically at the disposal aspect of plastic in urban waste. (So Afr Water Info Ctr)
W78-12399

SIMPLIFICATION OF WASTE WATER PROBLEMS THE FABRIC LINED PURIFICATION PLANT.
Civil Engineering Contractor (Johannesburg), Vol. 10, No. 9, p 34-35, 1976. 1 Illustr.

Descriptors: *Waste water treatment, *Linings, *Plastics, Deodourization, Low costs, Inflatable structures, Seepage control.

Describes European trends in wastewater treatment, where Germany which discharges 50 per cent of its waste water unpurified is aiming at attaining Sweden's low percentage of only 10%. The predominant need is for small and medium sized plants. A short description is given of two experimental economic compact systems at Simmern and Greetsiel. (So Afr Water Info Ctr)
W78-12415

RESOURCES DEPLOYED IN WATER RE-USE,
Pretoria Univ. (South Africa).
For primary bibliographic entry see Field 3C.
W78-12422

MODERN WATER RECLAMATION PLANT IN WINDHOEK,
J. P. Kriel.
Municipal Engineer, (Johannesburg), Vol. 8, No. 1, p 27-31, 1977.

Descriptors: Domestic water, *Waste water tretment, Wastewater treatment plant design, Potable water, Fish, Sewage treatment, Water reuse, Sampling, *Treatment facilities, Windhoek wastewater reclamation plant, *South Africa.

The modernised water reclamation plant, recently presented to the City Council of Windhoek, is described. The plant, which has been designed for a capacity of 200m3 per hour, and is capable of producing 20% of Windhoek's water requirements, incorporates the latest research results generated by the CSIR's National Institute for Water Research. Using a flow diagram a step by step account is given of the reclamation process. The construction materials and flow information is given and a description is given of the constant attention that is being paid to maintaining the quality of the product and the optimisation of the plant. (So Afr Water Info Ctr)
W78-12428

ADVANCED SEWAGE TREATMENT PLANT WITH COMPUTER-BASED CONTROL EQUIPMENT.
Municipal Engineer, (Johannesburg), Vol. 8, No. 1, p 70-71, 1977.

Descriptors: *Sewage treatment plants, *Municipal wastewater, Process control, Control equipment, Safety aspects, Activated sludge process, Automatic instrumentation, Metering, Computers, Equipment description, Personnel management, *Waste water treatment, South Africa.

The Anglian Water Authority is operating one of the world's most advanced sewage treatment works at Whitlingham, incorporating a computer based process control system which allows most of the sewage treatment processes to be carried out under remote automatic control. The operations controlled by the computer include two different types of sewage treatment plant-the traditional biological filter system and the activated sludge system. The application of automatic control at Whitlingham should eliminate many unpleasant manual tasks, while producing plant economics, increasing plant efficiency and flexibility to adapt to the rapidly changing content of sewage. In addition the system functions as a management information unit providing essential operational statistics and bulk material storage figures such as fuel and oil reserves, and antifoam additive. It also provides a complete log of all plant states every twenty-four hours or on demand. (So Afr Water Info Ctr)
W78-12430

ADVANCED SOLUTIONS TO POLLUTION PROBLEMS IN SOUTH AFRICA,
Johannesburg City Health Dept. (South Africa).
J. L. Barnard, and D. W. Osborn.
Municipal Engineer, Vol. 7, No. 3, p 33-35, 37-40, 1976. 9 ref, 7 fig, 2 tab.

Descriptors: *Pollution abatement, Water resources augmentation, *Sewage treatment, Water re-use, Trickling filters, Effluent quality, Nitrogen removal, Pilot plants, Phosphorus removal, Bardenpho process, Denitrification, Extended aeration, Activated sludge process, Industrial wastes, *South Africa.

As a result of the close co-operation between the Research organisations and the local authorities in South Africa, new treatment methods are readily accepted and incorporated in the designs for new plants. This has already led to the construction of activated sludge plants for large sewage treatment works on the principle of extended aeration, while complete denitrification using internal carbon sources and phosphate removal using the luxury uptake principle is being incorporated into many large new plants now being designed and built in South Africa. The design of such plants also

makes allowance for the addition of any other units that may be required to make the effluents produced, suitable for eventual re-use or total reclamation. (So Afr Water Info Ctr)
W78-12438

DESIGN OF FLOCCULATION SYSTEMS FROM BATCH TEST DATA,
Cape Town Univ. (South Africa).
J. Bratby, and M. W. Miller.
Water South Africa, Vol 3, No 4, p 173-182, 1977. 17 ref, 8 fig.

Descriptors: *Design data, *Flocculation, Batch processes, Complete mixing systems, Plug flow, Continuous processes, Comparison, Process performance, Costs, Optimization, Velocity gradients, Kinetics, Water treatment, *Waste water treatment, *South Africa.

Up to the present time, for the design of continuous completely mixed flocculation systems, it has been necessary to obtain experimental data by performing continuous type pilot plant trials. Because of the considerable expenditure involved in constructing the necessary apparatus and the lengthy testing procedures involved, design of flocculation systems (especially for relatively small plants) has often been based on rule of thumb procedures. In this paper the theoretical principles and experimental procedures are set out by which it is possible to obtain design data for continuous completely mixed flocculation systems using batch test results only. The validity of the theoretical link between batch type (or plug flow) behaviour and continuous type performance, presented in the paper is checked by comparing the data gained from continuous and batch test data. The principles set out should prove considerable value to design engineers faced with the problem of designing flocculation systems in which both performance and total costs require optimisation. (So Afr Water Info Ctr)
W78-12489

OBSERVATIONS ON ALGAL POPULATIONS IN AN EXPERIMENTAL MATURATION POND SYSTEM,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
S. N. Shillinglaw, and A. J. Pieterse.
Water, South Africa, Vol. 3, No. 4, p 183-192, 1977. 16 ref, 10 fig, 4 tab.

Descriptors: *Algal populations, *Polishing ponds, *Sewage treatment, *Nutrient removal, Ammonia nitrogen, Carbon deficiencies, Retention time, Water reuse, Algal metabolism, Population dynamics, Chlorophyll, Suspended solids, Zooplankton, Dissolved oxygen, Temperature effect, Nitrate nitrogen, Orthophosphate, South Africa.

A dense algal population is of primary importance in sewage maturation ponds for the removal of plant nutrients, especially ammonia and orthophosphate. In the Republic of South Africa and in South West Africa sudden algal population declines have occurred at times in maturation ponds. These declines cause serious problems in the reclamation of purified sewage effluents for re-use. The possible causes of these declines are considered here from the physical, biological and chemical observations of an experimental maturation pond system. The algal populations of the system fluctuated from very high to very low cell concentrations. High algal cell concentrations were only maintained for short periods of time. Zooplankton grazing was responsible for removing algae from the system at times but this was not the primary cause of all the algal population declines. It is very likely that sudden increases in ammonia nitrogen concentration when the pH was high, caused the algal population declines. Carbon deficiencies could have occurred during peak algal cell concentrations which would have resulted in population declines. A possible means of preventing the algal population declines could be by increasing the retention period of the pond system. The results confirmed that dense algal populations removed plant nutrients efficiently from the pond system. (So Afr Water Info Ctr)
W78-12490

THICKENING OF BROWN WATER SLUDGES BY DISSOLVED-AIR (PRESSURE) FLOTATION,
Cape Town Univ. (South Africa).
J. Bratby, and GvR. Marais.
Water S A, (Pretoria), Vol. 3, No. 4, p 202-212, 1977, 7 ref, 24 fig.

Descriptors: *Sludge thickening, *Pressure flotation, Cationic polyelectrolytes, Dosage, Water treatment, Colour, Humic acids, Fulvic acid, Water wastage, Sludge volume, Sludge disposal, Process variables, Model studies, Activated sludge, Mixed liquor, Flow rate, Continuous processes, Effluent quality, Suspended solids, Costs, South Africa.

A model describing the inter-relationships influencing dissolved-air (pressure) flotation systems, developed earlier for activated sludge, is veified using the settled sludge derived from the treatment of brown waters from the Table Mountain catchment area. For efficient flotation, a cationic polyelectrolyte at an optimal dosage of 0,05g kg-1 needs to be added to the brown water sludge. The effluent from the flotation unit treating the settled sludge was comparable to that from the sedimentation basins. Float solids' concentrations up to 12% (12- gl-1) were achieved by flotation. This concentration is compared to a value of 2500mg l-1 achieved by the settled sludge after chemical addition and settling in the plant. Taking the maximum flow handled by the plant as 18Mld-1 the water wasted with the sludge is approximately 450m3d-1, ie 2,5% of the total flow. By applying flotation to thicken the waste brown water sludge to 12% would reduce the wastage to 9m3d-1, ie 0.05% of the total flow. This has a further important implication when considering possible subsequent sludge disposal operations where the required handling capacity of such facilities is reduced by 98%. Running costs associated with polyelectrolyte addition and power requirements of a flotation system to thicken the waste sludge from a plant treating brown waters would constitute a mere increase of 1,43% of the present overall running (chemical) costs. (So Afr Water Info Ctr)
W78-12492

HYACINTH LAGOONS- LOW-COST SEWAGE TREATMENT,
J. Joseph.
Municipal Engineer, Vol. 8, No. 5, p 13-17, 1977.

Descriptors: *Water hyacinth, Low cost, *Sewage treatment, *Aquatic weed control, Cleanup procedure, Water pollution, Water purification, Pollutants removal, Harvesting, Biocontrol, Sewage ponds, Filtration, Absorption, Chemical composition, Eichhornia crassipes, South Africa.

An effective water purification system is within the reach of even the smallest community. The water hyacinth, a fast-growing 'wonder weed', provides a natural technique for ridding sewage and industrial effluent of pollutants. The system is the newest innovation in pollution clean-up and may hold the key to low-cost treatment of community and industrial wastewater. (So Afr Water Info Ctr)
W78-12495

MICROBIAL TREATMENT OF AN INDUSTRIAL EFFLUENT CONTAINING VOLATILE FATTY ACIDS,
J. C. Du Preez, and P. M. Lategan.
South African Journal of Science, Johannesburg, Vol 73, No 11, p 349-351, 1977.

Descriptors: Waste disposal, Fatty acids, Microorganisms, Laboratory studies, Fermentors, Aginetobacter, *Waste water treatment, Sasol, South Africa.

The Sasol oil-from-coal plant produces an aqueous effluent containing approximately 1% (m/v)C2-C5 fatty acids and which thereby creates a waste disposal problem. The investigation reported here was undertaken to determine whether this material could be treated by microorganisms and, if so, whether they could utilize these fatty acids as their sole carbon source. A possible benefit of such a process is the production of single-cell protein (SCP), especially since this effluent is currently of no economic value. The investigation indicated that Acinetobacter could be effective in the treatment of the Sasol effluent for the removal of fatty acids. Furthermore, Acinetobacter would probably be acceptable as a source of SCP. This investigation was undertaken with the financial support of the South African Coal, Oil and Gas Corporation Ltd. (So Afr Water Info Ctr)
W78-12508

SOME CRITERIA FOR SELECTION BETWEEN CORRECTION OF THE INDICATIVE FLOW AND THE WASTE TREATMENT EFFICIENCY IN A SMALL RIVER BASIN,
Institute of Meteorology and Water Management, Warsaw (Poland).
M. Metler, and T. Sedzikowski.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, Convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS-AISH Publication No 125, p 252-261, 1978. 5 fig, 2 tab, 7 ref.

Descriptors: *River basins, *Streamflow, *Waste treatment, *Efficiencies, *Water quality, Evaluation, Reservoir construction, Estimating, Construction costs, Graphical analysis, Treatment facilities, Size, Mathematical computations, Cost decrease, Settling tank, Joint operation, *Economic relationships.

The necessary waste treatment range is frequently determined in relation to the required water quality level as a function of the indicative flow. This paper evaluates the influence of increased indicative flow resulting from construction of reservoirs on the required waste treatment efficiency in a small river basin. It also deals with the estimation of the economic relationships between the construction costs of a reservoir to provide increased indicative flow and the inputs in construction of a waste treatment plant for the increased flow. The basic standard relations have been shown in graphs as a series of mathematical computations. It has been found that although the increase of the indicative flow resulting from construction of reservoirs may not be an economically justified method of maintaining the required water quality level, the interrelations between the reservoirs and the waste treatment plants should not be neglected in the water management system of a river basin. (Bell-Cornell)
W78-12535

WATER QUALITY MODELLING IN SURFACE WATER NETWORKS WITH SPECIAL REGARD TO QUALITY BREAKDOWNS,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 5B.
W78-12537

OPTIMIZATION OF TECHNOLOGICAL PARAMETERS IN AN ACTIVATED SLUDGE SYSTEM AS A FUNCTION OF THE REQUIRED

WATER QUALITY UNDER VARIABLE CONDITIONS,
Institute of Meteorology and Water Management, Warsaw (Poland).
M. Metler, and T. Sedzikowski.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, IIASA and IAHS jointly. IAHS-AISH Publication No. 125, p 343-350. 1978. 2 fig, 7 ref.

Descriptors: *Activated sludge, *Optimization, *Water quality, *Technological parameters, *Waste treatment, Standards, Aeration, Biochemical oxygen demand, Equations, Mathematical models, Regulation, Waste quality, Recirculation rate, Sludge concentration, Operation research.

The optimum technological conditions for maintaining the required constant level of pollution discharged from the activated sludge system to the subsequent treatment stages or to surface water have been determined using a mathematical model of the waste treatment based on the activated sludge method. Despite the stochastically variable parameters of the wastes entering the system and the changing level of water quality, it is possible to maintain the required level of waste quality, thanks to the regulation of the suspended sludge in aeration tanks by means of optimum recirculation control. The calculation method and the nomograph presented provide for the determination of the required parameters of the process and they have been supplemented by a hypothetical example. (Bell-Cornell)
W78-12544

OPTIMAL PLANNING OF REGIONAL WASTE WATER TREATMENT,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
D. Stephenson.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, IIASA and IAHS jointly. IAHS Publication No. 125, p 351-360, 1978. 3 fig, 9 ref.

Descriptors: *Waste water treatment, *Regional development, *Planning, *Computer models, *River basins, *Optimization, *Cost minimization, Water supply, Constraints, Pollutants, Treatment facilities, Equations, Systems analysis, Separable programming, Linear programming, Decomposition techniques.

The water resources of South Africa are limited and it may soon become necessary to recycle reclaimed waste water for the Witwatersrand area. Optimum planning of the location of waste water treatment works, sewers, and quality of effluent is needed. It is shown herein how such planning may be accomplished with the assistance of computer models, where the system may be described in terms of equations and constraints, which are linear except for the pollution load balance equations. These equations are in a form suitable for separable programming optimization techniques which can be used to derive least-cost planning alternatives. An optimum river basin plan may be produced and basins linked using decomposition of linear programming techniques. (Bell-Cornell)
W78-12545

REGIONALIZATION AND STAGING OF WASTE WATER TREATMENT PLANTS TO MEET WATER QUALITY STANDARDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
S. L. Klemetson, and W. J. Grenney.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, IIASA and IAHS jointly. IAHS-AISH Publication No. 125, p 361-372, 1978. 7 fig, 4 tab, 6 ref.

Descriptors: *Waste water treatment, *Water quality, *Standards, *Regional development, *Optimization, *Staging, *Cost minimization, Treatment facilities, Dynamic programming, Evaluation, Timing, Decision making, Planning, Capacity expansion, Lower Jordan River(Utah), Mathematical models, Systems analysis.

Presented is the Wastewater Treatment Optimization Model (WTOM), feveloped using dynamic programming to evaluate the timing and capacity expansion alternatives for the regionalization and staging of waste water treatment facilities to meet water quality standards. It was applied to the Lower Jordan River Region of the state of Utah an area of about 450,000 people and various types of light and heavy industry. Among the factors which were considered are the (1) quality and quantity of waste water and its change with respect to time; (2) rate of interest and of inflation; (3) capital, operation, and maintenance costs; (4) treatment efficiencies; (5) economies of scale; (6) excess capacity; and (7) service life. Demonstrated is how this model makes an economic selection of the optimum alternative treatment systems that meet the desired water quality objectives at the lowest future discounted costs. Adjustments of the model to fit regional conditions are possible through the selection of the appropriate cost indices and input data. WTOM allows an inexpensive evaluation of a wide variety of treatment alternatives. (Bell-Cornell)
W78-12546

SOME PHYSICAL AND ECONOMIC ASPECTS OF OPTIMIZATION OF THE DEGREE OF WASTE WATER AND WATER TREATMENT,
Technical Univ. of Warsaw (Poland). Inst. of Water Supply and Hydrotechnics.
R. Milaszewski, and M. Roman.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, IIASA and IAHS jointly. IAHS-AISH Publication No 125, p 373-382, 1978. 5 fig, 1 tab, 9 ref.

Descriptors: *Waste water treatment, *Water treatment, *Optimization, *River sections, *Economic aspects, *Physical aspects, Treatment facilities, Constraints, Water quality, Color, Discharge(Water), Water (Build)or- Equations, Mathematical models, Systems analysis.

This paper discusses the application of optimization models of water and waste water treatment. The optimization problem is considered on the basis of an elementary system, consisting of a waste water treatment plant, a water treatment plant, and the river section between the waste water discharge and the water intake. Connections between the parameters describing this system are the physical basis of the optimization. The problem of the decision variables, optimization criteria, and constraints as well as some chosen examples are also discussed. The absence of a common index to determine the degree of waste water and water treatment makes this problem difficult to solve; herein, color is used as the common index. Besides the several existing methods of formulating optimization models of waste water and water treatment degree, there is still a need for further research on the physical basis of the optimization, e.g., river velocity and depth; it is also necessary to study further the cost functions expressed in terms of plant size and a common index of pollutant removal efficiencies. (Bell-Cornell)
W78-12547

STUDIES OF TRACE METALS IN THE WATERS AND SEDIMENTS OF BADFISH CREEK AND LAKE WINGRA, NEAR MADISON, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-12603

DESIGN, COST ESTIMATION AND OPTIMIZATION OF SEWAGE COLLECTION AND TREATMENT SYSTEMS FOR HOUSING DEVELOPMENT IN THE GLENWOOD, NEW YORK AREA,
Calspan Corp., Buffalo, NY.
L. K. Wang, M. H. Wang, and D. B. Dahm.
Project Report No. ND-5390-M-1, January 1974. 97 p, 31 tab, 12 fig, 9 ref.

Descriptors: Planning, Systems analysis, Population, Sewage, *Sewers, *Sewage treatment, Activated sludge, Trickling filter, Lagoon, *Cost analysis, Design, *Waste water treatment, New York, *Optimization, Physical-chemical treatment, Conventional activated sludge, Extended aeration, Contact stabilization, High-rate activated sludge, Trickling filter, Aerated lagoon.

An economic study of alternate sewage collection and treatment systems was conducted for proposed and existing housing development in the vicinity of Glenwood, New York. Based on the available performance and cost data for selected sewage treatment methods, cost-effectiveness tradeoffs were examined for different alternative strategies: (1) expanding the existing sewage treatment plant to handle the projected population growth; and (2) selecting and designing a new sewage treatment plant for serving the concerned area under different assumptions of participation by existing and projected population centers. Major sanitary sewer lines for transporting the sewage to the proposed sewage treatment plants were considered and their cost estimated. An optimum sewage system from both a technical and economic point of view was delineated by an overall cost optimization analysis.
W78-12611

DISCOUNTED FLOOD RISKS IN LEAST-COST DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil and Ceramic Engineering.
W. H. Tang, L. W. Mays, and H. G. Wenzel.
In: Stochastic Processes in Water Resources Engineering, Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Sweden, August 2-4, 1976. Lars Gottschalk, et al. (Eds.), Water Resources Publications, Fort Collins, Colorado, 1977, Chapter 13, p 293-318. 7 fig, 5 tab, 14 ref, append. OWRT B-098-ILL(1).

Descriptors: *Flood damage, *Storm sewers, *Networks, *Dynamic programming, *Evaluation, Design, Installation costs, Hydraulic models, Probability, Risks, Hydrographs, Annual, Inflow, Optimization, Effects, Mathematical models, Equations, Systems analysis, *Cost minimization, Uncertainties.

A method of evaluating flood damages from storms is formulated considering the uncertainties in predicting storm inflow capacity, the flood volume versus flood depth, and the flood depth versus flood depth relationships for the specific neighborhood. Using hydraulic, cost and probabilistic models, each of seven major factors is studied and analyzed systematically. The present worth of all potential flood damages during the expected service period is combined with the sewer installation cost for a tradeoff analysis within a dynamic programming model for the least-cost design of storm sewer networks. An example is given to illustrate the details of the application to designing a storm sewer network in a typical urban basin. It appears that the potential flood damages have a more significant effect upon the design of the downstream pipes, where flood volumes are more likely to exceed the threshold storage and cause direct physical damages. Moreover, the uncertainties contributed by factors other than the randomness in precipitation should not be ignored in determination of the minimum cost design. (Bell-Cornell)
W78-12612

DRAFT GUIDELINES FOR AREAWIDE WASTE MANAGEMENT PLANNING. SECTION 208, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-12658

PRETREATMENT OF THE COMBINED INDUSTRIAL-DOMESTIC WASTEWATERS OF HAGERSTOWN, MARYLAND -- VOLUME I,
Kappe Associates, Inc., Rockville, MD.
D. S. Kappe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 506, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Ada, Oklahoma, Report EPA 600/2-78-043a, Robert S. Kerr Environmental Research Laboratory, Office of Research and Development, February 1978. 99 p, 8 fig, 72 tab, 3 ref. 11060 EJD, EPA 600/2-78-043a.

Descriptors: *Biochemical oxygen demand, *Sewage treatment, *Activated sludge, *Settling tanks, *Waste water treatment, *Pretreatment(Water), *Oxygen demand, Hydrogen sulfide, Water pollution, Water pollution control, Biological treatment, Maryland, Hagerstown(MD), Grit chambers, Aeration tanks, Volatile organics, Industrial pollution.

The city of Hagerstown, Maryland, with a population of over 35,000 persons, is a manufacturing city with about 130 industrial firms, which are classified in more than 25 different product categories. Thus, the water pollution control plant receives both domestic sewage and a diversity of industrial waste and process waters. This treatment plant was unable to achieve waste water treatment to the degree necessary to meet the requirements of the Maryland Departments of Health and Water Resources. Certain methods of 'pretreating' the city's combined waste waters to render these waters more amenable to the existing conventional biological treatment processes were tried and evaluated. These methods were intended to assist the existing treatment plant in meeting oxygen demands through initial oxidation since the combined waste waters regularly exerted high immediate and ultimate oxygen demands. The methods were diffuse aeration with and without the addition of waste activated sludge, chlorination, sodium nitrate addition, and potassium permanganate addition. Ammoniation was also tried in an effort to destroy some of the more noxious industrial materials in the waste waters. Pretreatment of the municipal waste waters by plain aeration, by aeration with and addition of activated sludge, and by chlorination were most effective in improving the degree of waste water treatment received by the treatment plant. (Coan-NC)
W78-12660

FRESHWATER WETLANDS AND SEWAGE EFFLUENT DISPOSAL: PROCEEDINGS OF A NATIONAL SYMPOSIUM HELD AT THE UNIVERSITY OF MICHIGAN.
For primary bibliographic entry see Field 5E.
W78-12707

PLANT GROWTH, NUTRIENT ACCUMULATION AND DECOMPOSITION IN A CENTRAL MICHIGAN PEATLAND USED FOR EFFLUENT TREATMENT,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W78-12711

SEWAGE SPRAY IRRIGATION IN A DELAWARE RIVER FRESHWATER TIDAL MARSH,
Rider Coll., Trenton, NJ. Dept. of Biology.
For primary bibliographic entry see Field 5E.
W78-12712

MARSH/POND SEWAGE TREATMENT PLANTS,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
M. M. Small.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 197-213, 1976.

Descriptors: *Sewage effluents, *Freshwater marshes, *Biological treatment, *Waste water treatment, Marshes, Ponds, Cattails, New York, Costs, Harvesting, Wildlife, Wetlands.

Brookhaven National Laboratory is operating a 10,000 gallon per day sewage treatment system that consists only of a shallow cattail marsh and a stabilization pond. The influent to this system is raw sewage blended with septage and sludge; the effluent is potable water. The system is odor, rodent, fly and mosquito free. It produces no sludge nor airblown particles. It produces a useful annual crop which is salable and provides suitable habitat for fish, birds, and wildlife. This project is the prototype of similar systems which are proposed for communities of up to 10,000 inhabitants. They can be built at a cost of about $0.60/gal-day and operated at less than one man-year expense. (See also W78-12707) (Stihler-Mass)
W78-12715

ARTIFICIAL AND NATURAL MARSHES AS WASTEWATER TREATMENT SYSTEMS IN WISCONSIN,
F. L. Spangler, W. E. Sloey, and C. W. Fetter, Jr.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 215-240, 1976. 3 fig, 9 tab, 12 ref.

Descriptors: *Waste water treatment, *Sewage effluents, *Biological treatment, *Freshwater marshes, *Phosphorus, Wisconsin, Wetlands, Harvesting, Gravels, Biochemical oxygen demand, Suspended solids, Nitrogen, Coliforms, Rooted aquatic plants.

Observations were made on the effect of artificial marshes on primary and secondary municipal treatment plant effluent. Water quality improvement by a polluted natural marsh was also studied. Phosphorus (P) removals of 30 to 40% can be expected in both natural and artificial marshes but ranged up to 65%. Phosphorus removal during the growing season may be negated by loss during winter and spring. Harvesting of plants is not a feasible P removal technique nor does it influence treatment efficiency. In the artificial system, 75% of the P removed from the waste water went into the gravel; only 5% went into harvestable tissue. Most of the purification processes, i.e., BOD removal and nutrient retention, appear to be carried out in the substrate system. Retention time did not seem to be critical to BOD removal over a 5-hour to 10-day range for secondary effluent. (See also W78-12707) (Stihler-Mass)
W78-12716

MINNESOTA'S PEAT RESOURCES: THEIR CHARACTERISTICS AND USE IN SEWAGE TREATMENT, AGRICULTURE AND ENERGY,
Minnesota Univ., St. Paul. Dept. of Soil Science.
R. S. Farnham, and D. H. Boelter.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 241-255, 1976. 12 ref.

Descriptors: *Peat, *Minnesota, *Fuels, *Agriculture, *Sewage treatment, *Hydrology, Wetlands, Wild rice, Soil amendments, Streamflow, Nutrient removal, Waste water, Biological treatment.

Minnesota has three million ha (7.5 million acres) of peatland wetlands. One of the more important resources of peatlands is water, and the headwater areas for several major river basins are located on peat-covered wetlands in the northern forested regions of Minnesota. Peatlands often play a less significant role in the seasonal distribution of runoff with a large portion of the annual flow occurring prior to June 15. Drained and fertilized, these organic soils are particularly suited to the production of vegetable, seed, and forage crops, wild rice and other specialty crops. High water storage capacity and low density make peat materials ideal soil amendments. The relatively high caloric values of peat have led to their use as fuel. Renovation of waste waters is quite good using a combination of the filtering and absorbing action of peat and the harvest of plants growing on the filter beds. (See also W78-12707) (Stihler-Mass)
W78-12717

TREATMENT OF SECONDARY EFFLUENT USING A PEAT BED,
Forest Service (USDA), Milwaukee, WI.
H. T. Stanlick.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 257-268, 1976. 4 fig, 2 ref.

Descriptors: *Sewage treatment, *Biological treatment, *Peat, *Waste water treatment, Coliforms, Phosphorus, Nitrogen, Biochemical oxygen demand, Suspended solids, Peat beds.

The peat bed consisted of the following layers, from bottom to top: pea gravel, sand, sand and peat mixture, and peat. It was planted with water-tolerant grass. Effluent was applied using a sprinkler system. Operating during the growing season, peat bed effluent should be produced that will meet most, if not all, discharge requirements. Such effluent should have no fecal coliform, little total coliform, BOD5 and suspended solids of approximately 5 mg/l, and nitrogen content of less than 10 mg/l. A system of this type could be used to disinfect and improve the quality of effluent all year if there are no stringent requirements on phosphorus and nitrogen. A peat bed should be designed to handle not more than 0.625 cm/hr and 5-15 cm/day of secondary or primary effluent. A bed life of close to 10 years is expected. After three years, treatment efficiency has not deteriorated, but has increased. (See also W78-12707) (Stihler-Mass)
W78-12718

VIRAL ASPECTS OF WETLAND DISPOSAL OF EFFLUENT,
Epidemiology Research Center, Tampa, FL.
F. M. Wellings.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 297-305, 1976. 1 fig, 6 tab.

Descriptors: *Wetlands, *Viruses, *Sewage treatment, *Waste water treatment, Biological treatment, Florida, *Cypress domes, Wetlands.

From a virological standpoint, the effluent from a cypress dome treatment plant serving a small trailer court is relatively comparable with that of urban treatment plant effluent. The quantities of virus entering the plants are comparable, but the variety of virus types entering the dome is limited. Since this dome represented a burned out dome, the efficacy of sewage treatment by an undisturbed cypress dome has not been tested. (See also W78-12707) (Stihler-Mass)
W78-12720

RECOVERY OF NUTRIENTS FROM PEATLANDS USED FOR TERTIARY TREATMENT,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
D. L. Tilton.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 307-327, 1976. 2 tab, 9 ref.

Descriptors: *Peats, *Waste water treatment, *Forest management, *Biological treatment, Soil moisture, Cattails, Trees, Pulp and paper industry, Tertiary treatment, Michigan, Organic soils, Waterfowl, Nitrogen, Phosphorus, Land use.

Analysis of the Porter Ranch Peatland project, Michigan, indicates that low supply of available nutrients, poor soil aeration, light moisture content, and low soil temperature combine to produce a soil environment which is unsuitable for commercial production of most vegetable and field crops. Silviculture of appropriate pulpwood species may be possible on peatlands irrigated with waste water. Forestry provides advantages in harvesting, nutrient storage, and low risk due to heavy metals and viruses. Forestry may not be feasible, however, if waterfowl production is a management goal or if nutrient requirements of the trees are not met by nutrient additions in the effluent. (See also W78-12707) (Stihler-Mass)
W78-12721

THE FEASIBILITY, PLANNING AND CONSTRUCTION OF PEATLAND TERTIARY TREATMENT SYSTEMS,
Williams and Works, Inc., Grand Rapids, MI.
T. C. Williams.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 331-343, 1976.

Descriptors: *Sewage treatment, *Biological treatment, *Wetlands, *Michigan, *Feasibility, Tertiary treatment, Land use, Economics, Aesthetics, *Houghton Lake(Mich).

The 'feasibility' of adopting wetlands irrigation as an integral part of tertiary waste water treatment involves finding satisfactory answers to the concerns of the local project Authority, the service area population, regulatory agencies and scientific investigators. The concerns are for economy, effectiveness, environmental compatibility and aesthetics. Communication and publicity efforts have helped forge feelings of common interest and working together among the separate township governments in the Houghton Lake Area Sewer Authority. The Houghton Lake Wetlands Study is a landmark in tertiary treatment, and in the future may rival upland irrigation in feasibility for rural and resort communities. (See also W78-12707) (Stihler-Mass)
W78-12722

PROCESS FOR THE REDUCTION OF EFFLUENT COLOR FROM A CELLULOSIC PULP BLEACHING SEQUENCE,
Hooker Chemicals and Plastics Corp., Niagara Falls, NY. (Assignee).
R. J. Gall, and F. H. Thompson.
U.S. Patent No. 4,081,317, 9 p, 11 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 968, No 4, p 1442, March 28, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Color, Bleaching wastes, Pulp and paper industry, Cellulose, Chlorine, Hypochlorite.

A process for bleaching a cellulosic pulp is provided which comprises treating the pulp in aqueous suspension with at least one member selected from the group consisting of chlorine and chlorine dioxide to solubilize non-cellulosic material associated with the cellulosic pulp, and thereafter treating the pulp at a weight consistency of from 3 to 15% to hypochlorination with from about 0.5 to about 3.0% hypochlorite on a dry pulp weight basis at a temperature from about 75 to about 160F., at a pH from about 6 to less than 9 for from 15 to 180 minutes. (Sinha-OEIS)
W78-12775

PURIFICATION OF WASTE WATER HIGH IN CARBOHYDRATES AND SIMULTANEOUS PRODUCTION OF HIGH PROTEIN FEED PRODUCT,
Bio-Kinetics Inc., San Rafael, CA. (Assignee).
J. R. Hulls, and D. M. Donofrio.
U.S. Patent No. 4,081,367, 6 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 968, No 4, p 1456, March 28, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, Carbohydrates, Food processing industry, Yeasts, *Aeration, Water reuse, Useful byproducts, Animal feed.

A method for purifying waste water high in carbohydrate and obtaining from it a high-protein feed product is described. The waste water is inoculated with yeast of the type that converts starch and sugars into more yeast. The pH is adjusted to desired levels, and then inoculated waste is circulated and recirculated in conjunction with air in amounts that enhance the growth rate of the yeast. The purified liquid waste is then separated from moist solids, and a large proportion of the moist solids is havested as feed material, while a smaller proportion is taken for use in recycle. The proportion to be recycled is sent to a treatment zone where the pH is lowered to approximately 3.5 and where antibiotics are added, the lowering of the pH an the antibiotics both serving to suppress a substantial portion of bacterial growth while enabling the yeast to grow. After a suitable dwell time, the treated material is used in the inoculating step as the inoculant. (Sinha-OEIS)
W78-12779

COMMON ION EFFECT TO ASSIST LM SEPARATION,
Exxon Research and Engineering Co., Linden, NJ. (Assignee).
N. N. E. Li, R. P. Cahn, and A. L. Shrier.
U.S. Patent No. 4,081,369, 4 p, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 968, No 4, p 1457, March 28, 1978.

Descriptors: *Patents, *Waste water treatment, *Separation techniques, *Membrane processes, Water treatment, Solubility, Emulsions, Chemical precipitation, Aqueous solutions, Heavy metals, Liquid membrane processes.

The invention relates to an improvement in the liquid membrane process for removing soluble materials from solution. More specifically, soluble materials are removed from solution by contacting the solution with an emulsion, the external phase of which is immiscible with the solution and permeable to the soluble materials. The internal phase contains a reactant which reacts with the soluble material and converts the soluble material to a material which is insoluble and thus trapped in the internal phase. The improvement comprises maintaining the concentration of the reactant in the internal phase of the emulsion at a level at which the concentation of the soluble material in the internal phase of the emulsion is less than the concentration to which it is desirable. Preferably the solution is aqueous and the soluble material is a salt. For example, the concentration of fluoride ion in an aqueous solution is lowered to less than 6 ppm by contacting the solution with an emulsion containing a soluble calcium salt in the internal phase. The concentration of calcium in the internal phase is maintained at a level sufficient to provide a concentration of less than 6 ppm soluble fluoride ion in the internal phase. (Sinha - OEIS)
W78-12781

LIQUID AERATION TO REDUCE BIOLOGICAL OXYGEN DEMAND,
Zink (John) Co., Tulsa, OK. (Assignee).
R. D. Reed.
U.S. Patent No. 4,081,378, 7 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 968, No 4, p 1459, March 28, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Organic wastes, Aeration, Chemical oxygen demand, Bubbles, Equipment.

It is necessary for effluent streams to be processed for reduction in biological oxygen demand before they can be vented to waterways in order to avoid very serious pollution of the waterways. Air is bubbled upwardly through the liquid so that the oxygen of the air becomes available to the liquid at the surface of each bubble. Because the air is forced into the liquid at some depth, the bubbles are small. But as buoyancy forces the bubble to rise, the size of the bubbles increases with rise. Therefore, the greater the number of bubbles formed as air enters the liquid, the better the air-liquid contact, which result in greater oxygen delivery to the liquid within a fixed time period. A tank or vessel is provided into which liquid is supplied at a controlled rate and temperature, through a pipe at the base of the vessel. There is a horizontal dividing wall near the bottom of the vessel with narrow slots through which all of the water must pass in the form of vertical sheets of liquid. An air manifold is connected to tubes, pipes, or arms and small diameter holes, openings or orifices are drilled in the bottom surface of the arms. A column of liquid plus bubbles rises directly above each of the arms and moves toward the top of the vessel. A horizontal baffle plate is provided near the top of the vessel, which forces the liquid and air bubbles to pass through the space between the outer circumference of the baffle and the inner surface of the vessel. The water and air bubbles then move radially inward, the bubbles are disengaged from the thin sheet of water and the liquid is drained out the side of the vessel. (Sinha - OEIS)
W78-12783

METHOD OF PURIFICATION,
Agence Nationale de Valorisation de la Recherche, Neuily-sur-Seine (France). (Assignee).
E. Papirer, and J. Donnet.
U.S. Patent no. 4,082,660, 5 p, 4 ref; Official Gazette of the United States Patent Office, Vol 969, No 1, p 268, April 4, 1978.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, *Water purification, Oil pollution, Organic compounds, Industrial wastes, Separation techniques, Chemical reactions, Polymers, Hydrocarbons, Petroleum.

The invention is related to a method of purification of waters polluted by organic impurities such as hydrocarbons. The purification agent is constituted by an pulverulent solid on the surface of the constituent particles of which chains of polymers are fixed by grafting. This grafting of the polymer chains on the pulverulent mineral solid distinguishes the purification agent from the products which would be constituted by particles simply coated with polymer. The purification agents are constituted by pulverulent solids selected from the group formed by silica, the oxides of zinc, of titanium, of aluminum, as well as silicates, silicoaluminates and metallic carbonates. The polymers grafted to the surface of the constituent particles of the purification agent may be selected from the group which comprise double bonds, carbonyl groups or peroxide groups. The purification agents thus constituted are completely insoluble in aqueous media and very effective by reason of the large contact surface that they offer to the hydrocarbons which have to be extracted

from the polluted aqueous media. The insolubility of the purification agents enables them to be very easily recovered once the aqueous medium has been purified. (Sinha-OEIS)
W78-12785

LIQUID WASTE TREATMENT APPARATUS,
J. E. Prince, F. E. Terry, and W. H. Mullins.
U.S. Patent No. 4,082,663, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 969, April 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Sewage treatment, Organic wastes, Aeration, Oxygen, Temperature, Equipment.

A self-contained extraction, aeration and return unit capable of intrusion into existing liquid circuits is provided. The unit can intrude either as a supplementing step, such as for boosting aeration-rates in existing aerating vessels, or as a preliminary step either immediately before the remaining treatment steps or at a geographically remote point which permits action of the oxygen in the waste liquid while enroute to a treatment plant. The invention is not limited to use in the treatment of sewage but has application in any liquid circuit where aeration is required such as reducing mineral content of potable water and aquaculture applications. In addition to its use as an oxygenating aerator, the unit may be employed to infuse relatively cooler air into warm or hot waste liquid and thereby reduce the temperature of waste liquid. The preferred form of the invention includes an aspirator having an elongate, constant-area mixing chamber at and immediately downstream from the point at which the air is drawn into the liquid. (Sinha-OEIS)
W78-12787

SEPARATOR OF OIL AND WATER,
Barton Hydraulic Engineering Co. Ltd., Birmingham (England). (Assignee).
For primary bibliographic entry see Field 5G.
W78-12789

REMOVAL OF HEAVY METAL IONS FROM AQUEOUS SOLUTIONS WITH INSOLUBLE CROSSLINKED-STARCH-XANTHATES,
Department of Agriculture, Washington, DC. Office of the Secretary.
R. E. Wing, and W. M. Doane.
U.S. Patent No. 4,083,783, 11 p, 2 fig, 14 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 969, No. 2, p 636, April 11, 1978.

Descriptors: *Patents, *Waste water treatment, *Chemical wastes, *Industrial wastes, Water pollution treatment, Heavy metals, Separation techniques, Crosslinked-starch-xanthate.

Insoluble-starch-xanthates were prepared by xanthation of highly crosslinked-starches under various conditions. After isolation of the products by solvent dehydration, freeze drying, spray drying, or flash drying, their properties were determined. Products prepared using magnesium salt incorporation gave increased room temperature stability. Concentrations of heavy metal ions obtained in several industrial effluents were reduced to below the most stringent aqueous discharge limits. (Sinha-OEIS)
W78-12801

BIOLOGICAL TREATMENT PLANT FOR LIQUID SUSPENSIONS,
Degremont Societe Generale D'Epuration et D'Assainissement, Rueil Malmaison (France). (Assignee).
J. Bernard, and M. Renaudin.
U.S. Patent No. 4,083,785, 9 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 969, No 2, p 937, April 11, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water quality control, *Water pollution treatment, *Biological treatment, Industrial wastes, Oxygenation, Aerobic conditions.

An improved plant arrangement for carrying out a biological process is provided which affords a more regular supply of oxygen to the various compartments or tanks of the plant, thus ensuring a better continuity in the oxygen contents of the liquor contained in the enclosures. A more regular operation of the plant in general is obtained, while reducing the oxygen consumption and finally improving considerably the power balance. The oxygen or oxygen-enriched air is caused to circulate through the oxidation tank or compartment in counter-current relationship to the liquor and recycled sludge, the oxygen being fed to the downstream tank while the venting to the atmosphere takes place in the upstream tank. This venting is directly subordinate to the oxygen content of the gaseous phase of the upstream tank where the oxygen demand and therefore the consumption of this valuable gas assume their highest values. The flow of oxygen-enriched air from the down-stream tank, where the demand and consumption are lower, is attended by an immediate and continuous increment or increase in the oxygen content of the gaseous phase of the upstream tank. With the arrangement it is thus possible to obtain a rapid response to any oxygen demand, as well as a regular and continuous oxygen supply throughout the plant. (Sinha-OEIS)
W78-12802

D-XYLOSE RECOVERY FROM HARDWOOD SULPHITE - LIQUOR USING ISOPROPANOL AZEOTROPE.
German Patent DS 1939-695. Issued July 13, 1978. Derwent German Patents Abstracts, Vol. A. No. 29, p 1, August, 1978.

Descriptors: *Sulfite liquors, *Pulp wastes, *Pulp and paper industry, *Patents, *Separation techniques, Hardwood, Chemical precipitation, Crystallization, Waste water treatment, Industrial wastes.

A patent has been issued for a process to recover crystalline D-xylose from hardwood sulfite liquors. Under reduced pressure, the effluent is concentrated to a solids content of 40-55% at <60C and extracted azeotropically by a 5:1 isopropanol-to-water mixture at the same temperature. The extract is further concentrated by removing the water and isopropanol, followed by separation with 6 liters isopropanol/kg concentrate at <60C. The extract is cooled to 5C and the precipitated impurities are filtered from the concentrate. The filtered material is concentrated, dissolved in a 95% ethanol solution, and recrystallized. (Lisk-FIRL)
W78-12927

REMOVAL OF MINERAL OIL AND HEAVY METAL IONS FROM EFFLUENT - BY FILTRATION THROUGH LAYERS OF WOOD SHAVINGS AND SULPHONATED COAL TO IMPROVE PURITY.
Soviet Patent SU-569-546. Issued September 14, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 27, p 6, August, 1978.

Descriptors: *Oil wastes, *Heavy metals, *Filtration, *Patents, *Coals, Sawdust, Pine trees, Wood wastes, Filters, Absorption, Oil industry, Copper, Zinc, Design data, Waste water treatment, Saturation, Incineration, Industrial wastes.

A patent has been issued for a combined sawdust-sulfonated coal filter that absorbs mineral oil and heavy metal ions from oily effluent streams. The filter is packed with a 2:1 weight ratio of sawdust to sulfonated coal. In an example cited, 200 liters of industrial waste water bearing 280 mg/liter of mixed compressor and transformer oils, 15.0 mg Cu/liter, and 18.5 mg Zn/liter were filtered through the pine shavings and sulfonated coal layers at a rate of 0.25 liters/min. The filter has an oil absorption capacity of 270 mg/g of media and becomes saturated after throughput of 200-fold of the filter volume in effluent. When the media reaches its saturation point, it is incinerated. Copper ions are reduced by 97.8% and zinc levels decreased by 97.3% on the filter. (Lisk-FIRL)
W78-12929

MIXED CULTURE INTERACTIONS IN CONTINUOUS CULTURE: STUDIES ON THE ROLE OF PHOTOSYNTHETIC BACTERIA IN WASTE WATER TREATMENT,
New South Wales Univ., Kensington (Australia).
H. Sawada.
PhD. Thesis, 1977.

Descriptors: *Photosynthetic bacteria, *Textiles, *Antibiotics(Pesticides), *Anaerobic bacteria, *Biological treatment, Protein, Trace elements, Vitamins, Nutrient requirements, Competition, Biochemical oxygen demand, Waste water treatment, Industrial wastes.

The role of photosynthetic bacteria in the treatment of textile and antibiotic manufacturing waste water was evaluated in the presence of competition by heterotrophic bacteria. Rhodopseudomonas capsulata, a non-sulfur purple species, was used as the representative photosynthetic bacteria; Klebsiella pneumonia, a facultative anaerobic, was used as a representative heterotrophic bacteria. High BOD synthetic waste water and effluent from wool scour, abattoir, and antiobiotic processing plants were employed as culture media. In mixed cultures sustained under anaerobic and illuminated conditions, glucose was converted by the heterotrophs to fatty acids which were then assimilated by the photosynthetic bacteria. The growth rates of photosynthetic bacteria increased in the presence of: a strong light source; a micro-aerobic environment; sources of vitamins, trace heavy metals, and some amino acids; and autolyzed heterotrophic bacteria. Low dilution rates also enhanced growth. The degradation of fatty acids was more efficient in a two-stage continuous mixed culture where autolysis of the heterotrophic bacteria stimulated waste degradation by R. capsulata in the second stage. In wool scour and abattoir effluent, the photosynthetic flora developed during the beginning phases of batch treatment. R. capsulata was more effective in the antibiotic effluent, where photosynthetic bacteria developed during the latter stages of treatment. The bacteria were considered a potential source of single cell protein. (Lisk-FIRL)
W78-12931

TREATMENT OF WASTE TREATMENT PLANT EFFLUENTS BY REVERSE OSMOSIS,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre; and Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
H. K. Johnston, and H. S. Lim.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 84, 1978. 122 p, 33 fig, 14 ref, 29 tab, 4 append. 73-3-14 (Volume II).

Descriptors: *Waste treatment, *Waste water treatment, *Reverse osmosis, *Industrial plants, *Industrial wastes, Pilot plants, Laboratory tests, Nutrient removal, Chemicals, Bacteria, Sewage treatment, Effluents, *Flux levels, *Cellulose acetate membranes.

The suitability of reverse osmosis as an advanced wastewater treatment process was investigated in laboratory and pilot plant situations. The effectiveness of this technique for the removal of nutrients, bacteria, and various chemical constituents was examined. Laboratory test cells and eight tubular modules were employed to treat nutrient solutions, various secondary effluents,

nutrient spiked sewage and raw sewage. Cellulose acetate membranes with 75 percent and 90 percent salt rejection were employed. Optimum operating conditions for the pilot plant were determined and chemical cleaning techniques were applied to restore permeate flux levels. Flux was adversely affected by membrane fouling. However, results indicated high, yet stable, removals for most constituents. Although not yet economically competitive, in many cases, reverse osmosis is a potentially advantageous wastewater treatment technique. (WATDOC)
W78-12947

REMOVAL OF PERSISTENT CONTAMINANTS FROM MUNICIPAL EFFLUENTS BY REVERSE OSMOSIS,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre; and Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
H. K. Johnston, and H. S. Lim.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 85, 1978. 66 p, 6 fig, 10 ref, 7 tab, 2 append. 73-3-14 (Volume III).

Descriptors: *Heavy metals, *Pesticide removal, *Water pollution sources, *Separation techniques, *Reverse osmosis, Municipal wastes, Effluents, Toxins, Dissolved solids, Suspended solids, Sorption.

The effectiveness of the reverse osmosis process in removing specific toxic substances from municipal effluents was studied. The toxic substances considered were: arsenic, selenium, cyanide (simple and complex salts), nitrilotriacetic acids (NTA), phenols, aldrin, DDT, chlordane, endrin, melathion, and parathion. Experiments were conducted in the laboratory and in a specially equipped mobile pilot plant. Data on removal efficiencies are presented along with reverse osmosis (RO) system permeation rates and variations in those rates with time. Membrane fouling problems and cleaning methods were examined and are reported on. Chlorinated hydrocarbon and organic phosphate pesticides are almost completely removed by RO while the heavy metal removal rate was consistently greater than 95 percent. The removal rates for other substances examined such as: complex cyanide, NTA, selenium, arsenic and phenols, varied between 43 percent and 90 percent. (WATDOC)
W78-12948

SUMMARY REPORT ON PHOSPHORUS REMOVAL,
Ontario Ministry of the Environment, Toronto.
J. D. Archer.
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 83, 1978. 82 p, 6 fig, 5 ref, 6 tab, 3 append. 75-1-42.

Descriptors: *Nutrient removal, *Phosphorus, *Waste water treatment, *Treatment facilities, *Desalination processes, Chemical reactions, Testing, Sludge disposal, Effluents, Operating costs, Capital costs, *Jar testing, *Full-scale testing, Phosphorus concentrations, Treatability studies, Chemical costs, Lower Great Lakes Basin.

This report covers the findings of the phosphorus removal studies carried out on wastewater treatment plants under the Canada-Ontario Agreement on Great Lakes Water Quality. Phosphorus removal can be achieved at any existing wastewater treatment plant with the addition of iron salts, aluminum salts or lime. Since essentially any of these three chemicals can adequately remove phosphorus at a wastewater treatment plant, the purpose of the treatability studies described in this report was to determine which chemical would most economically remove the phosphorus to the required level, yet be totally compatible with the existing treatment process. Information was collected on the phosphorus removal facilities installed at wastewater treatment plants, to compare the actual performance of these facilities with the predictions that were made from treatability studies. The two-stage treatment study (jar and full-scale testing) was found to be the most reliable method of selecting the appropriate chemical and dosage rate. Operational problems, and capital and operating costs are presented and discussed. (WATDOC)
W78-12950

DEWATERING ALTERNATIVES FOR POTATO WASTES, A PRELIMINARY STUDY,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
H. W. Campbell, and J. W. Pike.
Technology Development Report EPS 4-WP-78-6, August, 1978, 33 p, 11 fig, 12 ref, 8 tab, append.

Descriptors: *Potatoes, *Solid wastes, *Industrial wastes, *Industrial plants, *Dewatering, Waste treatment, Drying, Chemicals, Fermentation, Landfills, Feeds, Model studies.

Potatoe processing plants generate large quantities of solid waste from both process and waste treatment sources. One of the major constituents is the waste from the lye peel process. This waste has a high pH (approximately or less than 12.5), a relatively low solids content (approximately or less than 12 percent) and, due to its gelatinous consistency, is extremely difficult to dewater. A study was initiated in 1975 to identify conditioning methods which would improve the dewaterability of this waste, and to evaluate those dewatering processes which were capable of producing a material suitable for either cattle feed or disposal as a solid material in a landfill site. The experimental program was carried out in two phases. The first phase consisted of bench scale experiments at the Wastewater Technology Centre (WTC), Burlington, Ontario to identify potential conditioning chemicals, and to qualitatively evaluate the feasibility of thermal drying. The second phase consisted of experiments on a pilot scale steam heated drum dryer, carried out under contract by the Research and Productivity Council, Fredericton, New Brunswick. Although many conditioning chemicals were evaluated, only the following achieved any degree of success: a combination of ferric chloride and lime; and methanol. Additions of ferric chloride and lime produced only marginal thickening at relatively high chemical additions (20 percent ferric chloride, 20 percent lime). The addition of methanol in a 1 to 1 volume ratio resulted in a sludge which could be readily dewatered. Cake solids exceeding 30 percent were achieved with the lye peel waste from both the bench centrifuge test and filter leaf test. (WATDOC)
W78-12951

5E. Ultimate Disposal Of Wastes

NUMERICAL MODELLING OF LIQUID WASTE INJECTION INTO POROUS MEDIA SATURATED WITH DENSITY-STRATIFIED FLUID: A PROGRESS REPORT,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-12102

INTERACTION OF ROOT GROWTH AND REFUSE DECOMPOSITION IN A SANITARY LANDFILL,
Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 5G.
W78-12110

THE CULTURE OF CRAYFISH FOR WASTE RECYCLING AND HUMAN CONSUMPTION,
California Univ., Davis. Dept. of Animal Science.; and California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5G.
W78-12114

WATERCRESS-CRAYFISH POLYCULTURE AS AN ECONOMIC MEANS OF STRIPPING NUTRIENTS FROM ENRICHED WATERS,
California Univ., Davis. Div. of Environmental Studies.; and California Univ., Davis. Dept. of Animal Science.
For primary bibliographic entry see Field 5G.
W78-12115

EFFECT OF VEGETATION ON LANDFILL STABILIZATION,
Auburn Univ., AL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-12136

OCEAN DISPOSAL IN THE MID-ATLANTIC BIGHT,
Environmental Protection Agency, Philadelphia, PA.
W. C. Muir, G. M. Horwitz, and G. D. Pence.
In: Oceans '78, 'The Ocean Challenge', Fourth Annual Combined Conference, Marine Technology Society and Institute of Electrical and Electronics Engineers, held in Washington, DC on 6-8 September 1978. p 456-461, 3 fig, 2 tab, 11 ref.

Descriptors: *Waste disposal, *Water pollution sources, Municipal wastes, Industrial wastes, Environmental effects, Outer Continental Shelf, Mid-Atlantic Bight, Ocean dumping.

With the passage of the Marine Protection, Research, and Sanctuaries Act of 1972, the U.S. Environmental Protection Agency has been given the lead role in the protection of the nation's oceans from the disposal of toxic pollutants. Through the establishment of a permit program, the U.S. EPA's Middle Atlantic Region III has brought the indiscriminate disposal of municipal and industrial wastes under control. The goal is to eliminate ocean disposal of harmful waste by January, 1981 through the development of sound, reasonable and environmentally acceptable land based alternatives. Until that goal is attained, an intensive monitoring program has been established to assess the fate and effects of all pollutants dumped into the Region's waters. (Sinha-OEIS)
W78-12176

WET AIR OXIDATION: EFFECT ON SLUDGE COMPOSITION,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
L. E. Sommers, and E. H. Curtis.
Journal Water Pollution Control Federation, Vol. 49, No. 11, November 1977, p 2219-2225. 2 fig, 4 tab, 6 ref. OWRT A-045-IND(3).

Descriptors: *Oxidation, *Waste disposal, Metals, Nutrients, Sludges, Sludge disposal, Sludge treatment, Waste treatment, Wet-air oxidation, Land disposal.

Wastewater sludge samples were obtained from waste treatment streams in two wastewater treatments before and after wet-air oxidation. Wet-air oxidation resulted in a 10 to 20 percent reduction in volatile solids. Concurrently, total N levels in the sludges decreased by >50 percent while P, Cu, Zn, Ni, Cd, and Pb concentrations either increased or remained unchanged. From the standpoint of applying wastewater sludge to agricultural land, inclusion of a wet-air oxidation unit in a treatment plant will decrease the desirability of using sludge as a fertilizer material.
W78-12269

PROTRACTED RECHARGE OF TREATED SEWAGE INTO SAND: PART II - TRACING THE FLOW OF CONTAINATED GROUND WATER WITH A RESISTIVITY SURVEY,
Rensselaer Polytechnic Inst., Troy, NY.
For primary bibliographic entry see Field 5D.
W78-12305

PROTRACTED RECHARGE OF TREATED SEWAGE INTO SAND: PART I - QUALITY CHANGES IN VERTICAL TRANSPORT THROUGH THE SAND,
Rensselaer Polytechnic Inst., Troy, NY.
For primary bibliographic entry see Field 5D.
W78-12306

REUSE FOR SURVIVAL,
E. Adler.
Saccap Action News, Vol. 3, No. 1, p 25-28, 1977.

Descriptors: *Solid wastes, *Resources recovery, Soil erosion, *Industrial wastes, Mine wastes, Municipal wastes, Sewage sludge, *Waste reuse, Waste composition, *Waste disposal, Sanitary landfills, Incineration, Pyrolysis, South Africa.

Problems are reviewed of recovery and reuse of re-usable waste products and ways and means of disposing of such wastes as are demand irrecoverable. The wastage of natural resources is discussed, of which soil erosion is one of the most important aspects. Industrial and mining wastes are looked at as well as municipal wastes and sewage wastes. Suggestions as to the possible use of organic wastes as composts are given. (So Afr Water Info Ctr)
W78-12405

LETS TALK RUBBISH, PART 7, DISPOSAL OF OLD TYRES.
Municipal Engineer, Vol. 8, No. 1, p 35-37, 1977.

Descriptors: Tyres, Rubber wastes, *Solid wastes utilization, *Landfills, *Waste disposal, Pyrolysis, Combustion, Costs, Economics, Recycling, Reclamation, Furnaces, Embankments, *South Africa.

Because of the fact that it is uneconomical to reclaim and re-use old tyres in the tyre making industry, and not withstanding the fact that about 20% of the tyre market belongs to retreads, all of the two hundred million new tyres produced in the USA thirty million in the UK and six million in S.A. have ultimately to be disposed of. Various ways of disposing of old tyres are discussed. A very small percentage of old tyres are reclaimed for production of new tyres while even a smaller percentage are used as scrap rubber for the production of matting, non skid additive to road surfaces etc. Research work is being done on a thermal process of distillation to produce gasses, oils and acids but it is doubtful if such a plant would be economically viable. Various incineration processes are discussed as well as the use of old tyres using the sidewalls as re-inforcement in earth embankments alongside roads enabling side slopes of embankments to be increased effecting large savings in construction costs. (So Afr Water Info Ctr)
W78-12429

HIGH DENSITY BALING.
Municipal Engineer, Vol 7, No 5, p 80-81, 1976.

Descriptors: *Waste disposal, *Waste baling, Landfills, Environmental aspects, Metals removal, Waste size reduction, Operating costs, Waste shredding, Waste utilization, Solid wastes, *South Africa.

The use is discussed of high density baling of refuse procedures to replace land reclamation as a method of disposal. New installations in Glasgow and seeds are discussed but the author comes to the conclusion that although the principle of baling, to achieve volume reduction, was sound, the complexity of the equipment and the buildings would make it financially unacceptable in South Africa. High density baling in Japan, where bales are coated with about 100 mm of concrete and then used as building blocks, is also discussed. (So Afr Water Info Ctr).
W78-12441

LETS TALK RUBBISH, PART 4: REFUSE COLLECTION.
Municipal Engineer, Vol 7, No 3, p 69-72, 1976.

Descriptors: *Wastes, Municipal solid wastes, Collection systems, *Wastes processing, Waste sorting, Plastics, Polythene containers, Drums, Waste compacting, *South Africa.

The quiet revolution that has taken place during the past five years or so in refuse collection is described. Most municipalities now have regulations empowering them to stipulate both size and type of container which they approve for the storage of domestic or trade refuse. First the galvanished metal bin, then the high-density polythene bin after that the two ply paper sack and lately, the polyethelene sacks for refuse storage. Also described in the article are compaction vehicles in use today. (So Afr Water Info Ctr)
W78-12443

ASEA REDUCES NUCLEAR WASTE IN SWEDEN.
Electrical Engineer, Johannesburg, No 4, p 39-40, 1977.

Descriptors: *Sweden, *Nuclear reactors, *Nuclear wastes, Radioactive wastes, Ion exchange, Strontium, Leaching, Nuclear fuel reprocessing, Radiation, Calcination, Vitrification, Waste disposal, Hot isostatic pressing.

ASEA the worldwide manufacturer of electrical and mechanical equipment with headquarters in Vasteras, Sweden, is working on the development of a method using hot isostatic pressing for the safe containment and storage of nuclear wastes. The waste is compacted together with suitable materials to form dense and solid bodies, which have a very high leach resistance to the groundwater and a greater mechanical strength than, for example granite. ASEA's method may help the utilities to meet the laws and regulations covering nuclear waste management and the final disposal of such waste. (So Afr Water Info Ctr)
W78-12452

OPERATING THE FRANKLIN WASTE RECOVERY AND COMPLEMENTING WASTE WATER TREATMENT PLANT-RECLAIMING PAPER FIBRES, METALS AND GLASS,
B. F. Eichholz.
Municipal Engineer, Vol 8, No 4, p 35-37, 39. 1977. 2 fig.

Descriptors: *Waste recovery, *Solid wastes, Waste paper, *Wastes utilization, Metals, Glass, Regional treatment plants, Sewage treatment, Sewage sludge, Burning, Sewage effluents, Fly ash, Settling, Costs, *Waste disposal, Ohio.

A resume of the operation of the Franklin Ohio, USA, Solid Waste Disposal and Reclaim Facility. The heart of the facility is the Hydrasposal process, which is actually similar to systems used in hundreds of paper mills. All incoming refuse is fed by conveyor into the hydrapalper and there reduced to a pulp. At the time of the original design, the scope of the system began to expand. Engineers reasoned that if 50% of municipal solid waste is paper, why cannot the paper fibres by reclaimed. And accordingly the the fibre reclaim system was added. This thought also posed the question: Why not also reclaim metals and glass. And accordingly the system was broadened to extract metals and glass. The possibility of extraction of the glass attracted the attention of the Glass Container Manufacturers Institute and now, the City and the Glass Container Manufacturers Institute, assisted by a Demonstration Grant from the Solid Waste Management Office, are adding a glass sorter which separates the aluminium from the glass and then sorts the glass into three colours: clear, amber and green. (So Afr Water Info Ctr)
W78-12467

LET'S TALK RUBBISH - PART 10.
Municipal Engineer, Vol 8, No 4, p 69, 71, 1977.

Descriptors: *Solid wastes, *Waste disposal, *Recycling, *Wastes utilization, Resources recovery, Landfill, Leachates, Industrial wastes, Wastes to energy, Baling, *South Africa.

Discusses the papers presented at the 79th Conference of the institute of solid wastes management at Torbay, England. Titles of the papers discussed are: (1) Re-Use of Waste; (2) Attenuation and Control of Landfill Leachates; (3) Maximising Human Resources in the Present financial climate; (4) The Impact of Site Licensing on the Future of Industrial Waste Disposal; (5) Energy from Waste and its Potential Use as a Fuel; (6) Trends in Refuse Collection; (7) High Density Baling as a Solution to Solid Waste Disposal. (So Afr Water Info Ctr)
W78-12470

THE BASIC DESIGN OF JOHANESBURG'S DIEPSLOOT OUTFALL SEWER BRIDGE STRUCTURES, WITH SPECIAL REFERENCE TO MAJOR THERMAL MOVEMENTS,
A. J. Hay.
Municipal Administration and Engineering, (Johannesburg) Vol 42, No 504, p 7-8, 10, 12-14, 1977, 2 tab, 5 fig.

Descriptors: *Design criteria, *Outfall sewers, Arch bridges, Engineering structures, Geology, Creep, Shrinkage, Deformation, Elastic properties, Pipelines, Bridge piers, Expansion joints, Thermal expansion, Reinforced concrete, South Africa.

Discussion is presented the associated geology and design criteria, and gives a description of the Diepsloot outfall sewer arch bridges at Johannesburg. It also covers movements and survey control during construction, in order to verify design criteria and hence to make adjustments to fit the actual conditions in practice. Vertical and horizontal movements caused by thermal effects, creep, shrinkage, elastic deformations and pipe and pedestal movements related to the basic structure are also covered. The paper is of extreme importance to the municipal engineer. (So Afr Water Info Ctr)
W78-12482

CRACKING ON THE EXPOSED CONCRETE PIPELINE OF THE DIEPSLOOT OUTFALL SEWER, JOHANNESBURG: FIELD INVESTIGATIONS AND INTERPRETATIONS,
For primary bibliographic entry see Field 8F.
W78-12486

DESIGN OF FLOCCULATION SYSTEMS FROM BATCH TEST DATA,
Cape Town Univ. (South Africa).
For primary bibliographic entry see Field 5D.
W78-12489

SLUDGE, THE AWKWARD CINDERALLA,
J. Halliday.
Imiesa, Johannesburg, Vol 2, No 10, p 24-27, 1977. 2 fig.

Descriptors: *Waste water treatment, *Sludge treatment, *Biological filtration, Activated sludge process, Sludge settling, Centrifugation, Flocculation aids, Sludge incineration, South Africa.

The difficulty with sewage is the solids it contains. Not that the solids are in such vast quantities but rather that separating the solids from the liquids is half the task of sewage purification. The other half is treating the solids. Primary sludge volume could be approximately 1% of the main flow in domestic sewage and the mass of dried solids could be of the order of 0.05% of the original flow. However, depending upon what was done with this sludge the cost of its treatment could be 30-50% of the total cost of the wastewater treatment operation. The author emphasized the influence, the type of liquid phase treatment may have on the subsequent sludge handling. (So Afr Water Info Ctr)
W78-12503

THE WASTES ENDURE,
For primary bibliographic entry see Field 5B.
W78-12564

FLOW OF KAOLINITE AND SEWAGE-SLUDGE SUSPENSIONS IN SAND-SILT POROUS MEDIA,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-12606

A MULTILEVEL DEVICE FOR GROUNDWATER SAMPLING AND PIEZOMETRIC MONITORING,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 7B.
W78-12636

FRESHWATER WETLANDS AND SEWAGE EFFLUENT DISPOSAL: PROCEEDINGS OF A NATIONAL SYMPOSIUM HELD AT THE UNIVERSITY OF MICHIGAN.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 305, Price codes: A15 in paper copy, A01 in microfiche. Symposium held on May 10-11, 1976. Report NSF/RA-760251. Michigan University, Ann Arbor, 1976. 343 p.

Descriptors: *Wetlands, *Water pollution, *Sewage treatment, *Conferences, *Sewage disposal, *Waste water disposal, Marshes, Sewage, Sewage effluents, Waste water treatment, Sewage effluent disposal.

The symposium was held to discuss the feasibility of using freshwater wetland ecosystems to remove certain chemicals from secondarily treated waste water before they enter lakes, streams, and groundwaters. The papers provide a survey of the state-of-the-art and the work that needs to be done. Areas of discussion are: (1) Hydrology: fate of waters beyond the wetlands, loading rate, flow rate within the wetland; (2) Nutrient dynamics and accumulation: efficiency of treatment, mechanism of nutrient removal from waste water, loading rate; (3) Environmental impacts: changes in species composition, habitat protection, health; (4) Legal aspects: enabling policy and legislation; (5) Economic considerations: savings in construction cost, benefits associated with protection of environmental quality; (6) Land use: compatible with other traditional uses of wetlands, policies associated with state and federal wetlands; and (7) Design considerations: artificial or natural wetlands, method of effluent discharge, schedule of pumping, determination of discharge rate. (See W78-12708 thru W78-12722) (Steiner-Mass)
W78-12707

SURFACE HYDROLOGY OF PEATLANDS,
Michigan Univ., Ann Arbor. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2H.
W78-12708

DISSOLVED NUTRIENTS IN A PEATLAND NEAR HOUGHTON LAKE, MICHIGAN,
Utah State Univ., Logan. Dept. of Wildlife Science.
For primary bibliographic entry see Field 5C.
W78-12709

PRODUCTIVITY AND NUTRIENT CONTENT OF EMERGENT MACROPHYTES IN TWO WISCONSIN MARSHES,
Wisconsin Univ.-Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-12710

PLANT GROWTH, NUTRIENT ACCUMULATION AND DECOMPOSITION IN A CENTRAL MICHIGAN PEATLAND USED FOR EFFLUENT TREATMENT,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W78-12711

SEWAGE SPRAY IRRIGATION IN A DELAWARE RIVER FRESHWATER TIDAL MARSH,
Rider Coll., Trenton, NJ. Dept. of Biology.
D. F. Whigham, and R. L. Simpson.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 119-144, 1976. 8 fig, 2 tab, 34 ref.

Descriptors: *Sewage effluents, *Waste water, *Tidal marshes, *Delaware, *Biological treatment, Wetlands, Freshwater marshes, Coastal marshes, Nitrogen, Phosphorus, Nutrients, Rooted aquatic plants.

Populations of most perennial species along with wild rice and waterhemp were apparently not affected during the first year of sewage spray irrigation. Two dominant annual species, touch-me-not and bur marigold, were sensitive to the chlorinated effluent. A third annual, halberd tearthumb, increased in importance in all non-control enclosures. There was a general depression in the height of the upper canopy. During the summer months, nutrient concentrations tended to be lower in the drainage channels than the remainder of the marsh. This pattern is more variable in the fall, especially for nitrate nitrogen. It appears that vascular plants act as sinks for nutrients during the summer months and release nutrients during the fall and winter. (See alos W78-12707) (Stihler-Mass)
W78-12712

EFFECTS OF SEWAGE EFFLUENT ON ECOSYSTEM DYNAMICS IN CYPRESS DOMES,
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W78-12714

MARSH/POND SEWAGE TREATMENT PLANTS,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 5D.
W78-12715

ARTIFICIAL AND NATURAL MARSHES AS WASTEWATER TREATMENT SYSTEMS IN WISCONSIN,
For primary bibliographic entry see Field 5D.
W78-12716

MINNESOTA'S PEAT RESOURCES: THEIR CHARACTERISTICS AND USE IN SEWAGE TREATMENT, AGRICULTURE AND ENERGY,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W78-12717

TREATMENT OF SECONDARY EFFLUENT USING A PEAT BED,
Forest Service (USDA), Milwaukee, WI.
For primary bibliographic entry see Field 5D.
W78-12718

VIRAL ASPECTS OF WETLAND DISPOSAL OF EFFLUENT,
Epidemiology Research Center, Tampa, FL.
For primary bibliographic entry see Field 5D.
W78-12720

RECOVERY OF NUTRIENTS FROM PEATLANDS USED FOR TERTIARY TREATMENT,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
For primary bibliographic entry see Field 5D.
W78-12721

THE FEASIBILITY, PLANNING AND CONSTRUCTION OF PEATLAND TERTIARY TREATMENT SYSTEMS,
Williams and Works, Inc., Grand Rapids, MI.
For primary bibliographic entry see Field 5D.
W78-12722

THE EFFECTS OF THE OCEAN DISPOSAL OF MUNICIPAL WASTES.
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-12820

A NEW CAPACITOR FLUID - A CASE STUDY IN PRODUCT STEWARDSHIP,
Dow Chemical Co., Midland, MI.
For primary bibliographic entry see Field 5A.
W78-12969

EVALUATION OF THE SIGNIFICANCE OF WATERWAY SEDIMENT-ASSOCIATED CONTAMINANTS ON WATER QUALITY AT THE DREDGED MATERIAL DISPOSAL SITE,
Texas Univ. at Dallas, Richardson.
For primary bibliographic entry see Field 5A.
W78-12981

5F. Water Treatment and Quality Alteration

PERMISSIBLE CONTENT OF THE FLOCULLATION AGENT POLYOXYETHYLENE IN BODIES OF WATER (IN RUSSIAN),
Novosibirsk Sanitary Research Inst.
For primary bibliographic entry see Field 5G.
W78-12292

HYGIENIC ASSESSMENT OF AN ANTICORROSION HERMETIC AH-4 USED IN A HOT WATER SUPPLY SYSTEM (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny, Moscow.
For primary bibliographic entry see Field 5A.
W78-12295

FLOCCULANTS AND WATER TREATMENT,
J. R. Hoffman.
Municipal Engineer, Vol. 7, No. 5, p 69-72, 1976. 2 fig, 1 tab.

Descriptors: *Flocculants, *Water treatment, *Coagulants, Water purification plants, Potable water, Polyelecrolytes, Decolourization, Suspended solids removal, Colloidal flotation, Turbidity, Hydrogen ion concentration, Ferric chloride, South Africa.

A short description is given of the basic mechanisms of flocculation of turbid water with metal-salt coagulants and poly-electrolytes. The terms co-agulation and flocculation are explained and the influence of primary flocculants like aluminum sulphate and ferric chloride on unbuffered and buffered waters are described. A short review, regarding the properties and uses of poly-electrolytes, as well as comparative prices, are also given. (So Afr Water Info Ctr)
W78-12390

OBSERVATIONS ON THE DIAGNOSIS AND TREATMENT OF SCHISTOSOMIASIS IN AN ENDEMIC AREA,
Rhodesia Univ., Salisbury.
For primary bibliographic entry see Field 5G.
W78-12395

PARASITIC INFECTIONS IN BLACK CHILDREN IN AN ENDEMIC SCHISTOSOMIASIS AREA IN NATAL,
South African Medical Research Council, Potchefstroom.
For primary bibliographic entry see Field 5B.
W78-12396

CHLORINATION A CENTURY OF DISINFECTION.
Building and Construction, (Johannesburg), Vol. June 1976, p 35.

Descriptors: *Chlorination, *Disinfection, *Water treatment, Operators, Chlorine, Calcium hypochlorite, Lithium hypochlorite, South Africa.

A brief review is given of chlorination for the disinfection of water during water treatment and goes on to explain the various chlorination processes, the chlorine values of commercial chlorine products and how chlorine works in the disinfection process. (So Afr Water Info Ctr)
W78-12397

RECYCLING AND DISPOSAL OF PLASTICS WASTE IN SOUTH AFRICA,
Council fo Scientific and Industrial Research, Johannesburg (South Africa).
For primary bibliographic entry see Field 5D.
W78-12399

DOSE FINDNG TRIALS OF ORAL OXAMINQUINE IN RHODESIA,
Blair Research Lab., Salisbury (Rhodesia).
V. D. Clarke, D. M. Blair, M. C. Weber, and P. A. Garnett.
South African Medical Journal (Cape Town), Vol. 50, No. 46, p 1867-1871, 1976.

Descriptors: *Waterborne diseases, Public health, Bilharzia, Dosage, Chemotherapy, Mollusicides, *Human parasites, Schistosoma haematobium, Schistosma, Oxamniquine, *Rhodesia, Southern Africa.

Oral oxamniquine at a total dose of 60 mg/kg (given in 4 equal doses morning and evening over 2 days, after food) is an efficient and apparently very safe drug for the treatment of Schistosoma mansoni infections. Lower doses, or shorter schedules of treatment, are less efficient. The drug has little or no effect on S. Haematobium infections. Side-effects are mild and infrequent. (So Afr Water Info Ctr)
W78-12408

POWER STATION EFFLUENT CONTROL AND THE REUSE OF ASH WATER FOR COOLING WATER TREATMENT,
W. N. Van Eeden.
Energy (Braamfontein), p 21-27, June 1977.

Descriptors: *Thermal powerplants, Closed system, *Cooling water, Ash, Process water reuse, Pollution abatement, Effluents, Blowdown, Hydraulic transportation, Cost reduction, *Thermal pollution, Escom, *South Africa.

Power Station effluents, e.g. concentrated cooling water blowdown, regeneration effluents from demineralisation plant and sewage effluents plus a large quantity of high pH water used in the hydraulic transportation of pulverised fuel ash had a serious river pollution potential. A method and circuit was devised utilizing the available lime in the ash water to clarify, dealkalize and soften the cooling water, on a by-pass system. By precipitating the limiting constituents in the cooling water, higher concentrations with reduced water consumption were made possible. The water circuit was completely closed with no effluent outlet to a water course. This resulted in a water saving but the saving in water treatment chemicals amounted to R60 000 per annum at this power station. (So Afr Water Info Ctr)
W78-12417

MODERN WATER RECLAMATION PLANT IN WINDHOEK,
For primary bibliographic entry see Field 5D.
W78-12428

WATER FOR THE FRIENDLY CITY.
Prospect, Vol 15, No 2, p 14-17, 1976.

Descriptors: *Water supply, Aluminium sulphate, Water treatment, Purification, Pipelines, Reservoirs, Decolourization, Port Elizabeth, Churchill dam, Kromme River, Loerie dam, Paul Sauer dam, Gamtoos river, Eastern Cape, *South Africa.

The two water purification works which supplies Port Elizabeth are described. Water from the various dams supplying the city has a brown colour emanating from the natural environment. Aluminium sulphate plays an important part in the removal of this colour. The article goes on to describe the benefits derived from receiving supplies of aluminium sulphate by containerised transport. (So Afr Water Info Ctr)
W78-12456

THICKENING OF BROWN WATER SLUDGES BY DISSOLVED-AIR (PRESSURE) FLOTATION,
Cape Town Univ. (South Africa).
For primary bibliographic entry see Field 5D.
W78-12492

SOME PHYSICAL AND ECONOMIC ASPECTS OF OPTIMIZATION OF THE DEGREE OF WASTE WATER AND WATER TREATMENT,
Technical Univ. of Warsaw (Poland). Inst. of Water Supply and Hydrotechnics.
For primary bibliographic entry see Field 5D.
W78-12547

WATER RESOURCES AND HEALTH PROBLEMS IN DEVELOPING COUNTRIES (IN FRENCH),
Paris-7 Univ. (France). Dept. of Parasitology.
A. Coumbara.
Acta Trop 34(3), p 229-248, 1977.

Descriptors: Human diseases, Infectious diseases, Transmission(Diseases), *Developing countries, *Public health.

The rapidly increasing use of water for agricultural and hydroelectric development in developing countries is causing serious (human) health problems. These can be divided into 2 categories; the (infectious) diseases whose transmission depends on water, and the changes in the life style of the population. The principal health problems are briefly reviewed and the principles to be followed in solving them, and the reasons of the success or failure of health programs are analyzed. Among the topics considered are development vs. health, the collaboration of health service personnel with the rest of the personnel participating in water development schemes, the necessity of ensuring a multidisciplinary approach to the solutions of these health problems, the necessity of integration of the public health component within the administrative and budgetary levels and the coordination of public health measures with the development of project from the planning phase through the completion and maintenance phases, the purely medical aspects of the health problems involved appeared as being of secondary importance. Common sense and the use of simple, cheap methods adapted to the local conditions, and applied focaly, provide better solutions than the sophisticated, more general and expnsive approaches. The time and budget accorded for surveys and research, usually excessive, should be limited. It is necessary to adhere to a disciplined use of water. Ambitions and utopian dreams and strategies of disease eradication should, in general, give way to more limited, but accessible objectives, whose attainment would lead to a decrease of the clinical and socioeconomic gravity of the health problems to a reasonable level.--Copyright 1978, Biological Abstracts, Inc.
W78-12625

AN EPIDEMIOLOGICAL SURVEY ON THE CLONOCHIASIS IN THE HAN RIVER SIDES (IN KOREA),
Hanyang Univ., Seoul (Republic of Korea). School of Medicine.
For primary bibliographic entry see Field 5C.
W78-12682

PORTABLE WATER DISTILLATION APPARATUS,
G. Weiss.
U.S. Patent No. 4,081,331, 5 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 968, No 4, p 1446, March 28, 1978.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, *Distillation, Condensation, Evaporation, Condensers, Evaporators.

A distillation apparatus has an evaporator for vaporizing liquid to be distilled, a vertical up-and-down flowing condenser connected with the evaporator for condensing vaporized liquid received from the evaporator, and a heater for applying heat to and vaporizing fluid in the evaporator. The condenser feeds liquid into the evaporator to maintain a constant level of liquid in the evaporator at the highest normal point of flow of liquid in the condenser. The vapor travels downward through the condenser becoming condensed at the bottom where a distilled water output is provided for discharge of the distillate. This apparatus is portable and capable of quick connection and disconnection to available water supplies. It is especially suitable for use where tap water quality is poor. (Sinha-OEIS)
W78-12776

ACTIVATED CARBON AND PREPARATION THEREOF,
Sumitomo Durez Co., Ltd., Tokyo (Japan). (Assignee).

T. Aoki, Y. Kako, T. Kikuga, and K. Hatano.
U.S. Patent No. 4,082,661, 6 p, 2 tab, 12 ref; Official Gazette of the United States Patent Office, Vol 969, No 1, p 269, April 4, 1978.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, Filtration, *Activated carbon, Separation techniques, Absorption, Resins, Pyrogens, Ceramics.

For filtration and removal of alien substances from distilled water used as medium for medical injection fluid, alcholic drinks, refreshing drinks and other liquids which do not permit the presence of so-called 'pyrogen' i.e., fever-generating substances, there is an urgent need for developing more effective filtration materials. The present invention is based on the discovery that excellent activated carbon filtration materials are obtained by impregnating inorganic porous bodies such as conventional ceramic filter tubes or plates and the like, with thermosetting phenolic resins then drying the curing the resins and further baking and carbonizing such resin products in an inert atmosphere. It was also discovered that the sorptive ability of these products was remarkably enhanced by synergism between the physical filtration effect of the tube or plate and the chemical sorption effect of the activated carbon on the surfaces, thereby providing activated carbon having possibilities of various shapes with improved absorptive power for the elimination of pyrogen. (Sinha-OEIS)
W78-12786

WATER CONDITIONING PROCESS,
Rohm and Haas Co., Philadelphia, PA. (Assignee).
R. Kunin.
U.S. Patent No. 4,083,782, 4 p, 2 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 969, No 2, p 636, April 11, 1978.

Descriptors: *Patents, *Water softening, *Demineralization, *Water treatment, Water quality control, Water purification, Ion exchange, Resins, Heavy metals, Regeneration.

Acid waters may be made alkaline, hard waters softened, and dissolved heavy metals substantially removed from any water supply by the simple treatment with one carboxylic ion exchange resin without requiring complicated tank systems or expensive instrumentation. The carboxylic resins which may be used are those in which the carboxylic acid group is provided by copolymerizing methacrylic and a suitable crosslinking monomer such as divinyl benzene. The resins are intended to be used in their alkali metal salt or ammonium salt form. A suitably sized resin bed may be established by any known method to suit the extent and nature of the operation involved. The water to be treated is passed through the resin bed. The resin when exhausted may be regenerated by either a two-step acid/alkali technique or by a one-step technique using a citric or fumaric acid solution or a poly or hexamethophosphate solution. Water obtained by this method is substantially free of hardness ion, dissolved heavy metal ions and has a corrected pH between 7 and 9.5, preferably between 8 and 8.5. (Sinha-OEIS)
W78-12800

5G. Water Quality Control

A GUIDE TO THE NEW YORK STATE ENVIRONMENTAL QUALITY REVIEW ACT,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 6E.
W78-12104

MANAGEMENT OF SWINE MANURE FOR THE RECOVERY OF PROTEIN AND BIOGAS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W78-12108

INTERACTION OF ROOT GROWTH AND REFUSE DECOMPOSITION IN A SANITARY LANDFILL,
Alabama Agricultural Experiment Station, Auburn.
V. D. Browning, and F. J. Molz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 717, Price codes: A03 in paper copy, A01 in microfiche. Alabama Water Resources Research Institute, Auburn, Bulletin 32, Auburn University, July 1978, 20 p, 5 fig, 1 tab. OWRT A-044-ALA(1).

Descriptors: *Root growth, *Sanitary landfill, *Leachates, Degradation(Decomposition), Vegetated lysimeters.

Two sets of lysimeter experiments involving shrubs or trees and forage crops were performed. The objective was to study the interaction of root growth and refuse decomposition in sanitary landfill materials. Slash pine grew very well; its roots penetrated all refuse layers within 10 months after planting. Thorny elaeagnus did not appear as healthy as pine during wet seasons. Forage crops grew well but tended to have shallow root systems as compared to the trees and shrubs. Roots grew into and through refuse if no soil was available but grew around it if soil channels were accessible. Homogeneous mixtures of soil and refuse did not promote extensive root growth relative to other treatments. A major effect of vegetation was to increase oxygen concentration in the soil-refuse mixtures. This promoted a greater than normal amount of aerobic decomposition. The soil-refuse mixtures in the vegetated lysimeters underwent several wetting and drying cycles each year, while the material in fallow lysimeters stayed at or near saturation. The net result of this altered water-oxygen balance was for the vegetated lysimeters to produce a decreased leachate volume but an increased leachate potency as measured by COD (Chemical Oxygen Demand), TKN (Total Kjeldahl Nitrogen), and TS (Total Solids). Dry weight measurements showed an increased rate of refuse decomposition in the vegetated lysimeters relative to the fallow controls.
W78-12110

ESTIMATING RUNOFF POLLUTION FROM LARGE URBAN AREAS--THE DELAWARE ESTUARY,
Rutgers - The State Univ., New Brunswick, NJ.
For primary bibliographic entry see Field 5B.
W78-12111

A COMPARATIVE ECOLOGICAL STUDY OF THE CALIFORNIA CRAYFISH, PACIFASTACUS ZENIUSCULUS (DANA), FROM TWO SUBALPINE LAKES,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 2H.
W78-12112

ECOLOGICAL STUDIES OF THE CALIFORNIA CRAYFISH, PACIFASTACUS LENIUSCULUS, WITH EMPHASIS ON THEIR GROWTH FROM RECYCLING WASTE PRODUCTS,
California Univ., Davis. Div. of Environmental Studies; and California Univ., Davis. Inst. of Ecology.
C. R. Goldman, J. C. Rundquist, and R. W. Flint.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 782, Price codes: A0 in paper copy, A01 in microfiche. Presented at Second International Crayfish Symposium, Baton Rouge, LA, 1974, p 481-487. 16 ref. (California Water Resources Center Project UCAL-WRC-W-475) OWRT A-056-CAL(3).

Descriptors: *Crayfish, Water reuse, *Temperature, Recycling.

This research has two main objectives. The first is an investigation of the ecological role of Pacifastacus leniusculus in its natural habitat such as Lake Tahoe, the Sacramento River, and the coast range streams and lakes. The second objective involves cooperative research around the world as regards intensive crayfish culture. This paper reviews previous work and present outlook for the two objectives. (Snyder-Calif, Davis)
W78-12113

THE CULTURE OF CRAYFISH FOR WASTE RECYCLING AND HUMAN CONSUMPTION,
California Univ., Davis. Dept. of Animal Science.; and California Univ., Davis. Div. of Environmental Studies.
G. A. E. Gall, and C. R. Goldman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 702, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, June 1978. 12 p, 9 ref. (California Water Resources Center Project UCAL-WRC-W-475). OWRT A-056-CAL(5).

Descriptors: *Crayfish, Water reuse, *Effluents, *Nitrates, *Phosphorus, *Recycling.

An experimental watercress-crayfish culture system was developed which received a nutrient-rich effluent from a trout hatchery. The watercress system effectively stripped nutrients from effluent water and provided acceptable growth of watercress. The watercress removed 98% of the nitrate-nitrogen and 92% of the total phosphorus reducing the level of these two nutrients to near the level observed in the hatchery inflow supply. However, there was a significant increase of particulate organic matter in the effluent from the watercress growing-beds. Feeding trials indicated that watercress combined with a protein supplement provides a satisfactory diet for crayfish in terms of both growth rate and mortality. A detailed analysis of the growth of young crayfish from hatching through the fifth molt demonstrated that early growth involves two phases. During the larval, maternal-dependent stage, growth is linear and proceeds at a rapid rate. However, growth during the juvenile stage is exponential in nature and relatively slow during early stages. The optimal temperature for growth appeared to be in the ranges of 17-22 deg C. A successful system of stripping eggs from the female and hatching them in a drip-type egg incubator was developed which yielded a 90% hatch and normal metamorphosis. (Snyder-Calif, Davis)
W78-12114

WATERCRESS-CRAYFISH POLYCULTURE AS AN ECONOMIC MEANS OF STRIPPING NUTRIENTS FROM ENRICHED WATERS,
California Univ., Davis. Div. of Environmental Studies.; and California Univ., Davis. Dept. of Animal Science.
J. Rundquist, G. Gall, and C. R. Goldman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 700, Price codes: A02 in paper copy, A01 in microfiche. Presented at Proc. 3rd International Symposium Freshwater Crayfish. Kuopio, Finland, Dec 1976. 12 p, 2 fig, 4 tab, 25 ref. (California Water Resources Center Project UCAL-WRC-W-475). OWRT A-056-CAL(2).

Descriptors: *Crayfish, *Nitrates, Water reuse, *Effluents, Nutrients, Fish diets.

An experimental watercress-crayfish polyculture system is described. The watercress bed receives nutrient-rich effluent from a connecting trout hatchery and effectively strips nitrates, ammonia, and phosphorus from the waters. The harvested watercress also provides a clean and easy food source for crayfish. Preliminary feeding trials indicate that the watercress combined with protein supplement provides a satisfactory crayfish diet in terms of both growth and mortality. The develop-

ment of watercress-crayfish polyculture is economically promising because of three valuable outputs -- cleaner water, watercress, and crayfish. (Snyder-Calif, Davis)
W78-12115

ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION,
Louisiana Tech Univ., Ruston. Dept. of Agricultural Engineering.
J. W. D. Robbins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 373, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/2-78-046, Feb 1978. 34 p, 10 tab, 34 ref.

Descriptors: *Environmental effects, *Nonpoint pollution sources, Water pollution, *Agricultural runoff, *Farm wastes, Unconfined animal production, Cattle wastes, Sheep wastes, Swine wastes, Pasture, Range.

Knowledge related to environmental effects of unconfined animal production is outlined and evaluated. Animal species include cattle, sheep, and hogs. All available data indicate that pollutant yields from pasture and rangeland operations are not directly related to the number of animals or amount of wastes involved. Rather, these nonpoint source problems are intimately related to hydrogeological and management factors and are best described as the results of the erosion/sediment phenomenon. Unconfined livestock production can cause changes in vegetative cover and soil physical properties that may result in increased rainfall runoff and pollutant transport to surface waters. The most common stream water quality result is elevated counts of indicator bacteria. Increased levels of inorganic and organic sediments with associated plant nutrients and oxygen demands may result from problem areas. These areas are usually only a small portion of the total production system and are readily identified by observation. Generally the pollutant levels from the remainder of the production site are not discernible from background levels. If other changes, such as those affecting groundwater quality, occur, they are of no environmental consequence. A major challenge remaining is to demonstrate cost-effective routes toward achievement of various levels of pollution control from unconfined animal production. (East Central)
W78-12130

EFFECT OF VEGETATION ON LANDFILL STABILIZATION,
Auburn Univ., AL. Dept. of Civil Engineering.
F. J. Molz, and V. D. Browning.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 888, Price codes: A02 in paper copy, A01 in microfiche. Ground Water, Vol. 15, No. 6, p 409-415, Nov-Dec 1977. 8 fig, 2 tab, 19 ref. OWRT A-051-ALA(1) and B-048-ALA(2).

Descriptors: *Landfills, *Vegetation effects, *Leachate, Decomposition(Degradation), Ground water pollution, Revegetation, Evapotranspiration, Lysimeters, Water pollution, Chemical oxygen demand, Waste disposal.

Six types of vegetation were established successfully on lysimeters containing sanitary landfill materials. The vegetation grew well with the roots penetrating several refuse layers within one year. Leachate analysis indicated that vegetation and evapotranspiration (ET) reduced leachate volume and increased the rate of refuse decomposition. This was accompanied by production of a more potent leachate and a substantial increase in cumulative chemical oxygen demand. Therefore, this study suggests more potential ground-water pollution in a shorter period of time when vegetation is planted on a landfill. The net effect of ET on the stabilization of any particular landfill will be the result of a complex interaction involving climate, vegetation, soil type cover material, landfill geometry, and other variables. This makes extrapolation of these results to a particular field situation rather difficult.
W78-12136

EVAPOTRANSPIRATION FROM WATER HYACINTH IN TEXAS RESERVOIRS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2D.
W78-12155

WATER RESOURCES AND THE LAND-WATER INTERFACE,
Illinois Univ. Urbana-Champaign. Dept. of Ecology, Ethology, and Evolution.
For primary bibliographic entry see Field 5B.
W78-12164

ADVANCEMENTS IN OIL SPILL TRAJECTORY MODELLING,
Dow Chemical Co., Freeport, TX. Process and Computer Engineering; and Texas A and M Univ., College Station.
For primary bibliographic entry see Field 5B.
W78-12173

MARINE POLLUTION IN KUWAIT,
Millersville State Coll., PA.
For primary bibliographic entry see Field 5B.
W78-12174

STRATIFIED WATER CIRCULATION FORECASTING FOR WATER QUALITY MANAGEMENT PLANNING IN THE COASTAL ZONE,
Raytheon Co., Portsmouth, RI. Environmental and Oceanographic Services Dept.
For primary bibliographic entry see Field 5B.
W78-12175

OIL SPILL IDENTIFICATION SYSTEM.
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5A.
W78-12181

MODELING OF TIDE AND WIND INDUCED FLOW IN SOUTH BISCAYNE BAY AND CARD SOUND,
Miami Univ., FL.
For primary bibliographic entry see Field 2L.
W78-12187

AN EXPERIMENTAL INVESTIGATION OF SOME COMBINED FLOW SEDIMENT TRANSPORT PHENOMENA,
North Carolina State Univ. at Raleigh. Center for Marine and Coastal Studies.
For primary bibliographic entry see Field 2L.
W78-12188

FLOW-THROUGH MICROCOSMS FOR SIMULATION OF MARINE ECOSYSTEMS: DEVELOPMENT AND INTERCOMPARISON OF OPEN COAST AND BAY FACILITIES,
Naval Undersea Center, Kailua, HI. Div. of Chemistry and Environmental Sciences.
R. S. Henderson, S. V. Smith, and E. C. Evans, III.
Available from National Technical Information Service, Springfield, VA 22161 as AD-A035 331, Price codes: A05 in paper copy, A01 in microfiche. Naval Undersea Center Technical Paper No. NUC-TP-519, October 1976. 87 p, 25 fig, 11 tab, 31 ref.

Descriptors: *Ecosystems, *Water chemistry, *Water quality, *Simulation analysis, Hawaii, Bays, Nutrients, Biota, Outer Continental Shelf.

A low-nutrient flow-through seawater facility was constructed on a seaward side of Mokapu Peninsula, Oahu, Hawaii. This facility complements a system of similar design existing in the nearby high-nutrient environs of Kaneohe Bay. The double-plumbing innovation introduced at the newer facility has been very successful in reducing antifouling maintenance. Twelve outdoor tanks, each having a capacity of 160 gallons and identical dimensions, are present at each site. Flow rates are adjustable grom 0.1 to 15.0 lpm. A calibration test was performed to determine interfacility differences in source water chemistry, organism recruitment, and growth of biota in the tanks. At both locales simple microcosms consisting of sorted coral rubble, sand, and varying numbers of herbivorous fish Acanthurus triostegus, were subjected to 6 months of flow-through at 10 lpm. The bay source water generated a diverse, near-climax community within 60 days. At the oceanic facility succession was much slower and community productivity was significantly lower than in the bay microcosms. The principal difference in source water macronutrients between the two facilities was the PO4 content, the bay values being about double those of the oceanic source. NH3 and NO3 contents were nearly the same, but showed large fluctuations which correlated with tide and surf conditions. (Sinha-OEIS)
W78-12189

EVALUATING AQUACULTURAL USE OF THERMAL EFFLUENTS: AN APPLICATION OF SYSTEM DYNAMICS TO ENVIRONMENTAL PROBLEM SOLVING,
Rhode Island Univ., Narragansett. Coll. of Business Administration.
D. W. Callaghan, S. S. Callaghan, and R. A. Comeford.
Environmental Management, Vol. 1, No. 3, p 227-234, 1977. 3 tab, 3 fig, 11 ref.

Descriptors: *Systems analysis, *System dynamics, *Aquiculture, *Thermal water, *Oysters, *Model studies, *Fisheries, Heated water, Thermal powerplants, Beneficial use, Computer programs, DYNAMO, Dynamic models, Flow rates, Water temperature, Nutrients, Economic feasibility.

System dynamics, a computer modelling approach to environmental problems, was used to evaluate application of coastal power plant thermal effluents in oyster aquaculture. Analysis showed that increased water temperature, coupled with other critical system variables such as supplemental nutrients and seawater flow, sufficiently stimulates oyster growth to yield a favorable economic return. The once-valuable U.S. oyster fishery has declined because of set failure, over-harvesting, poor shoreline management, pollution of coastal waters, excessive predation, and winter kills. Use of the heated power plant is possible only through secondary heating of seawater, since the effluent is contaminated by copper, toxic chemicals, and trace radioactivity. The proposed oyster finishing plant modelled in this study involves placement of oyster propagation units into pond containment structures, through which the seawater, indirectly heated by warm power plant effluent pumped through a heat exchanger, is fed. The containment is large enough to allow adequate circulation and supply of nutrients. A computerized model was developed to determine optimum values for system capacity, seawater flow rate, maximum above-ambient temperature increase and use or non-use of supplemental nutrients. The system dynamics technique involves developing a qualitative graphical representation of the feedback loops at work, expressing variable relationships in quantitative form, and combining resultant equations in a base routine. (Lynch-Wisconsin)
W78-12196

POLLUTION CONTROL IN A TWO-SECTOR DYNAMIC GENERAL EQUILIBRIUM MODEL,
Guelph Univ. (Ontario). Dept. of Economics.
B. A. Forester.
Journal of Environmental Economics and Management, Vol. 4, No. 4, p 305-312, December 1977. 2 fig, 9 ref.

Descriptors: *Economics, *Pollution abatement, *Model studies, *General equilibrium models, Commodities, Equilibrium, Dynamic models, Pollution taxes(Charges), Standards, Consumers, Transportation, Air pollution.

The theoretical generation of pollution is incorporated into a simple dynamic general equilibrium model, and competitive and optimal control solutions are analyzed. The economy is assumed to produce two homogeneous commodities with different polluting characteristics. When both commodities cause pollution it is necessary to alter the production-consumption mix but not to curtail the output in each, as suggested by partial equilibrium analysis. This type of model sheds light on consumer choices related to such commodities as soap vs detergents, public vs private transportation, and returnable vs nonreturnable bottles. The analysis suggests that in the example of air pollution in a large urban area due primarily to automotive exhaust, an unregulated transportation system would lead consumers to overuse private transportation and underuse public transportation, because relative prices do not reflect the pollution-intensive nature of private automobiles. Private transportation is, as a result, artificially cheap. With severe urban pollution, the optimal strategy is to reduce use of private cars to less than the desired long-run target value and then to allow use to rise as air becomes cleaner. In a decentralized system a tax can be levied on private automobile mileage that is not imposed on public transportation. In all examples, the tax revenue collected must be returned as a lump-sum subsidy to households so that they can purchase the desired levels of the two commodities. (Lynch-Wisconsin)
W78-12197

POLLUTION CONTROL IN A SIMPLIFIED GENERAL-EQUILIBRIUM MODEL WITH PRODUCTION EXTERNALITIES,
Kansas Univ., Lawrence. Dept. of Economics.
P. M. Comolli.
Journal of Environmental Quality and Management, Vol. 4, No. 4, p 289-304, 1977. 4 fig, 1 tab, 11 ref.

Descriptors: *Pollution abatement, *Externalities, *General equilibrium models, *Model studies, *Economics, *Pollution taxes(Charges), Dynamic models, Static models, Regulation, Equilibrium, Standards, Public policy, Waste disposal, Water pollution control.

The effectiveness and conditions for success of a uniform tax for keeping pollution down to a specified minimum acceptable standard is assessed using a positive two-sector model with stationary capital and labor. In particular, conditions are determined for effective pollution control when the controlling agent operates with limited or no information about marginal private costs and social damage. Pollution externalities of the producer-producer type are considered. Use of an Uzawa-type general equilibrium model enables evaluation of both direct and indirect (price-induced) effects of the pollution tax. By assumption, output from the polluting sector can be diverted to pollution abatement. The tax-asjustment scheme posited is a 'stock-type' mechanism in which authorities raise the tax when pollution exceeds the target level, and vice-versa. Adjustment of this tax would always achieve the desired target, at least locally, if the decrease in pollution from the industrial sector (resulting from the marginal increase in overall pollution) was larger than the corresponding loss in the environment's assimilative capacity. In cases of normal solid-waste disposal and continuously regenerated receiving bodies it is probable that the pollution tax would effectively control pollution. In other situations the stability condition is apt to fail and the target may not be realized; direct controls may then be required. (Lynch-Wisconsin)
W78-12198

A MODEL FOR SOLAR RADIATION CONVERSION TO ALGAE IN A SHALLOW POND,
Purdue Univ., Lafayette, IN. School of Mechanical Engineering.
For primary bibliographic entry see Field 3E.
W78-12270

A MATHEMATICAL MODEL OF REGULARITIES IN POPULATION DYNAMICS OF PLANKTONIC BACTERIA AND DIATOMS IN SEVASTOPOL BAY (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5B.
W78-12282

PERMISSIBLE CONTENT OF THE FLOCULLATION AGENT POLYOXYETHYLENE IN BODIES OF WATER (IN RUSSIAN),
Novosibirsk Sanitary Research Inst.
E. M. Trofimovich, E. A. Strusevich, P. A. Kolesnikov, and V. I. Kazanin.
Gig Sanit 7, p 23-25, 1976.

Descriptors: *Lethal limit, *Water quality standards, *Polyoxyethylene, Biolchemical oxygen demand, *Toxicity, *Flocullation agents, Potable water, Water treatment.

The effect of polyoxygethylene with MW 2,3 and 5 million on organoleptic properties, BOC 20 (biological oxygen consumption) and foaming of water was studied. Its acute toxicity was determined by intragastric and i,p. administration to mice and rats. The threshold dose of polyoxyethylene of a MW of 5 million was most toxic in case of its chronic entry into the body in drinking water. Maximum permissible concentration of polyoxyethylene with MW 2,3 and 5 million in water suggested that it be set at levels of 0.125,0.1 and 0.02 mg/1, respectively.--Copyright 1978, Biological Abstracts, Inc.
W78-12292

MICROBIOLOGICAL STATE OF THE KIEV RESERVOIR IN THE SIXTH-SEVENTH YEARS OF ITS EXISTENCE (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5B.
W78-12297

MAIN ASPECTS OF THE ANTHROPOGENIC TRANSFORMATION OF LAKE ECOSYSTEM OF THE NORTHWESTERN EUROPEAN USSR (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
For primary bibliographic entry see Field 2H.
W78-12298

MACROINVERTEBRATE AND WATER QUALITY-QUANTITY SURVEY OF OTTER CREEK, PIUTE COUNTY, UTAH,
Brigham Young Univ., Provo, UT. Center for Health and Envrionmental Studies.
For primary bibliographic entry see Field 4D.
W78-12303

DECISIONS FOR DELAWARE: SEA GRANT LOOKS AT BEACH MANAGEMENT,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-12312

THE ROLE OF CYANIDE AS AN ECOLOGICAL STRESSING FACTOR TO FISH,
Concordia Univ., Montreal (Quebec). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12385

AN ASSESSMENT OF APPLICATION FACTORS IN AQUATIC TOXICOLOGY,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-12386

CLOSING REMARKS--AN OLD FROG CROAKS AN APPEAL FOR LOGIC,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
P. Doudoroff.
In: Recent Advances in Fish Toxicology, Environmental Protection Agency, Ecological Research Series, EPA 600/3-77-085, July 1977, p 191-202. 13 ref.

Descriptors: *Water quality standards, *Toxicity, *Bioassays, On-site investigations, Reviews, Methodology, Dissolved oxygen, Nitrogen compounds, Administrative agencies, Administrative decisions, *Environmental Protection Agency, *EPA, *Red Book, Quality criteria for Water.

The U.S. Environmental Protection Agency Publication Quality Criteria for Water, EPA 440/9-76-023, is criticized for its policy, especially in regard to dissolved oxygen and cyanides, for ignoring the definitive scientific work available and utilizing discarded, rejected and erroneous data and observations in setting up the water quality standards. The standards are established by the EPA suggests that the authors of these standards are negligent, incompetent and dishonest and the ill-considered pronouncements of the EPA will retard advances in water pollution control for many years. (See also W78-12376) (EIS-Katz)
W78-12387

FRESHWATER MUSSELS UNIONIDAE, WHAT IS THEIR DISTRIBUTION IN SOUTH AFRICAN INLAND WATERS TODAY,
Albany Museum, Grahamstown (South Africa).
For primary bibliographic entry see Field 6G.
W78-12394

OBSERVATIONS ON THE DIAGNOSIS AND TREATMENT OF SCHISTOSOMIASIS IN AN ENDEMIC AREA,
Rhodesia Univ., Salisbury.
J. M. Goldsmid, and S. Rogers.
South African Medical Journal (Cape Town), Vol. 51, No. 2, p 29-33. 1977. 20 ref, 2 fig, 3 tab.

Descriptors: *Waterborne diseases, Human parasites, Public health, Histological examinations, Eggs, *Epidemiology, Bilharzia, *Schistosomiasis, Schistosoma Haematobium, Schistosoma mansoni, Cercariae, Rhodesia, Southern Africa.

Attempts are made to evaluate the criteria used in the diagnosis of schistosomiasis in an endemic bilharzial area. The discussion deals with the possible value of criteria such as egg recovery, rectal biopsy specimens, eosinophilia, hepatomegaly, and serological and skin tests. A rational approach to the treatment of patients with schistosomiasis is proposed and features such as probability of re-infection are taken into account. (So Afr Water Info Ctr)
W78-12395

SOUTH AFRICAN MARINE POLLUTION SURVEY REPORT 1974-1975,
Council for Scientific and Industrial Research, Johannesburg (South Africa).
For primary bibliographic entry see Field 5B.

W78-12400

CLEAN ON STREAM,
W. H. Rapson.
Saccap Action News, Vol. 3, No. 1, p 23-24, 1977. 1 illustr.

Descriptors: *Paper industry, *Water pollution, *Pulp wastes, Process design, Economic justification, Pollution prevention technology, Plant modifications, Effluent quality standards, Closed system, Great Lakes paper company, Canada.

About one fifth of the world's water pollution can be laid to the door of the pulp and paper industry. Few experts will put their names to a precise figure but that seems to be a fair guess. As demand for paper expands with worldwide economic development, so, inexorably, does the attendant pollution. An economic, non-polluting technology for pulp and paper has been a long time coming but has finally arrived with the Great Lakes Paper Company's new Thunder Bay (Ontario, Canada) plant now entering production. This article by one of the two inventors of the key innovation gives a technical insight into the kind of modifications needed to transform conventional plant design to meet modern environmental standards. (So Afr Water Info Ctr)
W78-12403

SCHISTOSOMIASIS AND CARCINOMA OF THE BLADDER IN ZAMBIA,
Zambia Univ., Lusaka.
S. B. Bhagwandeen.
South African Medical Journal (Cape Town) Vol. 50, No. 41, p 1616-1620, 1976. 28 ref, 3 tab, 4 fig.

Descriptors: *Human parasites, *Waterborne diseases, Public health, *Carcinoma, Bladder, Schistosomiasis, Bilharzia, Schistosoma mansoni, Schistosoma haematobium, *Zambia, Southern Africa.

Carcinoma of the bladder is the thrid most important maligancy seen in Zambia, accounting for nearly 9% of all malignancies seen in the Department of Pathology at the University of Zambia. A review of 217 cases of carcinoma of the bladder seen in the department over a 5 year period revealed a preponderance of well-differentiated squamous cell carcinoma (75%). Of the 217 cases, 65% had concomitant schistosomiasis. These tumours tended to occur in a younger age group than that reported from England and North America. The pattern of pathology conforms with that reported from other parts of Africa with hyperendemic and endemic schistosomiasis. The aetiologica role of schistosomiasis in bladder cancer is critically examined. (So Afr Water Info Ctr)
W78-12406

PESTICIDES AND THE SOUTH AFRICAN POPULATION,
Department of Agricultural Technical Services, Pretoria (South Africa).
I. H. Wiese.
South African Medical Journal (Cape Town), Vol. 50, No. 44, p 1801-1805, 1976. 15 ref, 3 tab.

Descriptors: *Pesticides, *Legislation, *Public health, Hazardous wastes, Accumulation, Insecticides, Pesticide residues, Toxic wastes, Environmental impact, Chlorinated hydrocarbons, Organophosphorus pesticides, *DDT, *BHC, *Dieldrin, *South Africa.

Legislation which has a bearing on pesticides, and its current implementation by the State departments of Agricultural Technical Services and Health, are discussed. Organophosphate compounds account for about 80% of all deaths from pesticides and for about 60% of nonfatal cases of intoxication. In South Africa levels of lipophilic compounds in human adipose tissue are generally well under the world average and are demonstrating a progressive downward trend. (So Aft Water Info Ctr)
W78-12407

SUMMARY OF FRESHWATER POLLUTION LEGISLATION IN SOUTH AFRICA,
Department of Planning and the Environment, Pretoria (South Africa).
A. Darracott.
Environment RSA (Pretoria), Vol. 2, No. 1, p 4-5, 1975.

Descriptors: Water supply sources, Watershed protection, Water reuse, *Pollution survey, Water quality standards, Public health, Saitary criteria, Water quality control, *Legislation, Sewage treatment, Sewage disposa, Drainage systems, Potable water, *South Africa.

A summary of current (1975) pollution control legislation concerning water in the Republic of South Africa. Areas of responsibility, penalties, relevant laws and body of jurisdiction are tabulated. (So Afr Water Info Ctr)
W78-12412

THE TALE OF A LAKE,
Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
For primary bibliographic entry see Field 2H.
W78-12413

SIMPLIFICATION OF WASTE WATER PROBLEMS THE FABRIC LINED PURIFICATION PLANT.
For primary bibliographic entry see Field 5D.
W78-12415

MYRIOPHYLLUM, A POWERFUL THREAT TO OUR WATER SUPPLIES,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
A. Jacot Guillarmod.
Environment RSA, Vol. 4, No. 1, p 3-5, 1977.

Descriptors: *Aquatic weeds, Fish ponds, Herbicides, Water plants, Dams, Reservoirs, Rivers, Canals, Marinas, Saline water, Estuaries, Water supply, Limnology, *Aquatic weed control, Myriophyllum aquaticum, Myriophyllum spicatum, Parrot feather, *Water milfoil, South Africa.

The threat is discussed that the aquatic weed Myriophyllum aquaticum (water milfoil, parrot's feather, waterduisendblaar) poses to South African rivers, dams and lakes. The plant, originally form South America, was introduced into South Africa more than fifty years ago as an attractive fish pond plant, and has spread throughout Southern Africa from the Cape of the borders of Zambia. The plant is rooted on the banks of a water body and forms a dense and deceptively stable mat of tangled shoots above water level. As the plant grows it lessens the water flow and silt is deposited, building up a shelf on which the plant can extend itself further out. Each small portion of the plant, containing a node, is capable of growing, and in this way is spread by small portions clinging to motorboat propellor shafts etc. All species of Myriophyllum have been declared noxious weeds, which is most unfortunate as Myriophyllum spicatum, the indigenous species, is a beneficial plant which will probably suffer more in eradication attempts than Myriophyllum aquaticum which cannot effectively be eradicated by chemical or mechanical means. A comprehensive advertising campaign is suggested, so that the public may become aware of how dangerous a water weed this plant is. (So Afr Water Info Ctr)
W78-12427

NOT ONE DROP OF EFFLUENT - HYDROCHLORIC ACID RECOVERY FROM SPENT PICKLE LIQUOR.
Chemsa, Vol. 3, No. 2, p 20-22, 1977.

Descriptors: *Chemicals recovery, *Hydrochloric acid, Pickle liquor, Spent liquors, *Industrial wastes, Regeneration, Zinc chloride, Metals separation, Roasting, Pollution abatement, Water pollution, *South Africa.

The rules and regulations regarding water pollution in the Vaal river catchment area are just about the strictest in the world, which is understandable, as the Vaal river is the major source of water for developments situated in its own catchment area. Faced with trouble from the Water Affairs Department, prominent galvanisers from the reef approached Woodhall Duckham for advice on a pollution - conscious method of disposing of their spent pickling acid effluent. As the cost of installing recovery plants at individual industries were prohibitive a consortium of companies, each buying shares in one central plant, was decided upon for financial reasons. The Heriotdale plant was erected, which regenerates Hydrochlorid acid, which is sold back to the individual galvanisers. There is not a drop of effluent emanating from the Heriotdale plant and as much as 70% of the total acid requirements are regenerated whilst the fervous oxide which is reclaimed is sold as pigment to the paint, cement and roof-tile industry. (So Afr Water Info Ctr)
W78-12432

IS THE WATER HYACINTH A CURSE OR BLESSING.,
F. Schafer.
Farmer's Weekly, March 2, p 19-24, 1977.

Descriptors: *Water hyacinth, *Aquatic weed control, Nutrient removal, Sewage treatment, Plant growth, Growth rate, Eutrophication, Heavy metals, Animal feeds, Gas production, Water pollution, Eichhornia, *South Africa.

Not withstanding the fact that Government and private enterprise have spent millions on trying to control or destroy the prolific water hyacinth, which plagues some of the country's most popular recreational dams and rivers, the hyacinth still abounds and at present there seems to be no stopping its relentless advance. The author however, points out that researchers in the USA have established that man fails to recognise fully the water hyacinth's potential value in pollution control, and as a source of energy, food and livestock feed and fertilizer. Although South African scientists concede the possible uses they feel that these would not be economically viable in this country and state that even if utilisation of water hyacinths were an economic proposition, mankind would still have to overcome what was probably the biggest stumbling block of all at present; an efficient method of harvesting the plants. (So Afr Water Info Ctr)
W78-12433

THE NECESSITY OF ENVIRONMENTAL PROTECTION,
Johannesburg City Council (South Africa).
For primary bibliographic entry see Field 6G.
W78-12435

ENVIRONMENTAL POLLUTION CONTROL ON MINES,
J. T. Van Zyl.
Volksgesondheid, Johannesburg, Vol. 76, No. 3, p 63-76, 1976.

Descriptors: *Environmental pollution, *Pollution abatement, *Mines, Air pollution, Dust, Water pollution, Water laws, *Mine drainage, *South Africa.

One of the problems facing the mining industry is environmental pollution. For every ton of ore mined there is extra waste to be disposed of. The author considers the problems of air, noise, water and visual pollution and describes how the Witwatersrand mining industry takes pride in the efforts it has made to provide the citizans of the areas in which it operates with acceptable environmental conditions. (So Afr Water Info Ctr)
W78-12439

OIL IN THE MARINE ENVIRONMENT,
Department of Planning and the Environment, Cape Town (South Africa).
A. Darracott.
Environment Republic of South Africa, Pretoria, Vol 4, No 3, p 2-4, 1977. 30 refs.

Descriptors: Marine pollution, *Oil spills, *Toxicity, Food chains, Shellfish, Marine animals, Marine environment, Ecology, Accumulation, Aromatic hydrocarbons, Lobsters, Cape coast, Natal coast, False Bay, *South Africa.

Discussion is presented of the effects and accumulation of oil in the marine environment with special reference to South Africa, and among other things touches on the effects of marine life, the accumulation of hydrocarbons, some of which are carcinogenic, in marine life, the effect on man and accumulation on man and the effects and accumulation of oil pollution in South Africa.
W78-12447

JOHANNESBURG ON JUKSKEI.
Saccap Action News, Vol 2, No 2, p 18, 19, 36, 1977.

Descriptors: *River pollution, *Industrial wastewater, Municipal wastewater, Oil pollution, Litter, River banks, Legislation, Conservation, Solid wastes, Landfill, Leaching, Recreation, Environmental pollution, Water quality, Westdene dam, *Johannesburg, *Jukskei river, Hartebeespoort dam, *South Africa.

Efforts are described of Mrs Wendy Bodman, a Sandringham housewife, who has been appointed Transvaal liaison officer for the South African Council of conservation and Anti-Pollution, to mobilise forces to clear the Jukskei River of pollution. She smiled her way through the corridors of power in seven municipalities and today has staunch friends in every municipality bordering Johannesburg. Thanks to her efforts, large portions of the Jukskei and its tributaries flow free and clear today. (So Afr Water Info Ctr)
W78-12454

WATER FOR THE FRIENDLY CITY.
For primary bibliographic entry see Field 5F.
W78-12456

DOLPHINS DELIGHT AT THE OCEANARIUM,
S. C. Rutherford.
Prospect, Vol 15, No 2, p 11, 1976.

Descriptors: *Dolphins, Chlorine, *Filtration, Seawater, Health hazards, Marine animals, Aquaria, Flocculation, Suspended solids, pH effect, Marine bacteria, Oceanarium, Aluminium sulphate, Port Elizabeth, *South Africa.

The water treatment and filtration system used at the Port Elizabeth oceanarium are described. Water in a confined area produces types of bacteria not normally encountered by dolphins living under natural conditions. Thus for dolphins in captivity the control of bacteria is essential. Aluminium sulphate and chlorine is used to produce maximum clarity, algae control and a near bacteria-free environment. (So Afr Water Info Ctr)
W78-12457

ENVIRONMENTAL CONTROL IN THE MINING INDUSTRY,
G. H. Grange.
Journal of the South African Institute of Mining and Metallurgy, Johannesburg, Vol 78, No 2, p 19-23, 1977. 3 refs.

Descriptors: *Mines, Legislation, Pollution abatement, Air pollution, *Water quality control, Environmental pollution, *Mine wastes, Dumping, Soil conservation, *South Africa.

Details are given of three legal controls for the pollution of the air, the water, and the land, together with brief histories of the developments leading up to these controls. Attention is drawn to the fact that legal action may be instituted against a mine under common or other laws where pollution causes proveable damage or loss. It is suggested that an international conference should be held to define the philosophies and principles on which to base not only the necessary legislation for environment control but also the machinery by which the controls can be administered. (So Afr Water Info Ctr)
W78-12459

SOME ASPECTS OF ENERGY AND THE ENVIRONMENT IN THE STEEL INDUSTRY,
J. J. Heynike.
Journal of the South African Institute of Mining and Metallurgy, Johannesburg, Vol 78, No 2, p 24-33, 1977. 5 ref, 14 fig, 8 tab.

Descriptors: *Iron and Steel industry, *Pollution abatement, *Energy consumption, *Air pollution, Environmental pollution, Process improvements, Energy conservation, Metal processing wastes, Coke plant wastes, Furnaces, Pollutants removal, *South Africa.

The relationship between population growth and steel consumption since the beginning of the twentieth century is indicated, reference being made to the increasing capacity of production units and the resultant increased pollution in the same area. The need for the control of fugitive emissions with its associated high cost is pointed out. There is a direct relationship between energy usage and reduced pollution. Several practical examples of air-pollution control systems are described as applicable to the main metallurgical steel proceses of today. In conclusion, reference is made to the fact that, with the improvements attained in reducing pollution, the public will not tolerate a decline in the standards already attained. Environmental control and better energy utilization will continue to be important aspects of steel-plant design and operation. (So Afr Water Info Ctr)
W78-12460

HYDROCHEMICAL CHARACTERISTICS OF THE GORYN RIVER AND SOME OF ITS TRIBUTARIES (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5B.
W78-12462

DIMETHOATE APPLIED BY MICROJET AND DRIP IRRIGATION FOR CONTROL OF CITRUS PSYLLA, TRIOZA ERYTREAE TRIOZA ERYTREAE, THE VECTOR OF GREENING DISEASE,
For primary bibliographic entry see Field 3F.
W78-12473

FRENCH ACHIEVEMENTS IN THE FIGHT AGAINST WATER POLLUTION IN THE PULP AND PAPER INDUSTRY.
Energy, Braamfontein, Vol 3, No 6, p 21-25, 1977. 4 tab, 2 fig.

Descriptors: *Paper industry, *Water quality control, *Pollution abatement, *Pulp wastes, Effluents quality standard, Kraft mill wastes, Optimization, Process improvements, Industrial wastewater treatment, Bleaching, Waste recovery, Decolourization, Ultrafiltration, Biological treatment, Activated sludge, Aeration, Lagooning.

The pollution generated by the paper industry represents, in the case of France, 20% of total industrial water pollution. However the low toxic content of these effluents, whose polluting effect is measured principally by their BOD, COD, and colour contents, should be stressed. This pollution is not equally divided between the two branches of paper manufacture; it is estimated that the preparation of pulps alone is responsible for 90% of total papermaking pollution, the manufacture of paper only being accountable for the other 10%. The article therefore, concentrates on the problems of pollution relating to pulp manufacture, and goes on to discuss methods of compating pollution, improvements of present installations, changing the cooking process, development of new techniques and treatment of effluents. (So Afr Water Info Ctr)
W78-12484

HYACINTH LAGOONS- LOW-COST SEWAGE TREATMENT,
For primary bibliographic entry see Field 5D.
W78-12495

GOING UNDERGROUND SAVES ON COSTS,
For primary bibliographic entry see Field 8D.
W78-12497

AERIAL SURVEILLANCE TO MONITOR WATER QUALITY IN CATFISH PONDS,
Mississippi State Univ., Mississippi State. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 5A.
W78-12526

CHOICE BETWEEN RIVER QUALITY MODELS OF DIFFERENT DEGREES OF COMPLEXITY,
Nuclear Research Center, Karlsruhe (West Germany). Div. of Applied Systems Analysis.
For primary bibliographic entry see Field 5B.
W78-12533

ON THE OPTIMIZATION TASK FOR WATER QUALITY MANAGEMENT,
Institute of Meteorology and Water Management, Wroclaw (Poland).
B. Deniszczyk, and R. Krasnodebski.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, Convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS-AISH Publication No. 125, p 245-251, 1978. 1 fig, 2 tab, 12 ref.

Descriptors: *Water quality control, *Management, *Optimization, *River systems, *Networks, *Cost minimization, Constraints, Treatment facilities, Size, Economic efficiency, Mathematical models, Systems analysis, Regions, Water pollution.

Assumptions, definitions, and notions needed for the development of an optimized river system model are formulated, and the general case of a river network is considered. The model presented herein can be applied for water quality operational control, for water management, and for investment projects aimed at water quality protection. The model can be developed, at least theoretically, for any number of installations (treatment plants, reservoirs, etc.), the costs of which are to be minimized. Examples of questions which can be

answered through the model are: (1) what sizes and types of treatments should be planned to maintain desired water quality and minimize total costs; and (2) what water discharge rates from existing reservoirs should be applied, in order to fulfill the same two objectives. Dealt with are models containing only one quality parameter. It is shown how the constraint region for controllable variables (e.g., purification rates of sewage) is built. A theorem is formulated showing in what cases the optimization task can be significantly simplified. The model development is illustrated by an example. (Bell-Cornell)
W78-12534

SYSTEM DEVELOPMENT OF WATER RESOURCES AND WATER QUALITY CONTROL,
National Water Authority, Budapest (Hungary).
L. David.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, Convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS-AISH Publication No 125, p 262-268, 1978. 2 fig, 5 ref, 1 append.

Descriptors: *Water resources development, *Water quality control, *River basin development, Long-term planning, Hydrology, Optimum development plans, Mathematical models, Equations, Systems analysis, Water demand, Estimating, Water activities, Socio-economic conditions, Environmental requirements.

The purpose of this paper is to analyze the interconnection between water resources development and water quality control during river basin development (RBD) and to prepare a unified system model of the development of these basic activities. The basis of this analysis is the concept of unified development and the systems approach to the long-term river basin development process. The actual tasks of water quality control and water resources development in a river basin depend on the current stage and on the socio-economic, environmental and technical conditions of the development process in the basin. It is concluded that on a lower level of RBD, the increase of usable water resources and the water quality control (water purification, sewage treatment, etc.) could be developed independently. However, on a higher level of development, when the storage reservoirs, the water transfers, water users, and effluent dischargers have become numerous and their effects on each other and the region have a greater impact, the increase of usable water resources and the activities of water quality control could only be developed and managed in a unified system. Moreover, in a basin-wide, unified approach, activities can replace each other and can provide alternative development policies. (Bell-Cornell)
W78-12536

A SIMPLE MATHEMATICAL MODEL OF QUANTITATIVE AND QUALITATIVE PROCESSES OCCURRING IN THE STREAM CHANNEL FOR WATER DISTRIBUTION CONTROL,
Institute of Meteorology and Water Management, Krakow, Poland. Krakow Div.
A. Adamczyk, R. Konieczny, H. Slota, and J. Grela.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, Convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS-AISH Publication No 125, p 279-287, 1978. 4 fig, 1 tab, 8 ref.

Descriptors: *Simulation analysis, *Computer models, *Water quality control, *Water demand, *Streams, *Water distribution(Applied), *Vistula River(Poland), Channels, Reservoirs, Measurement, Gaging stations, Pollutants, Optimization, Biochemical oxygen demand, Dissolved oxygen, Operation research, Equations, Regression curve.

In order to fully utilize the potential water resources of the Upper Vistula River basin, it was necessary to derive optimal control principles for the existing multireservoir system. Simultaneously, a problem emerged regarding the influence of the planned water distribution rules on the quantity and quality characteristics of this river downstream of the mouth of the Sola River; it became essential to establish operating rules which would guarantee an optimal mix between water demands and water quality control. This article discusses a simulation model of qualitative and quantitative processes occurring in the Vistula River between Pustynia and Niepolomice stations. The model allows for studying changes in the quality and quantity characteristics of the river at given points in space and time for different time intervals. The adapted principles regarding the structure of river systems, model parameters, output and input values, description methods as well as methods of flow transformation processes and pollutant concentration modeling are presented. (Bell-Cornell)
W78-12538

WATER RESOURCES MANAGEMENT USING INTEGER PROGRAMMING MODELS,
Utah State Univ., Logan. Coll. of Engineering.
W. J. Grenney, and B. Finney.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, Convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS-AISH Publication No. 125, p 299-311, 1978. 3 fig, 5 tab, 7 ref.

Descriptors: *Water resources, *Management, *Water quality, *River basins, *Linear programming, *Simulation analysis, *Integer programming, *Cost minimization, Optimization, Waste water treatment, Standards, Streams, Pollutants, Constraints, Computer models, Equations, Algorithms, Mathematical models, Systems analysis, Prediction, Jordan River(Utah), Sensitivity analysis.

Two key areas of concern in water quality management for a river basin are: (1) deriving the least-cost combination for treatment of point and diffuse pollution sources that will satisfy water quality standards for various beneficial water uses; and (2) predicting the stream quality at various control points given the treatment combinations and pollutant discharges from activities within a river basin. The first problem is solved using a mixed integer linear programming algorithm subject to stream quality constraints that depend on the flow conditions and stream characteristics. The second problem is approached through the use of a simulation model to predict stream qualities, given the treatments and residual loadings as solved by the optimization model. This article describes the linking of the two models in order to capitalize on the unique advantage of each in managing river basin water quality. Considered is the application of the modeling approach to two problems: a sensitivity analysis and the Jordan River in Utah. (Bell-Cornell)
W78-12540

WATER QUALITY MODELLING AS A TOOL FOR DECISION MAKING IN HUNGARY,
Research Inst. for Water Resources Development, Budapest (Hungary).
B. Hock.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, Convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS-AISH Publication No. 125, p 312-321, 1978. 1 fig, 9 tab, 5 ref.

Descriptors: *Water quality, *Decision making, *Management, *Long-term planning, *Mathematical models, *Cost minimization, Annual, Sewage, Waste water treatment, Hydrologic aspects, Standards, Constraints, Equations, Systems analysis, Linear programming series, Optimization, River Sajo(Hungary).

The objective is to develop a water quality management programme as a tool for decision making in the Sajo catchment area, Hungary. The basic concept of the water quality management model is to optimize the net annual sewage and waste water treatment costs, considering the river's water quality conditions--the decomposition process. Based on some above principle, a complex model is developed that accounts for the hydrological conditions of the Sajo, sets river water quality standards, relates a system of alternative sewage and waste water treatment technologies to the most important point pollution sources, and selects an optimum solution by minimizing the net annual costs. The optimum solution is selected through the solution of linear programming series. The model is of long-term character, i.e., the sewage and waste water discharge data predicted for 1985 will be considered, and also the deadline for the completion of the construction works (management strategies) is set within the above period. The implementation of this programme will result in achieving water quality control -- along the total Hungarian length of the River Sajo, the latter being one of the most polluted water courses in the country -- at least as good as that defined by COMECON water quality standards class II, even in the case of low flow conditions; also it will provide a contribution to the improvement of the water quality of the Tisza River reach downstream from the mouth of the Sajo. (Bell-Cornell)
W78-12541

OPTIMIZATION OF LONG-TERM SEQUENTIAL PROGRAMMES OF WATER QUALITY CONTROL,
Technical Univ. of Budapest (Hungary). Inst. for Water Management and Hydraulic Construction.
I. Ijjas, and J Kindler.
In: Modelling the Water Quality of the Hydrological Cycle. Proceedings of the Baden Symposium, September 1978, Convened jointly by IIASA (Laxenburg, Austria) and IAHS (United Kingdom). IAHS AISH Publication No. 125, p 335-342, 1978. 15 ref.

Descriptors: *Water quality control, *River systems, *Construction, *Long-term planning, *Integer programming, *Cost minimization, Optimization, Waste treatment, Treatment facilities, Reservoir storage, Inter-basin transfer, Low flow augmentation, Design flow, Constraints, Investment, Decision making, Equations, Mathematical models, Systems analysis, *Waste load.

Achieving water quality levels compatible with the needs of man is of crucial importance. The correct design of a water quality management system requires that not only the scale of water quality control investments be considered, but also the order of their construction. Considered herein is a complex river system where water quality can be controlled by construction of waste treatment plants, storage reservoirs, and interbasin transfer facilities for low flow augmentation. It is assumed that alternative scenarios of future waste loads are given by the authorities concerned with regional and economic planning in the area. The future waste load levels and design flows are indicated for discrete time periods (e.g., every five years) over the entire time horizon subject to analysis. Depending on the water quality objectives related to each of these time periods, the waste discharges should be controlled so as to minimize the overall cost of the sequentially-implemented control measures. The problem is solved by application of zero-one integer programming. The self-purification processes occurring in the river system are

taken into account by the so-called 'pollution transition matrix'. (Bell-Cornell)
W78-12543

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME I: SUBSYSTEM DESCRIPTION DEFINITION OF SYSTEM REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 860, Price codes: A08 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., 15 June 1976. 153 p, 34 fig, 2 append.

Descriptors: *Computer models, *Water quality, *Legislation, *Information systems, *Safe drinking water, Data management, Regulation, Computer programs, Timing, Water pollution, Standards, Inventory, Public systems, Compliance, Enforcement, Systems analysis.

The Model State Information System (MSIS) is a computer-based information system for use by individual States and/or EPA Regions to perform the minimum data management functions mandated by the Safe Drinking Water Act of 1974 (PI 93-523). Three major documents were produced by American Management Systems, Inc., for EPA, outlining the basic concepts of an informational data management system to meet the water quality monitoring and reporting requirements of the Act; these are dated June 15, 1976. This report presents the definition of the inputs, outputs, files, processing steps, and timing requirements of the third of these documents: Model State Information System for Safe Drinking Water Program. Part of a feasibility study, this report defines the elements of the proposed MSIS at the level of detail required to prepare reasonable estimates of resource requirements and costs of development and operation, either as a stand-alone system to be run on each state's facility, or as a centralized system to be run at EPA using STORET. Considered herein are the eight subsystems of MSIS: (1) public water supply inventory; (2) water quality compliance; (3) regulations; (4) Federal reporting; (5) variances and exemptions; (6) enforcement actions; (7) sanitary survey; and (8) operator and mailing. The first four subsystems comprise the basic package, required if any portion of the MSIS is to be used. States may select the base package and one or more optional sub-sustems, depending on their volume of data and individual needs. (See also W78-12549 and W78-12550) (Bell-Cornell)
W78-12548

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME II: EXHIBITS, DEFINITION OF SYSTEMS REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 861, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., 15 June 1976. Available from National Technical Information Service, Springfield, VA., PB No 258 861. 96 p.

Descriptors: *Computer programs, *Water quality, *Information systems, *Safe drinking water, *Data management, Computer models, Systems analysis, Monitoring, Legislation.

The Model State Information System (MSIS) is a computer-based information system for use by individual states and/or EPA regions to perform the minimum data management functions mandated by the Safe Drinking Water Act of 1974 (PL 93-523). This report is concerned with the third of three major documents produced by American Management Systems, Inc., for EPA, outlining the basic concepts of an information data management system to meet the water quality monitoring and reporting requirements of the Act. Exhibited are input forms, records description, reports layout and explanation, and code tables for 'Model State Information System for the Safe Drinking Water Program,' dated 15 June 1976. (See also W78-12548 and W78-12550) (Bell-Cornell)
W78-12549

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME III: DATA ELEMENT DICTIONARY DEFINITION OF SYSTEM REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 862, Price codes: A10 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Wash D.C., 15 June 1976. 206 p.

Descriptors: *Computer programs, *Water quality, *Monitoring, *Information systems, *Reporting, Computer models, Legislation, *Safe drinking water, *Programs, Regulation, Data management, Water supply, Enforcement, Compliance, Timing, Water pollution, Standards, Inventory, Public systems, Systems analysis.

The Model State Information System (MSIS) is a computer-based information system for use by individual States and/or EPA Regions to perform the minimum data management functions mandated by the Safe Drinking Water Act of 1974 (PL 93-523). This report presents the data element dictionary of system requirements for the third of three documents produced by American Management Systems, Inc., for EPA, outlining the basic concepts of an informational data management system to meet the water quality monitoring and reporting requirements of the Act; the third document is called, 'Model State Information System for the Safe Drinking Water Program,' dated June 15, 1976. The MSIS consists of eight subsystems, includng public water supply inventory, regulations, variances and exemptions, and sanitary survey. Document 1 is a feasibility study of the development and implementation of an MSIS for EPA's Safe Drinking Water Program, and document 2 is an introduction to the MSIS; both are also dated 15 June 1976. (See also W78-12548 and W78-12549) (Bell-Cornell)
W78-12550

OUTER CONTINENTAL SHELF OIL AND GAS INFORMATION PROGRAM.
Geological Survey, Washington, DC.
For primary bibliographic entry see Field 7C.
W78-12555

OUTER CONTINENTAL SHELF LEASING.
Bureau of Land Management, Washington, DC.
Federal Register, Vol. 43, No. 19, p 3892-95, January 27, 1978.

Descriptors: *Land management, *Continental shelf, *Environmental effects, Leases, Oil industry, State governments, Federal government, Legislation, Coasts, Aquatic environment.

This final rulemaking governs the timing and type of environmental studies to be undertaken by the federal Bureau of Land Management as needed for the assessment and management of environmental impacts on marine and coastal environments of the outer continental shelf as a result of oil and gas leasing. Another final rulemaking action by the Bureau sets up the procedure for releasing specified information regarding any proposed activity relating to the outer continental shelf to state and local governments to determine the impact of such development and plan accordingly. An affected state is defined in the regulations as any state: (1) the laws of which are the laws of the United States for the affected portion of the shelf; (2) which is connected to any structure referred to in section (4)(a)(1) of the Outer Continental Shelf Lands Act; (3) which will receive oil extracted from the shelf; (4) which is designated by the federal Secretary of State as an area of significant impact; or (5) in which the Secretary designates that there is significant risk of serious damage to the marine environment. (Quarles-Florida)
W78-12558

INDEPENDENT RENDERING INDUSTRY EFFLUENT LIMITATION AND GUIDELINES.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol. 42, No. 194, p 54417-20, October 6, 1977. 4 tab.

Descriptors: Effluents, *Standards, *Cost-benefit analysis, *Federal water pollution control act, Oil, Regulation, Economic impact, Coliforms, Water quality standards, Water pollution treatment, Industrial wastes.

These final regulations issued by the federal Environmental Protection Agency established effluent limitations and new source performance standards for processing plants in the independent rendering industry which engages in the recovery of salable products from discarded animal materials. Certain pollutant limitations for existing plans are made less stringent while requirements for new plants are made more stringent than those originally promulgated. The allowance for cattle hide curing contained in the original new source regulation is restored. A discussion of public comment on the proposal is included, and it is concluded that a direct measure and limitation for oil and grease is essential. Oil and grease is a major constituent of rendering wastes. Monitoring costs are very minimal. All available information indicates the proposed BODS, TSS, pH and fecal coliform limitations are appropriate. Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best achievable are set forth in detail, as are the standards of performance for new sources. The regulations include an economic impact analysis and also provide for certain small business administration loans. (Quarles-Florida)
W78-12559

EXISTING SOURCES AND NEW SOURCE PERFORMANCE STANDARDS AND EFFLUENT LIMITATIONS AND GUIDELINES.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol. 42, No. 194, p 54417-20, October 6, 1977.

Descriptors: *Federal Water Pollution Control Act, *Industrial wastes, *Regulation, *Water pollution sources, Administrative agencies, Chemical wastes, Effluents, Federal government, Industries, Industrial wastes, Judicial decisions, Legal aspects, Standards, Waste water, Waste water treatment, Water pollution, Water quality, Water law, Legislation.

The Environmental Protection Agency (EPA) has promulgated effluent limitations and new source performance standards for processing plants in the independent rendering industry, under the authority of the Federal Water Pollution Control Act Amendments of 1972. The independent renderer recovers salable products such as fats, oils and proteinaceous meal from discarded animal materials. The effluent limited are: (1) BOD 5, (2) TSS, (3) Oil and grease, (4) pH and, (5) fecal coliform. The effluent limitations establish the quantity or quality of pollutants that may be discharged from a point source after the application of the best available technology economically achievable. If a renderer conducts hide curing, he may adjust the standards for BOD 5 and TSS. Effluent standards

of performance for new sources are also included. No plant closures due to these regulations are projected. Required price increases and effects on employment, growth, and international trade are expected to be minimal. The regulations will make certain pollution limitations for existing plants (section 1983 requirements) less stringent and will make requirements for new plants more stringent than those originally promulgated. (Jordan-Florida)
W78-12562

ENVIRONMENTAL IMPACT REPORTS UNDER THE CALIFORNIA ENVIRONMENTAL QUALITY ACT: THE NEW LEGAL FRAMEWORK,
San Diego Univ., CA. School of Law.
R. G. Hildreth.
Santa Clara Law Review, Vol. 17, No. 4, p 805-26, Fall, 1977.

Descriptors: *Environmental effects, *Project planning, *Research and development, *Administrative agencies, Projects, Judicial decisions, Legislation, Local governments, Environmental control, Project benefits, Project feasibility, Project purposes, Economic justification, Damages, Federal government, Social aspects.

The California Environmental Quality Act (CEQA) is patterned after the National Environmental Policy Act. Its' purpose is to minimize the adverse environmental effects of public and private projects. To accomplish this goal, the Environmental Impact Report is used. The report measures probable effects of proposed projects and is used by governmental authorities in determining whether to approve or disapprove of these projects. CEQA provides detailed procedures, yet it gives little guidance for those using the reports on how to comply with its requirements. Certain information should be included in each report. State guidelines, local government ordinances and judicial decisions are among these. A description of the project, its environmental impact, mitigation measures, and project alternatives should also be included. To conclude the report, all agencies consulted in its preparation should be listed. The decision-making agency which has approval power over the project must review the report and determine the feasibility of less harmful alternate projects. The courts can enforce compliance with the requirements of CEQA, yet have left unresolved how much weight will be given to a project's environmental costs and social and economic benefits. (Spiegel-Florida)
W78-12563

RETHINKING THE TIMETABLE FOR REFRESHING OUR WATERS,
E. A. Gee.
The Conference Board RECORD, Vol. 13, No. 4, p 54-57, April, 1976.

Descriptors: *Federal Water Pollution Act, *Cost-benefit analysis, *Water quality standards, *Economics, Water pollution sources, Marginal benefits, Legislation, Water pollution treatment, Industries, Economic justification, Costs, Budgeting, Cost allocation, Planning, Economic feasibility.

The results of the first three years of work by the Congressionally established Commission charged with studying all aspects of the 1972 Federal Water Pollution Control Act (FWPCA) are examined in this article. A major result of the Commission's ... has been the improved understanding of the source of water pollution. The Commission found that when the present law was passed; industry, municipal sewage, and non point sources each contributed approximately one-third of the total pollution load. Since the enactment of the FWPCA, dramatic progress has been made in the control of industrial discharges and city sewage. Once the 1977 technology is in place, nonpoint sources will be the major cause of water pollution. Thus, increasing expenditures by industries and municipalities to meet the 1983 requirements will not solve the problems created by nonpoint sources. The author suggests that a more selective basis be used in treating remaining water quality problems. Higher standards should not be applied in instances where objectives have already been met or can not be met until the nonpoint source problem is solved. The author feels that America must keep economic realities in mind when planning future environmental goals. (Stump-Florida)
W78-12565

TOXIC POLLUTANTS CONTROL: PROGRESS AT LAST,
P. S. Ward.
Journal Water Pollution Control Federation, Vol. 49, No. 1, p 6-9, January, 1977.

Descriptors: *Administrative agencies, *Industrial wastes, *Pollutants, *Water pollution control, *Federal Water Pollution Control Act, Administrative decisions, Chemical wastes, Regulation, Economic impact, Effluents, Environmental control, Feasibility, Federal government, Industries, Judicial decisions, Pollution abatement, Toxins, Waste disposal, Wastes, Water law, Water pollution, Water pollution sources.

The Environmental Protection Agency has experienced great difficulty in attempting to implement section 307a of the Federal Water Pollution Control Act (FWPCA), regarding toxic pollutant standards. This article discusses the adoption of a new enforcement policy which is designed to solve some of the problems engendered by section 307a. The new approach, spelled out in a covet-approved consent agreement, generally calls for regulating toxic pollutants through other sections of the FWPCA, under the Nation Pollutant Discharge Elimination System permit mechanism. Regulation of toxic pollutants is thus tied to the best available technology requirements, which allow for a longer compliance period than does section 307a. The new plan also relaxes the structure of section 307a by allowing consideration of technological feasibility and economic impact factors; and, it permits regulation on an industry-by-industry, rather than pollutant-by pollutant, basis. Section 307a will not be disregarded under the new approach, but will be applied only to extremely toxic pollutants requiring immediate regulation. The author examines the progressing development of standards under the new policy, and concludes that Congressional monitoring of the toxic effluent program will continue. (White-Florida)
W78-12567

PUBLIC INVOLVEMENT IN NATURAL RESOURCE DEVELOPMENT: A REVIEW OF WATER RESOURCE PLANNING,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
For primary bibliographic entry see Field 6E.
W78-12568

BERKLEY V. STATE DEPARTMENT OF ENVIRONMENTAL REGULATION (CONSTRUCTION IN BISCAYNE BAY APPROPRIATE UNDER THE COMPREHENSIVE FLORIDA AQUATIC PRESERVE ACT).
For primary bibliographic entry see Field 6E.
W78-12571

MINNEHAHA CREEK WATERSHED DISTRICT V. HOFFMAN (DEFINITION OF NAVIGABLE WATER UNDER THE RIVERS AND HARBORS ACT).
For primary bibliographic entry see Field 6E.
W78-12572

FLORIDA ENVIRONMENTAL LAND AND WATER MANAGEMENT ACT,
Florida Environmental Land and Water Management Act.
For primary bibliographic entry see Field 6E.
W78-12583

METROPOLITAN SEWERAGE DISTRICTS.
For primary bibliographic entry see Field 6E.
W78-12584

COUNTY WATER AND SEWER DISTRICT LAW.
For primary bibliographic entry see Field 6E.
W78-12585

NATURAL RESOURCES DEFENSE COUNCIL, INC. V. COSTLE (STANDARDS GOVERNING ISSUANCE OF NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS).
For primary bibliographic entry see Field 6E.
W78-12587

ENVIRONMENTAL DEFENSE FUND, INC. V. COSTLE (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT FOR CONSTRUCTION OF OCEAN OUTFALL SERVERS IN LONG ISLAND, NEW YORK).
For primary bibliographic entry see Field 6E.
W78-12589

PREDICTION OF ASSIMILATION CAPACITY IN SMALL RECEIVING STREAMS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-12604

DESIGN, COST ESTIMATION AND OPTIMIZATION OF SEWAGE COLLECTION AND TREATMENT SYSTEMS FOR HOUSING DEVELOPMENT IN THE GLENWOOD, NEW YORK AREA,
Calspan Corp., Buffalo, NY.
For primary bibliographic entry see Field 5D.
W78-12611

THE ROLE OF 208 IN PLANNING GROUNDWATER USE,
Southern California Association of Governments, Los Angeles.
R. J. Riga.
In: Proceedings of the Eleventh Biennial Conference on Groundwater, September 15-16, 1977, Fresno, California, California Water Resources Center, University of California, Davis, Report No. 41, November, 1977. p 88-90.

Descriptors: *California, *Groundwater resources, *Federal Water Pollution Control Act, *Comprehensive planning, Groundwater resources, Local governments, Management, Wastewater treatment, Water pollution, Water quality control, Water quality standards, Pollution abatement.

Section 208 of the 1972 Federal Water Pollution Control Act provides for the development and implementation of areawide and statewide plans to control and prevent pollution. Section 208 will have little impact on presently adjudicated or nonadjudicated groundwater basins which have been operated for several years without adversely affecting water quality. In basins where overdrafts are occurring that result in water quality degradation and impairment of beneficial uses, it can be anticipated that regulatory programs requiring protective measures or restrictions of pumpage will be established. Some of the subject areas that can be anticipated in many Section 208 plans include: (1)

control of pollution from unsewered communities; (2) industrial waste disposa from inadequate lagoon or injection systems; (3) runoff quality management; (4) agricultural activities; (5) residual waste disposal; and (6) facilities siting. While groundwater quality standards are not a requirement of the Act, federal Environmental Protection Agency guidelines for Section 208 planning speak to their desirability. A Section 208 plan must specify the means by which the proposals it sets forth are to be financed and th schedule by which they are to be carried out. (See also W78-06039) (Jordan-Florida)
W78-12616

WATER RESOURCES AND HEALTH PROBLEMS IN DEVELOPING COUNTRIES (IN FRENCH),
Paris-7 Univ. (France). Dept. of Parasitology.
For primary bibliographic entry see Field 5F.
W78-12625

UTILIZATION OF FISH AS INDICATORS OF WATER QUALITY: AND COMPARISON WITH THE BIOTIC INDEX METHOD: APPLICATIONS TO THE LAXIA RIVER IN THE FRENCH BASQUE REGION AND THE GABAS RIVER IN THE LANDES DEPARTMENT, (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France). Lab. de Methodologie des Inventaires.
For primary bibliographic entry see Field 5A.
W78-12634

CURRENT CONDITIONS AND INTENSITY OF SELF-PURIFICATION IN THE UPPER REACHES OF THE SUKHONA RIVER (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
For primary bibliographic entry see Field 5C.
W78-12654

THE DISTRIBUTIVE EFFECTS OF PUBLIC LAW 92-500,
Northwest Missouri State Univ., Maryville. Dept. of Business and Economics.
R. A. Collins.
Journal of Environmenta Economics and Management, Vol. 4, No. 4, p 344-354, 1977, 5 fig, 16 ref.

Descriptors: *Income distribution, *Economic impact, *Government finance, *Water pollution control, Tax burden, Waste water treatment plants, Biochemical oxygen demand, Industries, Legislation, *Public Law 92-500, *Clean Water Act, *Subsidies, Title II Amendments, Benefit distribution.

Described are the distributive effects of the Title II 1972 Amendments to the Federal Water Pollution Control Act. This Act provides subsidies for the construction of publicly owned waste water treatment plants where the subsidies accure partly to the municipalities and partly to certain industries. The author's intent is to estimate the potential effects of this federal subsidy program on the distribution of family income in EPA Region VII under the assumptions that the benefits accrue to the users of the treatment plants and that the tax burden is borne by the population of the study region in general. The author estimates the proportion of subsidies accruing to either the municipal or industrial sector and relates this subsidy to income groups. It is assumed that the municipal subsidy accrues to the various income classes of users of the treatment plants in proportion to their contribution to the treatment load. Since the total proportion of all industry that is connected to a municipal plant is rather small, it is unlikely that a large percentage of firms in any one industry will receive these large subsidies; it is assumed that these subsidies will accrue to the owners of the firms. The author concludes that most of the net benefits are received by the very rich. (Coan-NC)
W78-12655

TANKERS AND OIL TRANSFER OPERATIONS ON THE DELAWARE RIVER AND BAY.
Comptroller General of the United States, Washington, DC.
Report CED 77-124, August 23, 1977, 29 p.

Descriptors: *Harbors, *Delaware River, *Water pollution control, *Oil spills, Oil pollution, Regulation, Equipment, Standards, Channel improvement, Inspection, Navigation, *Tankers, *Delaware Bay, *Oil transfer operations, Coast Guard.

During the calendar years 1973 through 1976, 180 oil tanker pollution incidents and 83 tanker casualties were reported on the Delaware River and Bay. Seven caused a discharge of more than 10,000 gallons of oil. The primary causes of the pollution incidents and the casualties were human error and equipment failure. In their examination of these incidents, the GAO determined that expanded requirements for navigational, steering, and pollution prevention equipment have the potential to reduce the incidents; proposed U.S. regulations and international efforts to improve standards should help reduce the incidents; maintenance of the channel and the navigation system currently in operation appear adequate while improvements suggested by the Pilots' Association regarding the aids to navigation and restrictions on the use of anchorages may have the potential to further reduce risks to vessels using the area; the project proposed by the Coast Guard to establish a secondary channel in the river has merit; and expansion of the inspection program should help improve the safety of tankships. In general, the GAO concluded that steps taken since January 1977, or currently under consideration, should improve the safety of tankers using this area. (Nessa-NC)
W78-12656

PROCEEDING OF ENVIRONMENTAL IMPACT STATEMENT CONFERENCE, HELD AT KANSAS CITY, MISSOURI ON 8-9 NOVEMBER, 1972.
Environmental Protection Agency, Kansas City, MO.
For primary bibliographic entry see Field 6G.
W78-12657

DRAFT GUIDELINES FOR AREAWIDE WASTE MANAGEMENT PLANNING. SECTION 208, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 676, Price codes: A07 in paper copy, A01 in microfiche. May 3, 1974, (82 p).

Descriptors: *Water Quality Act, *Planning, *Management, Land use, Methodology, Nonstructural alternatives, Regulation, Water pollution, Water pollution control, Water pollution sources, *Federal Water Pollution Control Act Amendments of 1972, Section 208, *Areawide waste management planning, *Nonpoint sources, Point sources, Guidelines.

The Federal Water Pollution Control Act Amendments of 1972 require the control of point and nonpoint sources of water pollution in order to meet the goals of the Act. Section 208 of the Act encourages areawide management planning in areas which, as a result of urban-industrial concentrations or other factors, have substantial water quality problems. Regulations have been published (40 CFR Part 126) on 208 area and agency designations and have been proposed (40 CFR Part 35, Subpart F) on 208 planning grant applications. This guideline presents an approach to planning for areawide waste management under Section 208. The planning approach set forth in this guideline incorporates the basic planning features of problem identification, identification of management and technical constraints, identification of possible solutions to problems, alternative plan development, alternative plan analysis, selection of an areawide plan, and periodic updating of the plan. This guideline is intended to assist 208 planning agencies in carrying out their areawide waste management planning responsibilities. It also applies to other local, state,l and federal agencies that may be involved in the planning process for those areas or in plan review procedures. (Nessa-NC)
W78-12658

PLAN AND CONCEPTS FOR MULTI-USE MANAGEMENT OF THE ATCHAFALAYA BASIN,
Coastal Environments, Inc., Baton Rouge, LA.
For primary bibliographic entry see Field 6G.
W78-12686

WATER QUALITY PLANNING, AND OPPORTUNITY FOR CONSERVATION DISTRICT COMMISSIONERS,
Iowa Dept. of Soil Conservation, Des Moines. Conservancy District Div.
W. Hauser, III.
Journal of Soil and Water Conservation, Vol. 33, No. 3, p 102-103, January-February, 1978.

Descriptors: *Water districts, *Iowa, *Water pollution control, *Conservation, Legislation, Local governments, Soil conservation, Cost sharing, Water quality, Federal government, Adoption of practices, Planning.

Under section 208 of Public Law 92-500, nonpoint water pollution control planning still offers tremendous opportunities for soil conservation district commissioners throughout the United States. While the nonpoint plans are being completed, commissioners can exert much influence on future soil and water conservation policies. While erosion control programs are not to only answer to nonpoint water pollution problems, they can serve as useful guidelines in many respects. It is important that commissioners in each state know what parts of current district programs can effectively improve water quality. Iowa has been looked to as a state that has been able to use available resources to make contributions toward managing natural resource wisely and efficiently. Unfortunately, even programs in Iowa have not been 100 percent successful. Cost-sharing has been a limiting factor. Financing is not the only necessary component in a successful nonpoint pollution control plan. Other factors must be considered. Federal and state governments are turning to local districts to implement water quality plans. The time is now ripe for districts to take advantage of governmental support designed to put more responsibility for district policies and programs into commissioners' hands. (Spiegel-Florida)
W78-12687

ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS -- VOLUME III, EFFECTS ON LIVING RESOURCES AND HABITATS,
Conservation Foundation, Washington, DC.
J. Clark, and C. Terrell.
Fish and Wildlife Service, Office of Biological Services, Report FWS/OBS-77/14, March, 1978. 220 p, 53 fig, 30 tab, 176 ref.

Descriptors: *Continental shelf, *Oil fields, *Water pollution control, *Wildlife habitats, *Assessments, *Oil, Drilling, Oily water, Organic wastes, Water pollution treatment, Wetlands, Offshore platforms, Coastal structures, coasts, Outer Continental shelf, Offshore oil.

The potential effects are described of Outer Continental Shelf (OCS) development on living resources and habitats. Basic information is given for advance assessment of the effects of OCS oil and gas recovery on fish and wildlife resources and their supporting ecosystems. It encompasses offshore recovery operations, onshore facilities development, and the transport of raw and processed hydrocarbons. Ecological disturbances are described for the following OCS-related construction and operation subprojects: navigation improvement, piers, bulkheads, beach stabilization, site preparation, site development, artificial waterways and water bodies, roadways and bridges, groundwater supply, sewage systems, overland transmission systems, industrial cooling water systems, mosquito control, dikes-levees-impoundments, offshore and platform structures, marine transportation systems, and submerged transmission systems. A comprehensive review is provided of sources of ecological disturbance for OCS-related primary and secondary development. (Steiner-Mass)
W78-12697

DOING SOMETHING ABOUT OIL SPILLS,
P. W. Quigg.
Sierra Club Bulletin, Vol. 62, No. 7, p 21-24, September, 1977.

Descriptors: *Oil spills, *Ships, *Law of the sea, *Sea water, Federal government, Oil pollution, Legislation, Environmental effects, Oceans, Foreign countries, Transportation, Standards.

The Carter Administration has taken a tough stance on safety standards for oil tankers. New regulations require double bottoms on tankers, segregated ballast, inert gas systems, backup radar systems, and improved emergency steering standards. These regulations will be applied to more ships than were older standards. The Intergovernmental Maritime Consultative Organization is now drafting a convention on crew standards and training. This is a crucial issue. President Carter has ordered the U.S. Coast Guard to inspect foreign tankers at least once a year. One highly favored bill in Congress provides for comprehensive liability and compensation for oil pollution damages. After these measures are adopted and enforced, four issues will still concern environmentalities. First is the Coast Guard, which to this point, has been incompetent. A second question is whether states may take protective action on their own. Increasing navigation technology and the right to intercept foreign-flag tankers are the third and fourth issues. The United States has threatened withdrawal from the Law of the Sea convention unless the United States' laissez-faire attitude toward deep-sea mining prevails. With so many important issues to be decided, no one would benefit from such an action. (Spiegel-Florida)
W78-12698

MONTANA'S YELLOWSTONE RIVER: WHO GETS THE WATER,
For primary bibliographic entry see Field 6E.
W78-12699

WATER QUALITY MISMANAGEMENT,
I. C. Nisbet.
Technology Review, Vol. 80, No. 7, p 10-11, June-July, 1978.

Descriptors: *Federal water pollution control act, *Water quality standards, *Analysis, *Regulation, Toxins, Pollutants, Permits, Waste treatment, Sewage treatment, Industrial wastes, Effluents, Management.

The major elements of the Federal Water Pollution Control Act (FWPCA) are listed, analyzed and the major flaws therein discussed. The author faults the FWPCA for emphasizing the construction of 'conventional' types of municipal waste treatment facilities, which is viewed as detrimental to various innovative features of the FWPCA--the provisions for regional planning, control of non-point source pollutions, technology-based effluent standards and regulation of toxic pollutants. The most conspicuous failure in the FWPCA has been its inability to regulate toxic pollutants. The federal Environmental Protection Agency (EPA) has provided minimum guidelines and funding. Planning authority has been delegated to local agencies because control of sources of pollution that are also bases of regional economies is a politically volatile issue. The author feels the EPA implemented the FWPCA in an incorrect order. This has encouraged unwise land development, promoted various private interests, imposed treatment standards for point sources unevenly, extended public exposure to hazardous pollutants, and frustrated the realization of national water quality goals. An alternative implementation scheme, and the reasons therefore, is presented. (Horwich-Florida)
W78-12700

OIL AND GAS AND SULPHUR OPERATIONS IN THE OUTER CONTINENTAL SHELF.
Geological Survey, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-12701

HARMON COAL COMPANY V. DEPARTMENT OF ENVIRONMENTAL RESOURCES (REGULATION OF COAL STRIP MINE DRAINAGE OF ACIDIC WATER IN PENNSYLVANIA).
For primary bibliographic entry see Field 6E.
W78-12713

TEN-YEAR LOW MEAN MONTHLY DISCHARGE DETERMINATIONS FOR UNGAGED STREAMS NEAR WASTE-STABILIZATION PONDS IN WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
S. J. Field.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-284 266, Price Codes: A02 in Paper copy, A01 in Microfiche,Water Investigations 78-49, June 1978. 16 p, 3 fig, 6 tab, 3 ref.

Descriptors: *Water quality control, *Sewage lagoons, *Effluents, *Low flow, *Streamflow, Discharge(Water), Ponds, Waste dilution, Low-flow frequency, Streamflow forecasting, Regression analysis, Wisconsin, *10-year low mean monthly flow.

Communities in Wisconsin that use fill-and-draw waste-water treatment lagoons or waste-stabilization ponds are required to discharge during the spring and fall of the year at a rate that does not exceed the assimilative capacity of the receiving stream. The 10-year low mean monthly discharge (MMQ10) for October, November, April, and May for the receiving stream has been used to establish the discharge rate for the treatment systems at the appropriate time of the year. To determine the MMQ10 for the receiving stream the monthly mean discharge first was estimated by using a technique developed by Riggs (1969). Once the monthly mean discharge was determined the MMQ10 of the ungaged stream was estimated by using a graphical correlation between the monthly mean discharge and the MMQ10 of at least three gaging stations near the waste-stabilization pond. The MMQ10 for these gaging stations were determined by a log-Pearson Type III frequency analysis. The MMQ10 was determined for Maple Creek at Valmy, Allens Creek near Oakdale, North Branch Manitowoc River at Sherwood, East Fork Poplar River near Curtiss, and Yellow River at Barronette. (Woodard-USGS)
W78-12723

AN EVALUATION OF PROBLEMS ARISING FROM ACID MINE DRAINAGE IN THE VICINITY OF SHASTA LAKE, SHASTA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
R. H. Fuller, J. M. Shay, R. F. Ferreira, and R. J. Hoffman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 667, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-32, May 1978. 39 p, 5 fig, 7 tab, 19 ref.

Descriptors: *Water pollution sources, *Acid mine water, *Mine drainage, *Path of pollutants, *Water pollution control, Copper, Iron, Zinc, Pyrite, California, *Shasta County.

Streams draining the mined areas of massive sulfide ore deposits in the Shasta Mining Districts of northern California are generally acidic and contain large concentrations of dissolved metals, including iron, copper, and zinc. The streams, including Flat, Little Backbone, Spring, West Squaw, Horse, and Zinc Creeks, discharge into Shasta Reservoir and the Sacramento River and have caused numerous fish kills. The sources of pollution are discharge from underground mines, streams that flow into open pits, and streams that flow through pyritic mine dumps where the oxidation of pyrite and other sulfide minerals results in the production of acid and the mobilization of metals. Suggested methods of treatment include the use of air and hydraulic seals in the mines, lime neutralization of mine effluent, channeling of runoff and mine effluent away from mine and tailing areas, and the grading and sealing of mine dumps. A comprehensive preabatement and postabatement program is recommended to evaluate the effects of any treatment method used. (Woodard-USGS)
W78-12735

PROGRESS REPORT ON BLACK MESA PROGRAM--1977.
Geological Survey, Tucson, AZ. Water Resources Div.
Open-file report 78-459, April 1978. 38 p, 5 fig, 8 tab.

Descriptors: *Strip mines, *Coal mines, *Effects, *Water quality, *Water resources, Data collections, Surface waters, Groundwater, Observation wells, Water levels, Aquifers, Streamflowm, Sediment yield, Water chemistry, Indian Reservations, Arizona, *Black Mesa.

Monitoring of coal mine operations on Black Mesa, Ariz., was started in 1971 to determine the effects of strip mining on water resources in the area. Monitoring on and near the mesa includes measurements of ground-water levels and quality and quantity, sediment concentration, and chemical quality of surface water. The surface-water monitoring consists of: (1) rainfall-runoff characteristics near the mine, and (2) surface-flow conditions and water-quality characteristics at Moenkopi Wash at Moenkopi. Three watersheds of about 400 acres each are instrumented for the collection of flow data, precipitation data, and water samples for determination of chemical quality and sediment concentration. Each watershed is equipped with a data-collection platform that transmits data via satellite to a computer that provides near-real time information ground-water withdrawal on the regional potentiometric surface in the aquifer on a continuing basis. The available data are insufficient to assess the effects of mining on the quantity , sediment concentration, or chemical quality of runoff. Water levels in seven wells have not shown significant declines but water levels in other wells have declined as much as 7 feet. (Woodard-USGS)
W78-12740

URBAN STORM-WATER DATA MANAGEMENT SYSTEM, BROWARD COUNTY, FLORIDA,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Miami, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-12747

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, VOLUME 1: SUMMARY REPORT.
For primary bibliographic entry see Field 6B.
W78-12760

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, APP. XI: WATER SUPPLY & WATER QUALITY CONTROL: APP. XII: OUTDOOR RECREATION: APP. XIII: FISH & WILDLIFE.
For primary bibliographic entry see Field 6B.
W78-12765

KING RESOURCES COMPANY V. BOARD OF ENVIRONMENTAL PROTECTION (PROCEDURE FOR CONSTRUCTION CERTIFICATION UNDER THE FEDERAL WATER QUALITY CONTROL ACT AFFIRMED).
For primary bibliographic entry see Field 6E.
W78-12777

BALANCE CONTROL WATER SCREEN,
E. Forshee.
U.S. Patent No. 4,081,374, 5 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 968, No 4, p 1458, March 28, 1978.

Descriptors: *Patents, *Water quality control, *Water purification, *Separation techniques, Water pollution, Flotsam, Jetsam, Filtration, Screens, Equipment.

An apparatus is used in separating trash or debris from fluid such as water. It includes a means for conveniently and readily separating foreign matter or trash from water so that clean, filtered water can pass or be directed to a desired location, and the trash or other foreign matter removed from the water can be conveyed to a separate location. The balance control water screen apparatus is simplified by having a flange handle device to improve the operation of the door flap, and provide the flat itself with an improved bearing system. (Sinha - OEIS)
W78-12782

FLOW STILLING DEVICE,
Pro-Tech, Inc., Paoli, PA. (Assignee).
For primary bibliographic entry see Field 8B.
W78-12784

ACTIVATED CARBON AND PREPARATION THEREOF,
Sumitomo Durez Co., Ltd., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5F.
W78-12786

END POINT QUALITY CONTROL LIGHT CIRCUIT,
Continental Water Conditioning Corp., El Paso, TX. (Assignee).
C. L. Jones, and D. Aradio.
U.S. Patent No. 4,082,666, 11 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 969, No 1, p 270, April 4, 1978.

Descriptors: *Patents, *Demineralization, *Water quality control, *Water treatment, *Water purification, Monitoring, Electronic equipment, Safety, Electric currents.

The quality control light circuit for a water demineralizer comprises a power cord, a housing for the electronics, and a probe-light assembly. The probe-light assembly includes a pair of spaced apart A.C. energized probes, and applies approximately 12 volts to the water. The probes are transformer isolated from the power input, and the final drive to an indicating lamp is transistorized. The current through the probes, directly proportional to the quality of the water, develops a voltage that is compared to a threshold voltage. The indicating lamp is illuminated to indicate high water quality, and is switched off by the final drive transistor when the water quality becomes unacceptable. An optional switching circuit, isolated from the quality control circuit, enables the actuation or control of external devices in dependence upon water quality. Various techniques for minimizing leakage currents are also disclosed. (Sinha-OEIS)
W78-12788

SEPARATOR OF OIL AND WATER,
Barton Hydraulic Engineering Co. Ltd., Birmingham (England). (Assignee).
C. A. Bainbridge.
U.S. Patent No. 4,082,669, 5 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 969, No 1, p 271, April 4, 1978.

Descriptors: *Patents, *Water quality control, *Water pollution treatment, *Waste water treatment, Industrial wastes, Oil pollution, Oily water, Separation techniques, Flotation, Ballast water.

A separator for oil and water incorporates three separating stages through which oil and water mixture successively flows. The first stage comprises a series of plates over which the mixture flows in an upward direction. Oil in the mixture gathers on the surfaces of the plates and forms climbing films. These films move to the upper edges of the plates and form agglomerates. When the agglomerates are big enough for their buoyancy to overcome the surface tension holding them to the plates, they break away and float to a collecting zone. The second stage comprises a coagulator. Oil remaining in the water collects on the material in the coagulator bed which comprises finely divided material having a greater affinity for oil than water. Water leaving the plate separator filters up through the interstices of the coagulator bed while oil collects on the material of the bed forming climbing films which flow upwardly at a lower rate than the water and agglomerate above the bed. Water leaving the coagulator bed contains oil of molecular fineness which is removed by the screen of the third stage. Oil separated in the various stages collects in zones from which it can be removed, the clear water finally leaving the upper end of the separator. (Sinha-OEIS)
W78-12789

BUOY TYPE OIL GATE,
F. J. Dalli.
U.S. Patent No. 4,082,674, 5 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 969, No 1, p 273, April 4, 1978.

Descriptors: *Patents, *Water quality control, *Oil pollution, Floating, Barriers, Buoyancy, Buoys, Channels, Variable water levels.

A buoy type oil gate straddles a stream having variable water levels. The gate is arranged to float so that it has an area extended above the water level and has ends which ride in and seal to channels next to the banks of the stream. The buoy type oil gate rides up and down within a pair of channels so that it has the capability of holding back oil from passing downstream of the gate. The gate is beveled to reduce the friction and allows for free movement with the stream. (Sinha - OEIS)
W78-12790

DIRT FILTER FOR WATER PIPES,
V. Dulger.
U.S. Patent No. 4,082,676, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 969, No 1, p 273, April 4, 1978.

Descriptors: *Patents, *Water quality control, *Filtration, Separation techniques, Water conveyance, Pipes, Filters.

Water pipes of the type used for carrying water for household and industrial use have a dirt filter. The filter defines inlet and outlet chambers with an apertured dividing wall. An upper lid and a lower dirt collecting container are attached with threaded connections to the houseing. A filter insert is placed between the lid and the dividing wall and has a carrier with upper and lower cylinder rings which respectively engage the lid and the chamber dividing wall. The interior of the filter has fluid communication with the inlet chamber through the opening in the chamber away from the interior of the dirt collecting container but permits dirt to drop into the container. (Sinha - OEIS)
W78-12791

TESTING SKIMERS FOR OFFSHORE SPILLED OILS,
H. W. Lichte, and M. K. Breslin.
In: Proceedings Tenth Annual Offshore Technology Conference, held in Houston, TX, May 8-11, 1978, Vol 1, p 247-254, 1978. 5 fig, 7 tab. OTC No. 3076.

Descriptors: *Oil spills, *Skimming, *Testing, Water pollution, Pollution abatement, *Outer Continental Shelf, Sea conditions, Oil and Hazardous Materials Simulated Environmental Test Tank(OHMSETT).

The U.S. Environmental Protection Agency (EPA) began operation of a test facility in Leonardo, N.J., in 1974 to evaluate or develop spill cleanup methods and equipment without endangering the environment. The facility, Oil and Hazardous Materials Simulated Environmental Test Tank (OHMSETT), is operated for the EPA by Mason and Hanger-Silas Mason Co., Inc. The U.S. Coast Guard, U.S. Navy (NAVFAC and CEL), Dept. of Energy, and EPA have all sponsored test programs either singly or jointly. This report describes, for spill-control equipment users and designers, a unique test facility providing reproducible, simulated environmental conditions where the 21 advancing oil skimmers examined for inclusion in this paper have been evaluated during the four years of the facility's operation. The mean throughput efficiency for those skimmers observed is 23%, for operations between zero and 3 m/s (6.0 kt) advancng speeds in 0.6 m (2 ft) sea conditions when collecting low viscosity oils similar to No. 2 fuel oil. Performance improves with lower seas and heavier oils. The tables and charts of this paper do not include data from tests that develop unusually low results due to high tow speeds or severe sea conditions. (Sinha-OEIS)
W78-12804

TRAINING AS A FACTOR IN OIL SPILL RESPONSE,
D. A. Alberts, M. H. Philips, and D. Shea.
In: Proceedings Tenth Annual Offshore Technology Conference, held in Houston, TX, May 8-11, 1978, Vol. 1, p 255-260, 1978. 2 tab, 3 ref, OTC No. 3077.

Descriptors: *Oil spills, *Water pollution control, *Training, Education, Pollution abatement, Resources development, *Outer Continental Shelf.

A videotape Oil Spill Response Training Program has been developed by NUS Corporation in conjunction with Texaco Inc. to provide industry training for all levels of personnel in the areas of oil spill prevention, planning, and response. The

rogram consists of 23 1/2 hour color videotapes
iat integrate strong educational principles into the
reative videotape medium. It is structured to per-
iit the inclusion of specific material relative to
ny facility/installation, and is currently being
sed by both civilian and government agencies.
his paper addresses the motivation behind and
ie methodology used in the development of the
rogram. (Sinha-OEIS)
V78-12805

BEHAVIOR OF THE BOUCHARD NO. 65 OIL SPILL IN THE ICE-COVERED WATERS OF BUZZARDS BAY,
P. C. Deslauriers, and S. Martin.
n: Proceedings Tenth Annual Offshore Technolo-
y Conference, held in Houston, TX, May 8-11,
978, Vol. 1, p 267-276, 1978. 4 fig, 2 tab, 9 ref.
OTC No. 3079.

Descriptors: *Oil spills, *Ice cover, *Sea ice, *Water pollution effects, *Massachusetts, Pollution abatement, Resources development, Environmental effects, Weathering, *Outer Continental Shelf, Buzzards Bay(MA).

Most of the present data on oil pollution in ice-covered waters has been obtained from spills in static ice conditions. Thus, the Buzzards Bay spill, which occurred in moving ice, was of particular interest. Initially, the strong tidal currents transported most of the oil leaking from the barge into the broken ice field and beneath the large ice floes. The oil then collected in the crack systems of the rafted ice, hummocks, pressure ridges, and leads, and occupied an area of about 0.1 sq km. Oil pools formed by the rafted ice contained up to 2,000 gal of pure oil. No. 1 oil that was incorporated in hummocks and ridges was not as concentrated. Some oil in concentrated areas spread onto the ice floe surface primarily by wind forces. The No. 2 oil weathered at different rates, ranging from 6 to 47 percent volume loss, depending upon the degree of oil exposed to the air. On Feb. 5, 0.1 m of snow fell at Buzzards Bay covering most of the oil from view; oil in concentrated pools formed a slush-like mixture containing 30% oil by volume. This snow greatly hindered aerial surveillance, research efforts, and cleanup attempts. Several cleanup techniques were used; the most successful was direct suction from concentrated pools into vacuum trucks accounting for nearly 13,000 gal of recovered oil. The ice began to break up around Feb. 8, releasing the oil contained in the ice in the form of a thin sheen. In addition, oily ice floes were transported by the currents through Cape Cod Canal into Cape Cod Bay, where they melted. These processes continued until about Feb. 26, 1977, when Buzzards Bay was essentially free of visible oil. (Sinha-OEIS)
W78-12806

ENVIRONMENTAL ASSESSMENT OF THE BUCCANEER OIL AND GAS FIELD OFF GALVESTON, TEXAS: AN OVERVIEW,
For primary bibliographic entry see Field 5C.
W78-12807

ASSESSMENT OF ENVIRONMENTAL IMPACT OF OFFSHORE PRODUCTION IN THE BUCCANEER OIL FIELD: SEDIMENTOLOGIC AND GEOCHEMICAL RESULTS,
Rice Univ., Houston, TX.
For primary bibliographic entry see Field 5C.
W78-12808

OCEAN MINING AND PROTECTION OF THE MARINE ENVIRONMENT IN THE RED SEA,
Z. Mustaffi, and H. Amann.
In: Proceedings Tenth Annual Offshore Technology Conference, held in Houston, TX, May 8-11, 1978, Vol. 2, p 1199-1214, 1978. 14 fig, 15 ref. OTC No. 3188.

Descriptors: *Water pollution effects, *Resources development, *Environmental effects, *Mining, Ecosystems, Pollutant abatement, *Outer Continental Shelf, Deep-sea mining, Red Sea.

By all standards the Red Sea constitutes a unique marine environment. A highly diversified, rich and varying fauna and flora at the reef covered coasts and delicately organized pelagic life and benthos in deep graben waters combine with the yet largely unknown hydrography and the particular geology of a nascent ocean into an ecological system of great importance to the scientific community. This ecosystem is, at the same time, exposed to extreme natural influences: intensive sun irradiation, constant and hot winds, and subsequent evaporation with negligible inflow of terrestrial water and a reduced exchange of fresh ocean water over the southern sill at Bab el Mandab. Salinity and temperature of the water are thus higher and oxygen and nutrient contents are lower than in other seas of the world. This results in carefully balanced metabolisms of the ecosystem. New technologies such as ocean mining of the Red Sea metalliferous muds must be concerned with the environment and its safeguarding. With this understanding the Saudi Sudanese Red Sea Joint Commission has entrusted Preussag in 1976 with the technical development of occurrences of ore bearing muds (Zn, Cu, Ag) in the deep sea graben. A comprehensive program is being carried out: monitoring the deep sea and coastal environment and designing for their protection, test production and controlled redeposition of tailings and sediments in graben areas as well as beneficiation and metallurgy of the complex marine ores. A description of the task and preliminary results of recent research and development work until early 1978 are given together with an outlook on forthcoming steps. (Sinha-OEIS)
W78-12809

A CONCEPTUAL MODEL FOR RESPONSE TO ARCTIC OIL SPILLS,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5B.
W78-12818

POLAR CONTINENTAL SHELF PROJECT. TITLES AND ABSTRACTS OF SCIENTIFIC PAPERS SUPPORTED BY PCSP.
Department of Energy, Mines and Resources, Ottawa (Ontario) Polar Continental Shelf Project.
For primary bibliographic entry see Field 5C.
W78-12819

STUDY OF DETECTION, IDENTIFICATION, AND QUANTIFICATION TECHNIQUES FOR SPILLS OF HAZARDOUS CHEMICALS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5A.
W78-12821

AN OIL AND SORBENT MIXTURE CONTAINMENT BOOM.
Office of Naval Research, Arlington, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A003 051, Price codes: A02 in paper copy, A01 in microfiche. U.S. Navy Case No. 58,515, Patent Serial No. 767,746, Filed 22 July 1976. 14 p, 3 fig.

Descriptors: *Oil spills, *Water pollution treatment, *Equipment, Water pollution control, Oil pollution, *Outer Continental Shelf, *Oil booms, Containment.

A containment boom is described for containing a mixture of oil and sorbent floating on water. The boom comprises a series of interconnecting, rigid, solid barrier, having floats attached. The floats hold each rigid barrier vertically with respect to he surface of the water. A pair of porous screens are attached to the top edge and the bottom edge of each rigid barrier. Each pair of corresponding rigid barrier lies in a plane with its corresponding rigid barrier. (Sinha-OEIS)
W78-12823

A RIGID, PERFORATED PLATE OIL BOOM FOR HIGH CURRENTS,
Shell Development Co., Houston, TX.
R. R. Ayers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 139, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Protection Technology Series No. EPA-600/2-76-263, December 1976. 144 p, 35 fig, 5 tab, 7 append. EPA-68-03-0331.

Descriptors: *Oil spill, *Water pollution control, *Equipment, Pollution abatement, Resources development, Currents(Water), Flow control, *Outer Continental Shelf, *Oil booms.

A boom capable of diverting oil spills toward shore in a 3-knot (1.5 m/s) river or tidal current has been developed. Loss of No. 2 and No. 4 Fuel Oil at this velocity is typically less than 15% when the angle of the boom is 45 degrees to the shoreline. In contrast, conventional booms lose this amount at only 1 knot (0.5 m/s). Good performance at high currents is achieved by placing a baffle upstream of a conventional flat plate boom. The baffle, an inclined, perforated plate, is used to create a flow-sheltered region where the oil layer thickens. A continuation of the inclined plate baffle forms the 'floor' of the sheltered region to control the flow rate of existing water. Horizontal plates immediately behind the baffle reduce water downflow. The boom is made up of 8-foot (2.4 m) long, rigid sections similar in plan view to a floating dock module. The length of the boom depends upon the number of modules pinned together side by side. Floating suction or sorbent rope collection devices may be used to remove accumulated oil from the flow sheltered region and increase capability. (Sinha-OEIS)
W78-12824

TESTS OF THE ARCTIC BOAT CONFIGURATION OF THE LOCKHEED CLEAN SWEEP OIL RECOVERY SYSTEM IN A BROKEN ICE FIELD,
ARCTEC, Inc., Columbia, MD.
L. A. Schultz.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 832, Price codes: A05 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Report No. CG-D-108-76, March 1976. 86 p, 21 fig, 7 tab, 4 ref. DOT-CG-51487-A.

Descriptors: *Oil spills, *Ice cover, *Arctic, *Polar Region, *Equipment, Testing, Water pollution control, Pollution abatement, Outer Continental Shelf, Arctic Boar Configuration.

Full size tests of the Arctic Boat configuration of the Lockheed Model R2003 Clean Sweep oil spill recovery device were made operating in a simulated Arctic environment incorporating freezing temperatures and ice infested waters. Tests were conducted in a broken fresh water ice field of moderate ice piece size with crude oil. The tests were directed towards the evaluation of the oil recovery performance of the Arctic Boat configuration in comparison to the performance obtained from the unmodified device in tests conducted for the U.S. Coast Guard. The test results indicated that the oil recovery performance as measured by oil recovery rate and throughput efficiency is improved in the case of the Arctic Boat configuration with little effect on oil recovery efficiency in comparison to the unmodified unit, assuming that a suitable method is developed for the recovery of oil contained within the throughput barrier region. This improvement in oil recovery performance is

not achieved without penalty however. The Arctic Boat configuration tested showed a tendency towards drum jamming, and a far greater tendency towards ice rafting than was the case for the unmodified device. The oil recovery performance tests also indicated that the performance of the unit is highly dependent upon operating conditions. (Sinha-OEIS)
W78-12826

OIL SPILL CLEAN UP USING A COTTON SORBENT,
Texas Tech Univ., Lubbock. Dept. of Chemical Engineering.
J. E. Halligan, A. A. Ball, and G. F. Meenaghan.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 955, Price codes: A07 in paper copy, A01 in microfiche. Coast Guard Department of Transportation Report No. CG-D-63076, January 1976. 139 p, 28 fig, 18 tab, 12 ref, 2 append. DPT-CG-42557-A.

Descriptors: *Oil spills, *Pollution abatement, *Water pollution control, Dispersion, Sorption, Outer Continental Shelf, Cotton wasties.

On June 1, 1974 a nineteen month study was initiated to develop a sorbent dispersal, retrieval, and disposal system using cotton wasties to combat oil pollution. A test program was conducted to develop the design data base required to evaluate the concept as well as the system components. Major variables studied included crude oil type, sorbent to oil weight ratios, sorbent contact time, removal efficiencies, squeezing techniques, disposal via incineration, and air pollution parameters. The culmination of this effort has shown that the concept of using cotton as an oil spill clean-up agent is viable and that the system as operated was capable of retrieving approximately 95% of the oil confronted for water velocities of 2 feet/sec. or less and dispersion ratios of 0.05, or greater, pounds of cotton/lb of oil. (Sinha-OEIS)
W78-12827

TESTS OF OIL RECOVERY DEVICES IN BROKEN ICE FIELDS, PHASE II,
ARCTEC, Inc., Columbia, MD.
L. A. Schultz.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 748, Price codes: A09 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Report No. CG-D-55-76, January 1976. 171 p, 45 fig, 19 tab, 2 append.

Descriptors: *Oil spills, *Water pollution control, *Ice cover, *Equipment, Pollution abatement, Arctic, Water pollution effects, Resources development, Baseline studies, Testing, *Outer Continental Shelf.

The results of tests conducted in broken ice cover with crude oil and No. 2 fuel oil of five oil spill recovery devices manufactured by Lockheed, Marco, Ocean Systems, JBF Scientific, and Oil Mop are summarized. Additional tests were conducted to determine the natural spill thickness of crude oil and No. 2 fuel oil in open water at low temperature and in broken ice cover. The spreading tests indicated that thin oils will spread to a very thin layer whether in open water or in brokein ice cover. Heavy oils in broken ice cover will achieve a natural equilibrium thickness many times greater than the open water thickness due to the partial containment of the oil by the broken ice pieces. The oil recovery tests demonstrated that modifications made to the Lockheed and Marco devices did improve their performance when operating in broken ice cover. Tests conducted with the OSI, JBF, and Oil Mop units were more elementary in nature and did not incorporate modification of the devices for use in ice. (Sinha-OEIS)
W78-12828

MATERIALS FOR OIL SPILL CONTAINMENT BOOM,
Civil Engineering Lab. (Navy), Port Hueneme, CA.
D. E. Brunner.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 139, Price codes: A03 in paper copy, A01 in microfiche. Technical Note No. TN-1440, June 1976. 32 p, 1 fig, 4 tab, 31 ref.

Descriptors: *Oil spills, *Water pollution control, *Equipment, Materials testing, Resources development, Environmental effects, Pollution abatement, *Outer Continental Shelf, Oil booms, Hazardous materials.

A study was recently conducted at the Civil Engineering Laboratory to investigate containment boom material requirements, which were defined and weighted in terms of their relative importance. When available, standard test procedures for use in evaluating each requirement were identified. Both substrate materials and coatings to be applied are discussed in this report. From the limited investigation, polyester was the most promising substrate material, followed by nylon. Chlorosulfonated polyethylene, polyurethane with a polyether base, chlorinated polyethylene, and poly(vinyl chloride) formulated with ultraviolet inhibitors are the most promising coating materials. One substrate and coating combination could not be identified as best because of the variation in material properties. (Sinha-OEIS)
W78-12829

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1976.
Australian Water Resources Council, Canberra Dept. of National Resources.
For primary bibliographic entry see Field 2A.
W78-12833

PUBLIC DRINKING WATER SYSTEMS UNDER THE FLORIDA SAFE DRINKING WATER ACT.
Fla. Admin. Code, Ch 17-22, secs 22.101 thru 22.114, (1978). 1 app.

Descriptors: *Florida, *Water quality standards, *Water quality control, *Potable water, Permits, Water treatment, Turbidity, Organic compounds, Inorganic compounds, Water sampling, Water analysis, Wells.

These regulations are promulagted to implement the requirements of the Florida Safe Drinking Water Act as well as to acquire primacy for the State of Florida under the federal Safe Drinking Water Act (SDWA). The national primary and secondary drinking water regulations are adopted where possible. Otherwise, additional regulations are create fulfilling state and federal requirements. Certain public water systems are excluded from coverage of the SDWA and the Florida law. Maximum contaminant levels or the treatment technique, as well as sampling and analysis requirements for the water within public water systems, are provided in the regulations. The contaminants regulated include organics, inorganics, turbility, microbiological, radionuclides and other chemical contaminants. Requirements for construction, operation and maintenance of a public water system are set forth covering all aspects from collection through treatment, storage and distribution. The Department is required to implement a drinking water program and collect and verify reports from water suppliers. The procedure for public notification of imminent hazards is included, along with relevant forms to be used in the enforcement of the regulations. (Quarles-Florida)
W78-12836

POLLUTION OF WATERS.
Florida State Dept. of Environmental Regulation, Tallahassee.
For primary bibliographic entry see Field 6E.
W78-12837

VARIABILITY OF ANNUAL NUTRIENT AND SEDIMENT DISCHARGES IN RUNOFF FROM OKLAHOMA CROPLAND AND RANGELAND,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
R. G. Menzel, E. D. Rhoades, A. E. Olness, and S. J. Smith.
Journal of Environmental Quality, Vol. 7, No. 3, p 401-406, 1978. 4 fig, 4 tab, 22 ref.

Descriptors: *Oklahoma, *Fertilizers, *Nutrients, *Agricultural runoff, *Sediment yield, *Water quality, Nitrates, Agricultural chemicals, Water pollution sources, Nitrogen compounds, Nitrogen, Phosphorus, Soil propeties, Water pollution, Rainfal, Soil erosion, Sediments, Pollutants, *Soluble nutrients.

Nitrogen and phosphorus discharges in runoff from nearly level cropland and 3% sloping rangeland were measured from July 1972 to June 1976. Sediment discharges and runoff amounts from these 5- to 18-ha watersheds were measured from July 1966 to June 1976. Sediment and nutrient discharges varied greatly from year to year and between different land uses. It was concluded that long records are needed to compare discharges from different management practices. The average and maximum annual sediment discharges, respectively, were 3,600 and 8,900 kg/ha from irrigated cotton, 900 and 3,900 kg/ha from dryland wheat, 400 and 1,800 kg/ha from range with limited grazing, and 9,000 and 23,000 kg/ha from overgrazed range. Maximum annual sediment discharges occurred during the period in which nutrient discharges were measured. Maximum annual nutrient discharges were 13 kg/ha total N, 4 kg/ha nitrate N, 11 kg/ha total P, and 2 kg/ha soluble P. The average annual discharge for each nutrient form and land use was about half of its maximum value. Nitrate accounted for 10 to 30% of the total N discharged. Soluble phosphate accounted for about 20% of the total P discharged from cropland, and less than 10% of that discharged from rangeland. Annual deposition in rainfall averaged 5 kg/ha N and 0.15 kg/ha P. (Henley-ISWS)
W78-12858

SIERRA CLUB V. BERGLAND (FEDERAL AGENCY FINDING OF SUDDEN IMPAIRMENT OF WATERSHED CHANNEL REVERSED).
For primary bibliographic entry see Field 6E.
W78-12862

ELWOOD V. CITY OF NEW YORK (LIABILITY FOUND FOR POLLUTION DAMAGES TO PROPERTY CAUSED BY DIVERSION OF HEADWATERS OF DELAWARE RIVER).
For primary bibliographic entry see Field 6E.
W78-12871

ALTERNATIVE POLLUTION CONTROL STRATEGIES; EQUITY, EFFICIENCY AND INFORMATION REQUIREMENTS,
Tennessee Univ., Knoxville. Dept. of Economics.
H. W. Herzog, Jr.
The Annals of Regional Science, Vol. 11, No. 3, p 1-20, 1977. 1 fig, 3 tab, 21 ref.

Descriptors: *Water pollution control, *Equity, *Alternative planning, *Patuxent River(MD), *Model studies, *Pollution taxes(Charges), Economics, Effluents, Economic efficiency, River basins, Waste water treatment, Maryland, Environmental control, Water management(Applied), Costs, Water quality standards, Regulation, Rivers.

A water quality management simulation of the Patuxent River Basin (Maryland) documented relative efficiency and equity of alternative ef-

luent tax programs designed to provide second-best solutions to the water quality problem for various levels of treatment centralization. Although the efficiency gain from information availability was impressive, specific recommendations regarding program merit must await further assessment of information, administration, and transaction costs of the various tax programs. Even less can be said about program equity, though the study indicated that all dischargers within the basin would prefer efficient to noneffi-cient effluent tax programs. While results from the Patuxent Basin cannot be generalized in any way, the system of progressive movement from lesser to more efficient programs lends itself well to basins currently lacking detailed treatment cost and hydrologic information. As national expenditures for pollution control will probably never exceed 2.5% the burden will be modest at this level. However, the distribution of this responsibility among regions and economic activities will not impose equal hardships on all waste dischargers, and little substantive information is available on the distributional aspects (equity) of environmental controls. The 'water quality problem' as defined in this paper is the difficulty of maintaining water quality within a river and assigning waste treatment responsibility. (Lynch-Wisconsin)
W78-12875

ECONOMIC ASPECTS OF THE EFFECTS OF POLLUTION ON THE MARINE AND ANADROMOUS FISHERIES OF THE WESTERN UNITED STATES OF AMERICA,
Food and Agriculture Organization of the United Nations, Rome (Italy). Dept. of Fisheries.
F. J. Hester.
FAO Fisheries Technical Paper No. 162, 1976. 34 p, 1 fig, 17 tab, 14 ref.

Descriptors: *Water pollution effects, *Economic impact, *Fisheries, *Commercial fishing, *Pacific Coast region, *Pollutants, Marine fisheries, Anadromous fish, Economics, Productivity, Pacific Northwest U.S., California, Alaska, Washington, Hawaii, Oregon, Puget Sound, Columbia River, Aquiculture, Estuaries, Public health, Poisons, Habitats, Natural resources, Fish management.

This study examines direct and indirect costs of pollution as it affects yield and marketability of marine and anadromous fishery resources of the West Coast of the United States and associated tropical Pacific Ocean areas. Both conventional fisheries and aquaculture are considered. Two types of pollution are recognized: (1) addition of detrimental substances to the aquatic environment; and (2) physical loss or damage of aquatic habitat or mechanical destruction of organisms. A summary table presents major Type I and II pollutant inputs by location, with economic losses. It is concluded that: (1) poor management and natural population fluctuations have more influence on resources than does pollution; (2) BOD pollution is not a major factor in open waters; (3) Type II pollution, especially habitat loss, is more damaging than toxicants; and (4) Type I pollutants have caused more production losses from the threat to public health than from direct effects on resources. The study area comprises Alaska, Washington, Oregon, California, Hawaii, American Samoa and Guam, and the Trust Territory of the Pacific Islands. Eight Type I pollutants are considered: (1) trace heavy metals; (2) petroleum hydrocarbons; (3) chlorinated organic compounds; (4) sewage effluent and sludge, nutrients, pathogens, and BOD; (5) sediments; (6) fish processing wastes; (7) dumping wastes (including dredging spoils); and (8) electric power generation. (Lynch-Wisconsin)
W78-12876

A NOTE ON THE USE OF PROPERTY VALUES IN ESTIMATING MARGINAL WILLINGNESS TO PAY FOR ENVIRONMENTAL QUALITY,
Handelshogskolan i Stockholm (Sweden).
M. Karl-Goran.
Journal of Environmental Economics and Management, Vol. 4, No. 4, p 355-369, 1977. 3 fig, 11 ref.

Descriptors: *Social values, *Willingness to pay, *Property values, *Damage functions, *Pollution abatement, *Analytical techniques, Economics, General equilibrium models, Model studies, Environmental effects, Social aspects.

Underlying theoretical assumptions for using property values in estimating damage function are demonstrated as unrealistic, showing that such values alone cannot give viable estimates of marginal willingness to pay for environmental quality. In the first part of the paper a general equilibrium model (hedonic price model) is constructed in which environmental quality differences are capitalized into land rents, and in the second part some assumptions needed for this result are scrutinized and found untenable. The first such assumption is that there exists a continuum of individuals who will tend to locate in homogeneous communities having similar environmental quality, amenities, and prices. If the communities are not homogeneous, then property values do not reflect willingness to pay for environmental quality for all individuals. Assuming a continuum of households may be a good approximation if the urban study area is large enough, but it is shown that there is no direct relationship between relative land rents and marginal willingness to pay. The points made in this paper fall into two categories: (1) those that show there is no reason why willingness to pay should be related in any simple way to the influence on property values from environmental quality differences; and (2) those concerned with specification of empirical relation. (Lynch-Wisconsin)
W78-12879

THE EFFECTS OF POLLUTION TAXATION ON THE PATTERN OF RESOURCE ALLOCATION: THE DOWNSTREAM DIFFUSION CASE,
Tel Aviv Univ. (Israel).
E. Hochman, D. Pines, and D. Zilberman.
Quarterly Journal of Economics, Vol 91, No 4, p 625-638, November 1977. 4 fig.

Descriptors: *Resource allocation, *Model studies, *Pollution taxes(Charges), *Downstream diffusion, *Externalities, *Water pollution effects, Economics, Diffusion, Effluents, Industrial wastes, Agriculture, Rent, Land use, Social impact, Air pollution, Optimization.

Two models are used to analyze effects of externalities--specifically effluent from an upstream firm damaging the product of a downstream firm--on land utilization and rent along a water or air stream. Characteristics of resource allocation and the corresponding price system with and without pollution taxes are discussed. The first model assumes that only an urban center downstream suffers from the pollutants, while the second focuses on damage done to downstream agricultural producers. In the first model a pollution tax reduces land values, output, and pollution level at each location; without taxation the competitive system results in rent and labor-intensity functions that decrease with distance from the urban center. The optimum system, with a decreasing tax-distance function, may change these patterns, resulting in increasing labor intensity and rent with distance at some segments close to the urban center. In the second model downstream producers enjoy low transportation costs but suffer relatively heavy pollution damage which may result in increasing segments of the rent-distance function near the urban center. In contrast with the first model, support by optimal taxation results in restoration of a monotone-decreasing, rent-distance function. The analysis deals with an industry operating in a competitive system whose share in the market is relatively small so that product and factor prices are given. (Lynch-Wisconsin)
W78-12880

WATER TREATMENTS IN TRICKLE IRRIGATION SYSTEMS,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
R. S. Nakayama, R. G. Gilbert, and D. A. Bucks.
Journal of the Irrigation and Drainage Division, (ASCE), Vol. 1054, No. IR1, p 23-34, March, 1978. 11 fig, 1 tab, 12 ref.

Descriptors: *Irrigation practices, *Irrigation engineering, Filtration, Water treatment, Colorado River, Trickle irrigation, Return flow, Arizona.

Trickle irrigation has great potential in arid regions, by reducing the amount of water lost through evaporation as well as the amount of saline drainage return flow. A two-year study of trickle irrigation systems on the Colorado River in southwestern Arizona showed that adequate water filtration is a primary requirement for reliable emitter operation. For long-term operation of the trickle system, the accumulation of sediments, precipitates and microbial slime must be controlled by the practice of flushing mains, submains, and lateral lines and by chemical water treatment. Emitters, line materials, and other equipment should be resistant to chemicals that may be injected into the system. (Russell-Arizona)
W78-12920

EFFECT OF SALINITY ON AGRICULTURE IN IRAQ,
Mosul Univ. (Iraq). Coll. of Engineering.
M. At-Layla.
Journal of the Irrigation and Drainage Division, (ASCE), Vol. 104, No. IR2, p 195-207, June 1978. 3 tab, 2 fig, 3 ref.

Descriptors: *Salinity, *Saline soils, *Saline water, Irrigation water, Irrigation practices, Water management(Applied), *Drainage, Iraq.

Primarily an agricultural country, Iraq's major soil problem is that of salt accumulation aggravated by poor irrigation practices. Discharge of drainage water from reclamation projects into the Euphrates and Tigris Rivers creates problems for municipal and agricultural uses, and should be rerouted to the low marshes of the south to protect the rivers' water quality. Agricultural extension services should be strengthened to indoctrinate farmers through better irrigation practices. (Russell-Arizona)
W78-12922

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS, 1975, FIFTH ANNUAL ISSUE,
Colorado State Univ., Fort Collikns. Dept. of Agricultural and Chemical Engineering.
G. V. Skogerboe, S. W. Smith, and W. R. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 921, Price codes: A12 in paper copy, A01 in microfiche. Publication No. EPA-600/2-77-094, May, 1977. 249 p.

Descriptors: Fertilizers, Irrigated land, Irrigation systems, *Irrigation water, Nitrates, Phosphates, *Return flow, Salinity, Water pollution effects, *Water pollution sources, *Water quality control, *Abstracts.

Research related to the quality of irrigation return flow is being conducted at numerous institutions throughout the western United States. Related work is also underway at other institutions in the United States, as well as other portions of the world. Approximately 100 sources of material have been searched for articles pertinent to the National Irrigation Return Flow Research and Development Program. These articles describe water quality problems resulting from irrigated

agriculture, potential technological solutions for controlling return flows, recent research pertinent to return flow investigations, and literature associated with institutional constraints in irrigation return flow quality control. The first annual issue of SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS covered publications printed in 1968 and 1969, while the second annual issue lists publications printed in 1970 and 1971, the third annual issue covers calendar years 1972 and 1973, and the fourth annual issue covers literature published in 1974. This annual issue lists publications printed in 1975. This report was submitted in fulfillment of Grant Number R-800426 under the sponsorship of the Office of Research and Development, Environmental Protection Agency. (Skogerboe-Colorado State)
W78-12933

IRRIGATING ON THE DEAD LEVEL,
U.S. Water Conservation Lab., Phoenix.
For primary bibliographic entry see Field 3C.
W78-12935

EVALUATION OF THE MAGNITUDE AND SIGNIFICANCE OF POLLUTION FROM URBAN STORM WATER RUNOFF IN ONTARIO,
American Public Works Association, Chicago, IL.; and Florida Univ., Gainesville.
For primary bibliographic entry see Field 5B.
W78-12946

REVIEW OF CANADIAN MUNICIPAL URBAN DRAINAGE POLICIES AND PRACTICES.
Gore and Storrie Ltd., Toronto (Ontario).
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment, Canada, Ottawa, Canada; Pollution Control Branch, Ontario Ministry of Environment, Toronto, Ontario, Canada, Research Report No. 82, 1978. 54 p, 10 fig, 13 ref, 5 tab. 76-8-40.

Descriptors: *Urban drainage, *Sewers, *Sewerage, *Pollution abatement, Overflow, Flooding, Storm water, Storm runoff, Analytical techniques, Mathematical models, On-site investigations, Data collections, Computer programs, *Canada.

Canadian municipal urban drainage practices are summarized, based on information supplied to Environment Canada from provincial and municipal agencies, supplemented by information obtained from a number of consulting engineers across Canada. The summary is presented in three parts: - Design of new sewer systems - Abatement of pollution due to combined sewer overflows - Field studies of sewer systems. Many of the problems associated with the quantity of flow aspect of urban drainage, such as basement flooding, have long been apparent to most municipal engineers. There is now an increasing awareness by regulatory bodies of the qualitative effects of urban drainage on receiving waters. At the municipal level, attention is being given to the new storm water management techniques for solving quantity and quality problems through storage and treatment of storm water flows. Mathematical simulation models are being used for analyses of municipal urban drainage systems. There is still much work to be done, however, in collecting background data and refining and calibrating the computer programs in order to obtain the closest relationships with actual conditions. Research and development projects on urban drainage problems are being sponsored at the federal and provincial levels and are providing additional knowledge pertinent to Canadian conditions, and considerable impetus to the application of storm water management techniques all across Canada. (WATDOC)
W78-12949

STATISTICAL CONSIDERATIONS IN PLANNING AQUATIC BIOASSAYS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-12954

PREVENTIVE MEDICINE IN FISH DISEASES AND ENVIRONMENTAL ASPECTS OF TROUT FARMING,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark).
For primary bibliographic entry see Field 5C.
W78-12990

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

EVALUATING AQUACULTURAL USE OF THERMAL EFFLUENTS: AN APPLICATION OF SYSTEM DYNAMICS TO ENVIRONMENTAL PROBLEM SOLVING,
Rhode Island Univ., Narragansett. Coll. of Business Administration.
For primary bibliographic entry see Field 5G.
W78-12196

POLLUTION CONTROL IN A SIMPLIFIED GENERAL-EQUILIBRIUM MODEL WITH PRODUCTION EXTERNALITIES,
Kansas Univ., Lawrence. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-12198

REAL TIME CONTROL OF STORAGE IN A COMBINED SEWER SYSTEM,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-12286

ANALYTICAL FRAMEWORK FOR THE DESIGN OF DATA COLLECTION SYSTEMS THAT ARE RESPONSIVE TO THE NEEDS OF PLANNING AND MANAGEMENT OF WATER RESOURCES AND RELATED LAND SYSTEMS,
Case Western Reserve Univ., Cleveland, OH. Systems Engineering Div.
Y. Y. Haimes, J. Craig, and J. Subrahmanian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 919, Price codes: A14 in paper copy, A01 in microfiche. Completion Report, May 1978. 276 p, 34 fig, 41 tab, 4 append. OWRT C-6027(No. 5202)(1).

Descriptors: *Systems analysis, *Data collections, Management, Planning, *Analytical techniques, *Cost analysis, *Dynamic programming, Water demand, Water supply, *Stream flow data, *Optimum development plans, Land use, Capacity expansion, Water shortage.

In the first part of the report, a decomposition approach is proposed for the optimal sequencing of water supply projects constructed to meet a projected demand function. Efficient solution procedures based upon dynamic programming principles have been developed to select that sequence of projects which satisfies the demand for water at minimum cost; however, the requirements of such methods in terms of computational storage and time in general limits their application. A procedure based upon decomposition, dynamic programming, and incremental cost considerations is developed to permit effective analysis of systems, previously considered dimensionally infeasible. The method results in a substantial reduction of computational time requirements, while maintaining a high degree of accuracy in achieving the optimal solution. With the problem of dimensionality eliminated, the procedure may be applied to a variety of real water resource problems. Examples illustrated include the optimal expansion for a large regional system and the consideration of demand functions for multiple water qualities. In the second part, a methodology is presented for determining the worth of stream flow data used to estimate future yields of proposed water supply projects. The worth of any particular number of years of stream flow data is measured in terms of water shortages and opportunity losses expected to be incurred, if values of project yields estimated from that body of data are used in planning for capacity expansion of the water supply system. The capacity expansion model developed in the first part and a sampling technique are used to generate penalty matrices corresponding to different numbers of years of stream flow data. Values of expected penalties are extracted from these matrices and are used as measures of worth. Noncommensurable functions of water shortage and cost are then determined, and the Surrogate Worth Tradeoff method is used to obtain an optimal value for the number of years for which stream flow should be collected in order to minimize the two noncommensurable penalties. The third part of the report is devoted to a case study in which the worth of stream flow data is determined with respect to capacity expansion of a system consisting of six candidate projects.
W78-12388

SYSTEMS ENGINEERING IN WATER RESOURCES DEVELOPMENT,
Technion - Israel Inst. of Tech., Haifa.
N. Buras.
Conference on resources of Southern Africa today and tomorrow, (Johannesburg) South Africa, p 227-233, September 22-26, 1975. 5 ref.

Descriptors: *Systems engineering, *Water resources development, Model studies, Regional development, *South Africa.

Water resource systems tend to be nuclei around which other development activities concentrate - eg. Hydropower generation, irrigated agriculture, mining operations and locations of industries. In developing water resources engineers are confronted with various practical problems and by making use of systems engineering are able to analyse these problems, understand them and sometimes to find solutions. The objectives are, usually (1) economic - such as economic efficiency or the improvement in the balance of payment of the region or (2) social - such as redistribution of income, or maintaining a certain level of employment. Systems engineering is a powerful analytical tool and an important instrument in the hands of the water resources engineer in the discharge of his social responsibilities. (So Afr Water Info Ctr)
W78-12420

PREPARATION OF OUTLINE PLANS FOR THE DEVELOPMENT OF THE SURFACE WATER RESOURCES OF RHODESIA,
P. M. Gizic.
Rhodesia Science News, (Salisbury), Vol 11, No 6, p 133-134, 1977.

Descriptors: *Water resources development, Surface waters, Future planning, Rivers, Dam construction, Water utilization, *Rhodesia, Africa.

The basic reason for any planning is to try to meet, in advance, the requirements of the future. In many instances there is a somewhat uncertain future and projections into the future are often difficult and sometimes well nigh impossible. To have any hopes of success, plans for the future must be formulated taking into account all known information - information on past trends and performance, the current position, known information on future development, and this must be combined with a degree of intuitive crystal-gazing. Despite this,

because we are planning for an uncertain future, it is essential that any plans have a degree of built-in flexibility to cater for changed circumstances. The more longterm a particular plan is, the more flexible it must be. (So Afr Water Info Ctr)
W78-12477

EFFECT OF STOCHASTIC MODEL CHOICE ON HYDRAULIC DESIGN,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 8B.
W78-12527

APPLICATION OF STOCHASTIC MODELS TO RESERVOIRS NEAR THE ALPS,
Technische Univ., Munich (West Germany). Inst. for Hydraulics and Hydrology.
For primary bibliographic entry see Field 4A.
W78-12529

A STOCHASTIC OPTIMIZATION MODEL OF THE LECH RI VER SYSTEM,
Technische Univ., Munich (West Germany). Inst. for Hydraulics and Hydrology.
For primary bibliographic entry see Field 4A.
W78-12530

MULTIPURPOSE RESERVIOR OPERATION USING STOCHASTIC TRADE-OFF ANALYSES,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4A.
W78-12531

RIVER WATER QUALITY MODELLING: A COMBINED DETERMINISTIC-STOCHASTIC APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5B.
W78-12532

CHOICE BETWEEN RIVER QUALITY MODELS OF DIFFERENT DEGREES OF COMPLEXITY,
Nuclear Research Center, Karlsruhe (West Germany). Div. of Applied Systems Analysis.
For primary bibliographic entry see Field 5B.
W78-12533

ON THE OPTIMIZATION TASK FOR WATER QUALITY MANAGEMENT,
Institute of Meteorology and Water Management, Wroclaw (Poland).
For primary bibliographic entry see Field 5G.
W78-12534

SYSTEM DEVELOPMENT OF WATER RESOURCES AND WATER QUALITY CONTROL,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 5G.
W78-12536

WATER QUALITY MODELLING IN SURFACE WATER NETWORKS WITH SPECIAL REGARD TO QUALITY BREAKDOWNS,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 5B.
W78-12537

A SIMPLE MATHEMATICAL MODEL OF QUANTITATIVE AND QUALITATIVE PROCESSES OCCURRING IN THE STREAM CHANNEL FOR WATER DISTRIBUTION CONTROL,
Institute of Meteorology and Water Management, Krakow, Poland. Krakow Div.
For primary bibliographic entry see Field 5G.
W78-12538

COMPUTER PREDICTION OF THE CHANGES IN RIVER QUALITY REGIMES FOLLOWING LARGE SCALE INTER BASIN TRANSFERS,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 5B.
W78-12539

WATER RESOURCES MANAGEMENT USING INTEGER PROGRAMMING MODELS,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W78-12540

WATER QUALITY MODELLING AS A TOOL FOR DECISION MAKING IN HUNGARY,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5G.
W78-12541

ASSESSMENT TECHNIQUES FOR MODELLING WATER QUALITY IN A RIVER BASIN IMPACTED BY COAL RESOURCE DEVELOPMENT,
Geological Survey, Denver, CO.
For primary bibliographic entry see Field 5B.
W78-12542

OPTIMIZATION OF LONG-TERM SEQUENTIAL PROGRAMMES OF WATER QUALITY CONTROL,
Technical Univ. of Budapest (Hungary). Inst. for Water Management and Hydraulic Construction.
For primary bibliographic entry see Field 5G.
W78-12543

OPTIMIZATION OF TECHNOLOGICAL PARAMETERS IN AN ACTIVATED SLUDGE SYSTEM AS A FUNCTION OF THE REQUIRED WATER QUALITY UNDER VARIABLE CONDITIONS,
Institute of Meteorology and Water Management, Warsaw (Poland).
For primary bibliographic entry see Field 5D.
W78-12544

OPTIMAL PLANNING OF REGIONAL WASTE WATER TREATMENT,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-12545

REGIONALIZATION AND STAGING OF WASTE WATER TREATMENT PLANTS TO MEET WATER QUALITY STANDARDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-12546

SOME PHYSICAL AND ECONOMIC ASPECTS OF OPTIMIZATION OF THE DEGREE OF WASTE WATER AND WATER TREATMENT,
Technical Univ. of Warsaw (Poland). Inst. of Water Supply and Hydrotechnics.
For primary bibliographic entry see Field 5D.
W78-12547

ON THE COBB-DOUGLAS FUNCTIONS IN MULTIOBJECTIVE OPTIMIZATION,
Technion - Israel Inst. of Tech.m Haifa. Faculty of Industrial and Management Engineering.
U. Passy.
Water Resources Research, Vol. 14, No. 4, p 688-690, August 1978. 19 equ, 6 ref.

Descriptors: *Optimization, *Analytical techniques, *Cobb-Douglas functions, *Multiobjective programming, *Pareto solutions, Lagrangian multiplier, Costs, Projects, Water resources, Reservoirs, Equations, Systems analysis.

Properties of Pareto optimum solutions of multiobjective problems with Cobb-Douglas production-type functions have been analyzed. This type of production function is used widely in economic theory and is therefore used in the related literature on water resources. It has been found that under the defined conditions, every feasible point is a Pareto solution. A numerical example is given, where capital cost of a project, water cost due to evaporation, and total volume capacity of a reservoir are considered. (Bell-Cornell)
W78-12553

DESIGN, COST ESTIMATION AND OPTIMIZATION OF SEWAGE COLLECTION AND TREATMENT SYSTEMS FOR HOUSING DEVELOPMENT IN THE GLENWOOD, NEW YORK AREA,
Calspan Corp., Buffalo, NY.
For primary bibliographic entry see Field 5D.
W78-12611

DISCOUNTED FLOOD RISKS IN LEAST-COST DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil and Ceramic Engineering.
For primary bibliographic entry see Field 5D.
W78-12612

TESTING AN ITERATIVE, OPEN PROCESS FOR WATER RESOURCES PLANNING,
Stanford Univ., CA. Dept. of Civil Engineering.
T. P. Wagner, and L. Ortolano.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 318, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Army Engineer Institute for Water Resources, Fort Belvoir, VA, IWR Contract Report 76-2, December 1976. 67 p, 5 fig, 2 tab. DACW 73-73-C-0046.

Descriptors: *Evaluation, *Planning, *Methodology, *Water resources planning, Alternative planning, Flooding, Decision-making, Testing procedures, *Iterative open planning process, *Iterative planning, *Public involvement, Field test, Public participation, Implementation, San Pedro Creek River Basin(CA).

The study consists of an experiment undertaken in the context of an ongoing water resources planning study of the Corps of Engineers San Francisco District. The report describes the field test and evaluation of an iterative, open planning process (IOPP) in which the four traditional planning activities are carried out concurrently, but with different degrees of emphasis over time. The four planning activities are problem identification, formulation of alternatives, impact assessment, and evaluation. The process is flexible and is opened to all affected interests by actively identifying them at many stages of planning. The IOPP was used to formulate and evaluate alternative solutions to flooding problems in the San Pedro Creek River Basin in California. In conjunction with the Corps, the researchers designed a study procedure and participated in plan formulation and evaluation activities. The report describes the various problems encountered during the implementation of the IOPP technique and discusses means to avoid these problems and make the technique more efficient and effective. The IOPP was still experimental when the research was initiated. A process similar to IOPP has recently been adopted by the Corps, lending new sig-

nificance to the study results and conclusions. (Nessa-NC)
W78-12666

THE ARIZONA WATER COMMISSION'S CENTRA ARIZONA PROJECT WATER ALLOCATION MODEL SYSTEM,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6E.
W78-12924

6B. Evaluation Process

ENHANCEMENT OF WATER RESOURCES INFORMATION TRANSFER AND RESEARCH IN VERMONT,
Vermont Univ., Burlington. Water Resources Research Center.
For primary bibliographic entry see Field 10D.
W78-12116

POLLUTION CONTROL IN A TWO-SECTOR DYNAMIC GENERAL EQUILIBRIUM MODEL,
Guelph Univ. (Ontario). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-12197

POLLUTION CONTROL IN A SIMPLIFIED GENERAL-EQUILIBRIUM MODEL WITH PRODUCTION EXTERNALITIES,
Kansas Univ., Lawrence. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-12198

ESTIMATION OF WATER PRODUCTION FUNCTIONS FOR EVALUATION OF IRRIGATION METHODS: A CASE STUDY IN CHILE,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W78-12220

THE UPPER RIO GRANDE,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W78-12229

INTERNATIONAL EXTERNAL DISECONOMIES: THE COLORADO RIVER SALINITY PROBLEM IN MEXICO,
Escuela Nacional de Agricultura, Chapingo (Mexico); and Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6E.
W78-12231

OCS DEVELOPMENT IN COASTAL LOUISIANA: A SOCIO-ECONOMIC IMPACT ASSESSMENT,
New Orleans Univ., LA. Urban Studies Inst.
A. J. Mumphrey, Jr., R. E. Thayer, and F. W. Wagner.
New Orleans University Urban Studies Institute Report to Louisiana State Planning Office, August 1977. 283 p, 16 fig, 61 tab, 51 ref, 3 append. LSPO-SPO-77-21.

Descriptors: *Louisiana, *Resources development, *Economics, Sociology, Oil industry, Coasts, *Outer Continental Shelf, Oil resources, Gas resources, Environmental impact.

In the seven chapters which comprise this study, various impacts of outer continental shelf (OCS) oil and gas development on the Louisiana coastal zone and related topics are discussed. Chapter 2 deals with the OCS related production, employment, and population impacts. The public service sectors analyzed in Chapter 3 are education, highways, police protection, fire protection, water supply, solid waste disposal, sewerage, health and hospitals, and parks and recreation. Chapter 4 analyzes local needs, expenditures, and fiscal capabilities. Chapter 5, presents the stages of development, and the basic problems associated with development in this environment. The task of Chapter 6 is to assess the effectiveness of the planning and management capability of the local governments in Louisiana's coastal zone and recommend potential improvements. Chapter 7 provides a discussion of citizen participation at both the theoretical level and the practical level through an examination of the Louisiana Coastal Resources Program's Public Participation Program. (NOAA)
W78-12307

THE ROLE OF WATER DEVELOPMENT ADVISORY COUNCILS IN WATER RESOURCE PLANNING,
For primary bibliographic entry see Field 6E.
W78-12478

SOME CRITERIA FOR SELECTION BETWEEN CORRECTION OF THE INDICATIVE FLOW AND THE WASTE TREATMENT EFFICIENCY IN A SMALL RIVER BASIN,
Institute of Meteorology and Water Management, Warsaw (Poland).
For primary bibliographic entry see Field 5D.
W78-12535

RETHINKING THE TIMETABLE FOR REFRESHING OUR WATERS,
For primary bibliographic entry see Field 5G.
W78-12565

PUBLIC INVOLVEMENT IN NATURAL RESOURCE DEVELOPMENT: A REVIEW OF WATER RESOURCE PLANNING,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
For primary bibliographic entry see Field 6E.
W78-12568

A HISTORICAL SURVEY OF WATER UTILIZATION IN THE COOK INLET-SUSITNA BASIN, ALASKA,
Alaska Univ., College. Inst. of Water Resources.
W. R. Hunt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 964, Price codes: A02 in paper copy, A01 in microfiche. Report No. IWR-85, June 1978 1978. 4 p. OWRT A-056-ALAS(1), 14-34-0001-6002.

Descriptors: *Water utilization, *Alaska, *History, *Cook-Susitna Basin(Alas).

An investigation of appropriate archival and published literature bearing on the history of the Cook Inlet-Susitna Basin indicated the importance of water utilization in the region. To a great extent the development of the region's diverse and changing economy in historic times was related to the availability and exploitation of certain water bodies. Some dissemination of the historic research has been presented in popular publications and other writings will bring public attention to the importance of water utilization.
W78-12605

POLICIES, ISSUES AND CONCERNS OF WATER AND RELATED LAND RESOURCES INTEREST GROUPS,
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 6E.
W78-12619

SOCIAL IMPACT ASSESSMENT, 10.
Ad Hoc Interagency Working Group on Social Impact Assessment, October 1976, 20 p.

Descriptors: *Local governments, *Relocation, *Social impacts, *Methodology, *Land development, *Environment, *Assessments, Social adjustment, Equity, Planning, Land use, *Wisconsin Environmental Protection Act(WEPA), *Citizen perception, *Neighborhoods, *Social environment, National Environmental Policy Act(NEPA), Displacement, Human needs, Environmental Impact Statements.

This issue is a collection of short methodological articles on how to assess social impacts of proposed land development projects. The general scope of the report explores how the physical environment of a neighborhood may be changed by proposed land development, and how these changes may affect neighborhood as a social environment. Areas investigated are recreational patterns at public facilities, recreational use of informal outdoor spaces, shopping opportunities, personal safety and privacy, aesthetics and cultural values. These articles are intended for use by planners, appropriate line agency staff, and interested citizens involved with land use decisions. The major problem in assessing social impacts is the lack of empirical data useful for analysis. The report recommends using citizen surveys, direct observation and diaries to collect the needed baseline data. The baseline data can also be used for planning purposes, since they can identify the needs of neighborhood residents and define the development criteria which residents believe would be most responsive to their needs. (Coan-NC)
W78-12652

THE FUTURE OF UNIVERSITY EDUCATIONAL PROGRAMS IN A 'STEADY-STATE' ENVIRONMENT,
For primary bibliographic entry see Field 6E.
W78-12653

DRAFT GUIDELINES FOR AREAWIDE WASTE MANAGEMENT PLANNING. SECTION 208, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-12658

A ROLE FOR UCOWR IN MEETING NATIONAL NEEDS,
Idaho Univ., Moscow. Idaho Water Resources Research Inst.
For primary bibliographic entry see Field 6E.
W78-12659

BOATER DECISION MAKING,
Wyle Lab., Huntsville, AL.
M. Pfauth, C. Stiehl, and G. Lancaster.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 970, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Department of Transportation, Coast Guard, Office of Research and Development, Washington, D.C., November 1976. 56 p, append. DOT-CG-40672-A, T.O. 21.

Descriptors: *Boating, *Accidents, *Decision making, *Risks, Behavior, Design, Recreation, Capsize, Sink, Swamping, Small boats, Risk-taking, Accident analysis, Boat design, Coast Guard.

This study is designed (1) to determine whether a common cause exists for the capsizing, sinking and swamping of small boats; (2) to determine what design changes in boats would have prevented these accidents; and (3) to determine whether any behavioral problems, such as in-

creased risk-taking, would result from making these design changes. Phase I of this report tabulates and presents analyses of the most frequent causes of these boating accidents, an assessment of whether design changes would have prevented these accidents, suggested design changes, and an estimate of the effect of each design change. Phases II and III assess the effect of the recommended boat design changes on boaters, especially with respect to whether boaters' risk-taking level would increase and thus negate the accident prevention capacity of the design changes. Phase II presents the results from interviews and observations designed to uncover associations between boat design, environmental exposure, and personal characteristics. It also gives an indication of the effect of gross design differences on boaters' risk-taking behavior. While Phase II assesses the effects of gross design changes, it attempts to determine experimentally the effect of specific design changes on boaters' risk-taking behavior. (Nessa-NC)
W78-12663

PLAN OF ACTION: THE TRINITY RIVER PUBLIC INVOLVEMENT PROGRAM,
Texas A and M Univ., College Station. Dept. of Urban and Regional Planning.
D. L. Pugh, and C. B. Corich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 798, Price codes: A04 in paper copy, A01 in microfiche. Army Corps of Engineer District, Fort Worth, September 1976, 46 p, 9 fig, 1 append. DACW63-76-C-0123.

Descriptors: *Social participation, *Planning, *River basins, Methodology, Alternate planning, Flood control, Water quality, Recreation, Water supply, Navigation, *Texas, River basin development, *Public involvement, *Trinity River(TX), *River basin planning, Citizens Assistance Groups.

The Plan of Action is a comprehensive planning document setting forth the approach and procedures for achieving an active and viable program of public involvement in the planning process for the development of the Corps of Engineers Trinity River Project in Texas. The planning area includes the entire river basin, consisting of 22 counties divided into 3 regions, each constituting the planning area for a Citizens Assistance Group (CAG). The Plan will address flood control, navigation, water supply, recreation, fish and wildlife, environmental enhancement, and other topics. The Plan delineates the several alternatives available for: delineation of the planning area; delineation and composition of CAGs; and administration and operation of the CAGs. The process for selection of the appropriate alternative for each activity listed is explained and the selections are fully described along with the supporting rationale. The evaluation methods to be used are discussed, as is the system for providing a public opinion position statement for each major issue. The Plan was created within the context of the general goal of creating Citizen Assistance Groups composed of members whose attitudes fairly represent the interests of a majority of the citizens who live within the designated planning area. (Nessa-NC)
W78-12664

TESTING AN ITERATIVE, OPEN PROCESS FOR WATER RESOURCES PLANNING,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-12666

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, VOLUME 1: SUMMARY REPORT.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 742, Price codes: A13 in paper copy, A01 in microfiche. Prepared for Red River Basin Coordinating Committee, June 1968, 176 p, 19 tab, 23 fig, 2 plates, 2 annexes. One of 8 volumes.

Descriptors: *Planning, *Water resources development, *Land development, *Regional analysis, *River basin development, *River basins, Arkansas, Louisiana, Texas, Oklahoma Institutions, Economics, Cost analysis, Recreation, Fish management, Wildlife management, Flood control, Bank stabilization, Drainage, Water supply, Navigation, Hydroelectric power, Environmental effects, Reservoirs, Multiple-purpose projects, Non-structural alternatives, *Red River Basin, Single-purpose projects, Structural alternatives.

This volume is the Summary Report for the comprehensive basin study of the Red River below Denison Dam. The ad hoc Red River Coordinating Committee was composed of representatives of the U.S. Departments of Agriculture, Army, Commerce, Health, Education and Welfare, and Interior; the Federal Power Commission; and the states of Arkansas, Louisiana, Texas and Oklahoma. The study's purposes are to investigate those economic and physical development potentialties which interrelate with water and related land resources; to inventory associated short- and long-term needs concerning this development; and to recommend actions so that these potentialities might be realized. Specific problems addressed included flood control and drainage, water supply, navigation, hydroelectric power, recreation, fish and wildlife, bank stabilization, regional development, environmental aspects, and costs and monetary benefits. Early-action recommendations are reviewed as follows: (1) development of 49 upstream watershed multiple-purpose projects and 13 single-purpose upstream watershed reservoirs; (2) development of 12 major tributary reservoirs; (3) three channel improvement projects for local flood control; (4) modification of a local interest levee to conform to Federal standards; and (5) main stem navigation improvements and bank stabilization measures. Non-structural measures and programs proposed include better flood plain use; a public information effort; preservation of features of cultural, historical, archeological, scientific, ecological and aesthetic importance; and continued planning efforts. Final recommendations include periodic updating of the comprehensive plan and use of the report as a supporting document for project authorization requests submitted by construction agencies. (See W78-12761 thru W78-12767) (Zayac-NC)
W78-12760

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, VOL. 2, APP. I: ECONOMICS: APP. II: CLIMATE AND METEOROLOGY: APP. III: HYDROLOGY, SURFACE GROUND WATER AND GEOLOGY: APP. IV: FLOOD CONTROL AND MAJOR DRAINAGE.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 743, Price codes: A12 in paper copy, A01 in microfiche. Prepared for Red River Basin Coordinating Committee, by Army Corps of Engineers and Department of Commerce, June 1968, 262 p. One of 8 volumes.

Descriptors: *Water resources, *Economics, *Planning, *Climates, *Meteorology, *Hydrology, *Surface waters, *Groundwater, *Geology, *Drainage, *Flood control, Arkansas, Texas, Louisiana, Oklahoma, Cost analysis, Water supply, Economic prediction, Climatic data, Temperature, Winds, Evaporation, Runoff, Flood damage, Water resources development, Standard Project Flood, Flow characteristics, Flooding, Stage-discharge relations, Peak discharge, Stormwater, Storm runoff, *Red River Basin, Precipitation.

Volume 2 of the Red River Basin Study is comprised of four appendices. Appendix I presents the economic trends of the area encompassed within the Red River Basin below Denison Dam. It endeavors to establish a comprehensive concept of the economic growth of the study area and then attempts to relate this growth to that of the four states--Oklahoma, Texas, Louisiana and Arkansas--involved, and also to the nation as a whole. Included in the study are a discussion of the present economy, a determination of economic indicators, and economic projections. Appendix II presents a brief discussion of the study area's climatological data, including temperature, precipitation, wind and evaporation. Climatological and meteorological data published by the Environmental Science Services Administration are presented. Appendix III presents information on the geologic features and hydrologic environment of the study area to be used for both evaluating the sources. Included in the appendix are reviews of the basin's geology, runoff characteristics, and water supplies, the hydrology of the Red River, and a discussion of the standard project flood. Appendix IV presents results of an analysis of flood control and major drainage problems along the Red River and its major tributaries below Denison Dam. Data are presented on flood control and major drainage needs for areas susceptible to fluvial flooding. Also discussed is the potential increase in flood damage due to future development. Projects to satisfy short-term (10-15 years) needs are presented, and solutions to long-term (100 years) problems are suggested. (See also W78-12760) (Zayac-NC)
W78-12761

COMPREHENSIVE BASIN STUDY. RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, TEXAS. VOLUME 3, APPENDIX V: UPSTREAM WATERSHED PROTECTION, USE, MANAGEMENT, AND DEVELOPMENT.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 750, Price codes: A12 in paper copy, A01 in microfiche. Prepared by Red River Basin Coordinating Committee, by U.S. Department of Agriculture, June 1968, 238 p, 83 tab, 14 fig, 43 exhibits. One of 8 volumes.

Descriptors: *Water resources development, *Land development, *Agricultural watersheds, *Forest watersheds, Arkansas, Texas, Oklahoma, Louisiana, Multiple purpose projects, Multiple purpose reservoirs, Population, Economics, Surface water availability, Surface water, Drainage, Flood control, Erosion, Soils, Recreation, Irrigation, Non-structural alternatives, Water supply, *Upstream watersheds, *Red River Basin, *Agricultural resources, Single purpose projects, Single purpose reservoirs, Conservation Needs Inventory.

Objectives of this study are to identify water and related land resource problems; to prepare a potential plan for development of those resources; to compile agricultural and forestry data needed for the plan: and to prepare engineering, economic and related data that local organizations might use in developing the resouces. Population and economic projections indicate that water deficits in agricultural production are expected by 1980 and will increase unitl 2010. Additional development is needed for flood prevention, water supply, pollution abatement and recreation. The dendritic drainage pattern of the study area consists of 193 Conservation Needs Inventory (CNI) watersheds within 24 tributary basins. Of these watersheds, 122 are unfeasible for any development. Nearly all of the productive agricultural and forestry base area is adversely affected by soil erosion, soil

limitation and excess water problems. Conservation treatment by land user conversion and common soil and water conservation practices are suggested. Recommendations are made for single and multiple purpose reservoirs to meet irrigation and recreation needs in the area. The most obvious impacts of potential project development are conversions of land to water needs. However, increased agricultural production needs can be met by allowing formerly flooded and poorly drained land to be farmed more productively. Irrigation can increase production. Potential projects should result in better overall agricultural economic impacts such as rural employment and income; however, reduction of woodland acreage would adversely affect forest industry and related employment. (See also W78-12760) (Zayac-NC)
W78-12762

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, TEXAS. VOL. 4, APPENDIX VI: IRRIGATION: APPENDIX VII: DRAINAGE AND FLOOD PREVENTION ON FLATLANDS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 751, Price codes: A12 in paper copy, A01 in microfiche. Prepared for Red River Basin Coordinating Committee, by Department of the Interior, June 1968, 260 p, one of 8 volumes.

Descriptors: *Irrigation, *Water resources development, *Economics, *Drainage, *Land management, *Agriculture, *Agricultural watersheds, *Flood plains, Texas, Arkansas, Oklahoma, Louisiana, Irrigable land, Water requirements, Irrigation engineering, Arable land, Irrigation water, Water rights, Irrigation design, Irrigation canals, Irrigation effects, Irrigation practices, Flood control, Flood damage, Flood irrigation, Flood protection, Forest management, Crops, Land resources, *Red River Basin, *Flatlands.

The objectives of the irrigation investigations presented in Appendix VI include determination of the extent of the drought problem in the river basin and possible solutions. Included in the investigation were the creation of inventories of land suitable for irrigation, land currently irrigated by crops, irrigation facilities, project type lands, and water resources; the appraisal of feasibility for irrigation development; the study of potential irrigation development; and a review of irrigation water requirements for potential development. Present irrigation problems are investigated by summarizing irrigation development, water laws by states, water quality and water requirements. Potential irrigation development is studied through water availability, economic factors, future needs and potential development. The purpose of Appendix VII is to identify and inventory both drainage and flood prevention on flatlands as they pertain to water management. This analysis was conducted to facilitate consideration of comprehensive plans; it attempts to evaluate the total average annual reduction in net incomes due to the drainage and flood problems which occur with present cropping patterns and farming conditions. The problem of drainage and flood prevention development feasibility is studied through factors--physical, economics and crop yields and technology--affecting feasibility and also drainage and flood prevention in forestry management. An appraisal of the potential for drainage and flood prevention development is conducted by investigating the feasibility of outlet channels, economic factors, and potential drainage and flood prevention development. (See also W78-12760) (Zayac-NC)
W78-12763

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, TEXAS. VOL. 5, APP. VIII: MINERAL RESOURCES AND MINERAL INDUSTRY: APP. IX: ARCHEOLOGICAL, HISTORICAL AND NATURAL RESOURCES: APP. X: HYDROELECTRIC POWER.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 752, Price codes: A10 in paper copy, A01 in microfiche. Prepared for Red River Basin Coordinating Committee, by Department of the Interior and Arkansas University Musum, June 1968m, 219 p, one of 8 volumes.

Descriptors: *Archeology, *Natural resources, *Mineral industry, *Water resources development, *Hydroelectric power, Texas, Arkansas, Oklahoma, Louisiana, Mining, Planning, Hydroelectric plants, Electrid power production, Energy, Economics, Electrid power plants, Development, *Historical resources, *Mineral resources, *Red River Basin, Pumped-storage installations, Reversible-unit installations, Power needs.

The objectives of Appendix VIII are to report on the nature and extent of mineral occurrences and of the mineral industry in the Red River Basin, and to determine the nature and scope of involvement of these resources and industry in basin development plans. Physical aspects of the basin are first presented, followed by an inventory of mineral resources and industry (especially petroleum and natural gas, cement, sand and gravel, iron ores, stone, clay, lignite, salt and gypsum). Geographic distributions are summarized. Appendix IX has three objectives: to review the history of the basin; to comment on the potentialities of the basin's archeological, historical and natural resources; and to evaluate the dangers to those resources inherent in a water resources development plan such as is being considered for the Red River Basin. The natural setting and environment are reviewed, as well as the history of archeological work and the basin's history and prehistory. Assessments and recommendations by state are then made concerning these resouces. Appendix X inventories existing and projected power supply requirements. Conventional plants, reversible unit installations, and pumped storage installations were considered. This information is then used to determine if the potential hydroelectric development in the Red River Basin below Denison Dam is feasible and would be usable in serving the estimated future power loads in the power market area while adhering to the long-range basin plans for the development of water and related land resources. Potential hydroelectric projects were screened and selection of projects for immediate consideration was made within the limitations imposed by other basin development. (See also W78-12760) (Zayac-NC)
W78-12764

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, APP. XI: WATER SUPPLY & WATER QUALITY CONTROL: APP. XII: OUTDOOR RECREATION: APP. XIII: FISH & WILDLIFE.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 753, Price codes: A09 in paper copy, A01 in microfiche. Prepared for by Red River Basin Coordinating Committee, Department of the Interior and Federal Water Pollution Control Administration, June 1968, 195 p. One of 8 volumes.

Descriptors: *Fish management, *Wildlife management, *Recreation, *Water quality, *Water supply, *Planning, *Water resources development, Texas, Oklahoma, Arkansas, Louisiana, Water resources, Fisheries, Water quality control, Water quality standards, Cost-benefit analysis, Water supply development, River basin development, River basins, *Red River Basin.

The purposes of Appendix XI are to study present water use and potential water supply development; to project water requirements for municipal and industrial use; to determine existing and potential pollution problems; to review the effects of the comprehensive plan on the water quality of the basin's streams; to evaluate alternatives; and to study water supply allocation. Present municipal and industrial water use is studied and future water requirements are projected. Water quality control is discussed and a water quality control plan is suggested, followed by a determination of benefits. The goal of Appendix XII is to develop a plan to meet the outdoor recreation needs of the market and to provide an equitable distribution of opportunity. Outdoor recreation areas are reviewed by three categories of recreation activities. Emphasis was placed on determining the demand, supply and needs of the outdoor recreating public in the basin; appraising recreation potentials; evaluating the extent of short- and long-range development programs; and recommending specific action to meet the demand for outdoor recreation in the next 10-15 years. Appendix XIII is a study of expected fish and wildlife populations and associated human demands for these natural resources within the study area. The primary objective was to formulate realistic fish and wildlife planning that would provide for the development and utilization of these resources. (See also W78-12760) (Zayac-NC)
W78-12765

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS. VOLUME 8, APPENDIX XV: PLAN FORMULATION.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 755, Price codes: A09 in paper copy, A01 in microfiche. Prepared for by Red River Basin Coordinating Committee, by Plan Formulation Task Force, June 1968, 184 p, 33 tab, 21 fig, 2 plates. One of 8 volumes.

Descriptors: *Regional analysis, *Planning, *Long-term planning, *Short-term planning, Texas, Oklahoma, Arkansas, Louisiana, Environmental effects, Navigation, Irrigation, Water supply, Water quality, Drainage, Flood control, Recreation, Fish management, Wildlife management, Non-structural alternatives, Watersheds, River basin development, River basins, Bank stabilization, *Red River Basin.

This volume presents the comprehensive plan of development for the Red River Basin and describes and analyzes the planning processes leading to its development. Designed to meet water and land resource needs for the next 100 years, the plan reviews water supply for municipal, industrial and irrigation uses; water quality control; flood control; drainage; watershed protection; navigation; bank stabilization; hydroelectric power; grazing and cropland improvements; forestry production; outdoor recreation; fish and wildlife enhancement; regional development; environmental protection; and control of disease bearing vectors. Suggestions for Congressional authorization in the next 10-15 years are presented as a framework for future development. The Appendix is meant to serve as a summary and analytical tool for data generated throughout the study. Problems and needs are inventoried first. Then planning goals and objectives are discussed, followed by solutions considered for each of the previously discussed problems and needs. A comprehensive plan of development is outlined. An early-action plan is presented which specifically consider major reservoir improvements, local flood protection, upstream watersheds, navigation and bank stabilization, improvements for fish and wildlife, recreation needs and nonstructural measures. Lastly, a long-range plan of development is suggested. (See also W78-12760) (Zayac-NC)
W78-12766

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUI-

SIANA, OKLAHOMA, AND TEXAS. VOLUME 7, APPENDIX XIV: STATE WATER LAWS, POLICIES AND PROGRAMS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 754, Price codes: A14 in paper copy, A01 in microfiche. Prepared for Red River Basin Coordinating Committee, June 1968, 307 p, 4 sections. One of 8 volumes.

Descriptors: *Planning, *Water resources development, *Water law, *Water policy, *Programs, *Legislation, *Land resources, Texas, Arkansas, Louisiana, Oklahoma, Institutions, Legal aspects, Water permits, Water rights, Public rights, Judicial decisions, River basins, *Red River Basin.

The purpose of this Appendix is to identify and catalogue those state laws, policies and programs relating to water use and control in order to define the nature and extent of participation by the states in the development of the water and land resources of the basin. The Appendix is divided into four sections, each section reviewing state water laws, policies and programs in each of the four states of Arkansas, Louisiana, Oklahoma and Texas. Principles and concepts of state laws as defined by the state constitutions, statutes, case law and opinions are presented. Water rights are discussed concerning surface and ground waters, access to surface waters, diversion and eminent domain. Regulatory authorities are reviewed. Lastly, instrumentalities concerned with water and related land resources are inventoried, including state agencies, universities, political subdivisions and regional authorities. (See also W78-12760) (Zayac-NC)
W78-12767

BIG BLACK RIVER, MISSISSIPPI--COMPREHENSIVE BASIN STUDY, VOLUME I: INTERAGENCY SUMMARY REPORT.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 816, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Big Black River Basin Coordinating Committee, April 1968, 58 p, 5 tab, 14 fig, 3 plates, 1 attachment. One of 5 volumes.

Descriptors: *Water policy, *Planning, *Water resources, *Non-structural alternatives, *Recreation facilities, *Reservoirs, Mississippi, Water quality, Water supply developments, Watersheds(Basins), Land resources, Stabilization, Flood control, Flooding, Agricultural watersheds, Recreation demand, Multiple-purpose reservoirs, Channel improvement, Fisheries, Wildlife management, Water quality control, Water supply, Land treatment, Cost-benefit ratio, *Management, Structural alternatives, Upstream development, *Big Black River Basin(MS).

This study presents a proposed plan for the development and management of water and related land resources of the Big Black River Basin. This plan is aimed at providing 'the best use or combination of uses of these resources to satisfy the immediate and long-range needs within the Basin'. The planning period is 50 years. The conclusions are that there are important needs for flood protection, agricultural facilities, fish and wildlife conservation, and for agricultural land and water management. Proposals include both near-term (10-15 years) and long-term programs. Near-term recommendations include upstream watershed development, expansion of two existing recreational areas, and non-structural measures. Upstream watershed development is recommended for 32 of the area's 37 subbasins; land treatment and critical area stabilization is recommended for all subbasins. Included are such structural measures as floodwater retarding structures, multi-purpose structures and channel improvement. Two recreational areas are scheduled for upgrading. Non-structural measures include wildlife, fisheries and land management programs, enforcement of proposed water quality control programs, surveillance of potable water supplies, and informational and coordinating flood control programs. Long-range recommendations are scheduled upon future anticipated needs of the study area. Features include a main stem reservoir, tributary reservoirs at selected sites, 5 tributary upstream watershed programs, a navigable waterway project linking Jackson with the Mississippi River, and expansion of existing recreational areas. These recommendations should be considered as the economic development of the Basin warrants. (See W78-12769 thru W78-12772) (Zayac-NC)
W78-12768

BIG BLACK RIVER, MISSISSIPPI: COMPREHENSIVE BASIN STUDY. VOLUME II, ANNEX A: AGRICULTURAL REQUIREMENTS AND UPSTREAM WATERSHED DEVELOPMENT.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 817, Price codes: A08 in paper copy, A01 in microfiche. Prepared for Big Black River Basin Coordinating Committee, by Department of Agriculture, Soil Conservation Service, Economic Research Service, Forest Service. Jackson, MS, June 1968, 167 p, 62 tab, 9 fig.

Descriptors: *Agriculture, Water resources, *Land resources, *Planning, Mississippi, Crop production, Agricultural watersheds, Agricultural runoff, Agricultural engineering, Land management, Soil conservation, Irrigation programs, Cultivated lands, Farms, Farm units, Forestry, Rural areas, Small watersheds, Crops, Fish management, Wildlife management, Non-structural alternatives, Cost analysis, Economics, Institutions, *Management, *Big Black River(MS), Structural alternatives.

Annex A summarizes studies made by the Department of Agriculture. These studies were undertaken in connection with the comprehensive planning done for the Big Black River Basin as reviewed in the Interagency Summary Report. Annex A is oriented primarily to upstream watershed development. First the physical and environmental characteristics of the basin are inventoried--location and size, geology, soils, climate, land use and cover, hydrology, fish and wildlife and timber resources. Secondly, economic development, present and projected, is described in terms of population, labor force, employment, personal income and households. The agricultural economy is next reviewed--farm production, commodity requirements, production versus requirement, farm income, farmland and forestry resources. The study then moves into investigating the interrelationships of critical planning parameters. Water and related land resource problems and needs are investigated by discussing erosion, floodwater, sediment, drainage and then applying these data to management needs in flood control and prevention, land conservation, livestock, recreation and fish and wildlife. The potential for water and land resource development is studied through land and surface availability, groundwater potentials, recreation and fish and wildlife. Existing programs are then presented, followed by USDA's plan formulation. Finally, water and related land resource programs and measures recommended for early action are suggested. Included here are basin-wide projects, structural and non-structural projects, cost comparisons and recommended institutional arrangements. (See also W78-12768) (Zayac-NC)
W78-12769

BIG BLACK RIVER, MISSISSIPPI: COMPREHENSIVE BASIN STUDY. VOLUME III, ANNEX B: ENGINEERING STUDIES OF WATER DEVELOPMENT PROJECTS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 818, Price codes: A11 in paper copy, A01 in microfiche. Prepared for Big Black River Basin Coordinating Committee, by Department of the Army, Vicksburg District, Corps of Engineers, Vicksburg, MS, April 1968. 246 p, 13 tab, 2 fig, 8 plates, appendices.

Descriptors: *Engineering structures, *Engineering, *Water resources development, *Reservoirs, *Multiple purpose projects, Mississippi, Non-structural alternatives, Recreation facilities, Flood control, Flood damage, Flood plains, Fish management, Wildlife management, Reservoir sites, Economics, Cost analysis, Farms, Multiple purpose reservoirs, Planning, *Big Black River(MS), *Management, Structural alternatives.

Annex B summarizes engineering studies of water resource projects in Mississippi's Big Black River Basin. These studies were undertaken in conjunction with the comprehensive planning done for the Basin as reviewed in the Interagency Summary Report. Two main conclusions are reached in this annex. First, the main stem of Big Black River has a serious flooding problem; and second, there is a pronounced need for water-oriented recreation and fish and wildlife conservation. Recreation reservoirs are the most economically feasible alternatives. However, two factors militate against their realization: major reservoirs would inundate productive farmland and are opposed by local interests; and the construction by Federal agencies of single-purpose reservoirs is prohibited by law. There is economic justification for plans considered to provide flood protection on the main stem by channel improvement, levees, main stem or tributary reservoirs or any combination of these. Specific recommendations follow: multipurpose reservoirs must be further considered; long-range development planning must be incorporated; main stem channel improvement for flood control should be restudied in the future depending on the area's economic development; an integrated and comprehensive system of flood plain planning and flood protection be adopted by the concerned entities in the study area; and that no additional work for flood control and related purposes be undertaken by the Corps of Engineers at present. (See also W78-12768) (Zayac-NC)
W78-12770

BIG BLACK RIVER, MS: COMPREHENSIVE BASIN STUDY: VOL. IV, AN. C--RECREATION ASPECTS: AN. D--FISH & WILDLIFE RESOURCES: AN. E--MUNICIPAL & INDUSTRIAL WATER SUPPLY & WATER QUALITY CONTROL: AN. F--GEOLOGY & WATER RESOURCES: AN. G--ARCHEOLOGICAL, HISTORIC, & NATURAL RESOURCES.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 819, Price codes: A13 in paper copy, A01 in microfiche. Annexes prepared for Big Black River Basin Coordinating Committee, by Dept. of the Interior, Southeast Region, Atlanta, GA.

Descriptors: *Recreation, *Fish management, *Wildlife management, *Water supply, *Water quality, *Water resources, *Geology, *Archeology, *Natural resources, *River basin development, Mississippi, Planning, Surface water availability, Groundwater resources, Water demand, *Big Black River(MS), Historic sites.

Each annex reviews an important aspect of the comprehensive planning undertaken for the Big Black River Basin as presented in the Interagency Summary Report. The purpose of Annex C is to determine the impact of water resource development projects on outdoor recreation and to present a general plan for the outdoor recreation development of identified water and related land resources to meet outdoor recreation needs. An inventory of existing public outdoor recreation areas is included. Annex D provides information on current and projected sport fishing, hunting and commercial fisheries demands, supply of resources, and a proposed fish and wildlife plan. Long range

planning is an integral part of the study. The objectives of Annex E are to appraise basin water quantities and qualities; to summarize present and future municipal and industrial water supply demands; to investigate regulatory needs; to assess minimum water quality standards; and to study storage for both supply and stream flow control. The FWPCA finds that storage of water for water quality control will be required is a proposed industrial expansion plan materializes; and that future water requirements can be met from ground water sources. Annex F is a summary description of the geohydrology and water resources of the Basin and of ground water-surface water relationships. Its purpose is to inventory the facts needed to develop optimally the natural and cultural resources of the Basin. Findings indicate that abundant water supplies of good quality are available. Annex G summarizes the Basin's natural setting, especially in relation to demographic patterns. Settlement histories are explored and archeological findings are evaluated. No conflicts are seen between proposed development and historic sites, nor between proposed channelizations and archeological sites. (See also W78-12768) (Zayac-NC)
W78-12771

BIG BLACK RIVER, MISSISSIPPI: COMPREHENSIVE BASIN STUDY. VOL. V, AN. H: HYDROELECTRIC POWER: AN. I: ROLE OF THE STATE OF MISSISSIPPI IN THE PLANNING & DEVELOPMENT OF THE WATER AND RELATED LAND RESOURCES: AN. J: TRANSCRIPTS OF PUBLIC HEARINGS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 820, Price codes: A12 in paper copy, A01 in microfiche. Prepared for Big Black River Basin Coordinating Committee, Annex H prepared by Federal Power Commission, Fort Worth, TX. Annex I prepared Mississippi Board of Water Commissioners, Jackson, April 1968.

Descriptors: *Multiple-purpose projects, *Hydroelectric power, Water resources, *Water law, *Legal review, Mississippi, Hydroelectric plants, Planning, Water resources development, Legal aspects, Cost-benefit analysis, Economics, Peak power, Peaking capacity, Reservoirs, Public hearings, *Big Black River Basin(MS), Transcripts.

Annex H has as its objective the determination of whether or not potential multiple-purpose--especially hydroelectric--development in the Big Black River Basin is feasible and would be applicable to the estimated future power loads in the market area. This must be accomplished while also adhering to the long-range Basin development plans. The annex first inventories power resources and needs in the market area. Screening of potential hydroelectric projects is then undertaken. The study finds that development of a multiple-purpose project, including hydroelectric power, at the Basin's Edwards site is presently uneconomical. However, cost-benefit analysis indicates that 5-10 percent better economies--in terms of scale and peaking requirements--could justify the proposed plant. The study indicates that if at some future time a development for other purposes at this site is found to be desirable, hydroelectric power should receive careful consideration as a project purpose. Annex I presents pertinent sections of Mississippi law relating to the development and use of state water resources. These sections are scattered throughout the State Constitution and the Mississippi Code; this annex seeks to gather these sections together with a special effort made to recognize their applicability to the Big Black River Basin. Included are the relevant references to water rights, regulatory authority over water and rights to water, and establishment of State agencies whose activities have impact upon the development and use of the state's water resources. Annex J presents transcripts of public hearings concerned with the Basin's water resource planning. (See also W78-12768) (Zayac-NC)
W78-12772

DISAGGREGATED INTERTEMPORAL MODELS WITH AN EXHAUSTIBLE RESOURCE AND TECHNICAL ADVANCE,
Northwestern Univ., Evanston, IL. Graduate School of Management.
M. I. Kamien, and N. L. Schwartz.
Journal of Environmental Economics and Management, Vol. 4, No. 4, p 271-288, 1977. 15 ref.

Descriptors: *Technology, *Model studies, *Exhaustible resources, *Resource allocation, *Centralized planning, *Decentralized planning, Economics, Research and development, Natural resources, Externalities, Production functions, Capital.

Centralized and decentralized planning for allocation of an exhaustible resource are quantitatively compared under different market structures, abstracting from externalities and uncertainty as sources of difference. Three decentralized and one centralized economic model are compared, assuming a new endogenous technological advance may occur which would release or reduce dependence on the exhaustible resource. Overall qualitative temporal behavior of the optimal resource-capital ratio, per capita consumption, and investiment in research and development are the same in all four models. Specifically, the optimal resource-capital ratio declines through time, while the time profiles of per-capita consumption and research and development expenditure are single-peaked. A decentralized competitive model can replicate the behavior of a centrally planned economy, given an appropriate distribution of initial wealth. This holds true whether research and development is done by the government or by the natural resource sector, so long as borrowing from other sectors is possible. The necessity for resource owners to self-finance development of the new technology tends to accelerate decline of the resource-capital ratio, indicating that the resource may be depleted faster than is optimal. The behavior of the economy is independent of the market structure in the resource sector if and only if the production function is Cobb-Douglas. (Lynch-Wisconsin)
W78-12877

THE VALUE AND DISTRIBUTION OF THE BENEFITS OF NORTH SEA OIL AND GAS, 1970-1985,
National Inst. of Economic and Social Research, London (England).
S. A. B. Page.
National Institute Economic Review, No 82, p 41-58, November 1977. 4 tab, 7 ref.

Descriptors: *Benefits, *Value, *North Sea, *Oil industry, *United Kingdom, *Natural gas, Distribution, Income distribution, Economics, International trade, Prices, Oil fields, Depletion, Balance of payments, Energy, Public policy, Economic policy.

North Sea oil and gas will make the United Kingdom a net exporter of energy in the 1980s and supply a substantial portion of its need through the 1990s. Monetary benefits will accrue principally to balance of payments and government revenue. Balance of payments will significantly improve relative to the current status or that of other industrial countries, though the improvemnt will be slight compared to the situation prior to the rise in oil prices. The absolute amount of benefits and government share are extremely sensitive to exchange rate changes, including those which result from balance of payment improvements. Allocation of benefits has largely been determined by means of distribution decisions currently being made in the energy sector and for the exchange rate. OECD estimates show oil production in the United Kingdom rising from 12 million tons in 1976 to 104 million in 1980 and 145 million in 1985. Consumption in the United Kingdom is projected to increase from 95 million tons in 1976 and 1980 to 115 million in 1985. In forecasting over the next eight years it is assumed that oil output will come almost entirely from fields already discovered, and mainly from fields already declared commercial. This detailed analysis discusses output, depletion policy and reserves, world and U.K. prices, benefits of North Sea production, effects on the economy, and economic policy. (Lynch-Wisconsin)
W78-12881

RESOURCE DEVELOPMENT ALTERNATIVES: AN EVALUATION STRATEGY,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Economics.
J. L. Knetsch, and W. M. Fleming.
Annals of Regional Science, Vol 11, No 3, p 39-50, 1977. 2 fig, 1 tab, 11 ref.

Descriptors: *Analytical techniques, *Alternative planning, *Preservation, *Lumbering, *Lake of the Hanging Glaciers(British Columbia, Canada), *Resources development, Environmental effects, Recreation facilities, British Columbia(Canada), Canada, Natural resources, Lakes, Glaciers, Mountains, Opportunity costs, Methodology, Economics, Valuation, Value, Willingness to pay.

Lake of the Hanging Glaciers in the Purcell Mountains of southwestern British Columbia, Canada, is used to illustrate a strategy for facilitating planning choices for or against developmental disruption of a pristine site. The lake and surrounding area form an unusually beautiful and unique setting, but the watershed also contains substantial and accessible stands of old growth timber of commercially valuable species. Factors which influence expected worth of nonmeasurable values of amenities and wilderness recreation are considered, and the study demonstrates how information can be usefully organized to aid planning choices between the preservation and development options. A major objective was improvement of planning decisions in such cases, in particular using formal procedures to assess environmental impact. In the case evaluated, an estimated forestry loss of $450,000 would result from preserving the watershed in its present condition, in addition to expenditures of $260,000 to enhance recreation and preserve the amenity values, for a total of $710,000 if preservation is selected. Use of willingness-to-pay analysis to value the preservation option showed that, while the preservation value is likely to be low in the first year (about $3000), long-run benefits clearly indicate the superiority of this option. With few or no substitutes for the site, it is assumed that people collectively would be willing to sacrifice more than the timbering value to preserve the area. (Lynch-Wisconsin)
W78-12883

WATER RESOURCE PROBLEMS MERGE WITH ENERGY, LAND-USE POLICIES ON GLOBAL SCALE,
National Society of Professional Engineers, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-12928

RESPONSE TO DROUGHT,
Institute for Water Resources (Army), Fort Belvoir, Va.
R. Hamson.
Water Spectrum, Vol. 9, No. 3, p 34-41, Summer, 1977. 5 fig.

Descriptors: *Droughts, *Water conservation, *Water management(Applied), Regional development, State governments, Irrigation systems, Water rights, Legal aspects.

The responsibility for water management in times of drought lies primarily on individuals as well as on state and regional authorities. Water conservation programs can reduce residential consumption by curtailing activities such as car washing. Conservation in agriculture could bring about substantial long term savings, but results would be delayed since water-saving techniques require sizeable investments in improving irrigation systems. Water supplies can be temporarily increased by drawing upon groundwater or in some cases by cloud-seeding. Reallocation efforts are hampered by the regime of water rights that predominates in the west. (Russell-Arizona)
W78-12943

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A STATISTICAL ANALYSIS OF FACTORS AFFECTING WATER PRICES IN SMALL MUNICIPALITIES,
Mississippi Univ., University. School of Business Administration.
For primary bibliographic entry see Field 3D.
W78-12118

COST OF HOT WATER SUPPLY REDUCED BY SOLAR HEATING,
C. Taylor.
Vector (Pinetown), No. 11, p 16-19, 1976. 3 fig.

Descriptors: *Solar energy, *Solar heating, Water temperature, *Costs, Domestic water, South Africa.

With the almost continual rise in the cost of electricity, gas, oil and coal the stage has been reached where, with available technology and particular emphasis on marketing, solar heating is both a practical and economical proposition. The basic concept is to reduce the cost of hot water by using solar energy to preheat the water supplied to an existing hot water installation fueled by electricity, oil etc. With sufficient solar energy available, the heater has then only to raise the water temperature from 55 degrees centigrade or 60 degrees centigrade to the required figure instead of from the usual 15 degrees centigrade or 20 degrees centigrade. (So Afr Water Info Ctr)
W78-12391

WATER RESOURCES - THE SOUTHERN AFRICAN PICTURE,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
For primary bibliographic entry see Field 4A.
W78-12423

DISCOUNTED FLOOD RISKS IN LEAST-COST DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil and Ceramic Engineering.
For primary bibliographic entry see Field 5D.
W78-12612

DISAGGREGATED INTERTEMPORAL MODELS WITH AN EXHAUSTIBLE RESOURCE AND TECHNICAL ADVANCE,
Northwestern Univ., Evanston, Ill.. Graduate School of Management.
For primary bibliographic entry see Field 6B.
W78-12877

A NOTE ON THE USE OF PROPERTY VALUES IN ESTIMATING MARGINAL WILLINGNESS TO PAY FOR ENVIRONMENTAL QUALITY,
Handelshogskolan i Stockholm (Sweden).
For primary bibliographic entry see Field 5G.
W78-12879

THE EFFECTS OF POLLUTION TAXATION ON THE PATTERN OF RESOURCE ALLOCATION: THE DOWNSTREAM DIFFUSION CASE,
Tel Aviv Univ. (Israel).
For primary bibliographic entry see Field 5G.
W78-12880

THE VALUE AND DISTRIBUTION OF THE BENEFITS OF NORTH SEA OIL AND GAS, 1970-1985,
National Inst. of Economic and Social Research, London (England).
For primary bibliographic entry see Field 6B.
W78-12881

PAYING FOR WATER - BY RATES OR CHARGES.,
Water Pollution Research Lab., Stevenage (England).
T. Whiteley.
National Westminster Bank Quarterly Review, August 1977, p 31-40. 6 ref.

Descriptors: *Water policy, *Water management(Applied), *Water rates, *United Kingdom, *Water demand, *Water costs, *Metering, *Taxes, Economics, Water supply, Water utilization, Cost-benefit analysis, Equity, Municipal water, Domestic water, Industrial water, Potable water.

Various methods of assessing water costs to customers in the United Kingdom are evaluated, and a combination of a standing charge for all users supplemented by volumetric metered rates for commercial and industrial customers is recommended. The fixed charge would reflect the expense of adding a user to the system, while metering high-use customers would permit control of demand when necessary. Case studies are cited to demonstrate that metering achieves very little water savings while possibly increasing overall costs. In addition, the difference in cost to the water authority between five gal/hr and 100 gal/hr is negligible. At a certain standard of living water use reaches a plateau, and therefore holding down household use through metering could depress the living standard of lower income classes. Alternatives to meters include: (1) property tax, (2) poll tax, (3) equipment and facility tax, or (4) income tax. All have the disadvantage that the size of the bill cannot be lowered by reducing use, and political and equity drawbacks exist as well. Present charges are too low to significantly affect demand, as aggregate municipal water use is relatively inelastic, about -0.4 to -0.5. (Lynch-Wisconsin)
W78-12882

THE GREENING OF THE DESERT: WHAT COST TO FARMERS.,
For primary bibliographic entry see Field 3F.
W78-12932

6D. Water Demand

THE ECONOMIC DEVELOPMENT OF TIJUANA IN RELATION TO WATER SUPPLY AND ATMOSPHERIC, MARINE AND AQUATIC CONTAMINATION,
Sonora Univ., Hermosillo (Mexico). School of Law and Social Sciences.
For primary bibliographic entry see Field 6E.
W78-12227

INTERACTIONS IN WATER RESOURCE DEVELOPMENT,
Department of Water Affairs, Pretoria (South Africa).
J. P. Kriel.
In: Conference on resources of Southern Africa today and tomorrow, (Johannesburg), South Africa, p 234-241, September 22-26, 1975, 1 tab.

Descriptors: *Water resources development, *Agricultural use, *Industrial use, *Domestic consumption, Regional water authorities, Energy generation, Hydroelectric power, Water quality, Wildlife conservation, *Competing uses, *South Africa.

The need is described for a balance between advances in effectiveness of developing natural resources on the one hand and administrative and management expertise on the other. He sees the opportunity to plan and implement the balanced development of water and the other natural resources necessary to support the 'coming of age' of the subcontinent. In the article he dwells upon the present and future demand for water in South Africa and mentions the part that water resource development will have to play in the food and agricultural field, mineral resources development, energy supply, forestry and nature conservation. He concludes with the thought that there is good reason to believe that the future development of natural resources in South Africa can be faced with optimism - provided a far-sighted and imaginative but soundly based approach is maintained as we prepare today for the problems of tomorrow. (So Afr Water Info Ctr)
W78-12421

RESOURCES DEPLOYED IN WATER RE-USE,
Pretoria Univ. (South Africa).
For primary bibliographic entry see Field 3C.
W78-12422

WATER RESOURCES PLANNING, MANAGEMENT, AND DEVELOPMENT: WHAT ARE THE NATION'S WATER SUPPLY PROBLEMS AND ISSUES.
General Accounting Office, Washington, DC.
Report CED-77-100, July 28, 1977, 52 p, append.

Descriptors: *Water supply, *Water demand, *Planning, *Water resources development, *Evaluation, *Water resources planning, Water reuse, Water conservation, Water law, Cost-benefit analysis, Water quality, Conjunctive use, Cost sharing, Priorities.

The study's purpose is to identify existing and emerging U.S. water supply problems. The issues and concerns identified as meriting attention include: whether existing water resource plans and programs are adequate to meet competing demands for water uses; whether water agencies and industry have effective water conservation and reuse programs which demand and use water supplies more efficiently; how to resolve effectively the constraints of water laws and rights on meeting water needs; whether Federal agencies' benefit-cost analyses fully and realistically consider the beneficial and adverse effects of water resource projects; whether water supply and water quality programs are being effectively coordinated; whether water research programs are making progress both in developing technology and in finding ways to increase the nation's water supply; whether conjunctive use of surface water with ground and saline water sources is adequately considered in meeting water needs; what problems are affecting the timely, efficient and economical construction of water resource projects; and whether cost-sharing requirements of Federal and federally-assisted water resources programs are viable today. These issues and concerns are studied in order to provide assistance to the Congress in its consideration of ways to solve the key water problems facing the nation. (Nessa-NC)
W78-12665

BIG BLACK RIVER, MISSISSIPPI: COMPREHENSIVE BASIN STUDY. VOLUME II, ANNEX A: AGRICULTURAL REQUIREMENTS AND UPSTREAM WATERSHED DEVELOPMENT.
For primary bibliographic entry see Field 6B.
W78-12769

GROUND-WATER USE FOR NUCLEAR POWER PLANTS,
Bechtel, Inc., Gaithersburg, MD.
For primary bibliographic entry see Field 3E.
W78-12844

PAYING FOR WATER - BY RATES OR CHARGES.,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 6C.
W78-12882

6E. Water Law and Institutions

A GUIDE TO THE NEW YORK STATE ENVIRONMENTAL QUALITY REVIEW ACT,
Cornell Univ., Ithaca, NY.
E. G. Duvernoy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 715, Price codes: A03 in paper copy, A01 in microfiche. Cornell University Center for Environmental Research, Ithaca, New York, March 1978. 38 p, 3 fig, 2 append. OWRT A-056-NY(5), 14-31-0001-5032, 6033, 7067 and 7068.

Descriptors: *New York, *Legislation, *Environmental control, *Environmental impact statement, Governments, Agencies, Environmental effects, Land resources, Water resources, Decision making.

Citizen concern for the quality of the nation's air, water, flora and fauna has led to the passage of much environmental legislation. The federal National Environmental Policy Act of 1969 (NEPA) was an innovative approach to environmental protection. The best known result of this Act is the environmental impact statement (EIS). All federal agencies contemplating an activity which significantly affects the environment must prepare an EIS describing the proposed activity, probable environmental effects, and agency plans to minimize environmental harm. The agency must circulate the EIS to other federal, state and local agencies and to the general public for review and comment. Circulation of impact statements to persons outside the agency has opened up the decision-making processes of federal agencies to the public, often resulting in less harm to the environment and in decisions which are more responsive to citizen concerns. Following NEPA and the success of the federal EIS process, many states passed similar statutes. In 1975, the New York legislature passed the State Environmental Quality Review Act (SEQR), which establishes a state EIS process. It requires government agencies in one of the most industrialized states in the country to consider possible environmental effects of their proposed actions. This booklet describes the purpose and responsibilities of, and the actions subject to, SEQR. The EIS process is detailed, the State Environmental Quality Review Act outlined, and DEC Type I and Type II Actions listed. SEQR's requirement that agencies consider the environmental implications of their activities should help conserve New York State's resources and increase its long-term productivity.
W78-12104

ISLAMIC WATER LAW WITH SPECIAL REFERENCE TO OASIS SETTLEMENT,
Oxford Univ. (England). School of Geography.
J. C. Wilkinson.
Journal of Arid Environments, Vol 1, No 1, p 87-96, March 1978. 50 ref.

Descriptors: *Water law, *Water rights, *Islamic water law, Oases, Nomads, Arid lands, Deserts.

The basic principles of the Islamic water code are broadly based and applicable to a variety of hydrologic situations. Water is treated as a scarce resource belonging to the community in its natural state and therefore the code opposes speculation, protects the rights of both nomadic and sedentary peoples, and attempts to establish an order for agricultural exploitation. The application of the code follows the spirit of fair dealings and allows for a wide variety of interpretations adapted to different techniques of water exploitation and systems of water distribution. The code's flexibility and the hydrologic knowledge on which it is based account for its acceptance by many different societies as a basis for voluntary water use regulation. (Russell-Arizona)
W78-12212

THE LEGALIZATION OF GROUNDWATER STORAGE,
Southern California Metropolitan Water District, Los Angeles.
V. E. Gleason.
Water Resources Bulletin, Vol 14, No 3, p 532-41, June, 1978. 1 fig, 16 ref.

Descriptors: *Water law, *Water rights, *Appropriative rights, Legal aspects, *California, *Water storage, Aquifer management, Judicial decisions, Groundwater, Water supply.

California courts recently recognized underground aquifer storage rights that allow public agencies to store imported waters in aquifers, to prevent others from expropriating that water, and to recapture that water when it is needed. The two appellate decisions representing the common-law development of aquifer storage rights are discussed. One decision, entitled Niles Sand and Gravel Company vs Alameda County Water District 37 C.A. 3d 924 (1974), involved an aquifer managed under statutory authority, while the other, City of Los Angeles vs City of San Fernando 14 Cal. 3d 199 (1975), dealt with an aquifer managed under judicial authority. These decisions offer two rationales for aquifer storage rights: (1) to protect water supplies necessary for the overlying community, and (2) to increase water supply efficiency by using natural underground storage whenever possible. This paper analyzes the relationship between aquifer storage rights and conventional groundwater rights, indicating aspects of storage rights that need further development. (Russell-Arizona)
W78-12218

INTERRELATIONSHIP OF GROUND AND SURFACE WATER QUALITY IN THE EL PASO-JUAREZ AND MESILLA VALLEYS,
New Mexico State Univ., University Park. Coll. of Engineering.
For primary bibliographic entry see Field 5B.
W78-12225

THE SALT BALANCE OF THE MEXICALI, B.C. IRRIGATION DISTRICT (EL BALANCE DE SALES DEL DISTRITO DE RIEGO DE MEXICALI, B.C.),
Escuela Nacional de Agricultra, Chapingo (Mexico). Dept. of Irrigation and Drainage.
For primary bibliographic entry see Field 3C.
W78-12226

THE ECONOMIC DEVELOPMENT OF TIJUANA IN RELATION TO WATER SUPPLY AND ATMOSPHERIC, MARINE AND AQUATIC CONTAMINATION,
Sonora Univ., Hermosillo (Mexico). School of Law and Social Sciences.
C. Cabrera Fernandez.
Natural Resources Journal, Vol 18, p. 11-27, January 1978. 2 tab, 16 ref, English summary.

Descriptors: *Urbanization, *Water supply, *Mexico, Water shortage, *Colorado River, Tijuana, Aqueducts.

The lack of sufficient water is one of the major constraints on further development of Tijuana. Initially Tijuana's water supply came from wells in the Tijuana river bed, but by 1948 the supply was dependent on the Rodriguez Dam and shortages suspended local agricultural production. In the 1950's, a desalinization plant was built and wells were drilled to augment the supply and in 1974 Tijuana received water from Mexico's quota of Colorado River water. The Colorado-Tijuana River aqueduct, currently under construction, will provide for a population of 1 1/2-2 million, sufficient for about twenty years. (Russell-Arizona)
W78-12227

INTERNATIONAL RIVER COMMISSIONS AND THE INTERNATIONAL BOUNDARY AND WATER COMMISSION (LAS COMISIONES INTERNACIONALES Y LA COMISION INTERNATIONAL DE LIMITES Y AGUAS),
R. Cruz Miramontes.
Natural Resource Journal, Vol 18, p. 111-129, January 1978. 26 ref, English summary.

Descriptors: *International commissions, Mexico, *International Boundary and Water Commission, International waters.

International river commissions such as those controlling major European and American rivers, arose as a means of shared water control amid the existence of political, economic and social inequalities. The International Boundary and Water Commission, created to handle water problems along the US-Mexican border has been particularly successful. Its functions have been defined and modifed through many bilateral agreements, especially those of 1889, 1944, and 1970. It is now composed of two national sections and functions primarily in an administrative and jurisdictional capacity. To achieve better water use and conservation, the various commissions should advocate the creation of a World River Commission. (Russell-Arizona)
W78-12228

THE UPPER RIO GRANDE,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
J. W. Clark.
Natural Resources Journal, Vol 18, p 69-75, January, 1978. 7 ref.

Descriptors: *Regional analysis, *Water management(Applied), Data collections, Long-term planning, *International waters, *Mexico, Water resources development, Research priorities, *Rio Grande River, Environment.

A historical background of the issue of surface water distribution between Colorado, New Mexico and Texas, and between Mexico and the United States, is offered to give some perspective on the problems of shared ground water allocation. A research program is proposed to provide data on which to base a regional environmental management plan. The research design should include (1) evaluation of attitudes, goals, and priorities of the region's residents, (2) evaluation of current environmental resource utilization and possibilities for renewing and enhancing them, (3) evaluation of the relationships between growth and environmental resources, (4) the study of the region's institutional structure, (5) development and application of data management techniques, (6) development of sociopolitical and economic management models to test different alternatives, and (7) development of a regional environmental management plan and a plan for its implementation. (Russell-Arizona)
W78-12229

INSTITUTIONAL ALTERNATIVES FOR MEXICO-U.S. GROUNDWATER MANAGEMENT,
City Univ. of New York.
R. D. Hayton.

Natural Resources Journal, Vol 18, p 201-212, January, 1978. 21 ref, Spanish summary.

Descriptors: *Water management(Applied), *Groundwater resources, Groundwater basins, International Boundary and Water Commission, Mexico, Water resources development, Water policy, Institutions, Rio Grande River, International waters.

While the principle of basin-wide, integrated management of both surface and groundwater is generally accepted, the legal pluralism existing in Mexico and the United States presents an obstacle to the sectorial management of shared resources at the international level. In the U.S., attempts to solve interstate water problems may provide institutional models with which to approach the task of considering the institutional aspects of international shared resource management. It is essential that international water resource agreements be modified to include guidelines for groundwater use. Recommendations are made to provoke discussion on the appropriate institutional means for handling common groundwater supplies. (Russell-Arizona)
W78-12230

INTERNATIONAL EXTERNAL DISECONOMIES: THE COLORADO RIVER SALINITY PROBLEM IN MEXICO,
Escuela Nacional de Agricultura, Chapingo (Mexico); and Colorado State Univ., Fort Collins. Dept. of Economics.
F. Oyarzabal-Tamargo, and R. A. Young.
Natural Resources Journal, Vol 18, p 77-89, January, 1978. 18 ref, Spanish summary.

Descriptors: *Salinity, *Saline waters, Irrigation waters, Model studies, *Economic impact, Linear programming, International waters, Colorado River, Desalinization plants, Water quality, Alternative planning.

Saline drainage water released from an irrigation district in the United States reduced productivity and income for farmers using Colorado River water for irrigation in Mexico. In this paper, linear programming models were used to quantify the extent of economic damage caused to producers from degraded water quality after the 1973 salinity agreements were signed. The estimated external cost, about 160 million pesos at 1975 prices, indicates that maintenance of low salt discharges is warranted. However, alternatives to the proposed desalting plant, such as direct compensation to Mexican interests or continuing to bypass Mohawk-Wellton drainage waters, may be the most economical.
W78-12231

GROUNDWATER OCCURRENCE AND UTILIZATION IN THE ARIZONA-SONORA BORDER REGION,
Arizona Univ., Tucson. Dept. of Hydrology; and Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 4B.
W78-12233

INSTITUTIONS FOR THE SOLUTION OF SURFACE WATER PROBLEMS BETWEEN MEXICO AND THE UNITED STATES (INSTITUCIONES PARA LA SOLUCION DE PROBLEMAS DE AGUAS DE SUPERFICIE ENTRE MEXICO Y LOS ESTADOS UNIDOS),
Instituto Mexicano de Estudios Diplomatico.
C. Sepulveda.
Natural Resources Journal, Vol 18, p 131-141, January, 1978. 8 ref, English abstract.

Descriptors: *Legal aspects, *Mexican water treaty, *Mexico, *International waters, *International Boundary and Water Commission, Boundary disputes, Droughts.

While the 1944 treaty between Mexico and the United States was generally a good one, there remain several imprecise and potentially problematical points. One of these is the concept of 'extraordinary drought' and that of 'serious accident to the U.S. irrigation system'. In the case of extraordinary drought, the 1944 treaty specified that the U.S. could reduce the quantity of water sent to Mexico in the same proportion that water to American users is reduced. However, it is not specified whether the drought must be suffered by the entire basin or only part of it in order to qualify as an 'extraordinary drought'; nor was the intensity of duration of the drought defined. If difficult situations should arise as a result of this imprecision, the arbitrating capacity of existing institutions would be put to the test. While the International Boundary and Water Commission might provide voluntary arbitration between the two countries, its primary function is to offer and evaluate technical data rather than to resolve legal disputes. Alternatives include international arbitration and adjudication by the United Nations International Court of Justice. Weaknesses with both of these lead to the conclusion that diplomacy carried out through the International Boundary and Water Commission might be the best means of settling conflicts arising from imprecision in the treaty. (Russell-Arizona)
W78-12234

SUMMARY ANALYSIS OF THE NORTH AMERICAN (U.S. PORTION) OECD EUTROPHICATION PROJECT: NUTRIENT LOADING--LAKE RESPONSE RELATIONSHIPS AND TROPHIC STATE INDICES,
Texas Univ., at Dallas, Richardson. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-12245

WATER RESOURCE POLITICS AND INTEREST GROUP TACTICS,
Whitman Coll., Walla Walla, WA.
K. M. Beatty, H. Doerksen, and J. C. Pierce.
Water Resources Bulletin, American Water Resources Association, Vol. 14, No. 2, April 1978, (p 394-403). 2 tab, 20 ref. OWRT A-069-WASH(4).

Descriptors: Water resources, *Institutional aspects, *Water policy, *Interest groups, *Legal aspects, Water resources management, *Political aspects.

The traditional strong role of interest groups in water resources policy making has been modified recently by the introduction of many environmental groups. The new groups differ from traditional groups in their relatively modest resources and their lack of access to traditional decision points. This paper examines the extent to which the new groups differ in their perceptions of the effectiveness of tactics and in their use of tactics, taking into account group resources and group access to decision makers. (Humrichhouse-Wash St)
W78-12278

PESTICIDES AND THE SOUTH AFRICAN POPULATION,
Department of Agricultural Technical Services, Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W78-12407

SUMMARY OF FRESHWATER POLLUTION LEGISLATION IN SOUTH AFRICA,
Department of Planning and the Environment, Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W78-12412

SOUTH AFRICAN COMPANY INVOLVED IN INTERNATIONAL WATER INJECTION CONSTRUCTION.
For primary bibliographic entry see Field 8B.
W78-12418

ENVIRONMENTAL CONTROL IN THE MINING INDUSTRY,
For primary bibliographic entry see Field 5G.
W78-12459

THE ROLE OF WATER DEVELOPMENT ADVISORY COUNCILS IN WATER RESOURCE PLANNING,
D. G. Purnell.
Rhodesia Science News, (Salisbury) Vol 11, No 6, p 135-136. 1977.

Descriptors: *Water resources, *Planning, Water resources development, Legal aspects, Recommendations, *Rhodesia, Africa.

One of the main objectives of the Ministry of Water Development is to ensure the optimum development and utilization of the water resources of Rhodesia as these are limited and therefore have to be managed effectively and efficiently. With this and other objectives in view, the former Water Act and subsequent amending acts were completely revised and republished as the Water Act 1976 which became law on 19th November, 1976. (So Afr Water Info Ctr)
W78-12478

INTERNATIONAL RIVER LAW AND THE RHODESIA WATER ACT 1976,
S. W. Loewenson.
Rhodesia Science News, Salisbury, Vol 11, No 6, p 137, 143, 1977.

Descriptors: *Legal aspects, *River flow, *International law, Water law, Drainage basins, *Rhodesia, Africa.

There are two categories of international rivers, those that flow along the boundary separating two countries (called 'contiguous') and those that flow through one country into another (called 'successive'). International law does not draw legal distinctions between these two and ranks them on equal priority. Before the turn of the century, when rivers were used mostly for transport, international law was concerned with only the river and the water in the river in relation to its use for navigation. To-day it is recognized that rivers and their catchment areas serve many other functions in the promotion of national and regional development, so that international law now covers the whole of the river catchment systems, or drainage basin as its is sometimes called. (So Afr Water Info Ctr)
W78-12479

OUTER CONTINENTAL SHELF OIL AND GAS INFORMATION PROGRAM.
Geological Survey, Washington, DC.
For primary bibliographic entry see Field 7C.
W78-12555

OUTER CONTINENTAL SHELF LEASING.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-12558

INDEPENDENT RENDERING INDUSTRY EFFLUENT LIMITATION AND GUIDELINES.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-12559

ALLOCATION OF WATER STORED FOR FLOOD CONTROL AND NAVIGATION PURPOSES (PROPOSED RULE).
Corps of Engineers, Washington, DC.
Federal Register, Vol. 42, No. 191, p 53637-46, October 3, 1977. 5 tab.

Descriptors: *Flood control, *Water storage, *Reservoir storage, *Federal power act, Navigation, Regulation, Legislation, Federal government, Construction, Water control, Water allocation(Policy), Dams.

This rule proposed by the U.S. Army Corps of Engineers prescribes the policy and procedure for regulating certain reservoir projects for flood control or navigation and the use of storage allocated for such purposes and provided on the basis of flood control and navigation. These revised regulations are applicable to dam and reservoir projects which are licensed, maintained and operated under the Federal Power Act, and other similar pieces of legislation. They are equally applicable to reservoir projects constructed wholly or in part with federal funds pursuant to the Act. It is hoped that these proposed regulations will promote understanding among project owners, operating agencies and the Corps of Engineers regarding various activities and responsibilities concerning a national program of water control management in the interest of flood control and navigation. These regulations do not apply to projects owned and operated by the Corps of Engineers; the International Boundary and Water Commission (United States and Mexico); and those under the jurisdiction of the Columbia River Treaty. Several tables are included giving pertinent data for projects which are subject to this regulation. (Quarles-Florida)
W78-12561

EXISTING SOURCES AND NEW SOURCE PERFORMANCE STANDARDS AND EFFLUENT LIMITATIONS AND GUIDELINES.
Environmental Protection Agency, Washington, DC
For primary bibliographic entry see Field 5G.
W78-12562

ENVIRONMENTAL IMPACT REPORTS UNDER THE CALIFORNIA ENVIRONMENTAL QUALITY ACT: THE NEW LEGAL FRAMEWORK,
San Diego Univ., CA. School of Law.
For primary bibliographic entry see Field 5G.
W78-12563

THE WASTES ENDURE,
For primary bibliographic entry see Field 5B.
W78-12564

RETHINKING THE TIMETABLE FOR REFRESHING OUR WATERS,
For primary bibliographic entry see Field 5G.
W78-12565

AGENCY CREATED TO FIGHT COASTAL SUBSIDENCE MENACE,
Harris-Galveston Coastal Subsidence District, Houston, TX.
J. E. De Berry.
Water and Sewage Works, Vol. 124, No. 6, p 62-63, June, 1977, 2 fig.

Descriptors: *Land subsidence, *Texas, *Surface groundwater relationships, *Water wells, *Well regulations, Available water, Decisionmaking, Elevation, Groundwater, Groundwater availability, Groundwater resources, Gulf coastal plain, Local governments, State governments, Subsidence, Surface waters, Water permits, Well permits, Wells, Withdrawal.

The Texas gulf coast has suffered increasingly from the loss of land surface elevation, resulting in millions of dollars of damage and increased vulnerability to hurricane and flood damage. This article focuses on the establishment and operation of the Harris-Galveston Coastal Subsidence District, which was designed to end subsidence in the area. The District is governed by a 15-member board of directors appointed by local government officials. Under the provisions of the act creating the district, each water well within the district with a diameter greater than five (5) inches must receive a permit from the Board. Regulation of the amount of water withdrawn from the wells is the means by which the District controls subsidence. In reviewing permit applications, the Board considers, among other factors, the economic impact on the applicant, the relative effect on subsidence, and the quality, quantity, and availability of surface water at competitive costs. A plan to regulate groundwater withdrawal has also been formulated for the District. The effect of such regulation, if any, upon area subsidence will be determined from measurements of land elevation losses made by the U.S. Geological Survey. (White-Florida)
W78-12566

TOXIC POLLUTANTS CONTROL: PROGRESS AT LAST,
For primary bibliographic entry see Field 5G.
W78-12567

PUBLIC INVOLVEMENT IN NATURAL RESOURCE DEVELOPMENT: A REVIEW OF WATER RESOURCE PLANNING,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
G. A. Daneke.
Environmental Affairs, Vol. 6, No. 1, p 11-13, 1977.

Descriptors: *Water resources, *Water policy, *Project planning, *Planning, Natural resources, Legal aspect, Public utility districts, Environmental control, Political aspects, Local governments, Water resources development, Alternative planning, Benefits, Decision making, Public benefits, Public rights, Water users.

There exists today general agreement that citizen involvement in environmental policy-making must be increased, but the efforts being made are unclear and lack planning. However, public concern and legislative committment has made this area a focal point for the participatory movement. This article traces three approaches to public involvement in natural resources development. Traditional planning saw water planning and policy-making as basically decentralized processes dependent upon local support with an environmental movement blossoming in response to the 'growth syndrome'. Fishbowl planning involves a few selected citizens in policy-making by adding citizens' committees to water resources agencies. Both the traditional and fishbowl methods tend to isolate and polarize conflicting interest groups. The third approach, Alternative Participatory Technology, stresses integrating reluctant publics into the planning process. Recommendation on how to accomplish this include: (1) alerting affected publics to the benefits and burdens of participation, (2) underwriting the informational investment, (3) conducting workshops in organizational skills and (4) providing financial inducements similar to those granted to jurors. Although establishing broader based negotiations is no guarantee that polarized interests will agree, planning agencies will have a wider spectrum of interests from which to construct coalitions and force legislative action. (Spector-Florida)
W78-12568

RULES AND REGULATIONS GOVERNING WATER WELLS IN FLORIDA.
Florida State Dept. of Environmental Regulation, Tallahassee. Div. of Environmental Permitting.
Fla. Admin Code, Ch 17-21, secs 21.01 thru 21.13 (1978). 1 tab.

Descriptors: *Florida, *Groundwater resources, *Well regulations, *Well permits, Groundwater, Water management(Applied), Water wells, Permits, Environmental control, Water districts, Standards, Legislation.

These regulations are intended to effectuate the powers and the duties of the Florida Department of Environmental Regulation (DER) under the section of the state statutes establishing Water Management Districts. These DER rules govern water wells in Florida. The first part describes a water well permitting system to be administered and enforced by the Water Management Districts upon delegation by DER. The second part establishes minimum water well construction standards designed to conserve Florida's ground water resources. The final section specifies the Florida Statutes which provide for enforcement and penalties of these regulations. Since geology and hydrology vary throughout the state, the various Districts are given authority to adopt any consistent regulations in order to better protect local ground water resources. In general, these regulations provide that no person shall construct, repair, or abandon any water well contrary to the relevant statutes. Prior permission is required for construction of wells intended to be used for artificial recharge of ground water, or for the intentional introduction of water into any underground formation, or for repair or abandonment of any such well. (Quarles-Florida)
W78-12569

KEY V. LOUISIANA DEPARTMENT OF HIGHWAYS (COMPENSATION FOR DAMAGES TO PRIVATE LAND CAUSED BY STATE'S WIDENING OF HIGHWAY UPHELD).
357 So. 2d 1230-34 (La. Ct. App. 1978).

Descriptors: *Louisiana, *Eminent domain, *Flood damage, *Alteration of flow, Damages, Construction, Highways, Silting, Drainage, Flood flow, Condemnation, Natural flow.

Defendant, Louisiana Department of Highways, brought this appeal from a lower court decision awarding damages to plaintiff private landowner in an inverse condemnation action. The award was based on a finding that plaintiff's damages were caused by defendant's widening a nearby highway. Plaintiff's property was subject to a servitude of natural drain from land south and east of the property. In connection with the highway project, defendant removed large amounts of dirt, a house on an adjacent lot, and a concrete elevation which had acted as a partial diversion of drainage water from plaintiff's lot. Plaintiff's property subsequently sustained flooding and silting damage. Plaintiff was forced to construct drainage facilities. Defendant contended on appeal that it was not liable and that the damage award was excessive. Affirming the decision, the Louisiana court of appeal held that plaintiff was entitled to compensation for damages and that the evidence supported an award of damages in the nature of the cost of cure. However, plaintiff was not entitled to an award for depreciation in property value nor to damages for mental anguish. (Quarles-Florida)
W78-12570

BERKLEY V. STATE DEPARTMENT OF ENVIRONMENTAL REGULATION (CONSTRUCTION IN BISCAYNE BAY APPROPRIATE UNDER THE COMPREHENSIVE FLORIDA AQUATIC PRESERVE ACT).
358 So. 2d 552-56 (1st D.C.A. Fl. 1978).

Descriptors: *Florida, *Landfills, *Permits, *Land development, Construction, Sea walls, Aquatic habitats, Bays, Riprap, Navigable waters, Legislation.

In this appeal, petitioner-private landowner challenged an order of respondent Florida Department of Environmental Regulation (DER), denying his application for a permit to construct a seawall and fill his lands. Petitioner contended his application--which was denied on the ground that it did not comply with the Biscayne Bay Aquatic Preserve Act--was erroneously denied. Petitioner insisted the filling was necessary to enhance the utility and quality of the preserve. DER argued that Florida statutes excluded the Biscayne Aquatic Preserve (the land at issue), from being within the purview of the Florida Aquatic Preserve Act. The state court of appeal quashed the order denying petitioner's application and directed DER to grant the permit. The court held that where petitioner's land was privately owned and lying landward of an established bulkhead, it was not subject to the Biscayne Bay Aquatic Preserve Act by reason of exclusion under the Comprehensive Florida Aquatic Preserve Act. If the former act was to apply, DER should have granted the permit anyway because the project would enhance the preserve. (Quarles-Florida)
W78-12571

MINNEHAHA CREEK WATERSHED DISTRICT V. HOFFMAN (DEFINITION OF NAVIGABLE WATER UNDER THE RIVERS AND HARBORS ACT).
449 F. Supp. 876-86 (D. Minn. 1978).

Descriptors: *Minnesota, *Rivers and Harbors Act, *Federal Water Pollution Control Act, *Judicial decisions, State governments, Lakes, Regulation, Permits, Navigable waters, United States, Dams, Dam construction.

Plaintiffs, two political subdivisions of Minnesota, brought an action seeking injunctive relief from regulatory jurisdiction asserted by defendant, the U.S. Army Corps of Engineers, over Lake Minnetonka. The Minnesota Department of Natural Resources intervened as a plaintiff who sought a declaration that permits issued by defendant were invalid insofar as they conflicted with state and local regulations. Plaintiffs contended the lake and its outlet were not navigable waters of the United States as defined in the federal Rivers and Harbors Act. They insisted that the regulations promulgated by the defendants under the Federal Water Pollution Control Act were invalid because they regulated activities beyond the purview of the Act. The United States District Court stated that defendant's rationale for their determination of navigability was not binding on the court. The court held that the lake was not a navigable water under the Rivers and Harbors Act because it was located entirely within the state and because it formed no navigable interstate waterway connection. The court also held that defendant's regulation of riprap placement and dam construction was unavailable under the Federal Water Pollution Control Act.
W78-12572

UNITED STATES V. STATE OF CALIFORNIA (CALIFORNIA HAS DOMINION OVER SUBMERGED ISLANDS AND WATER WITHIN THE AREA SURROUNDING SANTA BARBARA ISLANDS IN THE CHANNEL ISLANDS NATIONAL MONUMENT).
98 S. Ct. 1662-70 (1978).

Descriptors: *California, *Federal-state water rights conflicts, *Submerged lands act, *Parks, State governments, United States, Federal government, Islands, Navigable waters, Shores, National monuments.

Plaintiff United States government brought this action seeking a determination of whether plaintiff or defendant state of California had dominion over the submerged islands and water within the one-mile belts surrounding Santa Barbara and Anacapa Islands within the Channel Islands National Monument. In 1949 the Monument was enlarged by Presidential Proclamation to encompass areas within one nautical mile of the shorelines of these islands. The submerged lands and waters within the one-mile belts was deemed to be under federal dominion as a result of a 1947 United States Supreme Court decision. Both plaintiff and defendant concentrated their arguments on the issue of Presidential intent in the use of the word 'areas' in the proclamation. However in this case, the United States Supreme Court, having original jurisdiction, concluded that this issue was irrelevant. After a consideration of the history of the controversy, the Court concluded that, regardless of past litigation, the dominion over the area at issue was vested in the defendant state by the 1953 Submerged Lands Act, one purpose of which was to undo the Court's earlier (1947) opinion. (Quarles-Florida)
W78-12573

STATE V. A. CAPUANO BROS., INC. (RHODE ISLAND'S FRESH WATER WETLANDS ACT HELD CONSTITUTIONAL).
384 A. 2d 610-15 (R.I. 1978).

Descriptors: *Rhode Island, *Wetlands, *Landfills, *Permits, Land, Regulation, Reasonable use, Compensation, Beneficial use, Eminent domain, Legislation, Navigable waters.

Plaintiff state appealed a lower court's refusal to grant injunctive relief and assess a civil penalty against defendant landowners for alleged violations of the Rhode Island Fresh Water Wetlands Act. Plaintiff contended defendants altered fresh water wetlands without the approval of the state Department of Resources (Department). Plaintiff maintained that defendants must: halt further filling without a permit; restore the altered wetland's to their prior condition; and, pay a civil penalty. Defendants submitted an application to alter their wetlands. The Department concluded that the Act was inapplicable and that no permit was required provided no extension of fill occurred in any direction. Later, the Department informed defendants that an application would be required to extend the fill. Defendants contended the Act was unconstitutional, and also that the state failed to prove that the property was a wetland. The Rhode Island Supreme Court held that the Act was not unconstitutional on the theory that it failed to provide notice to landowners, and that it did not deprive them of reasonable use of their property without just compensation. The Court also held that the property was wetland subject to the Act. (Quarles-Florida)
W78-12574

PIERCE V. RILEY (RIGHT OF RIPARIAN LANDOWNERS TO PROHIBIT EASEMENTS FOR LAKE ACCESS TO NONRIPARIAN OWNERS UPHELD).
264 N.W. 2d 110-15 (Mich. Ct. App. 1978).

Descriptors: *Michigan, *Easements, *Riparian rights, *Reasonable use, Right-of-way, Lakes, Riparian land, Channels, Marinas, Dredging, Inland waterways, Watercourses(Legal aspects).

Plaintiff, lake property owners, sought to enjoin other lake property owners from granting easements for lake access to nonriparian owners of a marina development. Plaintiffs' complaint was dismissed twice at the trial court level. This was the fourth time that the case was brought before the Michigan Court of Appeals, which earlier had reversed the circuit court and enjoined the granting of riparian rights to the nonriparian owners. The appeals court had also ordered the filling of a dredged channel in a riparian lot. On appeal to the state Supreme Court, the cause was ordered held in abeyance pending a decision on the problem by the state Department of Natural Resources (DNR). Relying on the DNR opinion, the circuit court imposed restrictions on the lot's use as a marina. On this appeal of the restricted-use order, the Court of Appeals held that where the proposed use of the channel would interfere with rights of riparian owners, it should be filled. The court decided that the question of reasonableness of use of the riparian lot as the site of a dredged channel was not subject to its review. (Quarles-Florida)
W78-12575

CITY OF COLUMBUS V. TEATER (BALANCING RIGHTS OF OHIO MUNICIPALITIES WITH THE STATE INTEREST OF CONSERVING NATURAL RESOURCES).
374 N.E. 2d 154-60 (Ohio 1978).

Descriptors: *Ohio, *Watercourses(Legal aspects), *Water resources, *Rivers, Local governments, State governments, Construction, Utilities, Channels, Water supply, Aesthetics, Preservation.

Plaintiff, an Ohio municipal corporation, brought an action against the director of the state Department of Natural Resources. Plaintiff challenged the constitutionality of a statute providing that no subdivision of the state may build or modify channels of any watercourse within a scenic river area outside the limits of municipal corporations without approval from the director. The trial court ruled in favor of the plaintiff. Pursuant to the statute at issue, defendant manifested an intent to designate part of the Big Darby Creek a scenic river area and notified plaintiff of such action. The creek section to be so designated was undisputably outside the municipal corporation's boundaries. Plaintiff instituted a program for the construction, operation and maintenance of a water supply reservoir to be located on the creek in the area of proposed designation by defendant. Defendant contended that the preservation of the state's rivers was a valid exercise of state police power. On appeal, the Ohio Supreme Court reversed the trial court and found for the defendant. The court held that the statute at issue was not facially violative of the state constitution. (Quarles-Florida)
W78-12576

MYOTTE V. VILLAGE OF MAYFIELD (UPPER RIPARIAN LANDOWNER LIABLE FOR DAMAGES CAUSED BY INCREASED WATER FLOW ONTO LOWER RIPARIAN LAND).
375 N.E. 2d 816-21 (Ohio Ct. App. 1977).

Descriptors: *Ohio, *Floods, *Surface drainage, *Riparian land, Damages, Drainage area, Local governments, Surface waters, Water utilization, Flow, Watercourses(Legal aspects), Permits.

Plaintiff, lower riparian landowner, successfully sought compensation for flood damage following development of an industrial park permitted by and financially beneficial to defendant village. Plaintiff owned land situated at the northeast end of a watershed which drained in a northeasterly direction. During heavy rains, plaintiff's land experienced flooding by way of a watercourse which ran through the property. After the development of the industrial park south of plaintiff's property, substantial flooding occurred following any rainfall. Plaintiff contended that defendant was liable for flood damage caused by its actions that permitted the replacing of a portion of the preexisting watercourse with storm sewers. Defendant maintained that the flooding could be eliminated if plaintiff replaced a small culvert on plaintiff's property with a larger pipe in order to allow the natural flow of water. On defendant's appeal, the Ohio Court of Appeals affirmed plaintiff's damages and held that where a lower riparian landowner stands to be seriously injured by the increased flow of surface water from an upper riparian estate, the upper riparian landowner should be liable for

damages, especially when they could have prevented the damage with little expense. (Quarles-Florida)
W78-12577

ULLIAN V. CULLEN (CHANNELS EVOLVED INTO NATURAL WATERCOURSES IN MASSACHUSETTS).
373 N.E. 2d 359-62 (Mass. App. 1978).

Descriptors: *Massachusetts, *Surface drainage, *Channels, *Obstruction to flow, Surface runoff, Channel flow, Natural flow, Watercourses(Legal aspects), Drainage, Culverts, Surface waters.

Plaintiff, landowner, sought to restrain defendants, adjoining landowner and leasor, from obstructing a watercourse which carried flow of surface water from plaintiff's property. Defendants leased part of their land to a town to be used as a sanitary landfill. At defendants' instruction an agent of the town filled a culvert which had been in place since World War 1. This substantially restricted the flow of water through it, causing water from two channels located on plaintiff's land to back up and flood part of plaintiff's land. The master's findings indicated that the two channels on plaintiff's land met the basic criteria for a natural watercourse. The main issue appeared to be whether this finding of the lower court--subsequently adopted by the lower court--was warranted by the subsidiary findings of the master. Upon defendant's appeal, the Massachusetts Appeals Court held that the channels at issue were not artificial ditches but, rather, constituted natural watercourses since the channels were formed by the natural flow of surface water. Thus, over the years, they had evolved into natural watercourses. (Quarles-Florida)
W78-12578

WASHTENAW COUNTY V. SALINE RIVER INTERCOUNTY DRAINAGE BOARD (REQUIREMENT OF BONDS WITH PETITIONS FOR ESTABLISHING INTERCOUNTY DRAINS IN MICHIGAN).
264 N.W. 2d 53-58 (Mich. Ct. App. 1978).

Descriptors: *Michigan, *Drainage programs, *Watercourses(Legal aspects), *Rivers, Local governments, Flood plains, Legislation, Drains, Construction, Drainage area, Drainage.

Plaintiffs, a Michigan town and city, sought to enjoin defendants, intercounty drainage boards, from establishing the Saline River as an intercounty drain. After losing at the trial court level, defendants brought this appeal. Several townships submitted a petition to establish and construct the river as an intercounty drain. Pursuant to statute, the defendant drainage boards were created, hearings were held and an order to commence was issued. Plaintiffs contended the petition, being filed pursuant to Section 541 of the State Drain Code, did not contain an agreement to pay, nor was it accompanied by a deposit for the cost of engineering, as required by statute. Defendants maintained these procedures were unnecessary since the petition was filed pursuant to section 513, not section 541. A section 541 petition purports to assume jurisdiction over the river while section 513 only relates to the establishment of the river as an intercounty drain. The Michigan Court of Appeals reversed the trial court and held that absent a request for complete control of the river, a petition to establish an intercounty drain did not require an agreement or deposit. (Quarles-Florida)
W78-12579

HALSTEAD V. FARMERS IRRIGATION DISTRICT (NEBRASKA IRRIGATION DISTRICTS LIABLE FOR SEEPAGE DAMAGE IRREGARDLESS OF A SHOWING OF NEGLIGENCE).
263 N.W. 2d 475-78 (Neb. 1978).

Descriptors: *Nebraska, *Damages, *Canal seepage, *Irrigation districts, Floods, Seepage, Canals, Irrigation canals, Irrigation operation and maintenance, Negligence, Judicial decisions, Penalties(Legal).

Plaintiff, farmland lessee, brought this appeal after his action seeking damages for crops destroyed by seepage from an irrigation canal owned by the defendant irrigation district was dismissed. The land which the plaintiff leased was located within the boundaries of the defendant district. Plaintiff contended defendant was liable for seepage damage within its boundaries even though negligence was not present. Defendant argued it was not liable for such damage absent a showing of negligence. On this appeal to the Nebraska Supreme Court, the court found for the plaintiff and held that irrigation districts organized under Chapter 46 of the Nebraska statutes are liable for seepage damages without regard to negligence. The court based its decision primarily on the state Constitution. In so holding, the court overruled an earlier case which rested on the theory that every landowner within an irrigation district has knowingly and intentionally waived his constitutional right to damages. The court reasoned that such a theory was unrealistic. The case was reversed and remanded for further proceedings. (Quarles-Florida)
W78-12580

TITLE TO RIPARIAN ACCRETIONS AND ISLANDS.
N.D. Cen. Code Ann. secs. 47-06-05 thru -10 (1960), as amended (Supp. 1977).

Descriptors: *North Dakota, *Accretion(Legal aspects), *Avulsion, *Land forming, Rivers, Streams, Banks, Streambeds, Islands, Navigable waters, Non navigable waters, Riparian land.

In North Dakota, where land accretion occurs upon the bank of a river or stream, navigable or not navigable, such land becomes the property of the owner of the bank, subject to any existing right-of-way over the bank. Where part of a river or stream bank is removed through the process of avulsion, and that part is born to the opposite bank or to another part of the same bank, the owner of the part carried away may reclaim it within a year after the owner of the land to which it has been united takes possession of it. Where a stream forms a new course, abandoning its old bed, the owners of the land newly occupied take by indemnity the old abandoned bed. Land formed in navigable stream beds belongs to the state, if there is no title or prescription to the contrary. The power of management of these lands is in the board of university and school lands with derived income to be used to defray general expenses of state government. Land formed in nonnavigable streams belongs to the shore owners. (Quarles-Florida)
W78-12581

APPROPRIATION OF WATER.
N.D. Cen. Code Ann. secs 61-04-01 thru -22 (1960), as amended (Supp. 1977); secs 61-04-23 and -24 (Supp. 1977).

Descriptors: *North Dakota, *Appropriation, *Preferences(Water rights), *Legislation, Beneficial use, Water rights, Permits, Water delivery, Surplus water, Prescriptive rights, Diversion, Water utilization.

Beneficial use is the basis, the measure, and the limit of the right ot use water in North Dakota. With certain exceptions, a person must secure a water permit from the state engineer before appropriating any water in the state. The form and procedure for filing applications for permits to make beneficial use of waters in the state are provided in this statute. After filing for an appropriation permit an applicant is required to give notice to surrounding landowners and also to publish notice of the application in a newspaper. After a hearing the state engineer issues the permit if he finds: (1) a prior appropriator's rights will not be unduly affected; (2) the proposed means of diversion or construction are adequate; (3) the proposed water use is beneficial; and (4) the proposed appropriation is in the public interest. In regard to competing applications for water from the same source, the order of priority is: (1) domestic; (2) municipal; (3) livestock; (4) irrigation; (5) industrial; and (6) recreational. Priority in time is given the superior water right. Prescriptive water rights are exempted from permitting. Applications for use or point of diversion changes proceed in the same manner as appropriation permits. (Quarles-Florida)
W78-12582

FLORIDA ENVIRONMENTAL LAND AND WATER MANAGEMENT ACT,
Florida Environmental Land and Water Management Act.
Fla. Stat. secs. 380.012 - .12 (1977).

Descriptors: *Florida, *Water management(Applied), *Land development, *Legislation, Natural resources, Environment, Water quality, Water utilization, Land management, Permits, Water storage, Environmental control.

The state of Florida establishes its land and water management policies to coordinate local decisions relating to development while preserving the existing rights of private property. This is deemed necessary in order to protect the state's natural resources, and to reverse the deterioration of water quality and provide optimum utilization of limited water resources. The state land planning agency is given the power to exercise general supervision of the administration and enforcement of this act. The agency (or any regional planning agency) may recommend to the Administration Commission specific areas of critical state concern. In order to accomplish the purposes of this act, the Big Cypress Area of Florida is designated as an area of critical state concern. It is the intent of the legislature for the state and the federal government to engage in an agreement to acquire the area designated as the Big Cypress National Preserve. The procedure to be used in determining the regional impact of developments is set forth. The Land and Water Adjudicatory Commission is created by the act for the purpose of allowing appeals from decisions granting or denying permission to develop. (Quarles-Florida)
W78-12583

METROPOLITAN SEWERAGE DISTRICTS.
Wisc. Stat. Ann secs. 66.20 thru 66.24 (Supp. 1977).

Descriptors: *Wisconsin, *Sewage districts, *Sewerage, *Legislation, Local governments, Solid wastes, Sewage, Sewage disposal, Sewage treatment, Sewers, Storm water, Drainage.

The establishment of metropolitan sewerage districts is provided for by Wisconsin law. The procedure to be followed in the creation of a district is set forth. The district is given corporate status and is authorized to sue and to be sued. Each district is to be governed by a five member commission with individual commissioners appointed by the county board for staggered five-year terms. The procedures relevant to appointment, compensation and other matters relating to the commission are set forth in the act. The commission is to prepare and adopt standards of planning, design and operation for all projects operated by the district. The commission may engage in research on treatment processes and adopt rules for the management of district facilities. The commission is responsible for the collection and transmission of sewage within the district. The commission must regulate connections with the sewage system and may acquire property to

facilitate the operation of the system. The commission is authorized to construct (when necessary) and assume ownership of, existing utility works and facilities. The commission is also responsible for storm water drainage and solid waste management. (Quarles-Florida)
W78-12584

COUNTY WATER AND SEWER DISTRICT LAW.
Fla. Stat. secs. 153.50 thru .95 (1977).

Descriptors: *Florida, *Sewage disposal, *Sewer districts, *Legislation, Population, Water supply, Public health, Sewage, Construction, Water law, Local governments, Facilities.

As a result of the extensive growth of population throughout Florida, public health and water supply problems have arisen. In many unincorporated county areas in the state, the population is not served by water and sewer facilities normally provided by municipalities, their agents or private persons. In view of the dire need for such facilities, it is the purpose of this act to provide means for county governments to alleviate such conditions in their unincorporated areas. The statute provides that the board of county commissioners in any county may establish one or more water and sewer districts as necessary in the public interest. An alternative method of establishing a district is provided whereby a petition signed by persons owning not less than 10 percent of the property within the boundaries of the proposed district is to be filed with the county property appraiser. The procedure to be followed in the creation of a district is set forth. The district has the power to construct and maintain a water and a sewer system. The district may also fix and collect rates. (Quarles-Florida)
W78-12585

KRAFT V. LANGFORD (LIABILITY FOR DIVERSION OF SURFACE WATERS IN TEXAS PREDICATED ON PERMANENCY OF INJURY AND OWNERSHIP OF LAND).
565 S.W. 2d 223-30 (Tex. 1978).

Descriptors: *Texas, *Diversion, *Drainage effects, *Natural flow, Drainage, Real property, Compensation, Storm drains, Discharge(Water), Surface waters, Damages, Land development.

Plaintiff, landowner, brought suit against developers and engineer for damages resulting from wrongful diversion of surface water onto plaintiff's land. Plaintiff owned a tract of land in Texas which was bordered in part by defendant's land. A small drainage channel on the two tracts drained excess rainwater from the land. Subsequently, defendants developed their tract into a subdivision. The defendant engineer was hired for this project. He constructed a storm sewer which drained the entire subdivision and, following the course of the natural drainway, discharged an increased amount of water onto plaintiff's land. Following a jury verdict for the plaintiff, defendants appealed. The case was then reversed and remanded for retrial. Upon appeal of the retrial order, the Texas Supreme Court affirmed the reversal in favor of defendants. The Court held that the injuries should be characterized as a temporary injury and the landowner was not entitled to permanent damages. Also, the landowner had no course of action under the statute prohibiting diversion of the natural flow of surface waters against the engineer because he owned no interest in the tract which unlawfully diverted the surface water. (Quarles-Florida)
W78-12586

NATURAL RESOURCES DEFENSE COUNCIL, INC. V. COSTLE (STANDARDS GOVERNING ISSUANCE OF NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS).
568 F. 2d 1369-83 (D. C. Cir. 1977).

Descriptors: *Federal Water Pollution Control Act, *Regulation, *Permits, *Wastewater(Pollution), Standards, Discharge(Water), Water pollution, Water pollution control, Administrative decisions, Legal review, Water pollution sources, Water quality, Judicial decisions, Impact(Rainfall), Administration, Environment, Administrative agencies, Water law, Water permits, Runoff, Rain.

Plaintiffs sought to have Environmental Protection Agency (EPA) regulations promulgated under the Federal Water Pollution Control Act (FWPCA) declared unlawful. The regulations concerned both the discharge of rainfall runoff which picks up pollutants as it drains over terrain into navigable waters, as well as exempted categories of point sources from National Pollution Discharge Elimination System (NPDES) permit requirements. The defendant argued that Section 402 of the FWPCA Amendments of 1972 gave the EPA discretion to exempt point sources from NPDES permit requirements. Despite the deference accorded to agency construction of new statutes, the Fifth Circuit Court of Appeals held that Congress intended permits to be required in all situations of pollution discharge from point sources. The court also rejected defendant's administrative infeasibility arguments and held: (1) that national effluent limitations are not always necessary for individual permitting despite the difficulty of promulgating special effluent limitations; (2) that permit conditions proscribing practices which increase pollution may be required when numerical limitations are infeasible; and (3) that area wide permits and other means are available to reduce administrative burdens. The court noted that EPA does have exclusive power to define 'point sources'. (Hoofman-Florida)
W78-12587

SOUTH SANTA CLARA VALLEY WATER CONSERVATION DISTRICT V. SANTA CLARA VALLEY WATER DISTRICT (WATER DISTRICT ALLOWED OVERLAPPING YET NON-INTERFERING EXISTENCE WITH WATER CONSERVATION DISTRICT).
143 Cal. Rptr. 193-99 (Ct. App. 1978).

Descriptors: *California, *Permits, *Water districts, *Supervisory control(Power), *Water management(Applied), Administrative agencies, Administrative decisions, Well permits, Wells, Governments, Legislation, Local governments, Construction, Judicial decisions, Legal aspects, Regulation, Water conservation, Water districts.

Plaintiff water conservation district and defendant water district have overlapping jurisdictions and both claimed the right to control construction and sealing of wells within their mutual territory. Defendant was empowered by ordinance to authorize all such construction within a countywide area. Plaintiff alleged that defendant district was precluded from exercising authority in plaintiff's territory without plaintiff's consent. The lower court granted summary judgment to the defendant and the plaintiff district appealed. In reversing, the appellate court held that: (1) the legislature possessed the power to extend defendant's boundaries countywide so that the defendant's and plaintiff's jurisdiction overlapped. The court found that the legislature has plenary power over districts organized for reclamation purposes. However, (2) since the legislature had specifically provided that the subsequently created defendant district could not condemn any of plaintiff district's structures, including those 'hereafter' constructed or acquired, the water district could not preclude plaintiff district from constructing or sealing wells within its own territory. (Baumbach-Florida)
W78-12588

ENVIRONMENTAL DEFENSE FUND, INC. V. COSTLE (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT FOR CONSTRUCTION OF OCEAN OUTFALL SERVERS IN LONG ISLAND, NEW YORK).
439 F. Supp. 980-1013 (E.D N.Y. 1977).

Descriptors: *Federal Water Pollution Control Act, *New York, *Outfall sewers, *Environmental effects, Legislation, Water policy, Sewage disposal, Waste disposal, Cesspools, Septic tanks, Water law, Judicial decisions, Saline water intrusion, Balance of nature, Commercial shellfish, Shellfish farming, Sewers, Pollutants, Sewage treatment.

Plaintiffs, eight non-profit environmental organizations, sought declaratory and injunctive relief against the Environmental Protection Agency (EPA) and officials of the state of New York to stop the construction of sewage treatment facilities. Plaintiffs alleged violations of the 1969 National Environmental Policy Act (NEPA) and the Federal Water Pollution Control Act (FWPCA). Defendants maintained that because of increasing population in the Long Island area and corresponding increase in quantities of sewage, additional sewage treatment or disposal facilities are needed. To meet this need the defendants decided to employ ocean outfall pipes which awaiting technological developments that would enable safe recharge of waste water. Plaintiffs charged that the EPA did not adequately identify and evaluate alternative solutions as required by NEPA. The Eastern District Court of New York concluded that the Environmental Impact Statement (EIS) involved complied with the requirements of NEPA. The court also concluded that the defendants did comply with the requirements of the FWPCA. However, the court did order the filing of a supplemental EIS because the original EIS did not adequately address the effect of the project on the shellfish industry. (Stump-Florida)
W78-12589

GROUND WATER AND WELLS.
S.D. Comp. Laws Ann. secs 46-6-1 thru 46-6-23 (1967).

Descriptors: *South Dakota, *Groundwater, *Well permits, *Drilling, *Well regulations, Groundwater resources, Water sources, Subsurface waters, Groundwater movement, Artesian wells, Seepage, Subsurface runoff, Water level fluctuations, Water wells, Supply, Wells, Well casings, Regulation, Well spacing, Administrative agencies, Water conservation.

Anyone claiming a vested right to groundwater for nondomestic use must file a claim which the commission describing the use to which the water has been applied. Anyone wishing to appropriate groundwater for non-domestic purposes must notify the commission of the well's location and the amount and use of the water desired. Proposed wells must not interfere with established wells. Upon complaint, the commission will judge the question of interference. Parties aggrieved by the commission's decision may appeal to the circuit court. Well drillers must pay a fee and obtain an annually renewable license to drill from the commission. The license is subject to revocation if poor construction methods are used. The commission shall specify methods of well construction to prevent waste. Drillers must notify the Commission of intent to drill and keep accurate records of well drilled. The use of water must be reasonable; waste is prohibited. Uncontrolled wells must be reported to the commission. The commission must plug abandoned and wild wells. The commission shall make additional rules and regulations governing well construction when it is in the public's best interest. Penalties for non-conformance are described in the statute. (Beamer-Florida)
W78-12590

CONTROL OF HISTORIC PROPERTY.
R.I. Gen. Laws secs 42-45, 1-3 thru 42-45, 1-5 (1976 Supp).

Descriptors: *Rhode Island, *Archaeology, *Regulation, Administrative agencies, Legal aspects, Legislation, Navigable rivers, Navigable waters, *Ownership of beds, Paleohydrology, Permits, Planning, State governments, Investigations, State jurisdiction, Water law.

The State of Rhode Island reserves to itself the exclusive right and privilege of field investigation on sites owned or controlled by the state in order to protect and preserve archaeological and scientific information, matter, and objects. Subject to any local, state or federal statute, the title to all bottoms of navigable waters within the state's jurisdiction in the territorial sea, and the title to any underwater historical properties lying on or under said bottoms of any other navigable waters of the state, is declared to be in the state. Such bottoms and underwater historical properties shall be subject to the exclusive dominion and control of the state. The state historical preservation commission shall be the agency responsible for administering the archeology and underwater archeology programs. The commission is empowered to prescribe such rules and regulations as may be necessary to preserve and protect underwater historic properties and specimens derived from archeological sites. Any person conducting field investigations shall be responsible for obtaining permission of any federal or state agencies having jurisdiction prior to conducting any recovery operation. Title to all objects and specimens recovered shall be retained by the state. (Jordan-Florida)
W78-12591

TEXAS CTY IRRIGATION V. CITIES SERVICE OIL CO. (USE OF GROUNDWATER FOR SECONDARY OIL RECOVERY).
570 P. 2d 49-51 (Okla. 1977).

Descriptors: *Oklahoma, *Water resources development, *Groundwater resources, *Secondary Recovery(Oil), Oil, Water resources, Groundwater, Water utilization, Water supply, Oil pollution, Administrative agencies, Adjudication procedure, Administration, Floods, Permits, Water allocation(Policy), Water rights.

The plaintiff irrigation association sought judicial review of the Water Resources Board's decision to grant the defendant oil company a permit to use fresh ground water in a water flood system for the purpose of secondary oil recovery. The plaintiff argues that such a use of water was 'waste' under the state ground water law. The defendant alleged that use of groundwater for secondary oil recovery was a beneficial use and was not 'waste'. The lower court reversed the Board's decision, supporting plaintiff's contention. On appeal, the state supreme court held that the use of fresh ground water for secondary oil recovery is not, of itself, a 'waste' under the state ground water law. The court found that the Board had promulgated administrative rules that recognized such a beneficial use. Since the legislation did not express its disapproval of these rules, the court held that the legislative intent was not to consider such a use a 'waste'. The court cautioned that this ruling did not mean such a use might not constitute waste. Each case must be determined on its individual facts. (Beamer-Florida)
W78-12592

BOZ-LEW BUILDERS V. SMITH (FARMERS' RIGHT TO PRESCRIPTIVE EASEMENT FOR IRRIGATION).
571 P. 2d 389-93 (Mont. 1977).

Descriptors: *Montana, *Prescriptive rights, *Water rights, *Irrigation, *Irrigation ditches, Legal aspects, Irrigation practices, Irrigation water, Canals, Easements, Alternative costs, Water policy, Flow, Damages, Ditches, Prescriptive rights, Equity.

The defendant farmers appealed from a judgment of the district court which imposed a continuing injunction prohibiting them from entering upon or interfering with the peaceable possession of the plaintiff apartment owner's property. The injunction was a result of the defendants attempt to exercise a prescriptive easement in a ditch which ran over plaintiff's property. Defendants had used this ditch for irrigation purposes since 1930. Although the ditch was open and visible, the plaintiff, after purchasing the property, acted on the advice of his attorney and filled in the ditch. The trial court in granting the injunction held that although the defendants owned a valid ditch right across plaintiff's property, the relief sought by the defendants would not result in a substantial benefit to them. The Supreme Court found that the defendants did suffer damages as a result of the plaintiff's invasion of their ditch easement. Consequently, the lower court's judgment was vacated. The Supreme Court, in balancing the equities, held that the plaintiff interfered with the defendants' right and the plaintiff must find an alternative way of getting water around his property. The court awarded damages equal to the cost of renting and operating the sprinkler system as well as attorney's fees to the defendants. (Beamer-Florida)
W78-12593

DEPARTMENT OF NATURAL RESOURCES V. ADAMS (RIPARIAN LANDOWNER'S RIGHT TO BUILD DUCK BLIND).
377 A. 2d 500-08 (Md. Ct. Spec. App. 1977).

Descriptors: *Maryland, *Ducks(Wild), *Riparian rights, *Hunting, *Sites, Bodies of water, Waterfowl, Wildlife, Riparian land, Riparian waters, Administrative agencies, Permits, Water law, Legal aspects, Watercourses(Legal aspects), Natural resources, Game birds, Wildlife management.

Plaintiff riparian landowner appealed an order of the Department of Natural Resources (DNR) which approved and confirmed the allocation of duck blinds along a statutory line separating two bays. Pursuant to a notification that his blind had been constructed too close to the site assigned to a third party, the plaintiff alleged that the defendant had assigned the blind site to the third party illegally. After reviewing the alleged illegal assignment, the defendant upheld the assignment to the third party. On appeal, the order of the defendant was reversed. In affirming the decision of the trial court, the appellate court found that the statute which created the statutory line for duck blind locations only authorized the defendant to issue site assignments to landowners whose lands were adjacent to the two bodies of waters mentioned in the statute. Since the third party was not a riparian landowner under this definition, the court found that the defendant erred in assigning him a duck blind location the statutory line. (Beamer-Florida)
W78-12594

MYERS V. CAPLE (RIPARIAN LANDOWNER'S RIGHT TO RECLAIM LAND).
258 N.W. 301-06 (Iowa 1977).

Descriptors: *Iowa, *Levees, *Remedies, *Riparian rights, *Alteration of flow, Flow, Rainfall, Administrative agencies, Flood damage, Damages, Flood data, Streams, Riparian lands, Legal aspects, Water rights, Drainage, Overflow, Floods.

Plaintiff landowners brought an action to enjoin the defendant landowner from completing a levee along the bank of a creek. The plaintiff also sought to have the defendant remove that part of the levee already constructed. The controversy arose when the defendant submitted plans to the Natural Resources Council for a levee to protect seventy acres of his land from flood damage. These plans were approved by the Council over plaintiff's objection. Although the plaintiffs did not appeal the administrative order, they sought and were granted a permanent injunction by the lower court. The defendant appealed the trial court decision alleging that the plaintiffs had failed to exhaust their administrative remedies. The Supreme Court of Iowa held that the plaintiffs did not have to exhaust their administrative remedies because the Natural Resources Council did not have exclusive jurisdiction over drainage differences. However, in balancing the equities, the court found that the plaintiffs were not entitled to injunctive relief because they failed to provide convincing evidence that they would suffer substantial or irreparable harm. However, if the levee causes damage in the future, the plaintiffs will not be foreclosed from seeking damages or injunctive relief. (Beamer-Florida)
W78-12595

RECREATIONAL TRESPASS ACT.
Mich. Comp Laws Ann sec 317.172 (1967), as amended, (Supp 1977).

Descriptors: *Michigan, *Farms, *Public rights, *Recreation, *Trespass, Behavior, Fishing, Highways, Hunting, Land tenure, Law enforcement, Legal aspects, Legislation, Public access, Reasonable use, Safety, Trapping, Water law.

A person shall not enter in or remain upon the lands of others for the purpose of hunting; fishing in a private lake, pond or stream; or operating a snowmobile, off-road vehicle or other recreational vehicle without the written consent of the owner, his lessee or agent, if: (1) the lands are enclosed to exclude intruders, or (2) the lands are posted in a conspicuous manner. A fisherman wading in or floating upon a navigable, public stream of a length greater than 15 miles may, without written permission or verbal consent, enter upon the upland and walk a route as closely proximate to the clearly defined bank as possible when necessary to avoid an obstruction or hazard. No person shall discharge a firearm within the right of way of a public highway adjoining any platted property; fenced or posted land; or farm land without the written permission of the owner, his lessee, or agent, of the abutting land. A person also shall not, without due authority, erect posters or enclose lands so as to prohibit the public enjoyment of recreational activities on the lands. (Jordan-Florida)
W78-12596

APPROPRIATION OF WATER.
S.D. Comp. Laws Ann. secs 46-5-1 thru 46-5-46 (1967).

Descriptors: *South Dakota, *Appropriation, *Water rights, *Water allocation(Policy), *Water management(Applied), Water distribution(Applied), Legislation, State governments, Streams, Springs, Riparian rights, Non-navigable waters, Dam construction, Irrigation, Permits, Domestic water, Surface waters, Reclamation, Reclaimed water, Diversion, Municipal water, Water utilization, Water users, Surplus water.

In South Dakota, a landowner cannot impede the natural flow of a stream on his land. However, he may construct a dam across a non-navigable stream if the course of the water is not changed and vested rights are not interfered with. In addition, a landowner may appropriate water subject to the principle of beneficial use. Appropriation in excess of reasonable needs is not allowed. Specific limitations on the amounts that may be appropriated for the purpose of irrigation are set. Permits are required for appropriation except that a permit is not required for reasonable domestic use. Construction of works prior to obtaining a permit is a misdemeanor and penalties are set forth. Procedures that must be followed in the application for water rights are indicated. In addi-

tion, procedures for approval of plans for construction are provided in the act, as well as procedures pertaining to improper construction. The act also regulates changes of use or place of diversion by the appropriator of the water. Failure to use beneficially appropriated water results in a reversion to unappropriated public water. Finally, the act sets forth procedures for appropriation by the United States, state institutions, or municipalities. (Quarles-Florida)
W78-12597

DAMS AND RESERVOIRS.
Mont. Rev. Code sec 89-701 (1947); secs 89-702, 89-702.1, as amended, (Supp. 1975).

Descriptors: *Montana, *Reservoir construction, *Reservoir operation, *Safety, Reservoirs, Reservoir design, Discharge(Water), Water storage, Impoundments, Surface waters, Storage, Structural stability, Dams, Dam design, Dam construction, Dikes, Flood control, Embankments, Impounded waters.

Any reservoir which is to be filled must be so thoroughly and substantially constructed so that it can safely hold any water that may be stored in it. Any person, association or corporation wishing to build a dam, dike, or reservoir must construct it in a thorough, secure and substantial manner. The department of natural resources may at any time examine any dam, dike or reservoir either on its own motion or upon complaint under oath made by three persons who feel their homes would be in danger in the event of a flood due to the breaking of a dam, dike, or reservoir. These persons must have reason to believe the structure is unsafe or is being overfilled. If the department finds the structure unsafe or overfull, it will notify the appropriate county attorney who will take the necessary steps to abate the danger and make the structure safe. If either party is dissatisfied with the department's findings, an appeal may be made to the appropriate district court but the department's judgment shall control until the court makes a final determination. The department's jurisdiction is limited to structures of the size defined in the statute. (Beamer-Florida)
W78-12598

DELANO V. COLLINS (DAMAGES FROM ALTERING NATURAL DRAINAGE).
364 N.E. 2d 716-21 (Ill. App. Ct. 1977).

Descriptors: *Illinois, *Real property, *Reasonable use, *Surface runoff, *Land development, Alteration of flow, Drainage, Drainage systems, Boundary disputes, Land tenure, Land use, Storm water, Urban drainage, Urban runoff, Adjacent landowners, Storm runoff, Water law, Judicial decisions.

Plaintiffs sought to enjoin the defendant from altering the natural drainage of his property. Plaintiffs alleged that a house which defendant built caused an unusually large amount of water to flow onto plaintiff's residential lot during heavy rains. Plaintiffs also sought punitive damages for alleged willful and wanton acts in continuing to construct the improvements. The trial court granted summary judgment for defendant and the appellate court affirmed. The appellate court held that the plaintiffs had the burden of proving that the acts of defendants were beyond a range consistent with the policy of reasonable use. The court also held that defendant was not required to maintain his lot in an unimproved, unused state for the benefit of plaintiffs. Because the plaintiffs failed to establish that the defendant violated the policy of reasonable use in constructing improvements on the property, the alleged failure to plan for drainage problems did not warrant the award of punitive damages. The record shows that the defendant did not alter the elevation or otherwise infringe upon the boundaries of plaintiffs' parcels. (Jordan-Florida)
W78-12599

GROUND WATER IN THE CALIFORNIA WATER QUANDRY,
Environmental Defense Fund, Washington, DC.
For primary bibliographic entry see Field 4B.
W78-12615

THE ROLE OF 208 IN PLANNING GROUNDWATER USE,
Southern California Association of Governments, Los Angeles.
For primary bibliographic entry see Field 5G.
W78-12616

THE INFLUENCE OF THE SAN FERNANDO CASE ON THE WORK OF THE GOVERNOR'S WATER RIGHTS COMMISSION,
For primary bibliographic entry see Field 4B.
W78-12617

POLICIES, ISSUES AND CONCERNS OF WATER AND RELATED LAND RESOURCES INTEREST GROUPS,
Kansas Water Resources Board, Topeka.
J. C. Gottschamer.
Bulletin No. 23, 1978. 45 p, 1 photo.

Descriptors: *Kansas, *Water resources, *Land resources, Organizations, Legislations, Water quality, Water utilization, Irrigation, Water conservation, Boats, Agriculture, Livestock, Local governments, Interest groups, Policies.

Groups and organizations known to have an interest in Kansas water activities were asked to submit a copy of their policies and resolutions regarding their position on various aspects of the state's water and related land resources. Comments of general or specific concern and suggestions for new or amendatory legislation also were encouraged and accepted. The policy and issues statements were organized into a 'Statement of Water and Related Land Resources Policies, Issues, and Concerns' for each of the respondent groups. A topical index also was included in the bulletin. (Froelich-ISWS)
W78-12619

WATER RESOURCES AND HEALTH PROBLEMS IN DEVELOPING COUNTRIES (IN FRENCH),
Paris-7 Univ. (France). Dept. of Parasitology.
For primary bibliographic entry see Field 5F.
W78-12625

SOCIAL IMPACT ASSESSMENT, 10.
For primary bibliographic entry see Field 6B.
W78-12652

THE FUTURE OF UNIVERSITY EDUCATIONAL PROGRAMS IN A 'STEADY-STATE' ENVIRONMENT,
A. R. Chamberlain.
Keynote address, UCOWR, July 28, 1975, Auburn, Alabama. Theme: The Challenge of Water Resources Education, 11 p.

Descriptors: *Universities, *Education, Water resources, Economics, Administration, Government, *Steady-state society, Myths, *Human capital, Energy independence, Freedom.

This keynote address first exposes the myth of a 'steady state' society. No growth or minimum-level growth is not possible because of the volatile nature of our economy and society. University enrollment is constantly changing in both age composition and subject interests; our monetary sector is in constant flux, showing inflation and recession at the same time; and our energy supplies and prices have switched from one resource area to another and from low to high costs. The author goes into depth concerning the steady-state situation of our universities and recalls that increased instability occurred in the late 1960's. Optimism rather than pessimism is warranted because of the deep-seated drive for eduction and learning in the U.S. There is not a surplus of teachers but only an unwillingness to permit these available teachers to fulfill useful functions. Government assistance to universities and the creation of a Water Education and Research Advisory Committee are twin modes for increasing interest and research in water resource education. (Coan-NC)
W78-12653

THE DISTRIBUTIVE EFFECTS OF PUBLIC LAW 92-500,
Northwest Missouri State Univ., Maryville. Dept. of Business and Economics.
For primary bibliographic entry see Field 5G.
W78-12655

TANKERS AND OIL TRANSFER OPERATIONS ON THE DELAWARE RIVER AND BAY.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-12656

PROCEEDING OF ENVIRONMENTAL IMPACT STATEMENT CONFERENCE, HELD AT KANSAS CITY, MISSOURI ON 8-9 NOVEMBER, 1972.
Environmental Protection Agency, Kansas City, MO.
For primary bibliographic entry see Field 6G.
W78-12657

A ROLE FOR UCOWR IN MEETING NATIONAL NEEDS,
Idaho Univ., Moscow. Idaho Water Resources Research Inst.
J. S. Gladwell.
Presented at 1975 annual meeting of Universities Council on Water Resources, Auburn University, Auburn, Alabama, July 27-30, 1975, Workshop No. IV, 9 p.

Descriptors: *Water Resources Research Act, *Water demand, Water resources, *Planning, *Legislation, Education, Water resources, Land use, Planning, Environment, Universities Council on Water Resources(UCOWR), *National needs, National involvement.

This article describes how UCOWR might prepare itself so that it would be in a position to continually assess national water needs and have the mechanisms by which these needs can be addressed. Its primary effort should be to define major issues in water resource planning. Land use planning and energy resource planning are two major areas which UCOWR must explore and relate to water resource planning. Educational programs beyond the level of training grants, such as exchange programs, visiting scientist programs, and water resource fellowships, should be explored and instituted. UCOWR's position on a variety of water resources issues should be explicitly described so that it may become an authority on national water resource issues. (Coan-NC)
W78-12659

OPTIONS FOR MONITORING LOCAL PERMITS IN THE NORTH CAROLINA COASTAL AREA.
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
Occasional Papers Series, June 1978. 85 p, 3 append. Nessa, S.; French, S.; and Lowry, G.K., editors.

Descriptors: *Coasts, *Permits, *Management, *Coastal areas, Regulation, Evaluation, Local

governments, State jurisdiction, Land use, Planning, Decisionemaking, Methodology, Administration, Programs, *Areas of Environmental Concern, *North Carolina, Implementation, Procedural monitoring, Substantive monitoring, Cumulative Impact Assessment.

A series of options is described for monitoring the implementation of one element of North Carolina's Coastal Management Program. The system will monitor the issuance of minor permits in coastal areas of environmental concern (AECs). Monitoring is distinguished from evaluation, and is defined as being concerned with the conformance of program activities with program goals and guidelines. The management of AECs is the joint responsibility of local governments in the coastal zone and the State. The monitoring program performs three functions--Procedural Monitoring insures that permit issuance complies with procedural requirements developed by the State; Substantive Monitoring insures that permit issuance complies with use standards and regulations developed by the State; Cumulative Impact Assessment measures the impact of development against the legislatively mandated goals and objectives for the coast. Several options for achieving each of these monitoring functions are described. Each option differs in breadth and depth, in the types of analysis required, and the amount of effort needed to collect the monitoring data. The final monitoring system would incorporate options from each functional area. Any combination of options is possible. A system for evaluating and selecting the best combination of options is described. (Nessa-NC)
W78-12662

PLAN OF ACTION: THE TRINITY RIVER PUBLIC INVOLVEMENT PROGRAM,
Texas A and M Univ., College Station. Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 6B.
W78-12664

WATER RESOURCES PLANNING, MANAGEMENT, AND DEVELOPMENT: WHAT ARE THE NATION'S WATER SUPPLY PROBLEMS AND ISSUES.
General Accounting Office, Washington, DC.
For primary bibliographic entry see Field 6D.
W78-12665

FLOOD EMERGENCY BUILDING INSPECTOR PROGRAM FOR THE CITY OF WILKES-BARRE.
Wilkes-Barre Dept. of Planning and Development, PA. Bureau of Flood Recovery.
For primary bibliographic entry see Field 6F.
W78-12667

WATER QUALITY PLANNING, AND OPPORTUNITY FOR CONSERVATION DISTRICT COMMISSIONERS,
Iowa Dept. of Soil Conservation, Des Moines. Conservancy District Div.
For primary bibliographic entry see Field 5G.
W78-12687

DOING SOMETHING ABOUT OIL SPILLS,
For primary bibliographic entry see Field 5G.
W78-12698

MONTANA'S YELLOWSTONE RIVER: WHO GETS THE WATER,
H. Fischer.
Sierra Club Bulletin, Vol. 63, No. 6, p 13-16, July-August, 1978.

Descriptors: *Montana, *Rivers, *Wildlife conservation, *Water allocation(Policy), Administrative agencies, Strip mines, Industries, Recreation, Water utilization, Competing uses, Regional development, Public benefits.

The destiny of nearly one third of Montana and much of northern Wyoming is in question as agricultural, industrial, municipal and environmental interests compete for unallocated water of the Yellowstone River. The outcome will determine the economic future of the area as well as the fate of the region's fish and wildlife. Under Montana law, all of Yellowstone River's remaining water will be allocated in 1978. Montana's Department of Fish and Game has requested the use of all the water not yet allocated. Ranchers and farmers have been the traditional users of Yellowstone River, but now others want the water. Stripmining began to boom in Montana in the late 1960's. With stripmining came mind-boggling energy development plans, and now industry factions are competing for the river's water. Montana law, however, gives priority to state agencies because they deal with public values such as wildlife conservation and clean water. At recent hearings, industries were not allowed to submit applications for the water. Who will ultimately get the water will be decided by the state's Board of Natural Resources. Montana now has the chance to limit industrial growth in deference to outstanding natural values. (Spiegel-Florida)
W78-12699

WATER QUALITY MISMANAGEMENT,
For primary bibliographic entry see Field 5G.
W78-12700

OIL AND GAS AND SULPHUR OPERATIONS IN THE OUTER CONTINENTAL SHELF.
Geological Survey, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-12701

HARMON COAL COMPANY V. DEPARTMENT OF ENVIRONMENTAL RESOURCES (REGULATION OF COAL STRIP MINE DRAINAGE OF ACIDIC WATER IN PENNSYLVANIA).
Pa. Cmwlth., 384 A. 2d 289-93 (1978).

Descriptors: *Pennsylvania, *Mine drainage, *Strip mine wastes, *Administrative decisions, Drainage water, Drainage effects, Alkalinity, Discharge(Water), Acidic water, Coal mine wastes, Strip mines, Acid mine water.

Plaintiff, a coal company, sought to review a state environmental hearing board order which affirmed the defendant Pennsylvania Department of Environmental Resources' (DER) denial of plaintiff's application for a mine drainage permit under the state's Clean Streams Act. Plaintiff leased several acres of land in a Pennsylvania township, which intervened as co-defendant. Plaintiff intended to operate a coal strip mine on the property, and applied for a mine drainage permit from defendant DER. Defendant DER denied the application, based on the low alkalinity and buffering capacity of the watershed. Defendant DER contention that this would make it difficult for any acid mine drainage or siltation from strip mining to be absorbed, resulting in a deleterious effect on the water supply. The Board affirmed defendant DER's denial and on appeal the Commonwealth Court of Pennsylvania affirmed. The court held the Board's findings that the overburden was acidic and that there would be a likelihood of acid mine drainage discharge were supported by substantial evidence. The court also held that the Board did not err in its determination that the DER's principal witness was qualified to give opinion evidence. (Quarles-Florida)
W78-12713

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, AND TEXAS. VOLUME 7, APPENDIX XIV: STATE WATER LAWS, POLICIES AND PROGRAMS.
For primary bibliographic entry see Field 6B.
W78-12767

BIG BLACK RIVER, MISSISSIPPI: COMPREHENSIVE BASIN STUDY. VOL. V, AN. H: HYDROELECTRIC POWER: AN. I: ROLE OF THE STATE OF MISSISSIPPI IN THE PLANNING & DEVELOPMENT OF THE WATER AND RELATED LAND RESOURCES: AN. J: TRANSCRIPTS OF PUBLIC HEARINGS.
For primary bibliographic entry see Field 6B.
W78-12772

KING RESOURCES COMPANY V. BOARD OF ENVIRONMENTAL PROTECTION (PROCEDURE FOR CONSTRUCTION CERTIFICATION UNDER THE FEDERAL WATER QUALITY CONTROL ACT AFFIRMED).
383 A. 2d 383-87 (Me. 1978).

Descriptors: *Maine, *Water quality control, *Water quality act, *Concrete construction, Construction, Piers, Permits, Navigable waters, State governments, Steel structures, Water quality standards, Water quality.

Plaintiff, owner and operator of oil terminal facility, appealed from a decision by the defendant Maine Board of Environmental Protection (Board), denying its certification that the proposed construction of a new pier would not violate applicable water quality standards. Plaintiff sought a permit from the U.S. Army Corps of Engineers to construct a new steel and concrete pier at plaintiff's oil terminal facility. Under the Federal Water Quality Control Act, plaintiff was required to obtain certification from the defendant Board that such activity would be conducted in a manner that reasonably assures no violations of applicable water quality standards. After denial of certification, plaintiff appealed. The case was remanded to the Board for further proceedings. Plaintiff contended here that certification should have been granted by the lower court, or alternatively, that on remand the Board should be limited to the pre-existing record. Defendant Board insisted that plaintiff lacked standing. The Maine Supreme Judicial Court held that plaintiff had standing to request certification under the Federal Water Quality Control Act. The court further held that the lower court acted properly in remanding the case because the record needed further development before disposal. (Quarles-Florida)
W78-12777

FLOOD PLAIN ZONING.
For primary bibliographic entry see Field 6F.
W78-12778

WATER MANAGEMENT DISTRICTS.
For primary bibliographic entry see Field 4A.
W78-12780

MANAGEMENT AND STORAGE OF SURFACE WATERS.
Saint Johns River Water Management District, Palatka, FL.
Fla. Admin. Code, Ch 161-4, secs 4.01 thru 4.47 (1978). 1 app.

Descriptors: *Florida, *Permits, *Water districts, *Water management(Applied), State governments, Administration, Regulation, Water quality control, Engineering structures, Dams, Construction, Surface waters.

The purpose of the rules described herein is to implement Florida's water policy concerning management and storage of surface waters in the St. Johns River Water Management District. Rules apply to those who wish to alter, construct, operate, or abandon a dam, impoundment, reservoir, or any similar work in the district. Generally, a permit is necessary before work may begin. The

permitted activity must among other things: be reasonable and beneficial; not interfere with any existing legal water use; not restrict or alter the rate of flow of a stream or watercourse by more than 10 percent at any time or any withdrawal point; not significantly increase or decrease groundwater or lake levels within the District. Regulations concerning permit applications and requirements are detailed, as are grounds for which exemptions may be granted. The granting of a permit does not give inalienable rights to the permittee. This type of licensing may be modified or revoked in certain instances. Permission to begin construction may be given before a permit has been issued when an emergency situation demands immediate action. A sample permit application is included. The District is obligated to inspect surface water works periodically to determine whether all rules and regulations are being obeyed. (Spiegel-Florida)
W78-12812

WORKS OF THE ST. JOHN'S RIVER WATER MANAGEMENT DISTRICT.
Saint Johns River Water Management District, Palatka, FL.
Fla. Admin. Code, Ch 1-6, secs 6.01 thru 6.49 (1978). 1 app.

Descriptors: *Florida, *Water districts, *Regulation, *Water management(Applied), State governments, Estuaries, Floodways, Canals, Administration, Permits, Administrative agencies.

The purpose of the rules described herein is to implement the declared water policy of the state of Florida and the St. Johns River Water Management District in relation to Works of the District. The rules pertain to the: St. Johns River; St. Johns Marsh; Oklawaha River; St. Mary's River; Nassau River; Intracoastal Waterway; and all the natural floodways, tributaries, canals, estuaries and channels in the respective districts. Anyone desiring to connect to, withdraw water from discharge water into, or otherwise use these waterways must abide by these regulations. Unless expressly exempted, a permit is required by anyone wishing to use the waterways in any of the aforementioned manners. Procedures for obtaining a permit are detailed, as are specific exemptions to the permit requirement. Conditions for issuance, revocation, and modification of permits are dealt with. EMergency and remedial measures are described, and a sample permit application is included. Periodic inspections by he Board are permitted to ensure compliance with the regulations. In the event the Board official or representative should determine on any such inspection that remedial measures are required, the procedure and requirements for an order requiring the remedial work are delineated. (Spiegel-Florida)
W78-12813

WORKS OF THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT.
Southwest Florida Water Management District, Brooksville.
Fla. Admin. Code, CH 16 J-1, secs .001 thru 1.41 (1978).

Descriptors: *Florida, *Water management(Applied), *Administration, *Watershed management, Permits, Regulation, Water conservation, Water supply development, Storm runoff, Surface runoff, Water districts.

In these official 'Works' rules of the Southwest Florida Management District, 'Works' are herein defined as any lake or other impoundment, stream or other watercourse, control structure or other facility owned and maintained by the District. The District's responsibility is to protect existing and future works from actions which would impair their capacity to accomplish intended purposes. A permit is required to connect to, withdraw water from, discharge water into, place construction within or across, or otherwise make use of a work. Certain activities are excepted from regulation such as removal of a dock or pier, and construction or removal of a pump for individual domestic use (as long as the bank is not altered). To obtain a permit, the activity must be reasonable, beneficial and must not be inconsistent with the public interest. Permits will be denied for several types of activities: those that (1) will cause serious adverse effects on lands not controlled by the applicant; (2) will increase or decrease a watercourse's rate of flow by five percent or more; or (3) will increase peak rate of flow or total volume of storm runoff by 10 percent or more. (Stump-Florida)
W78-12814

RULES OF THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT.
Southwest Florida Water Management District, Brooksville.
Fla. Admin. Code, Ch 16 J-0, secs .001 thru .40 (1978).

Descriptors: *Florida, *Water management(Applied), *Administration, *Watershed management, Permits, Regulation, Water conservation, Water supply developments, Water permits, Water districts, Water control.

The Southwest Florida Water Management District (SFWMD) has responsibility for planning, constructing, and operating necessary water management works in the Peace River Basin and for the Four River Basins Florida project (in cooperation with the federal government). It also controls the Green Swamp Watershed basin. All other watershed basins are controlled by local basin Water Management boards. This section of the SFWMD Rules contains explicit boundaries for each water basin within the SFWMD. Permits are required for any consumptive use of water, for construction of a well and for other activities relating to management and storage of surface waters. Permit applications are required to include drawings of a location plan showing points of installation, construction, withdrawal, discharge or use, and also designated elevations such as canal bottom elevations, water surface elevation and ground elevation. All permits are issued contingent upon continued ownership or other control of property rights in underlying, overlying or adjacent lands. The SFWMD must also establish minimum rates of flows and regulatory levels using the best information and methodology available to protect existing as well as future consumptive uses of water. (Stump-Florida)
W78-12817

CONSUMPTIVE USE OF WATER.
Southwest Florida Water Mangement District, Brooksville.
Fla. Admin. Code, Ch 16J-2, secs 2.01 thru 2.24 (1978).

Descriptors: *Water management(Applied), *Florida, *Consumptive use, *Watershed management, Water requirements, Withdrawal, Regulation, Riparian rights, Public rights, Well regulations, Water permits, Land development.

The Consumptive Use of Water Rules of the Southwest Florida Water Management District require permits if: (1) the withdrawal exceeds 1 million gallons of water in one day, or the average annual daily withdrawal will exceed 100,000 gallons; (2) the withdrawal is from a well with an inside diameter of more than six inches. No permit is required for domestic consumption of water by individual users. Permit applications must include the maximum amount of water to be withdrawn, the maximum amount to be consumptively used per year and on any sngle day, the source of the water supply, the use to be made of the water, and the place where the water is to be used. The applicant must include names and addresses of all persons whose property lies within designated distances from the point of withdrawal. A notice of the application is to be provided once a week for two consecutive weeks in a general circulation newspaper. Copies of the notice must be mailed to applicable neighboring property owners. Objections to the application may be received for 14 days after the first publication of notice, and a public hearing shall be held no sooner than seven days after that. (Stump-Florida)
W78-12822

SOUTH FLORIDA WATER MANAGEMENT DISTRICT V. RATNER (WATER MANAGEMENT DISTRICT WITH EASEMENT OVER PRIVATE PROPERTY MUST PROVIDE ACCESS ROUTES FOR LANDOWNERS).
357 So. 2d 1055-60 (3d D.C.A. Fl. 1978).

Descriptors: *Florida, *Access routes, *Projects, *Easements, Water management(Applied), Flood control, Levees, Canals, Land, Construction, Bridges, Legal apsects.

A private landowner brought this suit against the South Florida flood control district. Plaintiff sought to gain access to his land which was surrounded by levees and canals constructed by the defendant pursuant to an easement agreement entered into with plaintiff's predecessor. A lower court held that defendant must provide said access. The easement agreement which defendant and plaintiff's predecessors in title entered into gave the defendant the right to construct, operate and maintain a project for flood control, reclamation and conservation on the land. However, the grantors retained substantial rights in the property, surrounding plaintiff's land--defendant erected locked gates across the only access routes. Plaintiff was denied a key to the gates. On appeal, the Third District Court of Appeal held that the trial court was correct in its holding that plaintiff had a right to reasonable access and that the defendant was obligated to provide such access. However, the court reversed and remanded that portion of the decision which required the defendant to provide a bridge for the plaintiff. (Quarles-Florida)
W78-12825

PUBLIC DRINKING WATER SYSTEMS UNDER THE FLORIDA SAFE DRINKING WATER ACT.
For primary bibliographic entry see Field 5G.
W78-12836

POLLUTION OF WATERS.
Florida State Dept. of Environmental Regulation, Tallahassee.
Fla. Admin. Code, Ch 17-3, secs 3.01 thru 3.21 (1978) 1 app.

Descriptors: *Florida, *Water districts, *Well regulations, *Water users, Water quality control, Water quality standards, Water supply, Drainage wells, Effluents, Water management(Applied), Water permits, Water pollution control.

In order to protect state waters, the Florida Pollution Control Board (Board), under rules promulgated by the state Department of Environmental Regulation (DER), declares that the presence of pollutants in excess of certain concentrations is deemed to be prima facie evidence of pollution and is expressly prohibited. Where a new or increased source of pollution threatens degradation of existing water quality, such project development will be denied a DER permit until the Board is satisfied that such development is in the best interests of the state. The best practical treatment available under existing technology is required as a part of the initial project design. The Board will attempt to cooperate with the federal government on all matters affecting federal interests. Waters uses for navigation, utility and industrial purposes, known as Class V waters, are to be reviewed periodically with the goal of water quality enhancement and subsequent reclassification. The

criteria for the five different water classifications are set forth, as well as minimum conditions of all waters. The permit procedure for drainage wells is included, as are domestic and industrial waste treatment requirements. (Quarles-Florida)
W78-12837

SOVEREIGNTY SUBMERGED LANDS.
Florida Dept. of Natural Resources, Tallahassee.
Fla. Admin. Code, Ch 16C-12, secs 12.01 thru 12.04 (1978).

Descriptors: *Florida, *Land management, *Riparian land, *Regulation, Natural resources, Submergence, Islands, Administrative agencies, Sandbars, Navigable waters, Landfills, Land use.

These Florida Department of Natural Resources rules govern the purchase and sale of sovereignty submerged lands. These lands are defined to include tidal lands, islands, sandbars, shallow banks, and lands under navigable waters to which the state acquired title by virture of statehood in 1845. Application to the Board of Trustees of the Internal Improvement Trust Fund (Board) to purchase lands riparian to uplands may be made by the riparian owners only. An applicant must include, among other items, a survey of the area showing boundary lines of the parcel sought and of the applicants' adjacent uplands, the existing mean high water line, evidence of tital in the adjacent uplands, and a statement of proposed use. When state-owned submerged lands have been filled without authority, the Board may: (1) direct the fill be removed at the applicant's expense; (2) direct the fill remain as state-owned and have it surveyed at the applicant's expense; or (3) sell the filled lands. If sold, full payment is due within 90 days after notification of confirmation of the sale by the Board. Applications to purchase land not riparian to uplands must include similar information. (Quarles-Florida)
W78-12838

PERMITTING OF ARTIFICIAL RECHARGE SYSTEMS.
Florida Dept. of Natural Resources. Suwannee River Water Management District, White Springs, FL.
Fla. Admin. Code, Ch. 16 H5, secs 5.01 thru 5.31 (1978).

Descriptors: *Florida, *Water management(Applied), *Water districts, *Regulation, Permits, Administration, Well casings, Well regulations, Discharge(Water), Water wells, Artificial recharge, Administrative agencies.

The rules and regulations described herein are designed to regulate artificial recharge systems within the Suwannee River Water Management District. Artificial recharge, as used here, is defined as the intentional introduction of water into any underground formation. Included in the definition are fluids discharged from land application facilities, and disposal, storage, and connector well facilities. Excluded are wastewaters from residential septic tank systems, effluent from certain sewage treatment plants, and facilities for agricultural irrigation. In most instances, work may not commence on an artificial recharge system without a permit. Certain wells, however, are exempt from the permit requirement. Rules detailing how to file a permit application and under what conditions construction may be exempted are stated. The District may require public hearings before a permit is issued; it is also entitled to give orders relating to drilling techniques designed to prevent waste and pollution. In addition to the permit requirement, a specific casing and sealing program shall be submitted to the District for approval. Details in regard to this program are set out. Periodic well testing is required, as are written records of all construction work performed (Spiegel-Florida)
W78-12839

RULES OF THE WEST COAST REGIONAL WATER AUTHORITY.
West Coast Regional Water Authority, Clearwater, FL.
Fla. Admin. Code, Ch 16 M-1, secs 1.01 thru 1.06 (1978).

Descriptors: *Florida, *Local governments, *Regulations, *Water supply development, Legislation, Water supply, Environmental effects, Urbanization, Governmental interrelations, Water resources development, Comprehensive planning.

Florida statutes, chapter 74-114, authorizes municipalities and counties to create water supply authorities for the purpose of assisting local governments in meeting the water supply needs of rapidly urbanizing areas. Due to this act, Hillsborough, Pasco, and Pinellas counties, along with S. Petersburg and Tampa, created the West Coast Regional Water Supply Authority (Authority). The specific description of the organization is set forth herein, Rules governing the number of members and lengthj of appointments are included, as are Authority boundary limitations. All regulations concerning the acquisition of required water for use by Authority members are published in such a manner as will give priority to reducing adverse environmental effects of excessive or improper withdrawals of water from concentrated areas. Procedures to be followed when contracting for professional services are set out. Included are qualifying terms and performance data which firms must submit. The Authority is required to publicly announce when professional services are required, except in cases of valid emergencies. This regulation of public announcement insures competitiveness. All Authority proceedings shall be open to the public and conducted in accord with the promulgated rules. (Spiegel-Florida)
W78-12859

SIERRA CLUB V. BERGLAND (FEDERAL AGENCY FINDING OF SUDDEN IMPAIRMENT OF WATERSHED CHANNEL REVERSED).
451 F. Supp. 120-31 (N.D. Miss. 1978).

Descriptors: *Mississippi, *Channel improvement, *Watersheds(Basins), *Administrative decisions, Federal government, Watershed management, Permits, Judicial review, Floods, Administrative agencies, Environmental effects, Flood control.

Plaintiff Sierra Club brought this action against various federal agency administrators, as well as several county agencies of Mississippi, seeking injunctive relief to halt proposed channel improvement of a section of the Tippah River watershed. The proposed project, a joint venture by the U.S. Army Corps of Engineers and the federal Soil Conservation Service (SCS), called for the removal of silt deposits from the river. The project involved both government and privately owned land along the channel. The work on the federal land involved was authorized by Congressional legislation. Defendants contended that the work on the private property was authorized as ameliorating an impairment of the watershed, thus justifying emergency relief under the Flood Control Act (FCA). A permit was issued to defendants who did not prepare an environmental impact statement. The federal district court held that the administrative SCS decisions granting the project permit were subject to judicial review. On reviewing the evidence, the court held that there was no sudden impairment within the meaning of the FCA and that the SCS abused its discretion. An environmental impact statement is required in this instance and the injunction halting the channel improvements was issued. (Quarles-Florida)
W78-12862

ELWOOD V. CITY OF NEW YORK (LIABILITY FOUND FOR POLLUTION DAMAGES TO PROPERTY CAUSED BY DIVERSION OF HEADWATERS OF DELAWARE RIVER).
450 F Supp. 846 76 (S.D.N.Y. 1978).

Descriptors: *New York, *Pennsylvania, *Delaware River, *Thermal pollution, Riparian land, Thermal pollution, Headwaters, Water supply, River flow, Damages, Riparian water loss, Diversion.

Consolidated actions were brought by riparian landowners who claimed the value of their land, located in Pennsylvania along the Delaware River, was diminished by defendant New York City's activities. Defendant diverted the river's headwaters for its public water supply, thereby causing thermal pollution of the river. Defendant built several reservoirs upstream of plaintiffs' lands and diverted large amounts of water from the Delaware River and its tributaries to fill these reservoirs. After the water was used by the general public in the area, it was discharged into drainage basins other than that of the Delaware River. In a complex opinion, the U.S. District Court discussed prior proceedings affecting the Delaware River, the Delaware River Compact and New York's Environmental Conservation Law, and the river's apportionment. The court then held that defendant was liable for damages caused by its activities and plaintiffs are allowed recovery based on a permanent trespass theory. Damages were to be determined by computing the difference between the present value of the land and what the value would have been but for the trespass. (Quarles-Florida)
W78-12871

REGULATION OF WELLS.
Northwest Florida Water Management District, Tallahassee.
Fla. Admin. Code, Ch 16G-3, secs 3.01 thru 3.32 (1978). 1 tab.

Descriptors: *Florida, *Water wells, *Well regulations, *Administrative agencies, Well data, Drilling, Comprehensive planning, Logging(Recording), Well permits, Water management(Applied), Water supply development.

The Northwest Florida Water Management District is entrusted with certain responsibilities, including: the development of a district water use plan; establishment of minimum surface water levels; operation and maintenance of district works; permitting construction involving underground formations; and general management of water within the District. The purpose of the rules stated herein is to implement these responsibilities. Extensive knowledge of the region's geology and hydrology was necessary for this implementation. This information was derived from sampling and testing wells. The District must be apprised of proposed well so that an evaluation may be made as to whether geologic and hydrologic data should be compiled from a particular well. This data tells well designers and drillers valuable information relative to ground water production. These rules also delineate a permit system for construction, repair, and abandonment of wells. Permits, exemptions, fees, and revocation requirements are specified. Rules establishing minimum water well construction standards designed to protect ground water resources are also detailed. Finally, provisions for the enforcement of rules and penalties for non-compliance are set forth. (Spiegel-Florida)
W78-12872

REGULATION OF WELLS.
Saint Johns River Water Management District, Palatka, FL.
Fla. Admin. Code, Ch 161-3, secs 3.01 thru 3.80 (1978). 1 tab, 1 app.

Descriptors: *Water wells, *Florida, *Water management(Applied), *Well regulations, Well data, Drilling, Legislation, Potable water, Water

supply development, Well permits, Administration.

The rules described herein have promulgated to further the goals of the Saint Johns River Water Management District. These goals include, among others, permitting construction involving underground formations, developing a District water use plan, and general management of water within the District. These regulations pertain to public drinking water supply system wells only. The rules primarily relate to a system of permitting the construction, repair, and abondonment of wells. Included are rules concerning permits, exemptions, and fees. There is also a requirement regarding permit rejection. In instances such as these, a person receiving a permit rejection notice may request a hearing. Minimum standards for well construction are described. Included in this section is a table detailing dimensions and weights required for well casings. There are granting, sealing, and plugging regulations. The District may inspect during all stages of construction, repair, or abondonment to insure conformity with applicable standards. Finally, there are provisions for the enforcement of rules and penalties for non-compliance. (Spiegel-Florida)
W78-12873

ALTERNATIVE POLLUTION CONTROL STRATEGIES; EQUITY, EFFICIENCY AND INFORMATION REQUIREMENTS,
Tennessee Univ., Knoxville. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-12875

REGULATION OF WELLS.
Southwest Florida Water Management District, Brooksville.
Fla. Admin. Code, Ch 16J-3, secs 3.01 thru 3.30 (1978).

Descriptors: *Florida, *Water districts, *Well permits, *Well regulations, Drilling, Wells, Test wells, Drill holes, Water management(Applied), Water conservation, Water supply development, Adoption of practices.

This section of the Rules of the Southwest Florida Water Management District pertains to the regulation of wells. It codifies similar rules of the Florida Administrative Code, and is intended to enforce regulations promulgated by the state Department of Natural Resources regarding construction standards. The Rules require that drillers and contractors be registered, and provides an examination and registration procedure. Drillers are also required to post a $5,000 bond for protection of the District's water resources. Several grounds are listed on which the Governing Board (Board) may refuse to issue or revoke a registration. The Rules also regulate actual construction of wells, prohibiting the wasted escape of any water. A permit must be obtained from the Board before any well or test hole may be constructed, and permits are to be valid for six months unless an extension is granted. If the Board rejects a permit application, it must issue a statement of the grounds for rejection. An appeals procedure is provided. The Rules also authorize the Board to declare 'Water use-caution' areas where area-wide regulation is needed to forestall depletion of the District's water resources. (Stump-Florida)
W78-12878

REHABILITATION OF DEGRADED ARID LANDS,
United Nations, New York. Environment Programme; and Secretariat for International Ecology (Sweden).
H. N. Le Houerou.
Ecologica Bulletin, Vol. 24, p 189-204, 1976. 4 tab, 20 ref.

Descriptors: *Land reclamation, *Arid lands, Impaired wate use, Land development, Land use, Psychological aspects, Water resources planning, Social adjustment, Economic feasibility, Political aspects, Land conservation, Water conservation, Migration.

Desertization, aggravated by climatic circumstances, is primarily man-induced and any attempt at restoration must therefore interfere with human behavior. Cures of desertization as reviewed by this author consist of biological recovery or revival techniques which reverse the destructive processes. Natural, semi natural and artifical recovery techniques are reviewed and discussed although this analysis stresses the importance of social, political and economic reform. Among these reforms are population control, enforced emigration, transfer to other areas or activities, education, and control of land and water use. (Tickes-Arizona)
W78-12916

PERMITTING USES OF WATER.
South Florida Water Management District, Palm Beach.
Fla. Admin. Code, Ch 16 K-2, secs 2.01 thru 2.16 (1978).

Descriptors: *Florida, *Permits, *Administrative agencies, *Water policy, Artificial recharge, Water management(Applied), Water shortage, Drilling, Water districts, Groundwater, Surface waters.

The rules described herein provide for the implementation of a permit system designed to regulate and control the use of ground and surface water within the South Florida Water Management District. Permits are required before construction may begin on any project involving artificial recharge (the intentional introduction of water into any underground formation). It is also necessary to acquire a permit for any use, diversion or withdrawal of water from the district which exceeds 100,000 gallons per day. Persons using water in conjunction with oil well drilling projects in Lee, Collier, or Hendry counties must have a general permit issued for the work. Regulations relating to the application for, and the modification and revocation of, these permits are included. In certain emergency situations, permission to begin use, withdrawal, or diversion may be given before a permit has been issued. The District may declare the existence of a water shortage when insufficient water is available to meet the requirements of the permit system. When this occurs, other regulations may be imposed on those seeking water permits. (Spiegel-Florida)
W78-12917

PERMITTING USES OF WATER.
Saint Johns River Water Management District, Palatka, FL.
Fla. Admin. Code, Ch 161-2, secs 2.01 thru 2.54 (1978).

Descriptors: *Florida, *Water supply, *Water management, *Water districts, Groundwater resources, Surface waters, Administrative agencies, Permits, Domestic water, Water shortage, Water resources development, Planning.

The St. Johns River Water Management District has enacted certain regulations to provide for the implementation of a permit system designed to regulate and control ground and surface waters in the District. The regulations shall be implemented only in those areas to be transferred to the District from the Central and Southern Florida Flood Control District. Permits are required for any use, diversion, or withdrawal of water which meets any of the criteria described in the rules. Reasonable conditions may be imposed on the permits when necessary for the conservation, protection, and control of District waters. Exempted from these permit requirements are individuals who intend to use the water for only their own domestic use. Permit fee requirements are explained. Fees increase in direct relation to the average annual daily withdrawal of water requested. Permits may be modified or transferred in certain instances. The District Executive Director may, at his discretion, grant emergency authorization to begin use. The Board may also declare a water shortage to exist when there is sufficient water available to meet the requirements of the permit system. Procedures to be followed during a water shortage are listed. (Spiegel-Florida)
W78-12918

MANAGEMENT AND STORAGE OF SURFACE WATERS.
South Florida Water Management District, Palm Beach.
Fla. Admin. Code, Ch 16 K-4, secs 4.01 thru 4.38 (1978).

Descriptors: *Florida, *Water districts, *Surface waters, *Water quality control, State governments, Administration, Engineering structures, Dams, Construction, Permits, Regulation, Water management(Applied).

The purpose of the rules described herein is to implement Florida's water policy concerning management and storage of surface waters in the South Florida Water Management District. Rules apply to those who wish to alter, construct, operate or abandon a dam, impoundment, reservoir or any similar work in the district. Generally, a permit is necessary before work may begin. Regulations concerning permit applications and requirements are detailed, as are grounds for which exemptions may be granted. The permittee shall include in the project design all proposed or required techniques for storm water runoff quality control. Submission of water quality data for the water discharged from the permittee's property may later be required. The granting of a permit does not give inalienable rights to the person holding the permit. This type of licensing may be modified or revoked in certain instances. Permission to begin construction may be given before a permit has been issued when an emergency situation demands immediate action. The District is obligated to inspect surface water works periodically to determine whether all rules and regulations are being obeyed. (Spiegel-Florida)
W78-12919

THE ARIZONA WATER COMMISSION'S CENTRA ARIZONA PROJECT WATER ALLOCATION MODEL SYSTEM,
Arizona Water Commission, Phoenix.
P. C. Briggs.
Hydrology and Water Resources in Arizona and the Southwest, Vol. 7, 1977. p 29-31.

Descriptors: *Water management(Applied), *Water allocation(Policy), *Computer models, Model studies, Statistical models, Linear programming, Administration, Central Arizona Project, Arizona.

The purpose and operation of the Central Arizona Project water allocation model system are described, based on a system analysis approach developed over the past 30 years into an interdisciplinary science for the study and resolution of complex technical management problems. The system utilizes mathematical and other simulation models designed for computer operations to effectively solve such problems as the CAP faces including those concerned with social and economic considerations. The model is composed of two major components: (1) a linear program designed to determine the optimal allocation of all sources of water to all demands and, (2) a hydrologic simulator capable of reflecting the impact of distribution alternatives on per-unit cost of delivery. The model, currently being use, has substantially con

tributed to a greater understanding of water usage potential in Arizona. (Tickes-Arizona)
W78-12924

MANAGEMENT AND STORAGE OF SURFACE WATERS.
Southwest Florida Water Management District, Brooksville.
Fla. Admin. Code, Ch 16J-4, secs 4.01 thru 4.17 (1978).

Descriptors: *Florida, *Permits, *Surface waters, *Regulation, Dam construction, Engineering structures, Water storage, Engineering, Management, Project planning, Reservoirs, Construction.

The purpose of the rules described herein is to implement the water policy of the Southwest Florida Water Management District and the state of Florida concerning the storage and management of surface waters. Permits are necessary in many cases in order to construct, alter, abandon, or otherwise change any dam, reservoir, or appurtenant structure in Florida. Exemptions from this requirement may be given in some instances. Natural persons may be granted exemptions when attempting to capture and use the water for lawful purposes. In order to receive a permit, an application containing pertinent information must be filed. Permits may be denied if the proposed activity will adversely affect surface waters, or they may be granted conditionally. To receive a permit, one must pay processing fees and obtain an identification tag which must be displayed at the permitted facility. After a permit is issued, a public hearing may be called at which objections to the proposed project can be heard. Permits can be revoked or modified. Authorization for construction can be given without a permit in emergency situations. (Spiegel-Florida)
W78-12926

WATER RESOURCE PROBLEMS MERGE WITH ENERGY, LAND-USE POLICIES ON GLOBAL SCALE,
National Society of Professional Engineers, Washington, DC.
J. T. Kane.
Professional Engineer, Vol. 47, No. 10, p 16-18, October 1977. 3 pic.

Descriptors: *Water policy, *Administrative decisions, Water resources development, Planning, Political constraints, Administrative agencies, Comprehensive planning, Water law, Project planning, Water allocation(Policy), Water management(Applied), Constitutional constraints, State governments, Local governments, Federal government.

A review is presented of present and future worldwide water resource problems and the critical need for proper land use policies in solving the dilemma. Emerging from the U.N. Conference on desertification (1977) is the fact that 14 million acres of arable land per year are turning into deserts; however, national, state, and local organizations are becoming increasingly at odds between production and conservation points of view with respect to water resources. National legislation, such as the 1972 Water Pollution Control Act, the National Energy Act, and the establishment of the U.S. Water Resources Council are reviewed and the widespread lack of enthusiasm for the Carter administration's national water policy approach is documented. (Tickes-Arizona)
W78-12928

CAN DESERTIZATION BE STOPPED. SUMMARY AND RECOMMENDATIONS,
United Nations, New York. Environment Programme; andSecretariat for International Ecology (Sweden).
H. N. Le Houerou, and A. Rapp.
Ecologica Bulletin, Vol. 24, p 237-241, 1976. 11 ref.

Descriptors: *Desertification, *Arid lands, *Deserts, Human population, Animal populations, Population, Distribution patterns, Density, Environmental effects, Water resources, Planning, Droughts, Range management, Economic feasibility, Political constraints, Area redevelopment, Water resources development.

Halting desertization in arid regions where population pressure is high is primarily a problem of reducing exploitation either though out-migration or family planning. Arid and semi-arid regions are well adapted for use by man only if it is possible to give support to beast and man in these areas during critical times. These authors review priority measures needed in formulating long term efforts to combat desertization, including (1) planning with a view of minimizing future drought hazards, (2) grazing as a major form of land use, (3) avoiding expensive methods, and (4) encouraging complementary activities for decreasing the pressure on grazing lands. Emphasized in this analysis is the critical need for a strong political organization with the power to implement necessary measures. (Tickes-Arizona)
W78-12937

REVIEW OF CANADIAN MUNICIPAL URBAN DRAINAGE POLICIES AND PRACTICES.
Gore and Storrie Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5G.
W78-12949

6F. Nonstructural Alternatives

RELIABILITY OF FLOOD WARNING,
Illinois Univ. at Urbana-Champaign. Dept. of Civil and Ceramic Engineering.
B. C. Yen, and W. H. Tang.
In: Stochastic Processes in Water Resources Engineering, Proceedings, 2nd Intern. IAHR Symp. on Stochastic Hydraulics, Lund Institute of Technology, Sweden, August 1976. Lars Gottschalk, et al. (Eds.), Water Resources Publications, Fort Collins, Colorado, 1977, p 333-347 (Chapter 15). 2 fig, 11 ref.

Descriptors: *Reliability, *Hydraulics, *Flood flow, *River flood warning, *Probability theory, *Uncertainties, Flood stages, Flood routing, Upstream, Flood discharge, Prediction, Channels, Morphology, Simulation analysis, Mathematical models, Equations, Systems analysis, Forecasting, Hydrometeorologic factors, Multiplicative model, Physiographic factors.

Flood warning differs from flood forecasting in that for the former, the flood is actually occurring and the warning consists of prediction of the flood stage or discharge based on the flood information upstream; however for the latter, the prediction is made using estimated or measured hydrometeorological information such as rainfall, snowmelt, soil moisture conditions, and so forth. Usually, forecasting is made at a longer time in advance and is much less reliable than warning. Many hydraulic and hydrologic methods have been developed to route floods for flood warning. Unfortunately, none of the existing flood routing methods is exact, and consequently their accuracy is questioned. Moreover, uncertainties exist in many other aspects, including reliability of the hydrometeorologic and river morphologic input data used in the flood routing. Herein, a method based on probability theory is presented to demonstrate how the uncertainties involved in flood warning can be accounted for and how the probability of exceeding a flood stage can be assessed. The method adopts a first order, second moment analysis of uncertainties together with a multiplicative corrective model and is rather flexible in applications. (Bell-Cornell)
W78-12528

ALLOCATION OF WATER STORED FOR FLOOD CONTROL AND NAVIGATION PURPOSES (PROPOSED RULE).
Corps of Engineers, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-12561

THE INFLUENCE OF THE SAN FERNANDO CASE ON THE WORK OF THE GOVERNOR'S WATER RIGHTS COMMISSION,
For primary bibliographic entry see Field 4B.
W78-12617

FLOOD PLAIN INFORMATION: CORRALITOS CREEK, SANTA CRUZ COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 4A.
W78-12650

FLOOD PLAIN INFORMATION: LEVISA FORK AND TRIBUTARIES, BUCHANAN COUNTY, VIRGINIA, GRUNDY TO OAKWOOD.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-12651

FLOOD EMERGENCY BUILDING INSPECTOR PROGRAM FOR THE CITY OF WILKES-BARRE.
Wilkes-Barre Dept. of Planning and Development, PA. Bureau of Flood Recovery.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 914, Price codes: A04 in paper copy, A01 in microfiche. Economic Development Administration Technical Assistance Grant, January 1975, 66 p. 01-6-09571.70/71.

Descriptors: *Flood damage, *Building codes, *Inspection, *Floods, Buildings, Pennsylvania, Rehabilitation, Construction, Training, *Wilkes-Barre(PA), *Enforcement, *Flood recovery, *Building inspection program, Economic Development Administration, Consumer protection, Multiple inspections.

This report summarizes building inspection activities carried out by the City of Wilkes-Barre subsequent to damages caused by the Hurricane Agnes flood of June 23, 1972. The inspection program was made possible by a technical assistance grant from the Economic Development Administration. The City had taken an active role in building code enforcement prior to the flood. Without the EDA funds, the preexisting program could not have been expanded to assure that the $70 million of rehabilitation work and new construction could be carried out by competent workmen in a safe and orderly fashion. The amount of construction work generated by the flood brought a huge influx of new contractors and workmen. The liability of poor workmanship and dishonest business practices threatened many individuals. This program emphasized consumer protection. The procedure of making multiple inspections enabled the Building Inspector's Office to act as an intermediary to assure that all the work stipulated in a contract was performed and that it was performed in accordance with Code standards. The EDA grant also allowed the City to carry out an inspection process to cover an unprecedented amount of new construction. Some of the funds were used for training purposes. (Nessa-NC)
W78-12667

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, VOL. 2, APP. I: ECONOMICS: APP. II: CLIMATE AND METEOROLOGY: APP. III: HYDROLOGY, SURFACE GROUND WATER AND GEOLOGY:

APP. IV: FLOOD CONTROL AND MAJOR DRAINAGE.
For primary bibliographic entry see Field 6B.
W78-12761

BIG BLACK RIVER, MISSISSIPPI--COMPREHENSIVE BASIN STUDY, VOLUME I: INTERAGENCY SUMMARY REPORT.
For primary bibliographic entry see Field 6B.
W78-12768

FLOOD PLAIN ZONING.
Wis. Stat. Ann. sec 87.30, (1972), as amended, (Supp. 1977).

Descriptors: *Wisconsin, *Flood plains, *Flood plain zoning, *Flood control, Zoning, Local governments, Floods, Flood damage, Floodways, Drainage, Ditches, Regulation.

Wisconsin's flood plain zoning statute is amended. If any local government fails to adopt an adequatre flood plain zoning ordinance by 1968, the department, upon petition or by its own accord, shall determine and fix the limits of all flood plains within such division within which serious damage may occur. After public hearing the department is required to adopt a flood plain zoning ordinance applicable to that local government, except that no such ordinance shall be enacted unless the hydraulic and engineering studies necessary to determine the floodway limits have been made at state or federal expense. This last requirement was not contained in the previous statute. A final flood plain zoning ordinance required under this section does not apply to lands adjacent to farm drainage ditches if: (1) the land is not within the flood plain of a natural navigable stream or river; (2) the drainage ditches adjacent to such lands were nonnavigable streams before ditching or had no previous stream history; and (3) the lands are maintained in nonstructured agricultural use. This exception was also absent from the original statute. (Quarles-Florida)
W78-12778

WATER MANAGEMENT DISTRICTS.
For primary bibliographic entry see Field 4A.
W78-12780

6G. Ecologic Impact Of Water Development

A GUIDE TO THE NEW YORK STATE ENVIRONMENTAL QUALITY REVIEW ACT,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 6E.
W78-12104

ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION,
Louisiana Tech Univ., Ruston. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12130

COMPUTER-AIDED ANALYSIS OF LANDSAT DATA FOR SURVEYING TEXAS COASTAL ZONE ENVIRONMENTS,
Purdue Univ., Lafayette, IN. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7C.
W78-12178

CALIFORNIA COASTAL PROCESSES STUDY - LANDSAT II. FINAL REPORT: LANDSAT INVESTIGATION NO 22200,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5C.
W78-12179

DEVELOPMENT OF A SIMPLE, RAPID FIELD TECHNIQUE FOR ESTIMATING OIL CONCENTRATIONS IN THE SEDIMENTS,
Mississippi State Univ., Mississippi State.
For primary bibliographic entry see Field 5A.
W78-12182

DEEP OCEAN MINING ENVIRONMENTAL STUDY (DOMES). PHYTOPLANKTON & PRIMARY PRODUCTIVITY STUDIES; PRELIMINARY REPORT,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-12185

EFFECT OF THERMAL SHOCK ON DEVELOPMENTAL STAGES OF ESTUARINE FISH,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 5C.
W78-12191

INTERIM ENVIRONMENTAL SYNTHESIS OF THE NORTHEAST GULF OF ALASKA.
Science Applications, Inc., Boulder, CO.
Report Prepared for the Outer Continental Shelf Environmental Assessment Program, based on NOAA/OCSEAP Synthesis Meeting, held Anchorage, Alaska on January 11-13, 1977, March 1978. 205 p, 4 append.

Descriptors: *Resources development, *Baseline studies, *Environmental effects, *Water quality, *Alaska, *Water resources, Oil industry, Gases, Ecology, Fish, Birds, Mammals, Plankton, Benthos, *Outer Continental Shelf, *Gulf of Alaska.

Regional environmental information is provided in a form useful in decision-making processes related to OCS oil and gas development in the Northeast Gulf of Alaska (NEGOA) lease area: to increase and update scientific interdisciplinary understanding of the Northeast Gulf of Alaska region; and to identify important gaps in knowledge of the Northeast Gulf of Alaska marine environment that are relevant to OCS development. Proceedings of the meeting, material provided by the participants, and recommendations for specific research needs are organized in various chapters. Chapter II provides a description of the areas identified as being critical in view of the OCS oil and gas development. The main body of scientific knowledge is provided in Chapter III. Chapter IV outlines general conclusions reached during Synthesis Meeting discussions of the implications of oil-related impingement on the environment. Chapter V identifies gaps in knowledge and provides a summary of research needs which can be used as input for program direction and emphasis for future research. (Sinha-OEIS)
W78-12192

MAIN ASPECTS OF THE ANTHROPOGENIC TRANSFORMATION OF LAKE ECOSYSTEM OF THE NORTHWESTERN EUROPEAN USSR (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
For primary bibliographic entry see Field 2H.
W78-12298

MACROINVERTEBRATE AND WATER QUALITY-QUANTITY SURVEY OF OTTER CREEK, PIUTE COUNTY, UTAH,
Brigham Young Univ., Provo, UT. Center for Health and Envrionmental Studies.
For primary bibliographic entry see Field 4D.
W78-12303

OCS DEVELOPMENT IN COASTAL LOUISIANA: A SOCIO-ECONOMIC IMPACT ASSESSMENT,
New Orleans Univ., LA. Urban Studies Inst.
For primary bibliographic entry see Field 6B.
W78-12307

OUTER CONTINENTAL SHELF IMPACTS, MORGAN CITY, LOUISIANA,
University of Southwestern Louisiana, Lafayette.
E. F. Stallings, T. F. Reilly, and R. B. Gramling.
Southwestern Louisiana University Report to Louisiana State Planning Office, June 30, 1977. 330 p, 2 append.

Descriptors: *Environmental effects, *Land use, *Louisiana, *Resources development, Economics, Sociology, *Outer Continental Shelf, Petroleum development, Coastal Zone Management, Morgan City(LA), Environmental impact.

Over the period 1954-1972, OCS oil production increased from 3.3 million barrels to 389.2 million barrels. Morgan City and St. Mary Parish have benefited immensely from the development of OCS petroleum and natural gas. Total employment in St. Mary Parish has increased 89.5% from 1940-1970. Parish income has increased twice as rapidly as did that of Louisiana between 1947 and 1973. OCS activities and related population growth have placed great strains upon the ability of the community to provide adequate levels of services and facilities. Land use changes have occurred on a large scale. Primarily they have involved a shift from agricultural uses to urban, residential, and industrial uses. Also, some swampland has been converted for these same three uses. OCS related industries have required land primarily for siting purposes. Environmental impacts, including pollution, directly associated with OCS activities have been small. They have generally resulted from dredging activities and from the conversion of swampland to industrial sites. However, should OCS activities decline in the area, major disruption of the social and economic life of the community would occur. (NOAA)
W78-12310

CHICAGO LAKEFRONT DEMONSTRATION PROJECT. ENVIRONMENTAL IMPACT HANDBOOK,
Chicago, IL, Dept. of Development and Planning.
For primary bibliographic entry see Field 2H.
W78-12315

STATE OF NORTH CAROLINA COASTAL MANAGEMENT PROGRAM AND DRAFT ENVIRONMENTAL IMPACT STATEMENT. APPENDICES.
North Carolina Dept. of Natural Resources and Community Development, Raleigh.
NOAA, Office of Coastal Zone Management Draft Environmental Impact Statement, Proposed Coastal Management Program for the State of North Carolina, Appendices, March 1978. 572 p, 20 infold maps.

Descriptors: *Coasts, *Land use, *Resources development, *Environmental effects, North Carolina, *Coastal zone management, *Environmental impact statement.

The National Environmental Policy Act (NEPA) of 1969 mandates that an environmental impact statement be prepared as part of the review and approval process of major actions by Federal government agencies which significantly affect the quality of the human environment. It is the general policy of the Federal Office of Coastal Zone Management (OCZM) to issue a combined draft environmental impact statement and program document. This document has been prepared in two volumes. Volume I contains the draft environmental impact statement and program document. Volume II contains the appendices to the program

document. Part 1 of the Draft Environmental Impact Statement (DEIS) was prepared by the Office of Coastal Zone Management. Included in this section is a summary of North Carolina's Management Program which State officials have accepted as an accurate summary of the elements of the program that relate to the approval criteria in the CZMA. Part 2 of the DEIS is a description of the State's Coastal Management Program and was prepared by the State of North Carolina. Part 3 fulfills the NEPA requirements for a DEIS and was prepared by the OCZM, with some assistance from the State of North Carolina. (NOAA)
W78-12334

STATE OF NORTH CAROLINA COASTAL MANAGEMENT PROGRAM AND DRAFT ENVIRONMENTAL IMPACT STATEMENT.
North Carolina Dept. of Natural Resources and Community Development. Raleigh.
NOAA, Office of Coastal Zone Management Draft Environmental Impact Statement, Proposed Coastal Management Program for the State of North Carolina, March 1978. 287 p.

Descriptors: *Coasts, *Land use, *Resources development, *Environmental effects, North Carolina, *Coastal Zone Management, Environmental impact statement.

The National Environmental Policy Act (NEPA) of 1969 mandates that an environmental impact statement be prepared as part of the review and approval process of major actions by Federal government agencies which significantly affect the quality of the human environment. It is the general policy of the Federal Office of Coastal Zone Management (OCZM) to issue a combined draft environmental impact statement and program document. This document has been prepared in two volumes. Volume I contains the draft environmental impact statement and program document. Volume II contains the appendices to the program document. Part 1 of the Draft Environmental Impact Statement (DEIS) was prepared by the Office of Coastal Zone Management. Included in this section is a summary of North Carolina's Management Program which State officials have accepted as an accurate summary of the elements of the program that relate to the approval criteria in the CZMA. Part 2 of the DEIS is a description of the State's Coastal Management Program and was prepared by the State of North Carolina. Part 3 fulfills the NEPA requirements for a DEIS and was prepared by the OCZM, with some assistance from the State of North Carolina. (NOAA)
W78-12335

FRESHWATER MUSSELS UNIONIDAE, WHAT IS THEIR DISTRIBUTION IN SOUTH AFRICAN INLAND WATERS TODAY,
Albany Museum, Grahamstown (South Africa).
R. A. Jubb.
Piscator (Cape Town), No. 97, p 73-75, 1977, 4 ref.

Descriptors: *Mussels, Shellfish, Species distribution, Migration patterns, Benthic fauna, Aquatic animals, Freshwater fish, Limnology, Filter feeder, Mollusca, Salt tolerance, Water temperature, Eutrophication, Lethal limit, Pollutants concentration, Bioindicators, Biomonitoring, *Uniondae, *South Africa.

The freshwater mussels, Uniondae, are filter feeders that, as adults, posess little means of migrating over great distances, but nevertheless the dispersal of some Southern African species is considerable. Because of peculiar adaptions during their larval stages freshwater mussels can rapidly disperse through an interconnected freshwater system. The major food sources for freshwater mussels are algae and bacteria produced by the breaking down or decomposition of organic matter in the water. Most unionids tend to flourish in the shallow parts of rich and eutrophic waters, but they are sensitive to industrial inorgaic waste matter introduced into rivers, and most insecticides, herbicides and molluscacides prove lethal. (So Afr Water Info Ctr)
W78-12394

THE TALE OF A LAKE,
Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
For primary bibliographic entry see Field 2H.
W78-12413

THE NECESSITY OF ENVIRONMENTAL PROTECTION,
Johannesburg City Council (South Africa).
R. R. Charter.
Municipal Engineer, Vol. 7, No. 2, p 37, 39, 41, 43, 1976.

Descriptors: *Environmental management, Costs, Political aspects, Research and practice, Water pollution, Water reuse, Sludge dewatering, Sludge disposal, Landfills, *South Africa.

The author takes a close look at the environmental scene in the United States, discusses the politics behind Environmental Protection in that country and mentions the results achieved and the research done. He then goes over to discussing environmental protection in South Africa, and goes into detail into work being done by the City Council of Johannesburg regarding environmental protection. Johannesburg and the Witwatersrand is unique in that there are no large perennial rivers or adjacent coastal waters capable of diluting effluents and there may be dangers arising from steady accumulation of noxious substances during use and re-use of water. The author goes on to discuss problems concerning water pollution and water recirculation. The author, a Johannesburg City Councellor, calls for guidelines from the minister of the environment to be told where Johannesburg's responsibilities begin and end, as at present they have to make ad hoc judgements in isolation instead of in conformity with a national policy. (So Afr Water Info Ctr)
W78-12435

JOHANNESBURG ON JUKSKEI.
For primary bibliographic entry see Field 5G.
W78-12454

INTEGRATED RIVER BASIN DEVELOPMENT AND AQUATIC ECOLOGY,
K. F. Lagler.
Rhodesia Science News, Salisbury), Vol 10, No 5, p 124-127, 1976.

Descriptors: *River basin development, Integrated systems, Aquatic ecosystems, Man made lakes, Research and development, Hydroelectric power, Irrigation, *Ecology aspects, Economic development, *Mekong River, China, Southern Africa.

Integrated river basin development is about comprehensively blended, multiple resource usage for socio-economic gain. It involves rational, considered tradeoffs through carefully planned reductions of the ecological dysfunctions that major ecosystem alterations generate. Dams and reservoirs are implicit in most such schemes. Integrated development is best planned through applications of the principles of operations research and systems analysis. In this approach a conceptual model is attempted, based on understanding of ecosystem earth and its subsystems. The author reports the case history of the procedural model of planning for integrated river basin development of the Lower Mekong River Basin in South east Asia. (So Afr Water Info Ctr)
W78-12500

CABORA BASSA IN ITS FIRST YEAR: SOME ECOLOGICAL ASPECTS AND COMPARISONS,
P. B. Jackson, and B. R. Davies.
Rhodesia Science News, Salisbury, Vol 10, No 5, p 128-133, 1976, 18 refs, 1 tab, 1 fig.

Descriptors: *Ecology aspects, Hydrologic data, *Hydroelectric power, Fish growth, Research and development, Vegetation, Spawning, Macrophytes, Malaria, Schistosomiasis, Protein production, Tilapia, Water hyacinth, Fish harvest, *Cabora Bassa, *Southern Africa.

Closure of the Cabora Bassa Dam on December 5, 1974 led to the creation of a second large lake on the Middle Zambezi, some 200 km downstream from Kariba. The dam wall, located, about 37 km downstream from the entrance of the Cabora Bassa Gorge, which cuts through the spectacularly beautiful Songo Plateau, stands 176m high and will have a total power output of 3,870MW, making it the largest hydroelectric power project in Africa. The power, intended for use by both South Africa and Mocambique, will provide an important boost to the economy of the latter country. Various features of Kariba and Cabora Bassa are listed for comparative purposes and an outline map of Lake Cabora Bassa is shown. Cabora Bassa will be an enormous asset to the people of Mocambique, not only in terms of industrial development and protein supply, but also as a potential earner of foreign currency through export of fish products. However, extensive health hygiene and fishery training programmes, as well as sound legislation to prevent over-exploitation, are required now, in order to allow the lake to reach its full potential. Research development and management of this kind are common to all great dams of Africa. Cabor Bassa is no exception, and as a result of its morphometry and many nutrient-rich inflows it is likely to be richer than most other dams on the continuent. Sound management policies for Cabora Bassa will probably be even more rewarding than has already proved to be the case in the other dams. (So Afr Water Info Ctr°
W78-12501

LIFE-FORMS OF AQUATIC PLANTS,
G. E. Russel.
Rhodesia Science News, Salisbury, Vol 10, No 5, p 134-137, 1977. 6 fig.

Descriptors: *Aquatic plants, Aquatic habitats, Floating plants, Rooted aquatic plants, Submerged plants, Riparian plants, Soil moisture zone, *Rhodesia, *Southern Africa.

Rhodesia is a dry country, where water availability is a limiting factor for development. Because of the critical nature of the water supply, it is important that all aspects of water and the storage of water are understood. Knowledge of aquatic plants is important in the study of aquatic habitats because their presence or absence can affect the quality and possibilities of utilization of a body of water, and they may be judged to be either beneficial or harmful depending on the uses for which the water body is intended. (So Afr Water Info Ctr)
W78-12502

DAMMING THE UMFOLOZI: ENVIRONMENTAL ASSESSMENT,
R. N. Porter.
South African Journal of Science, Johannesburg, Vol 73, No 11, p 323, 1977.

Descriptors: *Future planning, Impoundments, Hydroelectric power, Resources development, *Environmental effect, Agriculture, Forestry, *Umfolozi River, *South Africa.

The Umfolozi River is one of the few major river systems in South Africa in which no significant engineering development has yet been undertaken. Further demands in South Africa for water will necessitate maximum economic use of all available resources, and thus the need and importance are recognized for impoundments on the Umfolozi

itself. In January 1976, the Minister of Water Affairs appointed a ten-man committee-known as the Committee of Inquiry into the Ecological Aspects of a Dam in the Umfolozi River which requested that the Natal Parks, Game and Fish preservation Board undertake an environmental impact assessment of the effects of proposed dams in the Umfolozi River basin. (So Afr Water Info Ctr)
W78-12505

SOME REGULARITIES IN THE CHANGES IN LAKE ECOSYSTEMS IN CONNECTION WITH ANTHROPOGENIC FACTORS (IN RUSSIAN),
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 2H.
W78-12557

ENVIRONMENTAL IMPACT REPORTS UNDER THE CALIFORNIA ENVIRONMENTAL QUALITY ACT: THE NEW LEGAL FRAMEWORK,
San Diego Univ., CA. School of Law.
For primary bibliographic entry see Field 5G.
W78-12563

REMOTE SENSING TO IDENTIFY, ASSESS, AND PREDICT ECOLOGICAL IMPACT ON LAKE CHAMPLAIN WETLANDS,
State Univ. of New York Coll. at Plattsburgh.
D. J. Bogucki, and G. K. Gruendling.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 339, Price codes: A10 in paper copy, A01 in microfiche. Final Report, 1978. 191 p, 8 fig, 36 tab, 10 plates, 66 ref. OWRT C-6075 (5210)(1).

Descriptors: *Lake Champlain, *Wetlands, *Remote sensing, *Water level regulation, New York, *Aquatic vegetation, Vermont, Ecology, Ecological distribution, Environmental effects, Aerial photography, Pre-impoundment.

The objectives were to (1) utilize remote sensing techniques (color and color infrared aerial photography) to map aquatic vegetation for 12 priority Lake Champlain wetlands (9135 hectares) at a 1:2500 scale, (2) analyze the ecological effects of naturally fluctuating lake levels on the composition and distribution of major aquatic plant populations, and assess the possible effects of water level regulation from the proposed Richelieu River dam construction. Evaluation of the effects of naturally fluctuating water levels on selected aquatic vegetation over a three year period indicated that certain floating, emergent, and shrub species (particularly Typha angustifolia, Sparganium curycarpum, Scirpus fluviatalis, Cephalanthus occidentalis, Nuphar variegatum, and Nymphaea tuberosa) benefit from high water levels. All showed decreases in distribution, density, and/or vigor during the 1975 and 1977 low water years. Low water conditions appear most favorable for the emergent Zizania aquatica and for the maintenance of the green timber areas. If Lake Champlain should be regulated, each of the Lake Champlain wetlands would react in a different manner. The varied present day wetland characteristics with respect to vegetation composition, slope, exposure, soils, and basin configuration all combine to result in a wide range of possible ecological impacts.
W78-12601

TRANSITION ZONES OF FORESTED INLAND WETLANDS IN NORTHEASTERN CONNECTICUT,
Connecticut Univ., Storrs. Inst. of Water Resources.
P. H. Anderson, M. W. Lefor, and W. C. Kennard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 983, Price codes: A06 in paper copy, A01 in microfiche. Institute Report No. 29, Sept. 1978. 92 p, 10 fig, 17 tab, 86 ref, 3 append. OWRT A-058-CONN(3), 14-31-0001-4007.

Descriptors: *Wetlands, *Hydrologic cycles, *Remote sensing, *Plant populations, *Forested inland wetlands, *Transition zones, *Index of abundance, Vegetation distribution, Soil water content, Relief, *Connecticut.

Inland wetlands are valuable natural resources intimately associated with the hydrologic cycle. This study was designed to (1) investigate vegetation distribution and selected physical and chemical properties of wetland and bordering upland soils and the interface between the two, and (2) provide the ground truth necessary for the identification and delineation of deciduous wetland forests using false-color infrared (FCIR) imagery. All study sites were within the 45 sq. mile Town of Mansfield in northeastern Connecticut. Field research was conducted during the growing season of 1975. Line transects were laid out across wetland to upland transition zones. Plant species were identified and their positions on line transects were recorded. Crown cover was determined for herb layers, shrubs layers and the tree canopy. Changes in soil water content, soil pH, depth to water table and elevations were determined along the transects. In order to describe the distribution of plant species among the various zones (wetland, transition, upland), a statistical 'index of abundance' was developed. Discriminant analysis applied to the abundance data showed which plant species best separate wetlands from uplands and which are representative of natural plant associations. Of the criteria studied, vegetation distribution, soil water content and relief are the most useful for delineating deciduous wetland forests. These results are valuable for identifying and delineating inland wetlands using remote sensing imagery. (DeLara-Conn)
W78-12609

PROCEEDING OF ENVIRONMENTAL IMPACT STATEMENT CONFERENCE, HELD AT KANSAS CITY, MISSOURI ON 8-9 NOVEMBER, 1972.
Environmental Protection Agency, Kansas City, MO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 335, Price codes: A06 in paper copy, A01 in microfiche. November 1972, 115 p.

Descriptors: *Fossil fuels, *Environmental control impacts, *Conservation, *Environmental effects, Construction, Transportation, Water resource development, *National Environmental Policy Act(NEPA), *Environmental design, *Environmenta Impact Statements, *Environmental impacts, Bureau of Reclamation, Research and education, Soil Conservation Service, Ecology, Corps of Engineers.

This volume is a compilation of papers presented by all speakers who participated in the Environmental Impact Statement Conference. The Conference was called to illuminate various dimensions of Environmental Impact Statements (EIS). The great number of lawsuits filed against responsible Federal agencies by environmental groups or individuals has proven to the conference sponsors that the EIS laws will be enforced. The proceedings deal with the different problems arising out of mandatory EIS. The transportation and construction industries, fossil fuel power stations, Bureau of Reclamation, Soil Conservation Service and Corps of Engineers all face peculiar problems with regard to drafting EIS. Additional articles cover the origins and history of NEPA, conservationist and ecologist public attitudes toward EIS, and a general discussion of environmental design. The participants are consultants, lawyers, and professors from the Kansas-Missouri area. (Coan-NC)
W78-12657

PLAN AND CONCEPTS FOR MULTI-USE MANAGEMENT OF THE ATCHAFALAYA BASIN,
Coastal Environments, Inc., Baton Rouge, LA.
J. L. Van Beek, W. G. Smith, J. W. Smith, and P. Light.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 488, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-600/3-77-062, May, 1977. 204 p, 44 fig, 14 tab, 70 ref, 2 append.

Descriptors: *Swamps, *Wildlife habitat, *Hydrography, *Louisiana, *Flood control, *Water resources development, Wetlands, Wildlife, Deltas, Forestry, Sedimentation, Water quality, Runoff, Water management(Applied), Channel improvement, Atchafalaya Basin(Louisiana).

A surface-water management plan is presented that is believed to provide for maximum longevity of the remaining Atchafalaya Basin swamp ecosystem, to minimize the conflict arising from flood control needs, and to make possible compatible derivation of benefits from both renewable and non-renewable resources. Surface water requirements are determined for the natural resource complex, including fishes, wildlife, forests, and the socio-economic resource uses, including flood control, urban and industrial development, mineral extraction, transportation, agriculture, and recreation. Requirements are expressed in terms of desirable annual water-level variation, and resulting hydrographs are compared with those for present and proposed conditions associated with channelization. Minimum volumetric inflow requirements were calculated on the basis of storage characteristics and water levels as attained at present. Hydraulic geometry at the present main river channel is analyzed, and those channel dimensions that are in equilibrium with bankfill discharge suggest that channel enlargement through dredging should not go beyond a cross-sectional area of 7,400 sq. m. (Steiner-Mass)
W78-12686

ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS -- VOLUME III, EFFECTS ON LIVING RESOURCES AND HABITATS,
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-12697

MONTANA'S YELLOWSTONE RIVER: WHO GETS THE WATER,
For primary bibliographic entry see Field 6E.
W78-12699

OIL AND GAS AND SULPHUR OPERATIONS IN THE OUTER CONTINENTAL SHELF.
Geological Survey, Washington, DC.
Federal Register, Vol. 43, No. 19, p 3880-87, January 27, 1978.

Descriptors: *Geological surveys, *Continental shelf, *Exploration, *Regulation, Mineral industry, Oil, Sulphur, Leases, State governments, Local governments, Environmental effects, Geologic investigations.

These regulations revise and define existing procedures for the submission by oil and gas lessees on the Outer Continental Shelf of plans for exploration and development activities on the shelf. The regulations also expand the information which states affected by development of the shelf will receive, and provide commenting procedures for affected states and local governments. Procedures for determining whether or not an Environmental Impact Statement will be required for exploration and development/production plans are outlined. The basic requirement that no exploration activities may commence until such activities have been

approved has been amended to allow preliminary activities to begin prior to submission and approval of a plan. Preliminary activities include limited surveys in order that lessees be able to gather sufficient information to prepare an initial exploration plan. The regulations define the procedure for determining the need for an environmental impact statement so that it complies with the National Environmental Policy Act. Requirements for environmental impact statements and the environmental reports that go to affected states are set forth. A discussion of major comments received after initial publication of the proposed regulations is also included. (Quarles-Florida)
W78-12701

DESCRIPTION OF THE ECOREGIONS OF THE UNITED STATES.
Forest Service (USDA), Ogden, UT.
May 1978. 77 p, 1 map. Compiled by Robert G. Bailey.

Descriptors: *Ecosystems, Environment, *United States, Regional analysis, *Regions(US), Climates, Vegetation, Soils, Wildlife, *Ecoregions(US), Geomorphology, *Land classification, Polar domain(US provinces), Humid temperature domain(US provinces), Dry domain(US provinces), Humid tropical domain(US provinces).

This manual is a companion publication to a map titled 'Ecoregions of the United States', published in 1976, which shows an initial attempt to systematically divide the country into ecosystem regions. This map, along with a brief narrative that described the approach and development of the system, is now being used in making assessments required by the 1980 Resources Planning Act and in the Roadless Area Review and Evaluation (RARE II) program. The supporting descriptions of the areas shown on the map are published here. They make the meaning of the map clearer and further explain the principles of the classification system. The objective has been to provide a broad synthesis of current knowledge about the ecosystem geography of the country that may be a useful reference for persons who desire an overview on a comparable basis. This publication gives, for each province, a brief description of the dominant physical and biological characteristics, under five headings: land-surface form, climate, vegetation, soils, and fauna. The descriptions are based on information compiled from many sources. Land-surface form is described using the terminology and classification of E.H. Hammond (1964). Climate descriptions are based largely on Koppen's classification (1931). Soil information is given by naming the principal soil orders of the Soil Taxonomy (Soil Survey Staff 1975). The approximate area of each province and section, and the proportinate extent of each in the United States are listed in an appendix.
W78-12749

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, VOLUME 1: SUMMARY REPORT.
For primary bibliographic entry see Field 6B.
W78-12760

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, TEXAS. VOL. 5, APP. VIII: MINERAL RESOURCES AND MINERAL INDUSTRY: APP. IX: ARCHEOLOGICAL, HISTORICAL AND NATURAL RESOURCES: APP. X: HYDROELECTRIC POWER.
For primary bibliographic entry see Field 6B.
W78-12764

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA AND TEXAS, APP. XI: WATER SUPPLY & WATER QUALITY CONTROL: APP. XII: OUTDOOR RECREATION: APP. XIII: FISH & WILDLIFE.
For primary bibliographic entry see Field 6B.
W78-12765

BIG BLACK RIVER, MS: COMPREHENSIVE BASIN STUDY: VOL. IV, AN. C--RECREATION ASPECTS: AN. D--FISH & WILDLIFE RESOURCES: AN. E--MUNICIPAL & INDUSTRIAL WATER SUPPLY & WATER QUALITY CONTROL: AN. F--GEOLOGY & WATER RESOURCES: AN. G--ARCHEOLOGICAL, HISTORIC, & NATURAL RESOURCES.
For primary bibliographic entry see Field 6B.
W78-12771

THE EFFECT OF PRUDHOE BAY CRUDE OIL ON A TIDAL-FLAT ECOSYSTEM IN PORT VALDEX, ALASKA,
Alaska Univ., College Station.
For primary bibliographic entry see Field 5C.
W78-12803

ENVIRONMENTAL ASSESSMENT OF THE BUCCANEER OIL AND GAS FIELD OFF GALVESTON, TEXAS: AN OVERVIEW,
For primary bibliographic entry see Field 5C.
W78-12807

ASSESSMENT OF ENVIRONMENTAL IMPACT OF OFFSHORE PRODUCTION IN THE BUCCANEER OIL FIELD: SEDIMENTOLOGIC AND GEOCHEMICAL RESULTS,
Rice Univ., Houston, TX.
For primary bibliographic entry see Field 5C.
W78-12808

OCEAN MINING AND PROTECTION OF THE MARINE ENVIRONMENT IN THE RED SEA,
For primary bibliographic entry see Field 5G.
W78-12809

ENVIRONMENTAL HAZARDS ON THE ATLANTIC OUTER CONTINENTAL SHELF OF THE UNITED STATES,
D. W. Folger, B. Butman, and H. J. Knebel.
In: Proceedings Tenth Annual Offshore Technology Conference, held in Houston, TX, May 8-11, Vol. 4, p 2293-2306, 1978. 13 fig, 2 tab, 25 ref. OTC No. 3313.

Descriptors: *Hazards, *Water pollution effects, *Resources development, *Sediments, Environmental effects, Oil spills, *Outer Continental Shelf, *Geologic hazards, U.S. East Coast, Petroleum resources.

Environmental studies have been carried out within the Georges Bank area off the New England States and the Baltimore Canyon Trough area off the Middle Atlantic States. These baseline studies have concentrated mainly on the identification and assessment of natural geologic hazards that might cause or distribute oil spills during exploration, development, and production operations. Major hazards on Georges Bank are associated with the high-speed currents driven by tides, storms, and waves; the mobility of the abundant surficial coarse detritus of glacial origin in response to the vigorous hydrologic regime; the highly variable texture of the substrate that may be unstable in response to loading; and the clockwise movement of water around the bank, which might entrain pollutants for a long time. However, none of the hydrologic or geologic hazards thus far observed in the two areas preclude exploration or development. Further basic and regional research should be pursued to ascertain the causes and mechanisms of sediment instability. (Sinha-OEIS)
W78-12810

A NOTE ON THE USE OF PROPERTY VALUES IN ESTIMATING MARGINAL WILLINGNESS TO PAY FOR ENVIRONMENTAL QUALITY,
Handelshogskolan i Stockholm (Sweden).
For primary bibliographic entry see Field 5G.
W78-12879

DESERTIFICATION PROCESSES AND THE SEARCH FOR SOLUTIONS,
Ben Gurion Univ. of the Negev, Beersheba (Israel). Research and Development Authority.
For primary bibliographic entry see Field 4C.
W78-12921

CAN DESERTIZATION BE STOPPED. SUMMARY AND RECOMMENDATIONS,
United Nations, New York. Environment Programme; andSecretariat for International Ecology (Sweden).
For primary bibliographic entry see Field 6E.
W78-12937

7. RESOURCES DATA

7A. Network Design

DESIGN CONSIDERATIONS FOR AMBIENT STREAM QUALITY MONITORING,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-12154

PHYTOPLANKTON SAMPLING IN QUANTITATIVE BASELINE AND MONITORING PROGRAMS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5A.
W78-12247

GUIDELINES FOR ZOOPLANKTON SAMPLING IN QUANTITATIVE BASELINE AND MONITORING PROGRAMS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5A.
W78-12249

HYDAC-100 - AN AUTOMATED SYSTEM FOR HYDROGRAPHIC DATA ACQUISITION AND ANALYSIS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W78-12253

7B. Data Acquisition

LOCATING DRAINAGE SYSTEMS BY MAGNETOMETER SURVEYS,
Toledo Univ., OH. Dept. of Geology.
For primary bibliographic entry see Field 8G.
W78-12142

PHYSICAL MEASUREMENTS OF RIVER ICE JAMS,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-12148

AN AIRLIFT SAMPLING DEVICE FOR IN SITU COLLECTING OF BIOTA FROM ROCKY SUBSTRATA,
National Marine Fisheries Service, Tiburon, CA. Southwest Fisheries Center.
J. R. Chess.

Marine Technology Society Journal, Vol. 12, No. 3, p 20-23, 1978. 2 fig, 4 ref.

Descriptors: *Sampling, *Biological communities, *Bottom sampling, On-site data collections, Benthis fauna, Benthic flora, Equipment, Aquatic populations, Research equipment, Coasts, Methodology, *Airlift sampling.

Problems inherent in collecting organisms from the rocky sublittoral zone have undoubtedly limited study of this habitat. Most investigation of benthic biology have dealt with assemblages of organisms on soft or unconsolidated substrata. This report describes a driver-operated airlift sampling device designed to collect organisms on rocky substrata. It is inexpensive but durable, made of readily available materials, and requires neither special talents nor tools for construction or operation. Most important, with it quantitative samples can be taken. (EIS-Deal)
W78-12242

A GUIDE TO GAUGING STATION INSPECTION,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
R. A. Terzi.
1972. 21 p, 16 fig, 9 ref.

Descriptors: *Gaging stations, *Equipment, *Inspection, *Installation, Water levels, Water level recorders, Crest stage gages, Water level fluctuations, Water measurement, Methodology, Telemetry, Sediments, Sampling, On-site tests, *Hydrometric data, Staff gages, Slope gages, Wire weight gages, Recording gages, Manual gages, Water level data, Servicing, Sensing.

The primary purpose of a gauging station is to provide a means by which hydrometric data may be systematically gathered. Stage (water level) information together with discharge records are derived. Some of the stage data are collected mechanically and automatically by way of strip-chart recorders which produce accurate permanent records. Others are obtained manually through the use of trained observers who, by means of gauges or measuring devices, observe and record water levels at prescribed intervals, generally twice daily. At present, the Water Survey of Canada operates approximately 2400 gauging stations across Canada. The construction and maintenance of gauging stations is the responsibility of the District in which the station is located. These offices must be informed of necessary repairs and maintenance or of acts of vandalism at gauging stations. Any conditions which might lead to missing record must be corrected as quickly as possible. (WATDOC)
W78-12260

THE ESTIMATION OF SAMPLE SIZE REQUIRED IN CHEMICAL LIMNOLOGY AND AUTECOLOGY OF SHELLED INVERTEBRATES,
Canada Centre for Inland Waters, Burlington (Ontario).
L. D. Delorme, and A. H. El-Shaarawi.
Scientific Series No. 85, 1978, 4 p, 1 fig, 4 ref, 3 tab.

Descriptors: *Estimating, *Sampling, Size, *Limnology, *Water chemistry, *Invertebrates, *Shellfish, Parametric hydrology, Ponds, Lakes, Canada, *Autecology, *Lake Kipabiskaw, *Saskatchewan.

Calculation of sample size is based on the central limit theorem for a normal distribution with mean zero, variance unity and the tail value equal to ALPHA. The confidence coefficient is 1 to 2 ALPHA. In the field of chemical limnology and autecology of shelled invertebrates, most chemical parameters must be transformed to obtain a normal distribution. The exception is pH, which is already transformed. Some parameters, such as carbonate and carbon dioxide, have an exponential distribution because of the carbonate-bicarbonate fence at pH 8.3. The sample size is a function of the parameter measured, primarily variance, mean and range. (WATDOC)
W78-12262

AERIAL SURVEILLANCE TO MONITOR WATER QUALITY IN CATFISH PONDS,
Mississippi State Univ., Mississippi State. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 5A.
W78-12526

REMOTE SENSING TO IDENTIFY, ASSESS, AND PREDICT ECOLOGICAL IMPACT ON LAKE CHAMPLAIN WETLANDS,
State Univ. of New York Coll. at Plattsburgh.
For primary bibliographic entry see Field 6G.
W78-12601

STUDIES OF TRACE METALS IN THE WATERS AND SEDIMENTS OF BADFISH CREEK AND LAKE WINGRA, NEAR MADISON, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-12603

PREDICTION OF ASSIMILATION CAPACITY IN SMALL RECEIVING STREAMS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-12604

TRANSITION ZONES OF FORESTED INLAND WETLANDS IN NORTHEASTERN CONNECTICUT,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6G.
W78-12609

THE WORLD REMOTE SENSING BIBLIOGRAPHIC INDEX,
Tensor Industries, Inc., Falls Church, VA.
P. F. Krumpe.
December 1976. 628 p.

Descriptors: *Remote sensing, *Bibliographies, *Indexing, *United States, Publications, Geographical regions, Agriculture, Natural resources, Resources, Foreign countries, Education, Environment, Agricultural resources, World index.

This volume is a geographic index bibliography of over 4,000 references on remote sensing of natural and agricultural resources throughout the world. Citations from 1970 to August 1976 are arranged within 14 major disciplines among more than 150 geographic areas, states, and countries. This extensive compilation originates from more than 850 foreign and domestic sources among 6 major publishing categories. Instructions for procuring desired publications or reports were included, in addition to guidelines for efficient utilization of the document. This book was designed as an integrated reference guide for use in remote sensing and environmental education, training, applications research, analysis, and technology transfer. (Froehlich-ISWS)
W78-12618

A MULTILEVEL DEVICE FOR GROUNDWATER SAMPLING AND PIEZOMETRIC MONITORING,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
J. F. Pickens, J. A. Cherry, G. E. Grisak, W. F. Merritt, and B. A. Risto.
Ground Water, Vol 16, No 5, p 322-327, September-October 1978. 5 fig, 1 tab, 7 ref.

Descriptors: *Sampling, *Groundwater, *Instrumentation, *Potentiometric level, Piezometers, Water levels, Water levels, Aquifers, Wells, Landfills, Leachate, Screens, *Pollutant identification, PVC pipe.

A simple, inexpensive device for sample collection and for monitoring of groundwater potential at many levels from a single borehole installation was developed. The device consists of a bundle of polypropylene tubes contained inside a polyvinyl chloride (PVC) pipe that is installed in the aquifer. Each tube protrudes through the wall of the pipe at a different elevation where it serves as a point water sampler and piezometer. The tip of each tube is encased in fine-meshed stainless-steel screening. The device is best suited for use in cohesionless deposits and where the piezometric levels are close enough to ground surface to enable samples to be obtained by suction methods. It can be installed conveniently using a hollow-stem auger, driven casing, or wash-boring methods. The usefulness of this multilevel sampling device has been demonstrated in detailed monitoring of a leachate plume from a sanitary landfill. (Visocky-ISWS)
W78-12636

A FIELD-MEASURING INSTRUMENT OF SATURATED PERMEABILITY KF IN UNDISTURBED SOIL SAMPLES BY THE CORE-SAMPLER METHOD,
Geologisches Landesamt Nordheinestfalen, Krefeld (West Germany).
For primary bibliographic entry see Field 2G.
W78-12638

DIFFERENCES IN RADAR RETURN FROM ICE-COVERED NORTH SLOPE LAKES,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-12639

A CASE STUDY OF THE MEASUREMENT OF SNOWFALL BY RADAR: AN ASSESSMENT OF ACCURACY,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2C.
W78-12644

REMOTE SENSING FOR IDENTIFICATION AND CLASSIFICATION OF WETLAND VEGETATION,
Fisheries and Wildlife, Jamestown ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 2I.
W78-12689

VARIABILITY OF WETLAND REFLECTANCE AND ITS EFFECT ON AUTOMATIC CATEGORIZATION OF SATELLITE IMAGERY,
Delaware Univ., Newark. Center for Remote Sensing.
V. Klemas, and D. Bartlett.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-21505, Price codes: A02 in paper copy, A01 in microfiche. Goddard Space Flight Center, Greenbelt, Maryland. January 10, 1977. 1 p.

Descriptors: *Remote sensing, *Delaware, *Tidal marshes, Wetlands, Mapping, Marshes, Marsh plants, Tides, Shore-line cover, Spatial distribution, LANDSAT, Multispectral data.

A technique for automated analysis of satellite (LANDSAT) multispectral data based on in situ measurements of target reflectance was tested and applied in delineating cover types in Delaware's tidal wetlands. The technique evaluated in situ measurements of target radiance and an atmospheric correction procedure to derive reflectance signatures for land-cover categories. Significant correlations were found between single bond reflectances and tidal inundation and plant morphologic characteristics. (Steiner-Mass)
W78-12690

INSECTS AND WETLANDS,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. A. Witter, and S. Croson.
In: Freshwater Wetlands and Sewage Effluent Disposal: Proceedings of a National Symposium held at the University of Michigan, Ann Arbor, May 10-11, 1976, p 269-295, 1976. 2 tab, 33 ref.

Descriptors: *Insects, *Wetlands, *Trapping, *Indicators, *Census, Invertebrates, Marshes, Methodology, Sampling, *Michigan, Population, Estimating, *Houghton Lake(Mich).

Six relative methods (Malaise traps, pitfall traps, light traps, bait traps, sticky traps, sweeping) and three absolute methods (emergence traps, unit of soil, unit of vegetation) of estimating population numbers of wetland insects are discussed. Relative sampling methods are easier and less expensive to use in most situations. Insect indicator species may serve as indices of changes in specific parameters or they may indicate broader changes, such as changes in environmental quality or community structure. Criteria to consider when selecting indicator species are presented. During an exploratory study in Houghton Lake Marsh, Michigan, 82 and 45% of all insects collected in Malaise traps and light traps were Diptera, respectively. Fourteen orders and 168 families were present in the samples. (See also W78-12707) (Stihler-Mass)
W78-12719

MULTISPECTRAL REMOTE OBSERVATIONS OF HYDROLOGIC FEATURES ON THE NORTH SLOPE OF ALASKA,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 2C.
W78-12832

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1976.
Australian Water Resources Council, Canberra Dept. of National Resources.
For primary bibliographic entry see Field 2A.
W78-12833

FIELD CALIBRATION AND USE OF THE NEUTRON MOISTURE METER ON SOME NIGERIAN SOILS,
Ibadan Univ. (Nigeria). Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-12843

TURBULENT FREE CONVECTION IN FRESH AND SALT WATER: SOME CHARACTERISTICS REVEALED BY VISUALIZATION,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2L.
W78-12856

PROCEEDINGS OF THE 3RD AQUATIC TOXICITY WORKSHOP HELD IN HALIFAX, NOVA SCOTIA, NOVEMBER 2-3, 1976.
Environmental Protection Service, Halifax (Nova Scotia).
For primary bibliographic entry see Field 5A.
W78-12952

7C. Evaluation, Processing and Publication

GENERATING STREAMFLOW SEQUENCES WITH TREND AND CYCLICAL MOVEMENTS,
Florida Univ., Belle Glade. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W78-12157

ESTABLISHING BASELINE DATA FOR MANAGEMENT OF HALIFAX, N.S., LAKE WATERSHEDS,
Nova Scotia Technical Coll., Halifax. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-12159

COMPREHENSIVE ANALYSIS OF WATER-TABLE AQUIFER TEST DATA,
Upper Mississippi River Basin Commission, Twin Cities, MN. Minnesota.
For primary bibliographic entry see Field 4B.
W78-12165

COMPUTER-AIDED ANALYSIS OF LANDSAT DATA FOR SURVEYING TEXAS COASTAL ZONE ENVIRONMENTS,
Purdue Univ., Lafayette, IN. Lab. for Applications of Remote Sensing.
S. J. Kristof, and R. A. Weismiller.
Available from the National Technical Information Service, Springfield, VA 22161 as E78-10018, Paper copy, A03 in paper copy, A01 in microfiche. Report No LARS Tech Rept 090677, to NASA/Johnson Space Center, September 1977. 32 p, 22 fig, 2 tab, 7 ref. NAS9-14016, NAS9-14970.

Descriptors: *Remote sensing, *Coasts, *Texas, *Baseline studies, Resources, Water resources, Environmental effects, Pollution, Geomorphology, Outer Continental Shelf, Coastal zone.

A study was conducted to determine the feasibility of using machine-aided processing of LANDSAT data to inventory environmental units within the Texas coastal zone. The analysis was conducted on Landsat data collected on November 27, 1972 and February 25, 1975 over the Matogorda Bay area of the Texas coastal estuarine system. The following terrestrial and aquatic environments were discriminated: alternating beach ridges, swales, sand dunes, beach berms, deflation surfaces, land-water interface, urban, spoil areas, fresh and salt water marshes, grass and woodland, recently burned or grazed areas, submerged vegetation and waterways. Visual observation of results obtained from both the November 1972 and February 1975 data indicate that no major differences existed in the land resource maps. The results did show that analysis of Landsat data with computer-aided techniques is a viable technique for surveying coastal features. (Sinha-OEIS)
W78-12178

CALIFORNIA COASTAL PROCESSES STUDY - LANDSAT II. FINAL REPORT: LANDSAT INVESTIGATION NO 22200,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5C.
W78-12179

COMPUTER ESTIMATES OF NATURAL RECHARGE THROUGH SOILS IN SOUTHERN ARIZONA, U.S.A.,
Geological Survey of Israel, Jerusalem; and Ben Gurion Univ. of the Negev, Beesheba (Israel). Inst. of Desert Research.
For primary bibliographic entry see Field 2F.
W78-12232

HYDAC-100 - AN AUTOMATED SYSTEM FOR HYDROGRAPHIC DATA ACQUISITION AND ANALYSIS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
J. Y. Durette, and P. Zrymiak.
Technical Bulletin No. 105, 1978, 43 p, 20 fig, 9 ref, 4 tab.

Descriptors: *Automation, *Hydrograph analysis, *Data processing, *Data collections, Editing, Systems analysis, Computers, Computer programs, Hydrologic data, Geomorphology, Analysis, Surveys, Methodology, Application methods, Information retrieval, Future planning(Projected), Volumetric analysis, Canada, Water analysis, *HYDAC-100, Positioning sub-system, Depth sounding sub-system, Data accumulation subsystem, Data processing sub-system, Power supply.

In recent years there has been an increasing demand for more complete and accurate information on hydrological and geomorphological processes in Canadian waters. Obtaining this type of information requires collection of massive amounts of data, rapid editing of all data and careful analysis of the results. To cope with these demands, the Sediment Survey Section of the Applied Hydrology Division has developed an automated high-speed data collection and processing system (HYDAC-100) and a computerized data reduction and analysis system (HYDRA). This paper provides information on the development and description of the HYDAC-100 system, a description of the survey to which the HYDAC system may be applied, the typical HYDAC-100 survey procedure, the development and description of the HYDRA system and an outline of possible future developments. (WATDOC)
W78-12253

COMPUTER PROGRAM FOR CALCULATING ATMOSPHERIC PLANETARY WAVES,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
S. Fogarasi, and M. Strome.
1978, 8 p, 3 fig, 8 ref, 2 tab, 6 append.

Descriptors: *Computer programs, *Analytical techniques, *Atmospheric pressure, *Atmospheric physics, Monthly, Height, Climatology, Winds, Wind pressure, Weather, Polar coordinates, Cartesian coordinates, Polar stereographic plots, Cartesian plots, *Planetary waves, Calculations, Fortran IV, Conrad and Pollak's technique, 700-MB pressure surace, Plotting.

A harmonic analysis technique is translated into Fortran IV computer language. The generalized program is especially suitable for analyzing upper level pressure charts along one or several latitude circles. Analysis of the 1976 monthly mean heights of the 700-mb surface is demonstrated, and the calculated harmonic waves are plotted in both polar and Cartesian coordinates. This technique could be applied to studies on climatic variation. Derivation of hemisphere waves is explained; selected examples are shown and interpreted. (WATDOC)
W78-12254

WATER QUALITY DATA, MANITOBA, 1961-1976.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5A.
W78-12255

IFYGL TEMPERATURE TRANSECTS, LAKE ONTARIO, 1972,
Canada Centre for Inland Waters, Burlington (Ontario); and Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W78-12256

A GUIDE TO GAUGING STATION INSPECTION,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7B.
W78-12260

LABS11 - A LABORATORY DATA MANAGEMENT SYSTEMS.
Department of the Environment, Moncton (New Brunswick). Water Quality Branch.
1978, 45 p, 10 fig, 4 tab, append.

Descriptors: *Laboratory equipment, *Laboratory tests, *Computer models, *Computer programs, *Sampling, Analysis, Analytical techniques, Data collections, Data processing, Data storage and retrieval, *LABS11 Data Management System, *Laboratory instruments.

LABS11 is a data management system designed for an operational laboratory which handles between 2000 and 3000 samples per year. The system was developed and implemented on a PDP-11/10 mini-computer. A modular design was used to minimize the memory requirements of each step in the overall system. The system is interactive allowing up to five simultaneous users. Five principal programs exist to initialize samples received onto the samples-in-progress files, produce worksheets for different sections of the laboratory, enter analytical values, validate analytical results and transfer the completed samples to a permanent file. The system has resulted in time saving in the logging, filing and validating of analytical results and has improved the integrity of data being supplied to all users. (WATDOC)
W78-12261

EXTENSION OF THE HISARS SYSTEM,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
E. H. Wiser.
Paper presented at ASAE Winter Meeting, Palmer House Hotel, Chicago, Ill., 12/13-16, 1977. 11 p, 4 fig, 9 ref. OWRT A-999-NC(52), 14-34-0001-8035.

Descriptors: *Computer programs, *Data storage and retrieval, *Climatic data, Storage, Streamflow, Rainfall, Temperature, *Hydrologic data, *Data collections, *HISARS.

Modellers have often been faced with a substantial part of their time being consumed by assembling data, storing it in a computer-accessible form and retrieving it as required. Faced with these problems, a computer system for storage, retrieval, and processing of hydrologic, climatological, and related data has been developed at North Carolina State University. The system is known as HISARS (Hydrologic Information Storage and Retrieval System). System characteristics and capabilities include: storage of daily streamflow records, daily rainfall records, daily temperature records, hydrographic records of streamflow and rainfall, hourly rainfall records, daily evaporation and wind movement records, daily snowfall and snow depth records, daily event ('days with') records, annual flood peak records, dam characteristics, environmenta resources, and water temperature records (evaporation pans). Extension of the Hydrologic Information Storage and Retrieval System (HISARS) are reviewed. Included are data and program extensions, as well as linkage to external programs. Possible future extensions are also considered. (Kiger-NC State)
W78-12276

'BASELINE MONITORING STUDIES, MISSISSIPPI, ALABAMA, FLORIDA, OUTER CONTINENTAL SHELF, 1975-1976' VOLUME III, RESULTS,
State Univ. System of Florida Inst. of Oceanography, St. Petersburg.
J. E. Alexander, T. T. White, K. E. Turgeon, and A. W. Blizzard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 803, Price codes: A21 in paper copy, A01 in microfiche. Report BLM-ST-78-32, June 1977, 482 p. MAFLA, yr. 2 (1975-76), No. 08550-CT5-30.

Descriptors: Marine biology, Chemical oceanography, Primary productivity, Hydrology, Systematics, *Monitoring, *Baseline studies, Miss-Ala-Fla area, *Outer Continental Shelf, Hydrocarbons, Trace elements, Benthos, Histopathology, Hurricane, Florida Middle Ground, Macroinfauna, Macroepifauna, Offshore oil production, Suspended particulate matter, Microbial biomass, Relative abundance, Species, Diversity.

Benchmark studies on the Eastern Gulf of Mexico Outer Continental Shelf were conducted seasonally to establish baseline information prior to extensive oil and gas development activity. No crude oil-like hydrocarbons were found in sediments, benthic organisms, zooplankton, suspended particulates nor dissolved phases on the Florida shelf. Moreover the abundance and diversity of organisms suggested that these organisms are living in an essentially pristine and natural ecological states, and show no evidence of stress owing to influx of pollutants. Some evidence of hydrocarbon anomalies were found in samples from the Mississippi-Alabama self probably due to drainage from the Mississippi River. A study of tissue pathology revealed only parasites in otherwise normal benthic organisms. Major features affecting the study area were the Mississippi River, the Loop Current and hurricane Eloise. Trace metal (Cd, Cr, Cu, Fe, Ni, Pb and V) concentrations in Eastern Gulf samples were at levels expected for nonpolluted areas. (BLM)
W78-12328

ANALYTICAL FRAMEWORK FOR THE DESIGN OF DATA COLLECTION SYSTEMS THAT ARE RESPONSIVE TO THE NEEDS OF PLANNING AND MANAGEMENT OF WATER RESOURCES AND RELATED LAND SYSTEMS,
Case Western Reserve Univ., Cleveland, OH. Systems Engineering Div.
For primary bibliographic entry see Field 6A.
W78-12388

MATHEMATICAL MODELS FOR SIMULATING MONTHLY WATER LEVELS AND SALINITIES IN SHALLOW LAKES,
University of the Witwatersrand, Johannesburg (South Africa).
For primary bibliographic entry see Field 2L.
W78-12411

SYSTEMS ENGINEERING IN WATER RESOURCES DEVELOPMENT,
Technion - Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 6A.
W78-12420

WATER RESOURCES MANAGEMENT USING INTEGER PROGRAMMING MODELS,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W78-12540

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME I: SUBSYSTEM DESCRIPTION DEFINITION OF SYSTEM REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-12548

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME II: EXHIBITS, DEFINITION OF SYSTEMS REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-12549

MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. VOLUME III: DATA ELEMENT DICTIONARY DEFINITION OF SYSTEM REQUIREMENTS.
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G.
W78-12550

OUTER CONTINENTAL SHELF OIL AND GAS INFORMATION PROGRAM.
Geological Survey, Washington, DC.
Federal Register, Vol. 43, No. 19. p 3887-90, January 27, 1978.

Descriptors: *Continental shelf, *Exploration, *Geological surveys, *Oil industry, Oil, Regulation, State governments, Local governments, Industries, Data, Coasts.

These regulations are intended to supplement the procedures contained in Parts 250 and 251 of this Chapter for the submission of oil and gas data and information resulting exploration, development, and production operations on the Outer Continental Shelf to the Director of the United States Geological Survey. This section also establishes procedures for the Director to make certain information available to the governors of affected states and, upon request, to interested local governments, in accordance with the provisions of the federal Freedom of Information Act. Any person engaging in the exploration for, or development and production of, oil and gas on the Outer Continental Shelf is required to make all obtained data from such activities available for inspection by the Oil and Gas Supervisor of the United States Geological Survey. The Director, will then make this information available to affected states and interested local governments by way of a summary report. This summary report shall include: (1) estimates of oil and gas reserves and estimated rates of production; (2) approximations of magnitude and timing of development; (3) methods of transportation to be used; and (4) location of facilities. (Quarles-Florida)
W78-12555

THE WORLD REMOTE SENSING BIBLIOGRAPHIC INDEX,
Tensor Industries, Inc., Falls Church, VA.
For primary bibliographic entry see Field 7B.
W78-12618

STORAGE-GAGE PRECIPITATION DATA FOR WESTERN UNITED STATES 1974-1975. VOLUME 20.
National Climatic Center, Asheville, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 424, Price codes: A03 in paper copy, A01 in microfiche. NOAA-76122002, 1976. 37 p.

Descriptors: *Weather data, *United States, *Precipitation(Atmospheric), *Arizona, *California, *Colorado, *Idaho, *Montana, *Nevada, *New Mexico, *Oregon, *Utah, *Washington, *Southwest U.S., *Rocky Mountain region, *Data collections, Maps, Stations, Measurement, Weather, Climatic data, Meteorological data, Regional analysis, *Western United States, Storage gage precipitation.

This storage-gage precipitation data report for the Western United States included data for the period 1974-1975. It contained data on precipitation measurements, station changes, a station index for

each state, and maps identifying the location of data collection sites in the states. (Froehlich-ISWS)
W78-12623

OPTIMIZATION OF LAKE HYDROGRAPHIC SURVEYS,
National Swedish Environment Protection Board, Uppsala (Sweden). Limnological Survey.
L. Hakanson.
Water Resources Research, Vol. 14, No. 4, p 545-560, August 1978. 20 fig, 8 tab, 9 ref.

Descriptors: *Lakes, *Surveys, *Bathymetry, *Mapping, Hydrography, Lake morphology, Optimization, Theoretical analysis, Analytical techniques, Equations, Mathematical models, Limnology, Empirical equations, Hypsographic curves.

Bathymetric maps are the source of most morphometric data used in limnological, hydrological, and sedimentological contexts. The reliability of the morphometric data will depend on the accuracy of the bathymetric map, which in turn will depend on the intensity of the hydrographic survey. The aim of this work was to analyze thoroughly the relationship between intensity of survey, aim of survey, and yield of survey and to deduce a formula which may be used to express these concepts quantitatively so that hydrographic surveys can be executed in an optimal manner. An empirical formula which may be utilized to estimate the length of contour lines of a given bathymetric map from the hypsographic curve also introduced. (Sims-ISWS)
W78-12624

FLOOD PLAIN INFORMATION: CORRALITOS CREEK, SANTA CRUZ COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 4A.
W78-12650

FLOOD PLAIN INFORMATION: LEVISA FORK AND TRIBUTARIES, BUCHANAN COUNTY, VIRGINIA, GRUNDY TO OAKWOOD.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-12651

UNSTEADY SOLUTE-TRANSPORT SIMULATION IN STREAMFLOW USING A FINITE-DIFFERENCE MODEL,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-12726

GROUND-WATER RESOURCES OF ADAMS AND BOWMAN COUNTIES, NORTH DAKOTA,
Geological Survey, Bismark, ND. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-12727

DROUGHT IN CALIFORNIA--WATER-RESOURCES DATA FOR 1977,
Geological Survey, Menlo Park, CA. Water Resources Div.
L. N. Jorgensen, and V. F. Pearce.
Open-file report 78-613, August 1978. 117 p, 2 fig.

Descriptors: *California, *Droughts, *Streamflow, *Low flow, *Water quality, Water shortage, Tidal effects, Estuaries, Saline water intrusion, Sediment discharge, Backwater, Water table, Groundwater, Water levels, Water wells, Hydrologic budget.

The 2-year dry period 1976-77 was the most severe drought in northern California's history, and the quantity and quality of all water-supply sources in the State were affected. This report contains special water-resources data collected by the Geological Survey during 1977. These data include: streamflow at 11 selected stations, comparing the 1977 mean monthly and yearly flow to the period-of-record medians; base-flow measurements at 189 selected sites; water quality at 131 selected sites; ground-water levels in wells and river stages along a 158-mile reach of the Sacramento River; and, finally, graphs showing the effect of tidal action on suspended-sediment concentration at the stream-gaging station on the Sacramento River at Sacramento. (Woodard-USGS)
W78-12730

PROGRESS REPORT ON BLACK MESA PROGRAM--1977.
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-12740

THE HYDROLOGY OF LAKE ROUSSEAU, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
E. R. German.
Water-Resources Investigations 77-126 (open-file map), 1978. 1 sheet, 13 fig, 1 tab, 10 ref.

Descriptors: *Lakes, *Impounded waters, *Hydrology, *Water quality, *Lake morphology, Inflow, Streamflow, Groundwater, Water levels, Discharge(Water), Chemical analysis, Water temperature, Maps, Hydrographs, *Florida, *Lake Rousseau(Fla), Inglis area(Fla), *Lake hydrology.

Lake Rousseau, about 4 miles southwest of Inglis, Florida, was formed in 1909 by impoundment of the Withlacooche River by Inglis Dam, west of Dunnellon, Florida. The lake was to have been part of the Cross-Florida Barge Canal; a lock and channel associated with the presently inactive project were completed in 1969. Lake Rousseau is about 11 miles long, covers about 4,000 acres, and contains about 34,000 acre-feet of water at the normal pool elevation of 27.5 feet above mean sea level. Inflow to the lake is relatively constant and responds slowly to rainfall. The estimated 100-year peak inflow, 10,400 cubic feet per second, is only 19 percent higher than the 100-year high monthly inflow. Water in Lake Rousseau is a calcium-bicarbonate type and is hard. Mean total phosphorus and organic nitrogen concentrations are considerably lower in Lake Rousseau than in north-central Florida lakes which have been considered to be eutrophic by other investigators, however, the lake supports of prolific aquatic plant community. Dissolved-oxygen concentrations near the water surface are occasionally less than 3 mg/liter. (Woodard-USGS)
W78-12741

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1977--VOLUME 1. ATLANTIC SLOPE BASINS, HUDSON RIVER TO CAPE MAY.
Geological Survey, Trenton, NJ. Water Resources Div.
Water-Data Report NJ-77-1, June 1978. 491 p, 17 fig, 4 tab, 30 ref.

Descriptors: *New Jersey, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Atlantic Slope basins, *Hudson River to Cape May.

Water resources data for the 1977 water year for New Jersey consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This volume of the report, Atlantic Slope basins and Hudson River to Cape May, contains discharge records for 66 gaging stations; tide summaries for 7 stations; stage and contents for 15 lakes and reservoirs; water quality for 37 gaging stations, 159 partial-record flow stations, 1 reservoir, and 147 wells; and water levels for 11 observation wells. Also included are 50 crest-stage partial-record stations and 45 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by U.S. Geological Survey and cooperating State and Federal agencies in New Jersey. (Woodard-USGS)
W78-12742

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1977--VOLUME 2. DELAWARE RIVER BASIN AND TRIBUTARIES TO DELAWARE BAY.
Geological Survey, Trenton, NJ. Water Resources Div.
Water-Data Report NJ-77-2, June 1978. 325 p, 16 fig, 4 tab, 30 ref.

Descriptors: *New Jersey, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for New Jersey consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This volume of the report, Delaware River basin and tributaries to Delaware Bay, contains discharge records for 26 gaging stations; tide summaries for 5 stations; stage and contents for 16 lakes and reservoirs; water quality for 17 gaging stations, 94 partial-record flow stations, and 57 wells; and water levels for 3 observation wells. Also includes are 27 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by th U.S. Geological Survey and cooperating State and Federal agencies in New Jersey. (Woodard-USGS)
W78-12743

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1977.
Geological Survey, Richmond, VA. Water Resources Div.
Water-Data Report VA-77-1, June 1978. 391 p, 4 fig.

Descriptors: *Virginia, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Virginia consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells and springs. This report contains discharge records for 198 gaging stations, stage only for 1 gaging station, stage and contents for 9 lakes and reservoirs, water quality for 32 gaging stations, and water levels for 49 observation wells. Also included are data for 95 crest-stage partial-record stations. Additional

water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Virginia. (Woodard-USGS)
W78-12744

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1977.
Geological Survey, Jackson, MS. Water Resources Div.
Water-Data Report MS-77-1, June 1978. 409 p, 5 fig.

Descriptors: *Mississippi, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Mississippi consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels of wells. This report contains discharge records for 85 gaging stations; stage records for 15 of these gaging stations; stage only for 3 gaging stations; contents for 4 lakes; water quality for 25 gaging stations, 2 partial-record stations, and 169 wells; and water levels for 186 observation wells. Also included are data for 138 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Mississippi. (Woodard-USGS)
W78-12745

URBAN STORM-WATER DATA MANAGEMENT SYSTEM, BROWARD COUNTY, FLORIDA,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Miami, FL. Water Resources Div.
L. D. Wilson, R. A. Miller, and W. H. Doyle, Jr.
In: Proceedings of the International Symposium on Urban Storm-Water Management, held at University of Kentucky, Lexington, July 24-27, 1978. 6 p, 6 fig, 1 tab, 6 ref.

Descriptors: *Urban runoff, *Storm water, *Model studies, *Computer models, *Urban hydrology, Water quality, Storm runoff, Analytical techniques, Hydrologic data, Input-output analysis, Statistical analysis, Computer programs, FORTRAN, *Florida.

A data management system was created for handling urban storm-water data collected in Broward and Dade Counties, Florida (one site in Dade County). The system, composed of about 20 Fortran programs, was developed to input data, output tables for publication, calculate discharge and constituent loads and interface to statistical and deterministic model application programs. Statistical interface programs retrieve data from the file and create user-specified parameters for use in SAS76, a comprehensive statistical analysis system (Barr and others, 1976). A deterministic model interface retrieves data for input into an urban storm-water model developed by Dawdy, Schaake, and Alley (1978). (Woodard-USGS)
W78-12747

QUALITY AND QUANTITY OF STORM-WATER RUNOFF FROM THREE LAND-USE AREAS, BROWARD COUNTY, FLORIDA,
Geological Survey, Miami, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-12748

DESCRIPTION OF THE ECOREGIONS OF THE UNITED STATES.
Forest Service (USDA), Ogden, UT.
For primary bibliographic entry see Field 6G.
W78-12749

SUMMARY OF METROMEX, VOLUME 2: CAUSES OF PRECIPITATION ANOMALIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-12830

ALTERNATIVE POLLUTION CONTROL STRATEGIES; EQUITY, EFFICIENCY AND INFORMATION REQUIREMENTS,
Tennessee Univ., Knoxville. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-12875

NORTH AMERICAN PROJECT--A STUDY OF U.S. WATER BODIES.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W78-12895

STATISTICAL MODELS AND METHODS FOR RIVERS IN THE SOUTHWEST,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2E.
W78-12925

8. ENGINEERING WORKS

8A. Structures

RHODESIA TODAY, 3 A REVIEW OF DAM CONSTRUCTION.
Civil Engineering Contractor (Johannesburg) Vol. 10, No. 7, p 34-42, 1976.

Descriptors: *Dam construction, Dam design, Rockfill dams, Spillways, *Rhodesia, Southern Africa, Darwendale dam, Mayfair dam.

Rhodesia's money squeeze has caused construction to be restricted to essentials only. This has meant a severe cut-back in dams with major water development projects deferred. The article looks at the situation and at dam construction underway. Special attention is given to the design features of Darwendale Dam which will provide Salisbury with water when Lake McIlwaine no longer fulfills its needs. (So Afr Water Info Ctr)
W78-12414

PORTABLE DAMS.
Municipal Engineer, Vol. 7, No. 2, p 59, 1976.

Descriptors: *Dams, *Portable equipment, Synthetic fabrics, Equipment description, New technique, Standing waters, *South Africa.

A short article describing a portable, self-anchoring dam system consisting of a steel framework covered with a tough membrane of flexible, tailored synthetic fibre, to hold back flowing water in rivers or static water in lakes or canals. Dams are placed at required distance apart and the water in between is pumped out, exposing a cleared section for the work in hand. (So Afr Water Info Ctr)
W78-12437

LAING DAM.
Municipal Engineer, Vol 7, No 4, p 23, 1976. 1 Illustr.

Descriptors: Flow regulation, Water supply, Design floods, Modifications, *South Africa, *Laing Dam.

In the 30 years that have elapsed since Laing Dam, near East London, was constructed, there have been marked changes in the accepted criteria on the basis of which dams are designed. Confirmation of the need to make provision for much larger floods than were originally expected came in April 1970 when flow over the spillway exceeded that for which the dam had been designed by 150 per cent. After extensive investigations it was decided to install vertical prestressed cables to hold the dam down against the pressure of the maximum probable flood. (So Afr Water Info Ctr)
W78-12442

A NEW GIANT ON THE ORANGE RIVER,
A. G. Davies.
Construction in Southern Africa, Johannesburg, Vol 22, No 7, p 22-25, 27, 31-33, 1977. 7 plans.

Descriptors: Dams, *Dam design, *Dam construction, Hydrology, Geology, Arch dams, Silt, Spillway gates, Dam foundations, Diversion structures, Concrete construction, Hydroelectric power, Design data, South Africa, P.K. Le Roux dam.

Discussion is presented of the design and construction of the project, highlighting the hydrological aspects of the construction, the geology of the dam sites, the design of the dam, giving details of the free overspill, silt outlet, gated spillway, radial joint grouting, cooling of the concrete during construction, foundation grouting and drainage and instrumentation placed in the arches to monitor changes. (So Afr Water Info Ctr)
W78-12485

BIG BLACK RIVER, MISSISSIPPI: COMPREHENSIVE BASIN STUDY. VOLUME III, ANNEX B: ENGINEERING STUDIES OF WATER DEVELOPMENT PROJECTS.
For primary bibliographic entry see Field 6B.
W78-12770

FUNDAMENTAL ARMOR MODULE IN BREAKWATER NET LINKED SYSTEM,
R. Pey.
U.S. Patent No. 4,083,190, 6 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 969, No 2, p 438, April 11, 1978.

Descriptors: *Patents, *Breakwaters, *Engineering structures, Coastal structures, Waves(Water), Ocean waves, Shore protection.

An improved breakwater network is composed of similarly sized members which may be prefabricated in concrete or other rigid material and transported to a job site to be interconnected with one another to form a breakwater network which is effective to resist wave action and relatively inexpensive in construction and to assemble. Each of the bodies includes a generally triangular configuration having equi-spaced legs extending from the vertexes to interlink in mating relation with corresponding bodies provided with similar legs, the legs being received in recesses provided in the bodies. (Sinha-OEIS)
W78-12796

8B. Hydraulics

KALMAN FILTER IN OPEN CHANNEL FLOW ESTIMATION,
Pittsburgh Univ., PA. Dept. of Civil Engineering.
C. L. Chiu, and E. O. Isu.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY8, Proceedings Paper 13946, p 1137-1152, August 1978. 9 fig, 19 ref.

Descriptors: *Open channels, *Model studies, *Open channel flow, Hydraulics, Mannings equation, Equations, Mathematical studies, Mathematical models, Estimating, *Kalman filter, Open channel hydraulics, Resistence coefficients, Manning formula.

In computing water surface profiles in open channels, uncertainties often arise in selection of resistance coefficients, such as Manning's n. In this paper the Kalman filtering approach was developed to deal with such uncertainties. This approach combined a mathematical system model and an observation model. The former consists of (1) stochastic nonlinear differential equation governing the steady one-dimensional open channel flow; and (2) one of three possible stochastic differential equations expressing Manning's n (constant, function of the location of channel cross section, or function of both the location and the water depth). The observation model simply shows the observed water depth as the sum of 'true water depth' and 'error'. The estimation technique was tested for its accuracy in generating estimates of water depth and Manning's n at several different schemes of sampling or measuring water depths. Results with Kalman filtering were compared with two parallel methods normally used today. (Lee-ISWS)
W78-12137

FLUID DYNAMIC LIFT ON A BED PARTICLE,
Canterbury Univ., Christchurch (New Zealand). Dept. of Agricultural Engineering.
T. R. H. Davies, and M. F. A. Samad.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY8, Proceedings Paper 13976, p 1171-1182, August 1978. 10 fig, 1 tab, 19 ref.

Descriptors: *Bed load, *Flow, *Erosion, Dunes, Rivers, Sedimentation, Sediment transport, Hydraulics, Reynolds number, Mathematical studies, *Bed forms, Bed movements, Bed ripples, Loose-boundary hydraulics, Hydrodynamic lift, Incipient motion.

Direct measurement of lift forces acting on an exposed sphere at the boundary of a fluid flow showed that the lift force may be negative (i.e., directed toward the boundary) if the grain-size Reynolds number R is less than about 5. The graphs presented strongly suggest that in a Newtonian fluid the dimensionless lift force is a function only of R, in which case the results obtained can be expected to apply to exposed grains at the bed of a loose boundary flow if similarity of R obtains. The onset of negative lift in such a situation as R decreases through about 5 coincides with well-documented changes in bedform (from dunes to ripples) and in incipient motion conditions. It was suggested that the change of sign of lift force is a significant factor in these behavioral characteristics; physical mechanisms capable of effecting the observed changes were considered in qualitative terms. (Lee-ISWS)
W78-12138

EFFECT OF STORMWATER ON STREAM DISSOLVED OXYGEN,
Municipal Environmental Research Lab., OH.
For primary bibliographic entry see Field 5B.
W78-12139

HORIZONTAL BUOYANT JETS IN QUIESCENT SHALLOW WATER,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
V. Balasubramanian, and S. C. Jain.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE4, Proceedings Paper 13943, p 717-730, August 1978. 12 fig, 1 tab, 14 ref, 2 append.

Descriptors: *Heated water, *Jets, *Laboratory tests, *Model studies, Hydraulic models, Temperature, Water temperature, Thermal pollution, Flow, Mixing, Dispersion, Thermal water, Spatial distribution, Shallow water, Hydraulics, Submerged flow, Buoyant jets.

The flow behavior of a single round buoyant jet discharging into a shallow quiescent body of water was investigated experimentally. The temperature distributions were measured in a large test basin for jet densimetric Froude numbers ranging from 5 - 20 and submergence ratios ranging from 2.5 - 7. Empirical relations for the flow-field stability of the near field, the temperature rise in the zone of surface impingement and the water surface area covered by the temperature rise isotherms were proposed. (Sims-ISWS)
W78-12141

MAXIMUM NONEROSIVE FURROW IRRIGATION STREAM SIZE,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 4D.
W78-12143

SIMILARITY OF FREE-VORTEX AT HORIZONTAL INTAKE,
Hydraulics Research Station, Wallingford (England).
H. O. Anwar, J. A. Weller, and M. B. Amphlett.
Journal of Hydraulic Research, Vol. 16, No. 2, p 96-105, 1978. 8 fig, 14 ref.

Descriptors: *Vortices, *Flumes, *Intakes, Reynolds number, Hydraulics, Equations, Mathematical studies, Pipes, Flow, Analysis, Entrainment, *Free-vortex, Horizontal intake, Air-entraining vortices, Weber number.

An investigation was conducted to study the onset of air-entraining vortices at a horizontal intake, with and without a bellmouthed entry, when the intake was projected into the experimental flume or mounted flush with the side wall. The basic nondimensional parameters that govern the onset of vortices at a horizontal intake in model and prototype were derived and determined experimentally. The results of measurements were given as a set of curves, which can be used for the design of a vortex-free intake and also for the selection of appropriate model scales. The results of the measurement showed that flow conditions in an air-entraining vortex are not affected by surface tension, and the viscosity of the test fluid when the radial Reynolds number and the Weber number are larger than 30,000 and 10,000 respectively. In this case, the formation of vortices depends largely on circulation, submergence head, and discharge into the intake. It was found that the bellmouth did not improve the performance of the intake, but its performance was improved considerably when the intake with or without bellmouthed entry was flush with the boundary wall. (Lee-ISWS)
W78-12160

EFFICIENT PRESSURE SOLUTION FOR CIRCULATION PREDICTION,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
K. W. Bedford, and I. S. Rai.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY6, Proceedings Paper 13833, p 899-915, June 1978. 3 fig, 1 tab, 30 ref. OWRT B-036-OHIO(1).

Descriptors: *Forecasting, *Pressure, *Circulation, Fluid mechanics, Lakes, Hydrodynamics, Numerical analysis, Oceanography, Water resources, Equations, Mathematical studies, Surface wind shear, Aitken acceleration method, Direct Gaussian Elimination Method.

Two formulations of the rigid-lid, wind-driven lake circulation model were presented. The first formulation results in the standard quasi-steady elliptic pressure equation. The second, used in variable topography applications, is a time splitting formulation resulting in a second-order elliptic pressure equation with coefficients that vary at each time step. The pressure equations are discretized by the finite element method and the quickest equation solver identified as a function of the degree of equation nonlinearity, the time variability of the applied surface wind shear, and permissible computational time step. The equation solvers are standard, readily available, easily programmable, and include optimal successive over relaxation, double sweep successive over relaxation, Aitken acceleration, direct Gaussian elimination with back-substitution, and direct Gaussian elimination with repeated elimination. The conclusion was that for large incremented changes in boundary loadings over the numerical time step, direct elimination results in considerable computation savings. (Lee-ISWS)
W78-12281

SOLVING THE PIPE NETWORK ANALYSIS PROBLEM USING OPTIMIZATION TECHNIQUES,
Southern Methodist Univ., Dallas, TX.
M. Collins, L. Cooper, R. Helgason, J. Kennington, and L. LeBlanc.
Management Science, Vol 24, No 7, p 747-760, March 1978. 4 fig, 4 tab, 47 ref. OWRT C-7115 (6223)(1).

Descriptors: *Water distribution(Applied), *Pipes, *Networks, *Analytical techniques, Algorithms, Optimization, Newton-Raphson technique, Nonlinear programming, Linear programming, Hydraulic head, Equations, Mathematical models, Systems analysis, Costs.

For over forty years, approximate solutions for the classical pipe network analysis problem have been obtained by direct solution of the nonlinear stationary point conditions. Proposed is a revolutionary new approach involving optimization techniques for solving water distribution network problems. It is shown that the pipe network analysis problem may be described mathematically in terms of a nonlinear convex cost network flow problem. Three mathematical programming algorithms for solving this problem have been coded and are computationally compared with a code using the traditional Newton-Raphson technique. Considered are a Content Model, Co-Cotent Model, the Frank-Wolfe Method with and without Partan, and the Convex Simplex Method. The computational experience demonstrates that this new approach provides an efficient alternative for solving the pipe network analysis problem. (Bell-Cornell)
W78-12285

SOUTH AFRICAN COMPANY INVOLVED IN INTERNATIONAL WATER INJECTION CONSTRUCTION.
Civil Engineering Contractor (Johannesburg), Vol. 10, No. 9, p 49-54, 1976. 1 map.

Descriptors: *Offshore platforms, Oil wells, Oil fields, *Water injection, *Arabian Gulf, United Arab emirates.

A complex in the Arabian Gulf costing in the region of R300 million is being internationally constructed. The name of the game is water injection. It is the equipment for this which an armada is bringing to Umm Shaif for installing offshore in a complexity and size never before attempted. There are few schemes in the whole history of the petroleum industry which have been planned and executed with a more international approach. The scheme will inject a daily 700 000 barrels of water to achieve an oil production of 390 000 barrels a day. Because South Africa is playing an important

role this article is giving the gigantic facts. (So Afr Water Info Ctr)
W78-12418

35 KM TUNNEL SYSTEM FOR CAPE WATER SCHEME,
Department of Water Affairs, Pretoria (South Africa).
For primary bibliographic entry see Field 4A.
W78-12444

EFFECT OF STOCHASTIC MODEL CHOICE ON HYDRAULIC DESIGN,
Water Resources Center, Budapest (Hungary).
I. Bogardi, L. Duckstein, and E. Castano.
In: Stochastic Processes in Water Resources Engineering, Proceedings, 2nd Intern. IAHR Symp. on Stochastic Hydraulics, Lund Institute of Technology, Sweden, August 1976. Lars Gottschalk, et al. (Eds.), Water Resources Publications, Fort Collins, Colorado, 1977, p 265-292, (Chapter 12). 8 fig, 5 tab, 9 ref.

Descriptors: *Hydraulic design, *Effects, *Stochastic processes, *Model choice, *Hydrology, *Optimization, *Levees, Methodology, Backwater, Construction costs, Probability, Flood stages, Statistical methods, Economic efficiency, Flood damage, Cost minimization, Uncertanties, Chi-square, Sample likelihoods, Mathematical models, Equations, Systems analysis.

Investigated is the effect of stochastic model choice on the design of hydraulics works. The methodology is illustrated by the design of a flood levee along the confluence reach of a tributary in the Hungarian plain. This levee reach is subject to backwater effect, which depends on (1) the water stage at the confluence point, (2) the water stage at the upstream end of the protected reach of the tributary, (3) the hydraulic model choice for flood routing, and (4) the stochastic model choice for the joint probability density function. The focus herein is on the latter factor. The optimum levee design which minimizes the sum of the construction costs and the expected flood levee losses is characterized by the levee height at the ends of the reach, since the optimum levee profile should follow the backwater curve. The effect on the optimum design of choosing a stochastic model is investigated by using sample data to fit distributions from various families. It is found that choice of stochastic model may substantialy influence the decision. The relative importance of sample uncertainty and model uncertainty is then discussed. It is found that a Bayesian composite probability density function provides encouraging results for handling both model and sample uncertainties in hydraulic structure design. (Bell-Cornell)
W78-12527

CHOICE OF DISTRIBUTION FUNCTIONS FOR HYDROLOGIC DESIGN,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
E. Castano, L. Duckstein, and I. Bogardi.
Water Resources Research, Vol. 14, No. 4, p 643-652, August 1978. 4 fig, 3 tab, 40 equ, 21 ref, append.

Descriptors: Hydrology, *Design, *Decision making, *Probability, *Confluence reach, *Distribution functions, Flood loss, Levees, Annual, Hungary, Methodology, Optimization, Hydraulic models, Uncertainty, Submodels, Economics, Cost minimization, Bivariate statistics, Bayesian framework, Systems analysis, Equations.

The problem of selecting a bivariate probability density function (pdf) for the simultaneous water stages at both ends of a confluence reach is considered. This pdf is used to compute the expected flood losses in the design of a levee for which the total expected yearly cost is minimized. A case study in Hunary illustrates the methodology throughout the paper. Two model selection procedures are compared: ranking the candidate pdf's by the likelihood of the X2 statistic and ranking them by their sample likelihoods. A composite model consisting of a linear combination of candidate pdf's weighted proportionally to their sample likelihoods is also considered. It is found that the two selection procedures lead to different choices, which in the example represent a significant cost variation. Although the ranking of the distributions reduces the uncertainty by imposing an ordering within the candidate set, a unique pdf does not fully account for the model uncertainty. In this sense, the composite model seem a more reasonable choice, especially if the decisions are based on expected values. (Bell-Cornell)
W78-12552

SHOALING OF WAVES UNDER ICE,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2C.
W78-12641

INTEGRAL EQUATION FAILURE IN WAVE CALCULATIONS,
New Orleans Univ., LA. Dept. of Physics.
For primary bibliographic entry see Field 2L.
W78-12642

HYDROLOGIC ANALYSIS OF THE U.S. BUREAU OF MINES' UNDERGROND OIL-SHALE RESEARCH-FACILITY SITE, PICEANCE CREEK BASIN, RIO BLANCO COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
R. H. Dale, and J. B. Weeks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 267, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-28, May 1978. 35 p, 16 fig, 4 tab, 5 ref.

Descriptors: *Dewatering, *Shafts(Excavations), *Mining engineering, *Oil shales, *Computer models, Groundwater movement, Planning, Aquifer characteristics, Drilling, Testing, Model studies, Waste disposal, Evaluation, *Colorado, *Piceance Creek basin(Colo), Rio Blanco County(Colo).

The U.S. Bureau of Mines plans to develop an underground oil-shale research facility near the center of Piceance Creek basin in Colorado. The oil-shale zone, which is to be penetrated by a shaft, is overlain by 1,400 feet of sedimentary rocks, primarily sandstone and marlstone, consisting of two aquifers separated by a confining layer. Three test holes were drilled by the U.S. Bureau of Mines to obtain samples of the oil shale, and to test the hydraulic properties of the two aquifers. The data collected during construction of the test holes were used to update an existing groundwater-flow computer model. The model was used to estimate the maximum amount of water that would have to be pumped to dewater the shaft during its construction. It is estimated that it would be necessary to pump as much as 3,080 gallons per minute to keep the shaft dry. Disposal of waste water and rock are the principal hydrologic problems associated with constructing the shaft. (Woodard-USGS)
W78-12732

FLOW STILLING DEVICE,
Pro-Tech, Inc., Paoli, PA. (Assignee).
K. W. Martig, Jr.
U.S. Patent No. 4,081,998, 5 p, 8 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 969, No 1, p 52, April 4, 1978.

Descriptors: *Patents, *Flow control, *Conveyance structures, Conduits, Sewers, Flow measurement, Safety, *Flow stilling device.

A stilling device is especially useful in large water or sewer pipes of conduits having sufficient flow to render it unsafe to venture further than an overhead access opening to sample the flowing liquid or measure its flow rate. The stilling device of this invention is tubular T-shape. The base of the T comprises telescoping sections adapted to be secured together at given extended length. Openings through one side of the T base in a direction perpendicular to the plane of the T facilitate equalization of liquid level inside with the surrounding level when immersed in a water or sewer pipe or conduit. The cross-bar of the T aids retention of the stilling device in place. (Sinha - OEIS)
W78-12784

DRAG REDUCTION OF DEGRADED AND BLENDED POLYMER SOLUTIONS,
David W. Taylor Naval Ship Research and Development Center, Bethesda, MD. Ship Performance Dept.
T. T. Huang, and N. Santelli.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 214, Price codes: A03 in paper copy, A01 in microfiche. Report 4311, December 1975. 41 p, 8 fig, 2 tab, 17 ref.

Descriptors: *Drag, *Polymers, *Pipe flow, Laboratory tests, Mathematical models, Chemicals, Organic compounds, Solutes, Aqueous solutions, Energy, Degradation(Decomposition), Hydraulics, *Drag reduction.

A 3.18-cm-ID smooth turbulent flow pipe facility was utilized to measure the drag-reduction characteristics of three polymer solutions: Polyox WSR-301, Separan 237, and Magnifloc 835A. A rotating disk was used to degrade the polymer solutions, and accurate control was maintained over the energy used to agitate (shear degrade) the solutions. Quantitative data were obtained on the relationship between degradation and drag reduction for these three polymers and for blended solutions prepared by mixing two different polymers in various proportions. A length scale correlation of polymeric drag reduction appears to be self-consistent for the wide range of concentrations, shear stresses, and degrees of degradation of Polyox solutions investigated. Time scale correlation of polymeric drag reduction was found to be questionable. The drag reduction of the blended solutions was found to follow a simple addition rule. (Sims-ISWS)
W78-12831

FLUID FORCES ON OSCILLATING CYLINDERS,
Naval Postgraduate School, Monterey, CA. Dept. of Mechanical Engineering.
T. Sarpkaya.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW4, Proceedings Paper 13941, p 275-290, August 1978. 8 fig, 3 tab, 17 ref, 1 append.

Descriptors: *Flow resistance, *Hydraulic structures, *Laboratory tests, *Loads(Forces), Fluid mechanics, Vibrations, Uniform flow, Flow, Dynamics, Theoretical analysis, Analysis, Drag, Methodology, Resonance, Oscillating cylinders, Forced vibrations, Cylinders, Transverse force.

The paper presented the results of an experimental and analytical investigation of the forced oscillations of a circular cylinder in uniform flow. The transverse force was decomposed into two components, and the appropriate force-transfer coefficients were determined experimentally through the use of a Fourier averaging technique. The results then were incorporated into the equation of

motion to predict the dynamic response of elastically-mounted cylinders. The numerical predictions were found to be in good agreement with those obtained experimentally. The use of the experimentally obtained drag and inertia coefficients for the transverse force together with a numerical integration scheme accurately predicts the dynamic response of a self-excited cylinder in the synchronization region. A parametric study of the separate and combined effects of material damping, mass ratio, and the response parameter showed that the maximum response of the cylinder is governed by the response parameter alone only for S sub G (damping ratio/response parameter) values larger than about unity. Additional data and calculations are needed to explore the effect of these parameters further. It appears, on the basis of somewhat limited observations, that a self-excited system may exhibit unstable oscillations for certain combinations of the damping and mass ratios. (Humphreys-ISWS)
W78-12846

VERTICAL CYLINDERS OF ARBITRARY SECTION IN WAVES,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
M. de St. Q. Isaacson.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW4, Proceedings Paper 13973, p 309-324, August 1978. 7 fig, 1 tab, 20 ref, 2 append.

Descriptors: *Hydraulic structures, *Waves(Water), *Coastal engineering, *Loads(Forces), *Mathematical models, Ocean waves, Model studies, Offshore platforms, Hydrodynamics, Drag, Theoretical analysis, Analytical techniques, Equations, Numerical analysis, Energy, Mathematical studies, Wave energy, Cylinders.

The wave interaction with large vertical cylinders of arbitrary section extending from the seabed or deep water and piercing the free surface was considered. A method was developed for the efficient computation of the wave loads on such cylinders. There is a considerable economy of effort, both in the complexity of programming as well as in computer time and storage requirements, when the method outlined is applicable and is adopted in place of a more general one used for bodies of arbitrary geometry. Comparisons of the present numerical method were made with previous analytical, numerical, and experimental results, and good agreement was obtained in all cases. As examples of the program's application, results were presented for the forces on an isolated circular cylinder, neighboring circular cylinders, and a square caisson at arbitrary orientation to the incident wave direction. (Humphreys-ISWS)
W78-12847

FRICTION COEFFICIENT VARIATION WITH FLOW IN AN URBAN STREAM,
Severn-Trent Water Authority, Birmingham (England).
D. Butler, S. P. Rock, and J. R. West.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 3, p 227-232, May 1978. 6 fig, 5 ref.

Descriptors: *Open channel flow, *On-site tests, *Roughness coefficient, *Hydraulics, Mannings equation, Discharge(Water), Velocity, Measurement, Roughness(Hydraulic), Water conveyance, Streamflow, Natural channels, Data collections, On-site data collections, Foreign research, *England, Urban streams.

Three reaches of an urban stream were surveyed during low and medium flows. Velocity, level, and channel cross section data were used to investigate the variation of Manning's 'n' with flow for each reach. The magnitude of 'n' for both lined and unlined reaches at medium flows was within the ranges given in the references quoted in this paper. For low flows, the magnitude of 'n' increased by a factor of two. In unlined channels it was found that reaches should be selected carefully if representative data was to be acquired. Further work is required on these reaches to extend the data to cover higher flows. Similar studies in a range of channels would provide engineers with a firmer basis for design work. (Humphreys-ISWS)
W78-12863

8C. Hydraulic Machinery

LIQUOR REMOVAL FROM LAGOON SURFACES - USING FLOATING TAKE OFF LINE WITH COMPENSATION FOR LEVEL CHANGES.
German Patent DS 2406-857. Issued June 29, 1978.
Derwent German Patents Abstracts, Vol. A, No. 27, p 3, August, 1978.

Descriptors: *Sewage lagoons, *Intakes, *Floats, *Water levels, *Patents, Pipes, Inflow, Design data, Equipment, Floating, Waste water treatment, Municipal wastes.

A floating decantation apparatus which automatically adjusts to the liquid level in a waste water treatment lagoon has been patented. Floats mounted on an intake pipe maintain the liquid decantation orifice just below the surface of the liquid. The edge of the intake pipe lies behind a plane which is perpendicular to the influent source; this perpendicular plane also intersects the axis about which the intake orifice turns. As the level of liquid in the tank changes, the intake pipe inclines to compensate for the new level and maintains the inlet mouth below the surface as it turns. A constant volume of effluent is withdrawn from the lagoon by the apparatus, even in the presence of large liquid level fluctuations. (Lisk-FIRL)
W78-12195

THE YEOVILLE PUMP STATION A VARIABLE SPEED PUMPING INSTALLATION,
J. W. Clayton.
South African Mechanical Engineer (Johannesburg) Vol 27, No 5, p 151-156, 1977. 3 fig.

Descriptors: *Pumping plants, *Pumping stations, Noise, Pumps, Power requirements, Automatic instrumentation, Water supply development, Water users, Plant modifications, Cities, Urban renewal, Yeoville pump station, Johannesburg, *South Africa.

The problem of supplying water to rapidly expanding and densely populated areas like Berea and Hillbrow through existing mains, with greatest efficiency and overall economy, has been the one that has taxed the Johannesburg City Engineer's Department. This paper describes the installation chosen and how the problem was solved. Variable spped horizontal split casing pumps were used with commutator motor drives. The speed of these and the number in operation is controlled by balancing the output from a discharge pressure transducer against the tachegenerator fitted to the pumpset and the present required head potentiometer. Flow, pressure and reservoir level are recorded on three-day charts and a typical 24h cycle is shown. (So Afr Water Info Ctr)
W78-12401

AIRBORNE NOISE OF PUMPING PLANT,
P. W. Lightfoot.
South African Mechanical Engineer (Johannesburg) Vol. 27, No. 5, p 144-150, 1977. 6 fig, 9 ref, 2 tab.

Descriptors: *Pumping plants, *Pumps, Noise, Legislation, Environmental impairement, Cost effectiveness, South Africa.

In recent years, increasing attention has been given by manufacturers to the measurement and suppression of airborne and structure-borne noise produced by pumping plant. This interest, shared by customers who increasingly specify maximum noise levels for pumps in water and sewage works, petrochemical plants and power stations etc, stems from the increasing awareness of the harmful effect that noise has on the environment we live and work in, and should be seen against the background of increasing legislation to reduce noise. Manufacturers normally faced with making a compromise between several conflicting factors have, in a cost-conscious economy, steadily increased the specific output of their pumps by raising speeds, which has in turn tended to elevate noise levels. The paper describes the noise measuring procedures used by a leading British pump manufacturer. Major sources of noise generation both within the manufacturers and the end users control, are identified and means of reducing or eradicating them briefly discussed. Dynamic sound patterns produced by pumps running at part load conditions are recorded, showing that mean level noise metering is inadequate to quantify the disturbing and irritating nature of these sounds. Experimental information obtained over a period of years is collated in order to derive empirical formulae to estimate pump total and octave band sound pressure levels. (So Afr Water Info Ctr)
W78-12402

PLUGGING IN TO THE BIG DYNAMO,
Council for Scientific and Industrial Research Pretoria (South Africa).
For primary bibliographic entry see Field 3E.
W78-12445

PUMPING FOR WATER SUPPLY,
J. L. Gardiner.
South African Mechanical Engineer, Johannesburg, Vol 27, No 4, p 95-101, 1977.

Descriptors: *Potable water, *Pumping plants, *Pumping stations, Hydraulic head, Service reservoirs, *Water supply, Hydraulic gradient, Rand Water Board, Vaal River, Johannesburg, Pretoria, *South Africa.

In order to meet the continuous demands of its consumers, the water supply authority has to maintain a supply authority at a head generally above the source of water. The pumping system in many cases involves long pipelines and consequently marked friction head variations with changes in the pumping rate. To meet the requirements the type and arrangement of pumps demands careful consideration while sustained high efficiency is of great importance. The paper describes the problems involved and the selection of types and arrangements of pumping plant and of drives to meet the requirements. (So Afr Water Info Ctr)
W78-12448

CONCRETE VOLUTE PUMPS IN SOUTH AFRICA,
A. H. Laird.
South African Mechanical Engineer, Johannesburg, Vol 27, No 4, p 102-106, 1977.

Descriptors: *Concrete volute pumps, *Electric powerplants, Camden power station, *South Africa, Escom.

As the size of central power station low head circulating water pumps increased, manufacturers found it increasingly difficult to provide foundry and machine shop capacity to make the larger units - particularly if they were to be made in South Africa. It is therefore natural that the larger components should be built in situ in concrete. The paper gives the history of the building of concrete volute pumps and highlights some of the problems encountered. Construction methods are covered through photographs. (So Afr Water Info Ctr)

W78-12449

RECENT DEVELOPMENTS AND OPERATING EXPERIENCE WITH BOILER FEED PUMPS FOR LARGE CENTRAL POWER PLANTS,
J. D. Barrie, and J. F. Hood.
South African Mechanical Engineer, Johannesburg, Vol 27, No 4, p 112-118, 1977. 3 refs, 11 fig, 2 tab.

Descriptors: *Boiler feedwater, *Boilers, *Steam generators, Pumps, *Pumping plants, Sealing, Powerplants, Power generation, Equipment description, Couplings, Impellers, South Africa.

Summarises recent operating experience on boiler feed pumps for 500 MW and 660MW generators reviews the specific, related development work which has been carried out since the machines were first installed. Both operating experience and development work are correlated to illustrate their influence on current design practice. In particular, the aspects which contribute significantly to pump reliability are examined, including factors affecting impeller life, rotating element and bearing design and the selection of pump couplings and seals. Current analytical methods used in the design and commissioning of pumps are described. (So Afr Water Info Ctr)
W78-12450

PUMPS IN NUCLEAR POWER STATIONS,
G. C. Siegers, and M. Wiese.
South African Mechanical Engineer, Johannesburg, Vol 27, No 4, p 119-124, 1977. 7 fig.

Descriptors: *Power generation, *Nuclear power plants, *Nuclear reactors, Pumps, Sealed cooling system, Safety measure, Steam, Operation and maintenance, Impellers, *South Africa.

The recent development of nuclear power stations has created very special problems for pump manufacturers. Not only are the block capacities of a nuclear power station far greater than those of a conventional fossil fired generating plant, but also because of other complex environmental and technical factors the problems facing the pump engineer are totally different from the conventional ones. The article deals with the various pump duties required in a nuclear generating plant, and the special requirements involved. It must be obvious, that in the limited scope of this article the subject can only be discussed in general terms, and relatively superficially. (So Afr Water Info Ctr)
W78-12451

STEENBRAS HYDRO-ELECTRIC SCHEME.
Power and Plant in Southern Africa, August, 1977, p 26-30, 4 diagrams.

Descriptors: *Hydroelectric power, *Pumped storage, Tunneling, Dams, *Steenbras hydroelectric scheme, *South Africa.

Progress on the huge R40 million Steenbras pumped storage hydroelectric project is described. Murray and Stewart are the main contractors, with major sub-contractors RUC Mining and Contracting and Savage & Lovemore, on civil work on the project. This is valued, with escalation, at some R20 million. The article describes the Power station shafts, machine hall and annexes, the steel pipework, tunneling, control works and reservoir and key dates. (So Afr Water Info Ctr)
W78-12480

COMPREHENSIVE BASIN STUDY, RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, TEXAS. VOL. 5, APP. VIII: MINERAL RESOURCES AND MINERAL INDUSTRY: APP. IX: ARCHEOLOGICAL, HISTORICAL AND NATURAL RESOURCES: APP. X: HYDROELECTRIC POWER.
For primary bibliographic entry see Field 6B.

W78-12764

BIG BLACK RIVER, MISSISSIPPI: COMPREHENSIVE BASIN STUDY. VOL. V, AN. H: HYDROELECTRIC POWER: AN. I: ROLE OF THE STATE OF MISSISSIPPI IN THE PLANNING & DEVELOPMENT OF THE WATER AND RELATED LAND RESOURCES: AN. J: TRANSCRIPTS OF PUBLIC HEARINGS.
For primary bibliographic entry see Field 6B.
W78-12772

CONTROL VALVE AND SPEED ADJUSTMENT FOR WATER DRIVE IRRIGATION SYSTEM,
Heinzman Engineering, Inc., Grand Island, NE. (Assignee).
For primary bibliographic entry see Field 3F.
W78-12774

DRAGHEAD FOR SUCTION DREDGER,
Bos Kalis Westminster Group N.V., Sliedrecht (Netherlands). (Assignee).
J. F. R. Andreae.
U.S. Patent No. 4,083,132, 5 p, 6 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 969, No 2, p 419, April 11, 1978.

Descriptors: *Patents, *Dredging, *Channel improvement, Excavation, Jets, Equipment, Slurries, *Suction dredger, Draghead.

A method and a draghead to be used is described for sucking a slurry of earth and transport water by means of a trailing suction dredger. The draghead includes at least one cutter for loosening the earth and water guiding means is provided to guide the transport water to the suction line in a powerful jet substantially parallel to and along the top edge of the cutter. With such method and such a draghead a considerably higher concentration of solid material in the sucked slurry is obtained. (Sinha - OEIS)
W78-12792

SWINGABLE WATER AND SLUSH TUBE ASSEMBLY FOR SUCTION DREDGERS,
Ballast-Nedam Groep N.V., Amstelveen (Netherlands). (Assignee).
C. J. Ravesteyn, J. de Koning, and T. A. Wolters.
U.S. Patents No. 4,083,133, 8 p, 20 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 969, No 2, p 419, April 11, 1978.

Descriptors: *Patent, *Dredging, *Channel improvement, Excavation, Slurries, Equipment, *Suction dredgers, Slush tube.

In a suction dredger, the connection between the water tube flunge and the water duct flange is more reliable in operation, if the slush tube is adapted to turn by means of a rotary gland with respect to the slush tube flange to be rigidly coupled with the floating body, with the slush tube flange being connected through an arm with a water tube piece, while the water tube piece is connected through a flexible tubing with the water tube. (Sinha - OEIS)
W78-12793

SUCTION HEAD FOR DREDGERS,
Anglo Dutch Dredging Co. Ltd., Beaconsfield (England).; and Amsterdamse Ballast Bagger en Grond (Netherlands). (Assignee).
K. Oterdoom.
U.S. Patent No. 4,083,134, 4 p, 12 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 9569, No 2, p 419-420, April 11, 1978.

Descriptors: *Patents, *Dredging, *Channel improvement, Excavation, Equipment, *Suction dredge.

The object of the invention is to minimize the energy required for the displacement of the suction head and to ensure that even compact soil is sucked up to an efficient extent. For this purpose the roller is arranged inside the suction chamber, is substantially closed at its head faces, as suction openings being distributed in the circumferential direction across the contact surface. With the trailing dredger embodying the invention the compact soil is agitated by the discontinuous contact surface of the roller, after which it can be readily sucked up across the roller allowing the flow to pass. The discontinuous contact surface locally exerts mechanical forces on the ground, which loosen the soil and the discontinuous suction openings produce continuous variations of the flow pattern, so that a high erosive effect of the ground is obtained. (Sinha - OEIS)
W78-12794

FLEXIBLE CONNECTING ARRANGEMENT FOR SUCTION DREDGERS,
Ballast-Nedam Groep. N.V., Amstelveen (Netherlands); and Amsterdamse Ballast Bagger en Gran, b.v., Nieuwegein (Netherlands). (Assignee).
T. van den Brink, and T. A. Wolters.
U.S. Patent No. 4,083,135, 11 p, 19 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 969, No. 2, p 420, April 11, 1978.

Descriptors: *Patents, *Dredging, *Channel improvement, Excavation, Equipment, Flexibility, *Suction dredgers, Flexible joints.

In order to avoid damage of the additional ducts at the area of the pivotal joint, the known suction dredger is improved by passing at least one flexible duct for causing the additional ducts arranged at the side of the pipe sections to communicate with one another across the cardan joint. The flexible duct comprises a hose extending through coupling means and at least one hinge part of the universal joint. (Sinha-OEIS)
W78-12795

8D. Soil Mechanics

NEW ASPECTS OF SOIL FRACTURING IN CLAY,
Kentucky Univ., Lexington.
K. R. Massarsch.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 104, No. GT8, Proceedings Paper 13961, p 1109-1123, August 1978. 5 fig, 2 tab, 43 ref, 2 append.

Descriptors: *Clays, *Fractures(Geologic), *Hydrostatic pressure, Oil wells, Dams, Soil properties, Permeability, Pore pressure, Piles(Foundations), Grouting, Piezometers, Engineering, Civil engineering, *Hydraulic fracturing, Sand drains, Pile driving.

A theoretical analysis using cavity expansion theory suggested that soil fracturing can occur within the plastic zone during expansion of a cavity in clay. Results from pore pressure measurements during pile driving and hydraulic fracturing tests supported these theoretical conclusions. Practical consequences of soil fracturing were considered with respect to pile driving in clay, the efficiency of driven sand drains, as well as field permeability tests. An analysis of the hydraulic fracturing tests for determination of in-situ stresses indicated that, in almost al cohesive soils, fracturing is likely to occur along vertical planes in both normally and over-consolidated clays. (Sims-ISWS)
W78-12161

GOING UNDERGROUND SAVES ON COSTS,
A. B. Davis.
South African Tunnelling, Johannesburg, Vol. 2, No. 2, p 6-9. 1977. 2 ref, 1 tab, 2 diag.

Descriptors: *Tunnel construction, *Sewerage, Flow augmentation, Tunnel design, City planning, Cost reduction, Tunnel linings, Sandstones, Cost escalation, Poer requirements, Hillary tunnel, Umhlatuzana tunnel, South Africa.

The planning and design of the Hillary and Umhlatuzana Sewerage Tunnels is described. In his summing-up, the author points out that the additional capital cost of tunnelling is rapidly offset when the additional operating costs of any alternative pumping scheme are taken into consideration. (So Afr Water Info Ctr)
W78-12497

SEALING EARTH DAMS.
For primary bibliographic entry see Field 8G.
W78-12512

EFFECT OF STOCHASTIC MODEL CHOICE ON HYDRAULIC DESIGN,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 8B.
W78-12527

CHOICE OF DISTRIBUTION FUNCTIONS FOR HYDROLOGIC DESIGN,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 8B.
W78-12552

CLASSIFICATION AND ENGINEERING PROPERTIES OF DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 8G.
W78-12621

FEASIBILITY STUDY OF GENERAL CRUST MANAGEMENT AS A TECHNIQUE FOR INCREASING CAPACITY OF DREDGED MATERIAL CONTAINMENT AREAS,
Texas A and M Research Foundation, College Station.
K. W. Brown, and L. J. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 509, Price codes: A11 in paper copy, A01 in microfiche. Technical Report D-77-17, October 1977. 223 p, 121 fig, 11 tab, 4 append. DACW39-75-C-0120.

Descriptors: *Dredging, *Moisture content, *Feasibility studies, Silts, Feasibility, Moisture, Ditches, Materials, Meteorological data, Evaporation, Drying, Rainfall, Weirs, *Dredged material, *Crust management, Containment area, Capacity, Evaporative drying, Small dredge, Outflow weir.

The influence of meteorological conditions on the physical, chemical, and mineralogical properties of fine-grained dredged material on the formation of crusts resulting from evaporative drying in confinement areas was evaluated. After decantation, the moisture content of the surface layer was equivalent to about 2.5 times the liquid limit. Evaporation of moisture during the first stage of drying was nearly the same as that from an open pan until the moisture content decreased to about 1.8 times the liquid limit. After this, drying proceededf at a rate dependent on the transport of moisture to the surface. As the material desiccated, surface cracks opened. The volume shrinkage was equivalent to the volume of water evaporated as the crust formed, and evidence was given that the volume change was irreversible. Rainfall was shed from the crust and drained into the cracks, from which it ran off if channels were provided to the outflow weir. Management practices, including stirring and the removal of a thin layer of crust, produced only a small increase in evaporation rate for a few days. Systems were developed to dig drainage ditches in the confinements and to remove the consolidated crusts. (Roberts-ISWS)
W78-12622

8E. Rock Mechanics and Geology

PROBLEMS APLENTY ON EXPLORATORY CONTRACT.
South African Tunnelling, Johannesburg, Vol. 2, No. 2, p 11, 13, 1977.

Descriptors: *Adits, Pumped storage, Hydroelectric power, Fissures, Exploration, Monitoring equipment, *Rock excavation, Elandesberg scheme, South Africa.

Poor ground conditions encountered during the driving of a 440m exploratory adit at the site of the proposed Elandsberg Pumped Storage Scheme delayed tunnelling operations and required elaborate support measures. An extensive drilling and geotechnical programme accompanied the exploratory tunnelling. (So Afr Water Info Ctr)
W78-12498

EXPLORATION FOR ROCK ENGINEERING.
Construction in South Africa (Johannesburg) Vol 5, No 11, p 4-9 Supplement, 1976. 1 tab.

Descriptors: *Exploration, *Rock excavation, Pumped storage, Tunneling, Tunnel design, South Africa, Elandsberg pumped storage scheme, Drakensberg pumped storage scheme, Ruacana Hydropower scheme.

Held in Johannesberg during 1976 was the symposium on 'Exploration for Rock Engineering'. The purpose of the meeting was to identify the engineering parameters which control the design and construction of excavations in rock masses and over 40 papers were presented by both local and overseas experts. A special feature of the symposium was the presentation of several detailed South African case histories and these are reviewed in this article. Special mention is made of the Elandsberg and Drakensberg pumped storage schemes, while the Ruacana Hydro-power scheme is also discussed. (So Afr Water Info Ctr)
W78-12510

8F. Concrete

INVESTIGATION OF THE RESISTANCE OF FRESHLY INJECTED GROUT TO EROSION AND DILUTION BY FLOWING WATER,
Army Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
For primary bibliographic entry see Field 8G.
W78-12169

DURABILITY OF ASBESTOS-CEMENT PIPES IN LIQUID CORROSIVE MEDIA,
For primary bibliographic entry see Field 8G.
W78-12466

PRELOAD DESIGNED WATER RESERVOIRS IN BOKSBURG.
For primary bibliographic entry see Field 8G.
W78-12468

WATER TOWER FOR KURGERSDORP (IN AFRICANS).
Construction in Southern Africa, Johannesburg, Vol 22, No 6, p 25, 27, 31, 1977.

Descriptors: *Water supply, *Water towers, Potable water, Reservoirs, Prefabricated units, *Precaste concrete, Engineering structures, *South Africa.

The outstanding characteristic of the design of the Krugersdorp city council's new water tower is the use of heavy scaffolding. Shuttering is being completely eliminated eliminated during its construction, due to the use of precast and prestressed concrete. Details of the design and construction is given. (So Afr Water Info Ctr)
W78-12481

THE CRACKING OF EXPOSED CONCRETE PIPES: CAUSES AND REMEDIES,
D. J. Stern.
Municipal Administration and Engineering, Vol 42, No 505, p 57-73, 1977. 31 refs, 8 diagrams, 2 fig, 3 tab.

Descriptors: *Concrete pipes, *Thermal cracking, Reinforcement, Curing, Design standards, Temperature effect, Climatic factors, Thermal stress, Strains, Flexibility, Hydration, Shrinking, Pipe joints, Failure, Prevention, Condensation, Waterproofing, Thermal expansion, Thermal insulation, South Africa.

The article contains an assessment of damage to exposed concrete pipes caused by ambient temperature variations and subsequent movements, strains and stresses; an appraisal of means of preventing thermal cracking; and description of occurrences and magnitudes of cracks; and it discusses the necessity for flexible joints and for improvement by insulating the pipeline, and gives a description of insulating materials. (So Afr Water Info Ctr)
W78-12483

CRACKING ON THE EXPOSED CONCRETE PIPELINE OF THE DIEPSLOOT OUTFALL SEWER, JOHANNESBURG: FIELD INVESTIGATIONS AND INTERPRETATIONS,
M. G. Alexander.
Municipal Administration and Engineering, (Johannesburg), Vol 43, No 502, p 6, 9, 11-13, 15, 1977, 6 fig.

Descriptors: *Concrete pipes, *Thermal cracking, *Sewers, Field tests, Distribution pattern, Temperature measurement, Strain measurement, Diurnal variations, Watertight, Seasonal variations, Stress analysis, *Thermal expansion, Thermal insulation, Fibre glass, Polyurethane, South Africa.

The causes of the cracking of exposed concrete pipes on the Diepsloot outfall sewer pipe bridges at Johannesburg. Thermal strain measurements showed that the cracking was caused by thermal bending set up by the difference in temperature between the inner and outer surfaces of the pipes. Experiments conducted on discrete insulated pipes showed that cracking could be controlled or arrested. Important conclusions for the design of exposed concrete pipes yielded by the experimental measuring programme are reached. (So Afr Water Info Ctr)
W78-12486

CORROSION RESISTANCE AND DURABILITY OF ASBESTOS-CEMENT PIPES.
For primary bibliographic entry see Field 8G.
W78-12496

8G. Materials

CLEANING RAKE ARRANGEMENT FOR A DRAIN CHANNEL GRID - IS OF LOW, STABLE CONSTRUCTION AND SUITABLE FOR GRIDS WITH STRAIGHT BARS.
German Patent DS 2608-774. Issued May 24, 1978. Derwent German Patents Abstracts, Vol. A, No. 22, p 3, July, 1978.

Descriptors: *Cleaning, *Sewers, *Drains, *Patents, *Hydraulic equipment, Sanitary en-

gineering, Sewerage, Design data, Dredging, Channels, Bearings, Equipment, Waste water treatment, Municipal wastes.

A cleaning rake for clearing sewer gratings is suitable for sewer grids with straight bars. The rake apparatus has teeth which slant about a horizontal axis and are attached to a rake arm unit which also pivots about a horizontal axis. Vertical motion of the rake arm is provided by a drive mechanism on the underwater side of the sewer grate. The arm assembly is mounted with its pivot shaft located along a curved guide track, forming a two-armed lever. The apparatus is driven by a continuous chain containing fixed sprockets which are located along the guide track and connected to the rake arm. The arm is attached to the side of the pivot shaft by a swinging bearing and to the free end of a swinging support. The cleaning rake apparatus can be moved to an inoperative position, a cleaning mode, and a horizontal discharge position for disposing of the materials to a collection system. (Lisk-FIRL)
W78-12121

LOCATING DRAINAGE SYSTEMS BY MAGNETOMETER SURVEYS,
Toledo Univ., OH. Dept. of Geology.
L. C. Ruedisili, and S. M. Logan.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR3, Proceedings Paper 13996, p 261-273, Sept. 1978. 7 fig, 14 ref, 2 append.

Descriptors: *Subsurface drains, *Magnetic studies, *Drainage systems, *Pipes, Surveys, Locating, Equipment, Instrumentation, Irrigation, Clay pipes, Plastic pipes, Concrete pipes, Remote sensing, Agriculture, Magnetometers.

The feasibility of using a portable, proton precession, ground magnetometer in the location of subsurface drainage systems was analyzed. Seasonal (fall, winter and spring) surveys of a field drained by clay tile and plastic (PVC) pipe and of a specially constructed test plot on agricultural land were presented. Magnetic anomalies over the drainage lines resulting from the contrast contract between the drain material, the void in the drain, and the surrounding soil were identified. This magnetic contrast was not affected by the different seasons or the moisture content of the soils. Developed methodology for magnetic location of drains showed that this technique is inexpensive after the initial machine purchase, it is relatively quick, it can be used with or without crop cover, it can be used in any season other than winter, and it requires only minimum manpower and limited technical skills by the magnetometer operator and data interpreter. (Sims-ISWS)
W78-12142

INVESTIGATION OF THE RESISTANCE OF FRESHLY INJECTED GROUT TO EROSION AND DILUTION BY FLOWING WATER,
Army Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
D. M. Walley.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 260, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper C-76-4, June 1976. 32 p, 8 fig, 4 tab, 4 ref.

Descriptors: *Materials testing, *Open channel flow, *Cement grouting, *Erosion rates, Erosion, Laboratory tests, Velocity, Viscosity, Cements, Bentonite, *Grouts, Admixtures, Time of set.

The relative resistance of 35 grout formulations to the effects of erosion and dilution by flowing water with a velocity of 0.3 fps or more was determined by a series of height-of-grout measurements conducted at fixed intervals along the transparent side of a flow channel model. Grout retention in the channel was determined immediately after injection in the flowing water and after 1 or 2 hr of additional water flow. Grouts that were more resistant to the effects of flowing water than other grouts tested were identified, and the materials and physical properties contributing to their increased resistance were discussed. (Adams-ISWS)
W78-12169

EVAPORATION: SOME PROBLEMS AND THEIR SOLUTIONS,
For primary bibliographic entry see Field 3E.
W78-12458

DURABILITY OF ASBESTOS-CEMENT PIPES IN LIQUID CORROSIVE MEDIA,
S. Barshlomo.
Municipal Engineer, Vol 8, No 4, p 11-15, 1977. 8 ref, 1 fig, 1 graph.

Descriptors: *Durability, *Asbestos cement pipes, *Corrosive liquids, Potable water, Sewerage, Water supply, *Corrosion resistance, Acids, Hydrogen sulphide, Carbon dioxide, Coatings, Sulphate, Chloride, South Africa.

One of the important arguments for the application of asbestos-cement pipes, for carrying both potable water and sewage, is their high resistance to most corrosive media encountered in practice. This, in fact, is one of the reasons for the enormous development the asbestos-cement industry has experienced during the last 15 years: the increase in range of nominal diameters, from 1,000 mm to 2,500 mm, in which asbestoscement pipes are presently produced and applied. Describes the use of asbestos-cement pipes for stormwater drainage, high corrosion resistance and the effects of aggressive substances on asbestos-cement pipes. (So Afr Water Info Ctr)
W78-12466

PRELOAD DESIGNED WATER RESERVOIRS IN BOKSBURG.
Municipal Engineer, Vol 8, No 4, p 55-57, 59, 1977.

Descriptors: *Reservoir construction, Water supply, *Prestressed concrete, *reinforced concrete, *Design criteria, South Africa.

The Preload system for prestressed concrete reservoirs is becoming more and more popular in South Africa. Many municipalities as well as the Rand Water Board approach Preload directly for their designs and have in fact specified Preload designed reservoirs in their tenders. Up to date some 80 tanks have been built according to the Preload system and it looks as though many more are to follow. Two of these reservoirs are currently under construction in Boksburg, one at Sunward Park and one at Impala Park. The main contractor, Peter Faber (Pty) Ltd. is able to save 30 weeks construction time by making use of this system, resulting in a considerable saving in cost for the municipality. Another cost saving factor is the fact that specialized equipment and shuttering is hired from Preload, thus avoiding capital outlay on the contractor's part. (So Afr Water Info Ctr)
W78-12468

THE BASIC DESIGN OF JOHANESBURG'S DIEPSLOOT OUTFALL SEWER BRIDGE STRUCTURES, WITH SPECIAL REFERENCE TO MAJOR THERMAL MOVEMENTS,
For primary bibliographic entry see Field 5E.
W78-12482

THE CRACKING OF EXPOSED CONCRETE PIPES: CAUSES AND REMEDIES,
For primary bibliographic entry see Field 8F.
W78-12483

CORROSION RESISTANCE AND DURABILITY OF ASBESTOS-CEMENT PIPES.
Municipal Engineer, Vol. 8, No. 5, p 79-89, 1977. 12 ref.

Descriptors: *Corrosion resistance, Durability, *Asbestos cement, Pipes, Potable water, Service life, Strength, Pipelines, Sewers, Protective coating, Sewage gas, Industrial wastes, Hydrogen sulphide, Corrosion protection, Pipe joints, Soil corrosion, Deterioration, Bitumens, Epoxy resins, Abrasion, South Africa.

The article deals with questions being asked on the subject of the durability of asbestos-cement pipes in liquid corrosive media and discusses abrasion, corrosion protection (coatings); External (soil) corrosion; Industrial effluents; Domestic sewage and corrosion of joints. (So Afr Water Info Ctr)
W78-12496

SEALING EARTH DAMS.
Building and Construction (Johannesburg), June 1976, p 26.

Descriptors: *Earth dams, *Soil sealants, Leakage, Evaporation ponds, *Sealants, South Africa.

The use of Hydroseal is described, a product used for sealing leaking earth dams. The product, which is a 100 per cent South African, manufactured product, is easy to lay and usually costs less than R1 per sq. metre to apply. Mention is also made of projects where this product has been used, as well as of other products in the same range that can be used for sealing metal and concrete reservoirs. (So Afr Water Info Ctr)
W78-12512

CLASSIFICATION AND ENGINEERING PROPERTIES OF DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
M. J. Bartos, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 768, Price codes: A09 in paper copy, A01 in microfiche. Technical Report D-77-18, September 1977. 170 p, 65 fig, 39 tab, 31 ref, 4 append.

Descriptors: *Dredging, *Soil properties, *Soil classification, Compaction, Sampling, Landfills, Soil mechanics, Dewatering, Soils, Soil engineering, Grain size, *Dredged material, *Soil sampling, Dewatered dredged material, Soil mechanics tests, Urban development, Field conditions.

Dredged material data and classification and engineering reports were acquired from Corps of Engineers Districts, from published reports, and from a program of sampling and testing of material to be dredged. Standard soil properties tests were used to determine the classification and engineering properties of dredged material samples. Sampling test specimen preparation, and test descriptions were presented. Samples were classified in accordance with each of 4 standard soil classification systems. The engineering properties of 10 samples of compacted dredged material were determined, and the results showed that dewatered dredged material has properties comparable to those of similar types of soil. The engineering properties of dredged material in some containment areas were presented, showing the variation of properties with depth, time, and distance from the dredge discharge pipe. The study concluded that dewatered dredged material is a soil, can be analyzed as a soil, and can be used as a soil. The use of soil mechanics tests and the comparison between soil and dredged material were presented to encourage the productive use of dredged material as a natural resource in urban and other development projects, especially in areas where a landfll could be met by available dredged material. (Roberts-ISWS)
W78-12621

WATER LEVEL ALARM APPARATUS,
For primary bibliographic entry see Field 4A.
W78-12773

DIRT FILTER FOR WATER PIPES,
For primary bibliographic entry see Field 5G.
W78-12791

DRAG REDUCTION OF DEGRADED AND BLENDED POLYMER SOLUTIONS,
David W. Taylor Naval Ship Research and Development Center, Bethesda, MD. Ship Performance Dept.
For primary bibliographic entry see Field 8B.
W78-12831

8I. Fisheries Engineering

EVALUATING AQUACULTURAL USE OF THERMAL EFFLUENTS: AN APPLICATION OF SYSTEM DYNAMICS TO ENVIRONMENTAL PROBLEM SOLVING,
Rhode Island Univ., Narragansett. Coll. of Business Administration.
For primary bibliographic entry see Field 5G.
W78-12196

HOMING OF RAINBOW TROUT TRANSPLANTED IN LAKE MICHIGAN: A COMPARISON OF THREE PROCEDURES USED FOR IMPRINTING AND STOCKING,
Wisconsin Univ.-Madison. Lab. of Limnology.
A. T. Scholz, C. K. Gosse, J. C. Cooper, R. M. Horrall, and A. D. Hasler.
Transactions of the American Fisheries Society, Vol 107, No 3, p 439-443, 1978. 2 tab, 1 fig, 16 ref.

Descriptors: *Rainbow trout, *Lake Michigan, Aquiculture, Wisconsin, Fish physiology, *Fish behavior, Juvenile fish, *Fish migration, On-site investigation, Fish management, Fish guiding, *Fish attractants, *Morpholine, Imprinting, Little Manitowoc River.

The homing ability of three groups of rainbow trout (Salmo gairdneri) stocked in Lake Michigan by different procedures was compared. One group of juvenile rainbow trout was imprinted to a synthetic chemical, morpholine, during the presmolt and smolt stages, and a second group was not imprinted. Both groups were stocked directly into Lake Michigan, 1 km north of the Little Maniowoc River. A third group of trout was retained in a pond on the Little Manitowoc River during the presmolt and smolt stages and then released into Lake Michigan at the same location as the other two groups. During the adult spawning migration, morpholine was metered into the Little Manitowoc River. This river and 16 other locations were monitored for returning fish. Themorpholine-imprinted fish returned to the Little Manitowoc River in greater numbers and strayed less than did fish from the other two treatment groups. This result is a consequence of exposure to a unique odor cue at the critical period for imprinting. (EIS-Katz)
W78-12517

A RESEARCH PROGRAM TO EXAMINE FISH BEHAVIOR IN RESPONSE TO HYDRAULIC FLOW FIELDS - DEVELOPMENT OF BIOLOGICAL DESIGN CRITERIA FOR PROPOSED WATER DIVERSIONS,
California Univ., Davis. Dept. of Wildlife and Fisheries Biology.
C. H. Hanson, and H. W. Li.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 992, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, Feb 1978. 23 p, 5 fig, 3 tab, 9 ref, append. OWRT C-7679 (No 7254)(1).

Descriptors: *Water intakes, *Fish guiding, *Fish behavior, *Fish barriers, Fish physiology, Water cooling, Electric power plants, Fish attractants, Hydraulic design, Design flow, Bio-energetics, *Design criteria, *Water diversion, *Intake velocity, Entrainment, Impingement.

An approach is developed for deriving intake velocity design criteria based on the interaction of bioenergetics and fish behavior in velocity gradients. Agreement between estimated energetically optimal swimming speeds and the mean of observed behaviorally selected swimming speeds for juvenile chinook salmon, bluegill, and silversides was good (r = 0.92). These results support the hypothesis that the behavioral response of fish to a hydraulic flow field is predictable in terms of an energeticaly optimal swimming speed for a given species and size class of fish. Physical and biological factors which influence the application of this approach to the development of design criteria which would minimize impingement losses at water intakes are discussed. Limitations of this approach and areas requiring additional research are suggested.
W78-12602

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ENHANCEMENT OF WATER RESOURCES INFORMATION TRANSFER AND RESEARCH IN VERMONT,
Vermont Univ., Burlington. Water Resources Research Center.
For primary bibliographic entry see Field 10D.
W78-12116

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

WISCONSIN GROUND WATER - AN ANNOTATED BIBLIOGRAPHY, 1973-1977.
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 2F.
W78-12135

BIBLIOGRAPHY OF CANADIAN GLACIOLOGY, 1975 - BIBLIOGRAPHY NO. 1, GLACIER INVENTORY NOTE NO. 10,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W78-12252

BIBLIOGRAPHY ON MARINE POLLUTION IN SOUTH AFRICA,
Council for Scientific and Industrial Research, Johannesburg (South Africa).
For primary bibliographic entry see Field 5B.
W78-12404

BIBLIOGRAPHY AND INDEX OF WISCONSIN GROUNDWATER, 1851-1972: ADDENDUM 1834-1972.
Wisconsin Univ.-Madison. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 313, Price codes: A03 in paper copy, A01 in microfiche. Technical Report WIS WRC 78-04, 1978. 39 p. Compiled by A. Zaporozec. Addendum to Special Report No. 2, Wisconsin Geological and Natural Survey. OWRT A-081-WIS(1), 14-34-0001-7106.

Descriptors: *Groundwater, *Bibliographies, *Indexes, *Wisconsin.

First annotated supplement to the Bibliography and Index of Wisconsin Ground Water, 1834-1972, includes 130 citations to publications on various aspects of Wisconsin's ground-water resource which were published during the year 1973 through 1977. The references were annotated from the following source materials: reports in professional and trade magazines and journals; reports, studies and unpublished material in federal, state and local files; books, documents and conference proceedings; and student theses in the University of Wisconsin libraries. The references are arranged by author for each calendar year, and accompanied by author, country, and general reference indexes. An abbreviation in the upper right corner of each entry indicates the library where the reference is located. (See also W78-12135)
W78-12600

THE WORLD REMOTE SENSING BIBLIOGRAPHIC INDEX,
Tensor Industries, Inc., Falls Church, VA.
For primary bibliographic entry see Field 7B.
W78-12618

ELM-ASH-COTTONWOOD FOREST TYPE BIBLIOGRAPHY,
Purdue Univ., Lafayette, IN. Dept. of Forestry and Natural Resources.
For primary bibliographic entry see Field 2I.
W78-12681

POLAR CONTINENTAL SHELF PROJECT. TITLES AND ABSTRACTS OF SCIENTIFIC PAPERS SUPPORTED BY PCSP.
Department of Energy, Mines and Resources, Ottawa (Ontario) Polar Continental Shelf Project.
For primary bibliographic entry see Field 5C.
W78-12819

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1976.
Australian Water Resources Council, Canberra Dept. of National Resources.
For primary bibliographic entry see Field 2A.
W78-12833

10D. Specialized Information Center Services

ENHANCEMENT OF WATER RESOURCES INFORMATION TRANSFER AND RESEARCH IN VERMONT,
Vermont Univ., Burlington. Water Resources Research Center.
E. A. Cassell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 067, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, November 1977. 15 p. OWRT A-029-VT(1).

Descriptors: *Research priorities, *Information exchange, *Vermont, Information transfer, Education, Research and development, Universities, *Water Resources Institute.

Research on the water resources of Vermont is severely restricted due to limited local and state funds. The annual allotment funds of the Vermont Water Resources Research Center are thus used to focus and enhance water research in Vermont on priority problems and to establish ongoing information transfer among researchers and between researchers and the community. Objectives of this

study were: (1) enhance the effectiveness of information transfer activities of the Vermont Water Resources Research Center, (2) encourage additional research funding and advanced educational activities relating to water resources, and (3) implement techniques for increasing the impact of the Vermont Water Resources Research Center on water research, education, and information transfer activities. Specific accomplishments of the Vermont Water Resources Research Center include: (1) the initiation of an awareness program of the Water Center, (2) achieving the creation of close working relationships with State, federal and local agencies and citizen groups, (3) the sponsoring of conferences and seminars on regional and local water resource problems and research, (4) the production of slide/tape show 'Research On Lake Champlain', (5) the development of A Six Year Program for Lake Champlain Research, and (6) the execution of outside funded research by Water Center personnel.
W78-12116

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